Springwood Development Nominees Pty Ltd

Land division creating an additional 1,201 allotments with associated bulk earth works, landscaping and removal of 47 Regulated Trees and 40 Significant Trees.

Calton Road Gawler East

960/D025/19 and 490/D026/19

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OVERVIEW

Application No	960/D025/19 and 490/D026/19
Unique ID/KNET ID	65313 /2019/09109/01 and 65314 2019/09104/14
Applicant	Springwood Development Nominees Pty Ltd
Proposal	Torrens Title land division - creating one-thousand two-hundred and one (1,201) allotments from six (6) existing allotments together with the removal of forty-seven (47) regulated trees and forty (40) significant trees
Subject Land	Calton Road, Gawler East • Volume 6186 Folio 896 (Allotment 9011, DP 114845) • Volume 6205 Folio 146 (Allotment 9010, DP 114845 • Volume 6212 Folio 430 (Allotment 7030, DP 119118) • Volume 6118 Folio 249 (Allotment 2, FP 7765) • Volume 6162 Folio 334 (Allotment 4, DP 28814) • Volume 6184 Folio 173 (Allotment 1, FP 13468)
Zone/Policy Area	Residential (Gawler East) Zone / Mixed Use Centre Policy Area 3 Open Space Zone
Relevant Authority	State Commission Assessment Panel *as delegate of the State Planning Commission
Lodgement Date	13 June 2019
Council	Town of Gawler and The Barossa Council
Development Plan	Gawler (CT) Development Plan (consolidated 20 February 2018) The Barossa Council Development Plan (consolidated 1 November 2018)
Type of Development	Merit
Category	Category 1
Representations	N/A
Schedule 8 Referrals	- Environment Protection Authority - Minister for Transport, Infrastructure and Local Government
Technical Responses	- Town of Gawler - The Barossa Council - SA Water Corporation - Department for Energy and Mining (Office of the Technical Regulator) - DPTI –Mark Maintenance - DPTI- Public Transport Division - Department of Education and Child Development
Report Author	Hannah Connell- Planning Officer
RECOMMENDATION	Development Plan Consent and Land Division Consent be **granted** subject to conditions

EXECUTIVE SUMMARY

The application seeks Development Plan Consent and Land Division Consent to convert approximately 186.1 hectares of vacant land into a master planned residential development comprising 1,201 Torrens Title allotments, associated public roads, drainage infrastructure, open space, earthworks, landscaping and future development provision for a village centre and educational precinct. The proposal also involves the removal of 47 Regulated Trees and 40 Significant Trees.

The site traverses two Council areas – the Town of Gawler ("Gawler Council") and The Barossa Council ("Barossa Council"). The portion of land that sits within the local government area of the Barossa Council is contained to the south-western corner of the site with the remaining majority of the subject site being situated in Gawler Council.

In August 2010, the land was subject to a Ministerial Development Plan Amendment (DPA), which saw the zone change, in both the Gawler Council and the Barossa Council Development Plans, to the Residential (Gawler East) Zone. The Gawler Council Development Plan zoning includes two policy areas as follows: Mixed Use Centre Policy Area 3, and Local Centre Policy Area 19.

The site is characterised by its steep topography, remnant vegetation and former quarry industry. Some key features of the land include Spring Creek and areas of native vegetation.

The proposed allotment configuration avoids areas of highest vegetation cover (where practical) and maintains over 70ha of the site in open space reserves.

Comprising a Category 1 form of development, the application did not undergo a process of public consultation as prescribed by Section 38(3) of the *Development Act 1993.*

Subject to conditions and standard requirements, no objections were raised by Schedule 8 referral bodies, or state agencies that were consulted for the purpose of obtaining technical advice pursuant to Section 29(3) of the *Development Act 1993*.

Gawler Council support the proposed proposal from the perspective of it seeking to establish a residential precinct, supported by commercial and social services, within a zone that envisages such development. The Gawler Council, however, object to matters pertaining to technical requirements which are detailed further in this report. The Barossa Council are generally supportive of the proposal however they too have raised some technical matters in relation to the Applicant's approach to infrastructure. The comments submitted by Gawler Council and Barossa Council are summarised, together with a corresponding response from DPTI planning staff, in Section 4 of this report.

On balance, it is considered that the proposed land division is not seriously at variance with the Gawler Council and Barossa Council Development Plans, such that it achieves the spirit and intent of the Residential (Gawler East) Zone, Mixed Use Centre Policy Area 3 and the Open Space Zone.

Accordingly, it is recommended that the SCAP grants Development Plan Consent and Land Division Consent (and subsequently Development Approval), subject to conditions and further requirements to be satisfied before the issuing of a Certificate under Section 51 of the *Development Act 1993*.

ASSESSMENT REPORT

1. BACKGROUND

1.1 Strategic Context

The site area comprises a total area of 186.1 hectares. The site is located within the Residential (Gawler East) Zone and Open Space Zone of the Gawler Council and the Barossa Council Development Plans. The desired character of the Zone (and Policy Area) envisages residential development occurring at low-to-medium density, with increased dwelling densities in proximity to centres, future public transport routes and public open spaces.

The plan of division proposes a variety of allotment sizes ranging from 210sqm to greater than 660sqm.

From a strategic perspective, the nature of the proposal is broadly consistent with the zoning for the land.

1.2 Pre-Lodgement Process

Two pre-lodgement meeting were carried out for this application.

- 21 Mach 2019; and
- 28 March 2019

2. DESCRIPTION OF PROPOSAL

Application details are contained in the ATTACHMENTS.

The overall design approach has been prepared by Tract and is derived around the concept of place-making.

'A place making approach considers the physical, cultural, and social qualities of a place and fosters their ongoing evolution'.

The physical representation of the land division is comprised of the following components:

- 186.1 hectares of land
- The creation of 1,201 residential allotments at a nett density of 6.45 dwellings per hectare;
- 15% affordable housing;
- A network of new local roads and laneways;
- Provision of land suitable for future development (Village Centre and Educational establishment);
- A detailed landscaping scheme for recreation areas, drainage and road reserves;
- Dedicated stormwater infrastructure including detention dam, infiltration wells, swales, wetlands and ecological sponges;
- Ancillary service infrastructure as required (sewer, electricity etc.);
- The retention of 296 Regulated and Significant trees (combined total) across the site; and
- Removal of 47 Regulated trees and 40 Significant trees.

The development will benefit from the newly constructed Gawler East Link Road and is proposed to be connected to the existing road network in the following manner:

- New link at Cheek Avenue and Calton Road intersection;
- Access to Calton Road to the proposed future Village Centre site;
- Collector Road to Balmoral Road; and
- Gawler East link Road (GELR) to west of the site.

The proposed allotments will support a range of dwelling types including large detached dwellings on low density allotments where land contours are the steepest, and medium density dwellings in proximity to the Village Centre.

The development also includes the provision of standard service infrastructure including Electricity, sewer, gas and potable water supply.

3. SITE AND LOCALITY

3.1 Site Description

The site consists of 6 allotments which traverses the local government boundary shared by the Gawler Council and the Barossa Council and is approximately 1.5km east of the Gawler Town Centre, and 37 km north of the City of Adelaide.

The subject site is legally described as:

Lot No	Suburb	Hundred	Title Reference
9011, DP 114845	Gawler East	Barossa	Volume 6186 Folio 896
9010 DP	Gawler East	Barossa	Volume 6205 Folio 146
7030 DP	Gawler East	Barossa	Volume 6212 Folio 430
2 FP 7765	Gawler East	Barossa	Volume 6118 Folio 249
4 DP 28814	Gawler East	Barossa	Volume 6162 Folio 334
1 FP 13468	Kalbeeba	Barossa and	Volume 6184 Folio 173

The proposed site has a 'primary frontage' on Calton Road (to the north) measuring approximately 1,013.66 m and extends south toward the South Para River, comprising a total area of 186.1 hectares.

The site contains vacant land used for grazing and agriculture. The north-western portion of the site was previously used as a sand quarry. Quarrying operations ceased in the year 2000.

The site is distinguished by its open rural character, rolling hills with gradients that range between 5-18%, and clusters of mature vegetation. Native vegetation is scattered around the site and includes Mallee Box trees and Iron-grass temperate grassland.

Gawler East Link road ("GELR") (a DPTI road project) dissects the land at its median, approximately 200m south of Calton road. The GELR links the site to Main North Road to the south-west, directing vehicles away from the Gawler Town Centre. The road is still currently under construction and projected to be finished in mid-2020.

A number of easements are registered on the subject land for the provision of electricity, water supply and a high-pressure gas transmission pipeline. These include;

- *An above ground 750mm diameter Barossa Trunk Main;*
- *450mm diameter high pressure SEA Gas transmission pipeline and associated 'main line valve'*
- *275kV overhead electricity power line within a 100 metre wide easement; and*
- *132 kV overhead electricity power lines within a 30 metre wide easement*.

3.2 Locality

The northern and western parts of the locality are characterised by traditional residential development comprising a variety of architectural styles on low-to-medium density allotments. The north-eastern part of the locality contains Easton Drive, part of the recently developed 2015 Springwood development, comprising 387 residential allotments which occur at medium-to-low density.

The southern and eastern parts of the locality are characterised by vast areas of low-intensity horticulture and agriculture, made more visually prominent than other parts of

the locality due to natural topographical features. Calton Road provides connections west toward the Gawler Town Centre and east to the Barossa food and wine district. South-west of the site lies the South Para River and toward the south-east lies the Barossa Character Preservation District, an area where scenic and rural landscapes are highly valued.

In terms of community facilities, the main facilities are provided within the heart of the Gawler Town Centre, approximately 1.5 km west of the subject site. These include common services such as shops and restaurants and the Gawler Central rail station. The nearest public transport facilities are located to the west of the site on Cheek Avenue. This includes two bus routes (492A and 492C) connecting to the Gawler Town Centre and railway station.

There is no public transport route or dedicated bicycle lane on Calton Road.

4. COUNCIL COMMENTS or TECHNICAL ADVICE

4.1 Gawler Council

The application was referred to the Gawler Council for technical comments for the purposes of the *Development Regulations 2008, 'Division 2 – Prescribed requirements – general land division'*, for the purposes of sections 33(1)(c)(v) and 51(1) of the Act. For the sake of specificity, the matters prescribed in *Division 2*, include the following:

- Widths of roads and thoroughfares
- Road widening
- Requirement as to forming roads
- Construction of roads, bridges, drains and services
- Supplementary provisions

Further to the above, in relation to the 'open space contribution scheme', section 50(2)(d) and section 50(3) of the Act, requires the SCAP to be satisfied that where land will be vested with a council to be held as 'open space' that the council is a party to an agreement as referred to in section 50(2)(d).

During the course of assessment, the ToG provided two responses:

- *First response received (15th August 2019)*
- *Second response received (12th December 2019)*

In summary, the following comments were made:

- Council does not support the granting of Development Plan Consent or Land Division Consent at this stage.
- Council does not agree with the proposed vesting of land and assets as proposed.
- Infrastructure Deeds between Council and the developer are required for the provision of essential infrastructure.

A summary of the main issues is provided below (please refer to attachment(s) for full copy of comments)

Comments		***Officer Response***
Vesting of Assets	Council has significant concerns with the process of SCAP potentially approving land and infrastructure assets which is proposed to be vested into Council Ownership. These assets	Division 2, regulation 54 of the Regulations requires the construction of assets i.e. roads, bridges, drains to be constructed with materials, and to a standard, approved by the Council.

	will be required to be managed and maintained in perpetuity by Council on behalf of the community, and if not adequately designed and constructed will impose a significant and ongoing financial burden on Council into the future. It is recommended that the Council approve all detailed design, a relevant construction methodology and the final state of any Infrastructure being vested into Council ownership.	This requirement is recommended to be secured by condition of LDC requiring agreement with Gawler Council prior to the issue of a certificate under section 51(1) of the Act. In relation to open space, section 50(3) of the Act requires council to be party to an agreement in relation to the land to be held as open space. As this is not a requirement for the purposes of issuing a certificate under section 51(1) of the Act, it is recommended that this requirement be subject to a condition of DPC.
Stormwater Infrastructure and Management	The stormwater strategy is not consistent with the Town of Gawler Stormwater Watercourse Management Policy. The Council have raised the following concerns with the strategy: • Strategy results in a significant dam structure in Spring Creek. • Offline strategies have been demonstrated to be feasible outside Spring Creek (for another land developer). • Council are not supportive of vegetation in Spring Creek to reduce erosion risk, given that it will be sited within land protected under the EPBC Act. • The stormwater strategy does not allow for major storm overland flow path to dispose of water in a safe and efficient way from the proposed road reserves. • Council have concerns with the location of infiltration wells in the rear of private allotments and how this will be managed.	The Stormwater Strategy is supported by the EPA and considered to satisfy the relevant provisions of the ToG Development Plan. For further details refer to section 9.8 of the report. • The on-line detention storage was considered reasonable and practical given the nature and topography of the subject site. • The Applicant is aware that they need to seek separate consents under the Native Veg and EPBC Act. Notwithstanding the need to obtain further (separate) consents, the proposal is deemed to reasonably satisfy and respond to the Development Plan policies concerning native vegetation. • Overland flow paths will be incorporated into the detailed design process and comply with relevant Australian Standards. • Infiltration measures are an effective means to manage and disperse stormwater runoff at source. The maintenance obligation lies with the property owner via an encumbrance. Maintenance occurs approx. every 10-20 years.

Infrastructure Funding	Council recommend that the Gawler East Traffic Interventions and Community Infrastructure Deed between Council and Springwood be executed prior to any planning consent being granted by SCAP. Gawler Council are not supportive of the Separate Rate Mechanism to secure infrastructure. The separate rate process is not commensurate with the rate of development and subject to challenge annually.	Infrastructure is a critical part of all land division applications however it is improper to determine the merits of an application on the proviso of their being (or not) an agreement in place, between the council and the applicant, in relation to the funding of public infrastructure outside of the subject land. Regulation 52 is the only regulation that addresses the prospect of works outside the subject land, the subject of a land division application. Specifically, Regulation 52 deals with existing or future requirements in relation to road widening and to that extent, the provision of land area required for road widening, not the securing of funding. Notwithstanding that funding to execute the recommendations of the Gawler East Traffic Interventions study is a matter for the Council to pursue outside of the assessment and determination of this application, it is considered that a suitable mechanism is in place (Gawler east Separate Rates) to secure necessary infrastructure and to fund and deliver the required infrastructure for the proposed plan of division.
Native Veg Act and Environment Protection Biodiversity Conservation Act (1999)	Council have reviewed the current allotment configuration overlaid with the previous Environment, Protection, Biodiversity and Conservation Act 1999 referral advice and notes that the layout conflicts with the protected areas in a number of locations. Council are concerned that the proposed development may not be able to lawfully proceed under the EPBC Act. Native Veg Council should also be sought for any proposed tree removal.	The Proposed Plan of Division has been designed to avoid and/or minimise the extent of intrusion upon areas containing native vegetation. The Applicant is aware of their obligations under the EPBC Act and Native Veg Act and will seek separate approvals subsequent to a decision being made on this application. Please refer to section 9.15 of the report.
Sloping Land	The slope of the land will dictate the location of particular dwelling types, with some more compact dwelling types located on relatively flat sites, whilst more traditional dwelling types will be located on those portions of the site with moderate to high slope.	The Applicant has provided a 'slope analysis' that details how the proposed allotments could be benched/retained so as to facilitate the envisaged dwelling envelopes. This is located in section 9.13 of the report. Many allotments throughout the proposed plan of division can accommode anticipated benching levels by a single

		rear retaining wall or by terraced walls of varying heights. Having reviewed the information provided by the applicant, together with an analysis of the pattern of subdivisions and topographical features of the site, DPTI staff are reasonably satisfied that the proposed allotments are of dimensions that support their future intended purpose. The design of dwellings and the response to localised topography will be subject to the desires of future land owners, and subject to a further planning assessment.
Traffic and Transport	Council notes that the amended Plan of Division proposes road reserve widths that are acceptable to Council. However, Council does not support road carriageway width less than 11.2 metres for collector roads. It is noted the GTA report previously proposed a carriageway width of 9 metres which is not supported by Council.	It is acknowledged that the Council are satisfied with the proposed road reserve widths, however do not support an 11.2m carriageway for a Collector Road. Currently one Collector Road is proposed in the plan of division at 9.0m which forms a V-shape south of the GELR. Further correspondence was sought in regards to the width of the proposed Collector Roads in the Plan of Division. GTA Consultants provided the following response: *'The proposed carriageway will facilitate on-street parking when required while providing two-way traffic movements. From a road safety perspective, the 9-metre-wide carriageway will assist in achieving voluntary compliance with the urban default speed limit, particularly when parking occurs, creating a road environment consistent with a 50km/h speed environment.* *By adopting 11.2-metre-wide carriageways for minor collector roads, particularly when there are low levels of parking, there is a risk that vehicle speeds will significantly increase as a result of the wider and more open road environment. Under such circumstances it is not desirable to construct local area traffic management (LATM) as a means of enforcing the speed since collector*

		roads should be kept free from such devices.' On balance, it is considered that the proposed road layout is acceptable and will provide safe and efficient movement within the development. Notwithstanding the above, a Condition is recommended to ensure that the final design and engineering specifications of road layout and design shall be undertaken with the relevant council prior to the issue of a Certificate under Section 51 of the Development Act.

4.2 Barossa Council

The application was referred to the Barossa Council for technical comments for the purposes of the *Development Regulations 2008, 'Division 2 – Prescribed requirements – general land division'*, for the purposes of sections 33(1)(c)(v) and 51(1) of the Act. For the sake of specificity, the matters prescribed in *Division 2*, include the following:

- Widths of roads and thoroughfares
- Road widening
- Requirement as to forming roads
- Construction of roads, bridges, drains and services
- Supplementary provisions

Further to the above, in relation to the 'open space contribution scheme', section 50(2)(d) and section 50(3) of the Act, requires the SCAP to be satisfied that where land will be vested with a council to be held as 'open space' that the council is a party to an agreement as referred to in section 50(2)(d).

In summary, the following comments were made:

- Council commend the 'thorough research and investigation undertaken in order to address the challenges presented by the site's topography, previous land uses and presence of infrastructure facilities'.
- Creation of discrete 'neighbourhoods' separated by infrastructure and open space to address challenges. However, Council have identified some issues with adopted land division and infrastructure approach

Comments		***Officer Comments***
Design and Layout	Land division is generally in accordance with Concept Plan Map Baro/15 with the exception of access. Concept plan indicates two access points into the area however only one is proposed.	Whilst the plan of division does not strictly accord with the access arrangements in the Concept Plan Map Baro/15, it should be noted that the Concept Plan is indicative only. Furthermore, the plan of division results in fewer residential allotments than envisaged by the Concept Plan, therefore access arrangements are considered acceptable.

Open Space	The plan of division promotes a number of allotments to back on to open space reserves. The style of fencing can impact on amenity. A Land Management Agreement or similar is recommended to direct the style and height of fencing. High retaining walls up to 5m in height will be required adjacent to areas of open space. This will severely restrict access to open space. Long term asset sustainability and robust engineering effectiveness are concerns regarding the above. Council should have direct input into setting standards for vesting open space into Council. It is recommended that a condition be included requiring some sort of agreement with Council prior to formal approval to commence construction and development of these respective areas.	The retaining walls will be designed in consultation with the landscape architects to ensure they provide a satisfactory outlook and encourage pedestrian activity to open space. The final design and engineering detail for fences and retaining walls will resolved in consultation with the council and confirmed prior to Section 51 clearance requirements for each stage and the vesting of assets with the relevant council.
Land Division	Significant cut/fill required in order to establish proposed allotments. This should be undertaken by the developer prior to sale of allotments and not by individual land owners in an attempt to ensure consistency.	The Applicant has provided a 'slope analysis' that details how the proposed allotments could be benched/retained so as to facilitate the envisaged dwelling envelopes. This is located in section 9.13 of the report. Many allotments throughout the proposed plan of division can accommodated anticipated benching levels by a single rear retaining wall or by terraced walls of varying heights. Having reviewed the information provided by the applicant, together with an analysis of the pattern of subdivisions and topographical features of the site, It is reasonably satisfied that the proposed allotments are of dimensions that support their future intended purpose. The design of dwellings and the response to localised topography will be subject to the desires of future land owners, and subject to a further planning assessment.
Hazards	Emergency fire access to Balmoral Road is not supported. Requires access over adjacent land not forming part of the subject land.	The Applicant has subsequently amended the plan of division to demonstrate that the proposed 'Balmoral Tack' is located entirely on the subject land. The proposed amendment will ensure that there are two points of entry to the south-west portion of the plan of

		division for emergency vehicles to access the area. In addition, the submitted Planning Statement states that a large proportion of roads will be perimeter roads which separate vegetation from future dwellings and provide access to areas of open space for fight fighting purposes.
Driveway Access	Access point to allotments require pre-approval to ensure strategic placement.	The location of driveways will be subject to further assessment upon the lodgement of future dwelling applications.
Stormwater Management	Proposed strategy is based on 18% AEP as per Town of Gawler requirements. Barossa requires 10% AEP. Proposed to provide major storm peak flow detention equal to pre-development flow rates. Supported, however this will not manage increased frequency of storm flows. Unrealistic to assume soft infrastructure (WSUD) will be the sole solution in term of long-term sustainability. Hard engineering (such as piped system) are expected to still be required. More detail required to mitigate risks of residential development in steep terrain.	Stormwater Issues are addressed in section 9.8 of the report.

5. STATUTORY REFERRAL BODY COMMENTS

Referral responses are contained in the ATTACHMENTS.

Pursuant to Section 37(1) of the *Development Act 1993*, and in accordance with Schedule 8(2) of the *Development Regulation 2008*, the following State Agencies have been consulted:

- Minister for Environment – Schedule 8, clause 2(10)
- Minister for Housing and Urban Development – Schedule 8, clause 2(23)

5.1 Minister for Environment – DIRECTION

Responsible State Agency: Environment Protection Authority

No objection, subject to conditions and advisory notes. Refer to ATTACHMENT.

Interface between Land Uses

The EPA considers that future occupants of the proposed allotments (residential and commercial) are unlikely to be exposed to any adverse noise and/or air quality impacts.

Water Quality –Staging

Stormwater management implementation sequencing has been outlined in the stormwater strategy, however the EPA is of the opinion that the strategy is generalised without clear time frames. Notwithstanding the lack of specificity, the EPA is satisfied that strategy adopts best management practices that demonstrate compliance with the general environmental duty as defined under section 25 of the *Environment Protection Act 1993*.

In response to the comments from the EPA, the Applicant has advised that the strategy has been established to ensure most stages within the development would feature a WSUD system. The Applicant has also advised that is difficult to provide a specific or definitive outline of infrastructure that would be implemented over a course of time, or even which 'stages'.

Stormwater Management

The stormwater strategy outlines a concept for the overall development including a number of WSUD features in a treatment train approach, including creation of trash racks and wetland pools and macrophyte zones within Spring Creek.

The EPA advises that stormwater quality treatment and WSUD features should generally be located offline from existing water bodies. However given the nature and topography of the site, the EPA considers online treatment as '*reasonable and practical'* solution for the operational phase of the development, provided all stormwater treatment is treated prior to its discharge to the existing mash area of the creek.

A condition is recommended to ensure that the detailed design of the stormwater management system must meet the outcomes at each outlet point modelled in the concept design.

Wastewater

It is understood that SA Water is currently updating their internal sewer concept plans for the proposed development (based on the proposed road and allotment layout) this would be used as the basis for detailed stage design for wastewater infrastructure. The EPA considers this arrangement acceptable and a condition is recommended in this regard.

SEDMP

Ekistics have confirmed that '*all WSUD measures for each stage of the development will be set as 'offline' sedimentation basins during the construction phase'*.

The EPA acknowledges that in some instances during the construction phase the SEDMP measures could be exceeded in large rain events. Therefore Sedimentation Pond A is located at a proposed instream wetland pond.

5.2 Minister for Transport, Infrastructure and Local Government – REGARD

Responsible State agency: Renewal SA

No objection.

6. LAND DIVISION CONSULTATION – State Agencies

Pursuant to Section 29(3) of the *Development Act 1993,* the SCAP may, in relation to an application involving the division of land, consult with any other State Agency. Accordingly, comments were sought from the following State Agencies:

- SA Water Corporation
- DPTI Public Transport Division
- DPTI Mark Maintenance Division
- Department of Education and Child Development
- Department for Energy and Mining (Office of the Technical Regulator)
    - SA Power Networks
    - ElectraNet
    - SEAGas

The advice obtained from the above State Agencies is to be considered and taken into regard in the determination of the application, however the SCAP is not legally bound to accept or adopt their recommendations. In particular, where matters raised are appropriately managed and/or controlled by separate legislation overseen by the OTR, it is considered appropriate to include an advisory note, rather than adopting an artificial control through the *Development Act 1993.*

6.1 SA Water Corporation

No objection, subject to standard financial and infrastructure requirements which are included in this recommendation as conditions of Land Division Consent.

6.2 DPTI – Public Transport Division

No objection.

6.3 DPTI – Mark Maintenance Division

No comment.

6.4 Department of Education and Child Development

No comment.

6.5 Department for Energy and Mining (Office of the Technical Regulator)

The position of the Technical Regulator is established under the following Act:

- *Electricity Act 1996*
- *Gas Act 1997*
- *Energy Products (Safety and Efficiency) Act 2000*
- *Water Industry Act 2012*

The Office of the Technical Regulator ("the OTR") sits within the Department for Energy and Mining ("DEM") and assists the Technical Regulator in the administration of the above Acts. Its' primary objectives are ensuring the safety of workers, consumers and property as well as compliance with legislation and applicable standards in the electricity, gas and water industries.

In this context, it is important to make the distinction that ElectraNet, SA Power Networks and SEA Gas are not State Agencies. Rather, the OTR, through DEM, is the State Agency which regulates these private corporations.

- **SA Power Networks:** No objection.
- **ElectraNet:** No objection.

- **SEA Gas:** SEA Gas have advised that the information submitted by the Applicant does not provide assurance that the development incorporates the actions identified in the 2017 Safety Management Study ("SMS").

***NOTE** – *The matters raised by DEM and SEA Gas in relation to the maintenance/release valve are of no relevance or consequence to this 'parent' application. Particulars in relation to the gas pipeline infrastructure are relevant to, and being considered under development application 490/D028/19).*

7. PUBLIC CONSULTATION

The subject land is located in the Residential (Gawler East) Zone in both the Gawler (CT) Development Plan and The Barossa Council Development Plan. As land division is neither listed as a complying or non-complying form of development in the zone, the proposed division of land is to be assessed on its merits pursuant to Section 35(5) of the Act.

With regard to public notification, the Zone defers to Schedule 9 of the *Development Regulations 2008*. The relevant clause in the categorisation of the application is outlined in Schedule 9, Part 1, Clause 5 which identifies the proposal to be a Category 1 form of development thereby the undertaking of public notification is expressly prohibited pursuant to Section 39(3)(a) of the Act.

8. POLICY OVERVIEW

The subject land is situated in the Residential (Gawler East) Zone (Mixed Use Centre Policy Area 3) and Open Space Zone of the Gawler Council Development Plan – (Consolidated 20 February 2018).

The subject land is also located in the Residential (Gawler East) Zone and Open Space Zone of the Barossa Council Development Plan (Consolidated 1 November 2018).

Relevant planning policies are contained in the Attachment and summarised below.

8.1 Zone Policy

Given that there is a high level of consistency across the policy for the respected Zones, the report has sought to consolidate the policy provisions where appropriate to limit repetition.

Residential (Gawler East) Zone (Gawler and Barossa Councils)

The Zone objectives seek to deliver a predominantly residential area comprising a range of low and medium-density dwellings with associated integrated infrastructure, retail, commercial, recreational, educational and community development in accordance with Structure Plan Map Ga/1 (Overlay 1) Enlargement G and (*Concept Plan Map Baro/15 - Gawler East)*.

From a broad land use perspective, the proposal is well aligned with the objectives of the Residential (Gawler East) Zone.

Mixed Use Centre Policy Area 3 (Gawler Council)

The Policy Area seeks to encourage a diverse zone accommodating a mix of commercial, retail, recreation, community, residential, office, consulting rooms and educational uses.

From a broad land use perspective, the proposal is well aligned with the objectives of the Mixed-Use Centre Policy Area 3.

Open *Space Zone (Gawler and Barossa Councils)*

The Zone objective seek to preserve the predominantly open space character to provide a visual contrast to the surrounding urban area.

The proposed plan of division will preserve the existing areas of open space. As such, the proposal is well aligned with the objectives of the Open Space Zone.

8.2 General Section Policy

The General Section provisions provide direction on the desire for safe, convenient, efficient and adequately serviced Neighbourhoods and Land division in appropriate localities to create a compact urban area.

The residential development objectives seek to deliver a housing that meets the needs and preferences of the community with an emphasis on changing demographics.

Furthermore, the Barossa Development Plan encourages Land division that is integrated with site features, including landscape and environmental features, adjacent land uses, the existing transport network and the availability of infrastructure.

8.3 Overlays

8.3.1 Affordable Housing

The proposal is subject to the affordable housing overlay.

The Applicant has provided an Affordable Housing Plan which provides 15% affordable housing. This accords with Objective 2 of the Zone Policy, which envisions a minimum of 15% affordable housing being provided.

9. PLANNING ASSESSMENT

The application has been assessed against the relevant provisions of the Barossa Development Plan (1 November 2018) and the Gawler Development Plan (consolidated 20 February 2018), which are contained in Appendix One.

9.1 Land Division

Gawler Development Plan

PDC 9 Land division:

(a) Should not exceed 1000 allotments until at least the following infrastructure indicated by Structure Map Ga/1(Overlay 1) Enlargement G has been constructed:
  (i) A collector road between Calton Road and One Tree Hill Road; and
  (ii) A collector road between One Tree Hill Road and Potts Road; and
  (iii) An upgrade of Potts Road and its intersection with Main North Road to accommodate the traffic flows associated with further continued development.

(b) Should not prejudice the construction of the collector road indicated by Structure Plan Map Ga/1(Overlay 1) Enlargement G.

The submitted Planning Statement confirms that *an allotment does not exist until it has been deposited in the Lands Titles Office and a title for that allotment is issued.*

The Gawler East Link Road is currently being constructed by DPTI and projected to be completed in 2020. This piece of infrastructure will be installed prior to the formal creation of 1000 allotments with the Lands Titles office for the proposed plan of division. Even in the event the road is not finished before the issuing of titles, the completion of the road construction is an assumed certainty. This is considered to satisfy part PDC9 part (a) and (b) above.

9.2 Land Use

In considering the planning merits of establishing a master planned residential development, regard was given to the relevant Zone/Policy Area objectives of the Barossa and Gawler Development Plans.

Residential (Gawler East) Zone

The primary objective of this Zone is to encourage a "*predominantly residential area comprising a range of low- and medium-density dwellings, with associated infrastructure, retail, commercial, recreational, educational and community development in master-planned locations".*

The proposed masterplan seeks to construct 1,201 allotments, of which a range of low-medium density residential allotments are proposed. The residential layout broadly accords with the Concept/Structure Plan(s) included in both Gawler and Barossa Development Plans, in terms of the strategic location of residential allotments.

The masterplan also seeks to provide associated infrastructure, including a comprehensive road network that links the residential development to Calton road (to the north) and the Gawler East Link Road (currently under construction) to Main North Road in the south-west.

Mixed Use Centre Policy Area 3

The purpose of the Mixed Use Policy Area is to provide *"A functional and diverse zone accommodating a mix of commercial, retail, recreation, community, residential, office, consulting rooms and educational uses".*

The 'Village Centre' is proposed within the Mixed-Use Policy Area, adjacent to Calton Road. It includes super-lots which are intended to accommodate a mix of uses, such as retail, commercial, community facilities etc. These forms of development are envisaged in the Mixed-Use Policy Area.

The north-western part of the site also contains a super-lot which is identified for a future school and associated public open space/playing fields.

As a result of the above, the conversion of the subject land to a master planned residential community is deemed from a broad land use perspective to be well aligned with the Zone and Policy Area objectives of the Barossa and Gawler Development Plans.

Open Space Zone

The primary objective of this zone is to preserve the open space character by comprising open space that accommodates a range of public and private activities in an open space and natural setting as stipulated in Objective 1 of the Open Space Zone.

The proposed Masterplan secures all land located within the designated Open Space Zone as public open space reserve.

The Masterplan is therefore in line with Objective 1 of the Open Space Zone and seeks to preserve and enhance the Open Space areas within the site.

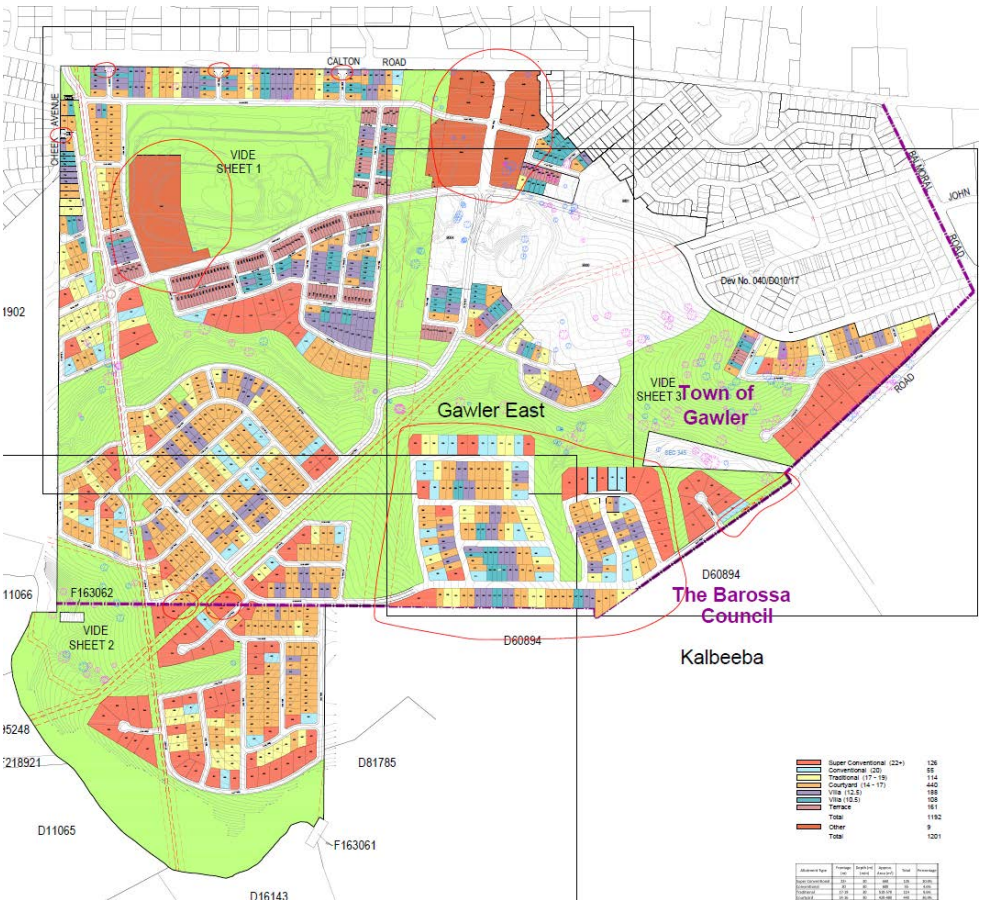
9.3 Allotment Configuration and Density

Residential (Gawler East) Zone

Objective 3: *A residential zone comprising a range of dwellings types, including a minimum of 15 percent affordable housing.*

Objective 4: *Increased dwelling densities in close proximity to centres, future public transport routes and public open spaces.*

The Plan of Division includes a cluster of neighbourhoods designed around an internal network of roads. The neighbourhoods have been designed in accordance with the desired layout as identified in the Structure Plan Map Ga/1(Overlay 1) and (*Concept Plan Map Baro/15 - Gawler East)* to benefit from their strategic location and accessibility to areas of public open space, together with existing topographical features.



In terms of allotment configuration, the physical characteristics attributed to the range of allotment types is outlined in the table below:

Super Conventional (22+)	126
Conventional (20)	55
Traditional (17 - 19)	114
Courtyard (14 - 17)	440
Villa (12.5)	188
Villa (10.5)	108
Terrace	161
Total	1192
Other	9
Total	1201

Allotment Type	Frontage (m)	Depth (m) (min)	Approx. Area (m^2)	Total	Percentage
Super Conventional	22+	30	660	126	10.6%
Conventional	20	30	600	55	4.6%
Traditional	17-19	30	510-570	114	9.6%
Courtyard	14-16	30	420-480	440	36.9%
Villa (12.5)	12.5	30	375	188	15.8%
Villa (10.5)	10.5	30	315	108	9.1%
Terrace	7	30	210	161	13.5%

Objective 3 and 4 of the Residential (Gawler East) Zone envisages residential allotments to accommodate a range of dwelling types with increased dwelling densities in proximity to centres, future public transport routes and public open space. The proposed development is considered to satisfy the above objectives and promote a varied housing typology including super conventional lots, as well as conventional, traditional, courtyard, villa and terraces.

PDC 17 of the Zone states that housing with an average site area for dwellings less than 250 square metre should be located within the Mixed Use Centre Policy Area or within walking distance of public open space, local shops and public facilities.

Dwellings with a site area less than 250 sqm are proposed at the edge of the Mixed-Use Policy Area. Whilst this is not strictly in accordance with PDC 17, the allotments will be a short distance from the proposed Quarry Park and future Village Centre. In addition, the lots will be surrounded by a road network that has the potential to accommodate public transport (bus) routes and is in proximity to walking and cycling infrastructure.

It is also noted that medium density allotments are proposed at the southern part of the development, in areas of steep slope. The ToG raised concerns about the suitability of these allotments in this part of the plan of division. As can be seen in the above map the medium density allotments are outweighed by the proportion of larger allotments south of Spring Creek. Furthermore the Applicant has demonstrated that relevant allotments can be appropriately benched/retained in section 9.13 of the report.

Superlots

The plan of division also includes nine (9) allotments which are envisaged to accommodate a range of complimentary uses that would suit the residential development. The uses envisaged for the area include a supermarket, childcare centre and service station/car wash facility. At the north-western part of the site, a future primary/secondary school with associated sports oval is envisaged. Whilst the proposed land uses do not form part of this application, the plan of division ensures that land is set aside for non-residential development. It should also be noted that five land use applications have been lodged and are currently under assessment.

9.4 Open Space

Residential (Gawler East) Zone

Objective 5: *Open space systems designed to provide multiple use reserve areas that promote water management, habitat retention and enhancement, and recreational linkages.*

Open Space Zone

Objective 1: *A zone:*

(a) in which the open space character is preserved to provide a visual contrast to the surrounding urban area

(b) comprising open space that accommodates a range of public and private activities in an open space and natural setting, including:

(i) passive and active recreation land uses

(ii) habitat conservation and restoration.

Section 50(1)(c) of the *Development Act 1993,* prescribes that the council in which the land is situated may require up to 12.5% of the total land area to be provided as open space. The proposal makes provision for 73.57 hectares of open space which equates to 39.5% of the total development site. For the purpose of clarity, there is nothing in the Act which prevents an applicant from making an open space contribution that is greater than 12.5%, or a council from accepting more than 12.5%.

The proposed open space will consist of a network of naturally formed gullies, pedestrian and cycle paths, parks/reserves and landscaped entrances. The Zone policy stipulates that public space areas should to accommodate both active and passive recreation opportunities.

The open space layout was largely governed as a response to the abundance of existing native vegetation on the site and the integration of stormwater detention, treatment and re-use given limitations on the potable water supply for the area. Each of the separate areas of open space are described in detail below:

Springwood Gully

A key part of the plan of division is to integrate and enhance Spring Creek, which is the central tributary on the site. The creek bisects the site and creates a unique green corridor. The Springwood Gully is proposed to be enhanced by new walking trails (loop course and adventure trails), cycle routes, respite areas including seating/BBQ facilities and replanting in appropriate sections. The entire length of Spring Creek will be publicly accessible. South Para River also exists to the south-west of the site and will incorporate a variety of trails and a Node park with recreational facilities. The enhancement of Spring Creek and South Para River is a significant public benefit of the scheme and ensures that the natural environmental and community value of these assets are maximised.

Pedestrian and Cycle Routes

Pedestrian and cycle pathways are also proposed across the plan of division and form a network of green linear corridors over the site. The majority of pathways will be sited under/over the existing easements that traverse the site. This currently includes the SA Power Networks overhead powerline that travels north-south and the SA Water/SEA Gas main that spans east-west. The proposed pathways will form a network of routes that interlink with the open space network. Landscaping will include low maintenance vegetation comprising a mix of native species to ensure they can be appropriately maintained and are water conscious.

Quarry Park

The former quarry is also proposed to be converted into a linear park which provides opportunities for active recreation (Mountain Bike). The area will make safe any unstable

ground. The intention for the Quarry Park is to retain the industrial connection by providing informative signage and retaining some of the notable steep land forms. The Park will offer residents a different user experience from the traditional parks and reserves that are also proposed on the site.

District and Neighbourhood Reserves/Parks

In terms of child play space, the scheme incorporates both formal and informal play areas dispersed at various locations around the site, with residents being no further than 200m from a designated area of open space.

No district parks are proposed under this application. Springwood Village Centre Park is proposed under (490/D028/19).

Springwood *Playing Fields*

The Springwood Playing Fields are located at the north-western part of the site and will provide the main playing fields for the wider community and future school. The facilities will include a sporting oval, courts and adventure playground equipment. The area will also include WSUD elements and revegetation in areas around the oval.

Vesting of Open Space

Notwithstanding the above, it is noted that Gawler Council initially raised concerns with the quantity of open space being vested to the Council. As such, the Applicant increased allotments in areas where it was feasible to do so. This resulted in an increased number of allotments from 1180 to 1201.

In terms of vesting of infrastructure, it is recommended that a condition is attached to ensure that Council have final sign off of any land vested to them, prior to the section 51 clearance.

On balance the Open Space strategy for the site is considered to be acceptable and provides residents with a variety of user experiences in close proximity to their homes. The abundance of open space will create a leafy outlook and opportunities for both active and passive recreation. The enhancement of Spring Creek and the South Para River is a key community and environmental benefit of the application. Thus, the proposal is considered to comply with the Open Space policy within the Residential Gawler East Zone and protects and enhances existing open space within the Open Space Zone.

9.5 Landscaping

The landscape plan prepared as part of the application depicts street trees, parkland trees and open space/road corridor and gateway plantings, in addition to a wide range of vegetation in the Riparian corridors. In total, 214 new trees will be planted throughout the development site reducing the heat island effect of the increased impervious surfaces. Street trees will be predominantly deciduous in nature and their planting location will be dictated by the road reserve width. Taller Australia natives have been selected to create a sense of entry on larger boulevards and to create a sense of place at junctions/entrances. In addition, a key part of the landscape plan is to restore the tree layer along the creek corridor with indigenous trees such as the Mallee Box Woodland and the River Red Gum incorporated into the river environment.

An extensive array of plantings including indigenous species will serve to ensure the landscape amenity of the proposed land division accords with the relevant policy provisions. The proposed selection and location of planting has been carefully designed to ensure that it responds to the landform and changing climate, in addition to capturing seasonal runoff and maximising soil hydration. A full list of species is provided within

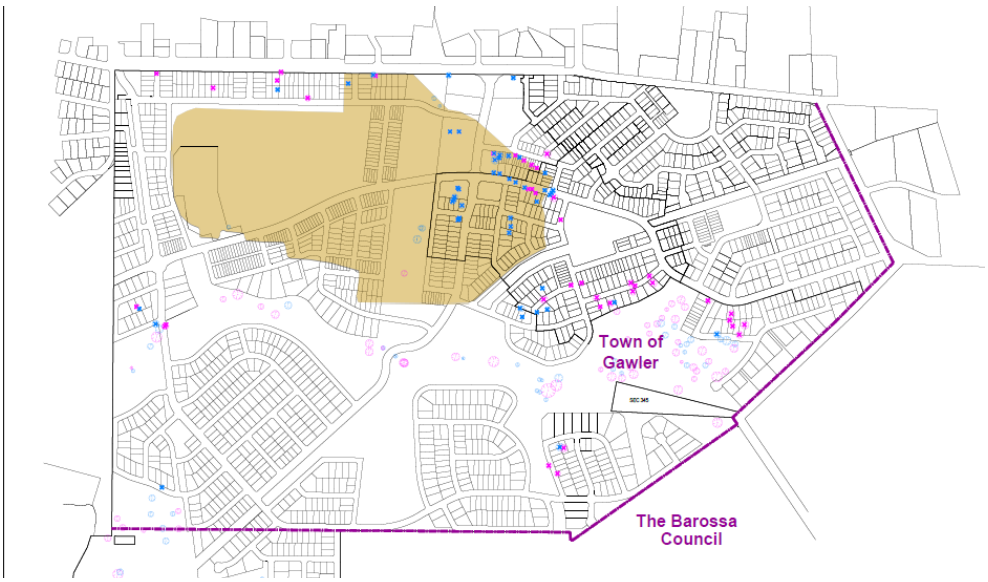
the Landscape Masterplan. In terms of hard landscaping a selection of surfaces have been identified within the Landscape Masterplan as suitable for the development.

The provisional planting outlined in the Landscape Masterplan is considered to result in a Residential streetscape amenity and landscape quality that accords with the general Zone provisions and promotes a high standard of design.

9.6 Regulated and Significant Trees

The proposed plan of division involves the removal of 47 Regulated and 40 Significant Trees. The application site currently contains a total of 183 Regulated and 200 Significant Trees, comprising a total of 383 trees in total. Of the total, 296 trees (77%) will be retained across the site in areas of existing open space. The Open space is proposed to be vested to Council.

The majority of trees to be removed are located at the central part of the site and have grown from self-seeded re-growth from the dispersal of uncontrolled fill caused by historic quarrying activity. The uncontrolled fill is not suitable for future development and therefore needs to be removed and compacted to make is suitable for the future intended development. Therefore, the trees highlighted in the brown shading provided in the map below are proposed to be removed.



PDC 224 of the Gawler Development Plan states that development should have minimum adverse effects on regulated trees. In addition, PDC 25 states that a regulated tree should not be removed or damaged other than where it can be demonstrated that one of the more of the flowing apply:

(a) the tree is diseased and its life expectancy is short;
(b) the tree represents a material risk to public or private safety;
(c) the tree is causing damage to a building;
(d) development that is reasonable and expected would not otherwise be possible;
(e) the work is required for the removal of dead wood, treatment of disease, or is in the general interests of the health of the tree.

On balance, it is considered that the proposed plan of division is considered to satisfy part (d) of PDC 225 above in that the development being proposed is reasonable (in line

with the land use objectives of the Residential (Gawler East) Zone and Mixed Use Policy Area and in in the case of trees located on the former Quarry site, necessary to remove these to ensure land is made safe for future development. It should also be noted that the Mixed Use Centre Policy Area 3 covers the area highlighted above as 'uncontrolled fill'. Therefore some tree loss is to be reasonably expected to support the achievement of the key objectives of the zone and policy area.

In accordance with Section 42(4) of the *Development Act, 1993* and Regulation 117 of the *Development Regulations, 2008*, the proposal will require replacement planting for Regulated and Significant Trees removed on the site. This will require two (2) trees to replace a Regulated Tree and three (3) trees to replace a Significant Tree. This equates to 214 replacement trees across the plan of division or alternatively the Applicant will need to pay a total payment of $20,116 into the Urban Tree Fund. Replacement tress will be in the form of:

- *Street Trees (deciduous in nature medium to large size)*
- *Parkland Trees (Mallee Box Woodland and Eucalyptus Camaldulensis Open Woodland)*

Replacement tree plantings (secured by condition) will ensure that Springwood retains a leafy character and that ecological processes can continue to thrive.

9.7 Hazards

Bushfire Protection

Objective 5: Development located to minimise the threat and impact of bushfires on life and property.

PDC 8: Development in a Bushfire Protection Area should be in accordance with those provisions of the Minister's Code: Undertaking development in Bushfire Protection Areas that are designated as mandatory for Development Plan Consent purposes.

The majority of the plan of division is located in a General Bushfire Protection area. The south-western part of the site (Barossa Council area) is located in the Medium Bushfire Protection area with parts of the border located in a High Bushfire Risk area. All land located within the High Bushfire Risk area will be retained as open space and devoid of any habitable buildings.

Barossa Council provided comments on the application, particularly as housing is proposed in the Medium Bushfire Protection area. The Council did not support the original plan of division, given that the proposed emergency fire access would use 'Balmoral Tack' which was partly located in land under separate ownership. Therefore it raised concern with the accessibility and management of this track.

As such, the Applicant has subsequently amended the plan of division to demonstrate that the proposed 'Balmoral Tack' is located entirely on the subject land. The proposed amendment will ensure that there are two points of entry to the south-west portion of the plan of division for emergency vehicles to access the area.

In addition, the submitted Planning Statement states that a large proportion of roads will be perimeter roads which separate vegetation from future dwellings and provide access to areas of open space for fight fighting purposes.

9.8 Stormwater and Runoff

Natural Resources

PDC 154 Development should include stormwater management systems to mitigate peak flows and manage the rate and duration of stormwater discharges from the site to ensure the carrying capacities of downstream systems are not overloaded.

PDC 156 Stormwater management systems should preserve natural drainage systems, including the associated environmental flows.

PDC 162 A wetland or low-lying area providing habitat for native flora and fauna should not be drained, except temporarily for essential management purposes to enhance environmental values.

Land division (Council wide policy)

PDC 127 When land is divided:
(b) stormwater should be capable of being drained safely and efficiently from each proposed allotment and disposed of from the land in a satisfactory manner;

Natural Resources

PDC 154 Development should include stormwater management systems to mitigate peak flows and manage the rate and duration of stormwater discharges from the site to ensure the carrying capacities of downstream systems are not overloaded.

Existing Site and Catchments

The existing site contains Spring Creek, which is the main tributary on the site. The creek flows east to west and is located centrally within the site. Spring creek is located within a gully that is serviced by a number of valleys that directly drain into the creek. Given the steepness of the site, stormwater is a key consideration for this application.

The South Para River is located at the south-western corner of the land. The southern area of the site drains directly into this river. The south and north para rivers converge into the Gawler River to the west and undulating discharge to the gulf. A number of detention features on the river exist both east and west of the site.

Given the rural nature of the land, there is no existing stormwater infrastructure located on the site.

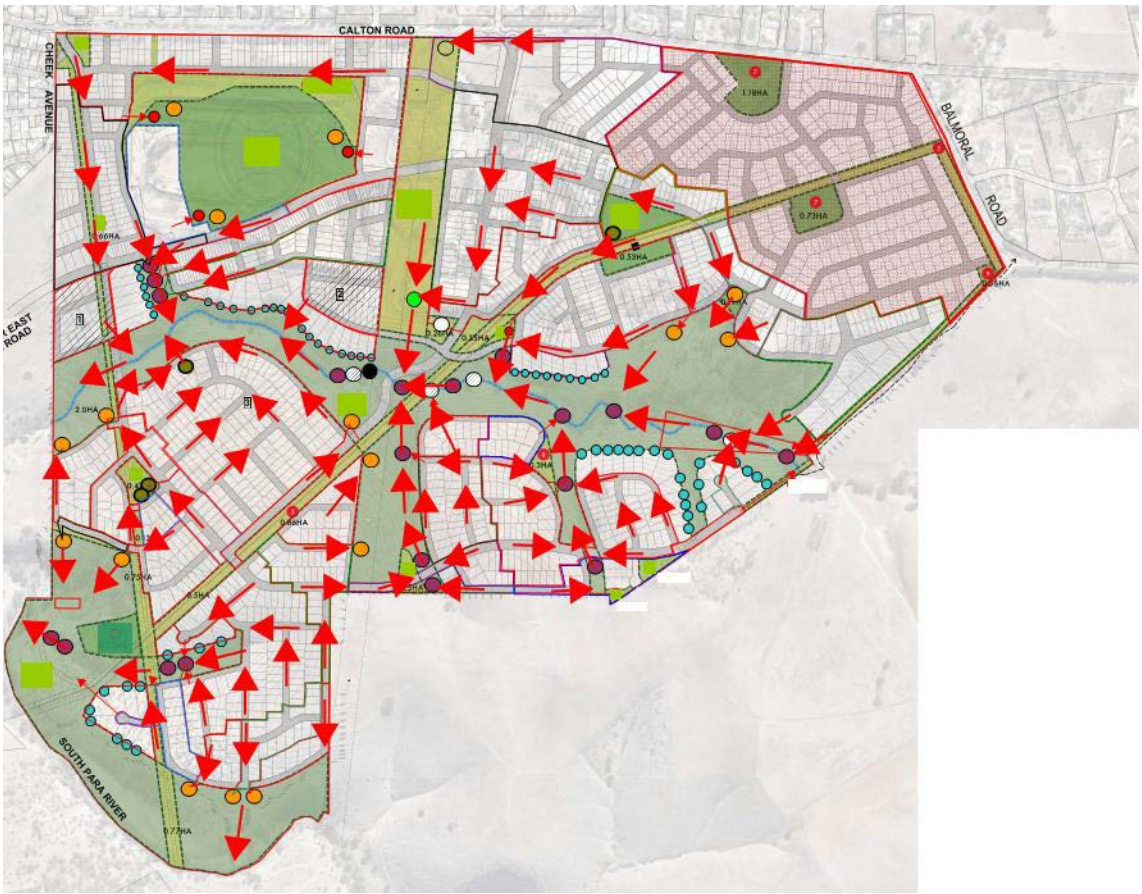
Proposed Stormwater Strategy

WGA have prepared a Stormwater Management Plan for the construction and operational phases of the development. This has been prepared with advice from DEW and EPA. The strategy has been prepared in conjunction with the EBS Ecology Springwood Flora and Fauna Assessment (2019).

Stormwater Design

The stormwater design is based on the minor and major system. The minor system will be based on an underground pipe system that collects stormwater runoff from the local roadways to a design standard of 10% AEP (1 in 10-year ARI). The stormwater runoff will then be directed to the nearest WSUD wetland/treatment system.

The Major system (overland flow paths) (design standard above 10% AEP (1 in 10-year ARI)) will be directed to drain via the existing roadways, flow paths and gullies into Spring Creek. The design of overland flow paths for major flows is carried out during the detailed design process.
A map provided below highlights the major flow paths and detention storage facilities proposed on the site;



Water Sensitive Urban Design (WSUD)

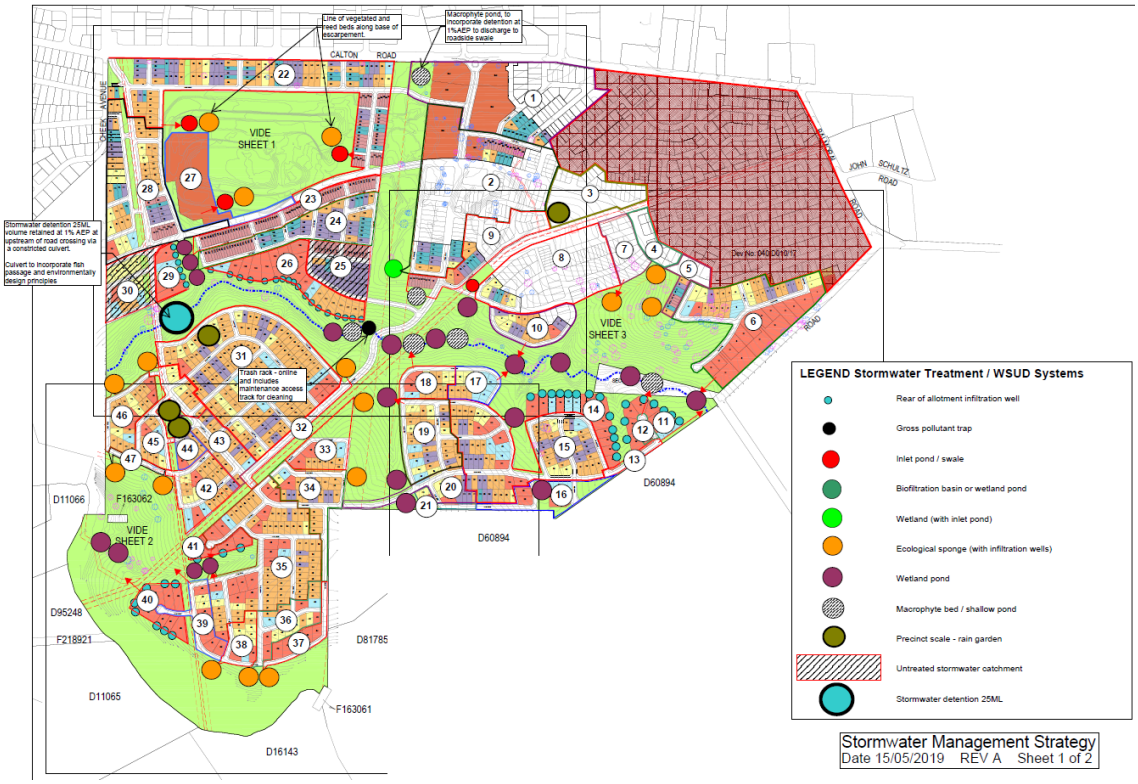
The proposed stormwater strategy relies on the implementation of Water Sensitive Urban Design (WSUD) systems across the site to slow stormwater runoff and improve filtration and infiltration before it reaches Spring Creek.

The use of WSUD systems are considered to be an effective way of managing stormwater in an environmentally conscious manner. WSUD measures include wetland systems and other mechanisms such as ecological sponges to detain and appropriately dispose of stormwater in appropriate locations.

Infiltration wells are also proposed at the rear of allotments and designed to trickle flow water out into the wider area. The location of each of these systems has been dictated by the site's topography to imitate the natural water balance on the site (pre-development).

Each of the WSUD treatment systems will include discharge control to allow flows to be released across a wider area over a 2-3 day period. Each of the stormwater treatment systems will include treatment processes including off-line sedimentation to remove pollutants from the stormwater. All WSUD measures for each stage of the development will be set as 'offline' sedimentation basins during the construction phase'

The location of each of the WSUD elements are shown in the map below;



Natural Resources

PDC 166 The location and construction of dams, water tanks and diversion drains should:
(a) occur off watercourse;
(b) not take place in ecologically sensitive areas or on erosion-prone sites
(g) protect ecosystems dependent on water resources

Gawler Council raised concerns with the location of the road crossing, detention dam embankment and instream vegetation in Spring Creek. The on-line detention storage facility will result in a dam structure within the creek and cause sections of the protected Iron-grass community to be inundated in major storm events.

As such, it was recommended that the Applicant adopts an off-line detention storage facilities in line with PDC 166 of the Gawler Development Plan. However, this was not considered feasible by the Applicant based on the following reasons (supported by WGA):

- *Several basins would be required;*
- *Council would take on additional assets and maintenance;*
- *Significant earthworks required;*
- *The topography is not feasible to intercept the whole of the development into offline detention.*

Furthermore, the Applicant has demonstrated several scenarios where similar detention facilities have been accepted on creeks within the Gawler Council area.

Comments received by the EPA on the 17th January 2020, state that the EPA considers online treatment as a 'reasonable and practical' solution for the operational phase of the

development given the nature and topography of the site. This is supported as a reasonable approach to stormwater management in this location.

With respect to the road crossing and culvert in the creek, this locations is considered necessary to provide access to the southern part of the development. Instream vegetation will also assist to create a riverine structure that will increase biodiversity benefits in current weed infested sections and provide a mix of local indigenous species.

Overall, it is considered that the impacts to the creek are acceptable given the nature and topography of the site and the overall net ecological benefits proposed to Spring Creek.

Discharge control

The on-line detention basin is proposed to release stormwater at a predetermined rate 1% AEP post development flow to equal 1% AEP pre-development flow rate, thereby reducing the peak runoff delivered to storm sewers and streams.

In addition the on-line detention basin will control flow frequencies; 63%, 20%, 10% 5% and 1% AEP critical events.

Erosion Risk

Erosion risk is proposed to be managed within the development site by the incorporation of additional planting in the in-stream marsh along the bed of Spring Creek and WSUD techniques that release water flow over a 2-3 day period.

In addition, a Stormwater Erosion and Drainage Management Plan (SEDMP) is proposed to be prepared for the site on the basis of a 'high risk site' and is located at section 3.4 of the stormwater strategy. The EPA have recommend that a (SEDMP) is secured for the entirety of each stage of the development in accordance with the Code of Practice for the building and construction industry. This is recommended to be added as an advisory note should consent be granted.

9.9 Noise Emissions / Air Quality

Upon completion of the development, the noise emissions associated with the proposal are considered to be consistent with what would ordinarily be anticipated in a residential zone.

Considerations with respect to noise emissions for the future use of development in the proposed 'Village Centre' will be during the future assessment of the land use applications.

The EPA is satisfied that there are no external noise features or air pollutants which would adversely impact on the establishment of residential development in this location.

9.10 Waste Management

Roadside collection of waste will be undertaken by Council. Bins can be transferred to the footpath for all dwellings fronting roads, and bins transferred to the laneways for those dwelling with rear-loaded garages. In terms of Access Places, bins may be positioned to the main street for collection or alternatively a refuse truck could reverse into these areas to service properties.

Wastewater will be connected to a SA Water sewered system with connections established as part of future land use applications for dwellings.

The internal sewer concept will be based on the proposed road and allotment layout. A portion of the development can be serviced via the existing wastewater infrastructure on Calton Road, which includes two pump stations as part of the 2015 Springwood development. The existing sewer network has the capacity to accommodate 660 residential allotments (inclusive of the 387 existing allotments). A combination of gravity sewer and internal pumping mains would be required to convey the wastewater to Calton Road.

The remaining allotments (>660) would require a new sewer pumping network to be installed from the site's western boundary to the gravity main installed within Gawler East Link Road/Potts Road. It should be noted that the gravity main is currently under construction.

SA water was consulted on the application and raise no objections subject to standard financial and infrastructure requirements.

9.11 Aboriginal Heritage

Aboriginal sites and objects are protected under the *Aboriginal Heritage Act 1988*. Further information was requested during the course of assessment to better understand whether the proposed development would impact sites (or objects) that are important to Aboriginal culture.

Accordingly, it has been confirmed that there are no recorded entries for aboriginal sites or objects upon the subject land. Confirmation was obtained through the latest Register of Aboriginal Sites and Objects administered by Aboriginal Affairs and Reconciliation (dated 16th December 2019).

It is noted that the South Para River was identified in a previous field survey as an unrecorded Aboriginal cultural site. A portion of the South Para River is located at the south-western part of the application site. This area is located in the Open Space Zone and is appropriately buffered from future development sites; residential allotments will be at least 85 metres from the centreline of the River.

On balance, it is considered the proposed plan of division would not have an adverse impact on sites or objects that are important to Aboriginal culture. Should, during site works, an Aboriginal site, object/s or remains be identified, Section 23 of the *Aboriginal Heritage Act 1988* require these to be reported to the Premier.

9.12 Barossa Character Preservation District Overlay

The Barossa Character Preservation District is a specified area in the Barossa Development Plan where scenic and rural landscapes are highly valued, retained and protected, which is stated in Objective 1 of the *Character Preservation District Overlay* in the Barossa Council Development Plan.

The proposed plan of division is not located within this area. It is appreciated that comments were received from Barossa Council with respect to the amended plan of division which proposes 29 'rear facing' allotments (with their rear boundary) abutting the Character Preservation District. This amendment was considered necessary from the Town of Gawler's perspective to reduce the extent of retaining walls being visible from the public realm. As such, this resulted in amended plan and the incorporation of batter slopes within the site.
Whilst comments from the Barossa Council are noted, there is no interface requirement for the sites immediately abutting Character Preservation Districts.

9.13 Sloping Land

Residential (Gawler East) Zone

The slope of the land will dictate the location of particular dwelling types, with some more compact dwelling types located on relatively flat sites, whilst more traditional dwelling types will be located on those portions of the site with moderate to high slope. Greater setbacks are envisaged on topographically steep sites in order to satisfactorily deal with earthworks and driveway gradients.

Land division (Council wide policy) (*Gawler Development Plan)*
PDC 127

(f) each allotment resulting from the division should have safe and convenient access to the carriageway of an existing or proposed road or thoroughfare at all times;
(g) proposed roads should be graded, or be capable of being graded to connect safely and conveniently with an existing road or thoroughfare;

The site is characterised by its natural topography and rolling hills. The site progressively steepens toward South Para River, with many valleys, ridges and spurs. The steepest part of the land is located in the southern part of the site.

The allotment configuration has been designed around the natural topography, with built form proposed in areas of grade ranging between 5-18%.

A WGA *Roads and Earthworks* report was submitted with the application to demonstrate that the proposed plan of division can accommodate;

- *Grade compliant driveways;*
- *Grade Compliant road long sections; and*
- *Suitable allotment grading/retaining.*

In making the above conclusions, the WGA '*Roads and Earthworks Report'* reviewed the steepest section of the land division, which is located south of Springwood Creek in the Gawler Council area.

Retaining Walls and Allotment Grading

Given the topographical features across the site, retaining will be necessary to ensure roads and allotments achieve a satisfactory gradient for their intended use.

The Gawler Council and the Barossa Council raised concern with the extent of retaining walls proposed on public land, which would result in an ongoing maintenance liability for the respected councils and restrict access to public open space. This was considered to be most severe in the southern part of the development site where the land is steeper and more retaining is required.

In response to concerns from both councils, the Applicant amended the parent land division by internalising the northern road (adjacent Spring Creek) and replacing the proposed retaining walls with batter slopes within the allotments. It is considered that this response to the natural topography improves the configuration of allotments and facilitates an increased number of allotments that have frontage to public open space, rather than the interface comprising retaining walls in the public realm.

Further advice was requested seeking confirmation of how the slope of land will be managed on future residential allotments. In particular, The Barossa Council wanted to understand how retaining walls might be coordinated and managed on future residential allotments, and the Town of Gawler raised concerns with medium density allotments on areas of significant slope.

The Planning Consultants have confirmed the following:

'*To effectively manage the height differential across adjoining allotments, WGA has proposed an approach where rear retaining walls are installed on the common boundary between allotments to reduce the total level difference. By delivering a consistent grade from the rear retaining to the garage setback, a worst case allotment grade of 10% can be delivered. This grade can then be managed through building design of individual lots. By constructing a 2.0m high wall on the common boundary, each allotment would then have less than 3 metres of level difference to consider through building design.*'

Whilst it is appreciated that a variety of allotment types are proposed in areas of significant slope, the applicant has demonstrated above that various techniques can be applied (in the worst areas of slope on the site up to 18%) to ensure that the allotments will be suitable for future residential development.

Driveway Gradients

Maximum driveway gradients have been designed to be in accordance with the Town of Gawler '*Standards and Requirements for Land Development/Land* Division' July 2012, where the maximum driveway gradient will be 1 in 5 i.e. 20%. It should be noted that the Australian Standard maximum driveway gradient (on private land) is 1 in 4 i.e. 25%.

9.14 Traffic Impact, Access and Parking

A Transport Impact Assessment was submitted with the application and prepared by GTA Consultants. The report details the proposed street layout and traffic generation for the whole of the development.

Access to the site

Access to the site will be provided via the following Collector roads and Gawler East link Road (GELR).

1. New link at Cheek Avenue and Calton Road intersection;
2. Calton Road at the proposed town centre;
3. Collector Road (in previous approved Highfield precinct) to connect to Balmoral Road
4. Gawler East Link Road (GELR) to west of site

The original plan of division proposed two local street junctions on Calton Road between Cheek Avenue and the future Village Centre. Gawler Council highlighted that the location of these roads are not necessary in order to facilitate safe and efficient traffic movements to and from Calton Road. The Applicant has subsequently removed these from the plan of division.

Street Layout

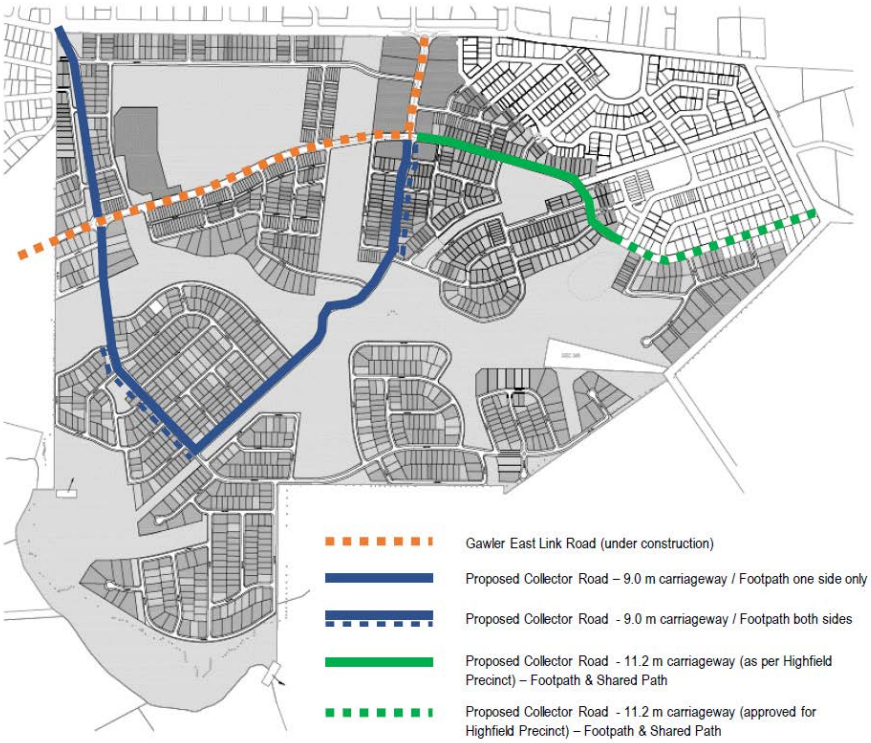
The proposed plan of division includes a network of Collector Roads and Local Streets that have been designed around Gawler East link Road, which is currently under construction by DPTI. Carriageways have been designed to comply with Austroad requirements and Australian Road Rules. The GELR will provide the main thoroughfare in the site, linking the development to Calton Road in the north and Main North Road in the south-west. The GELR is a two-way road and includes a raised median, parking bays and bicycle lanes on each side of the carriageway.

Another key consideration for the street layout is the natural topography of the land. The road layout has been designed to mitigate any severe steep gradients. Whilst this will be finalised at detailed design stage, the plan of division has been designed to avoid

road grades greater than 10%. That being said, it is acknowledged that 25% of roads will be greater than 1 in 10, where a maximum achieved longitudinal grade = 12.5%.

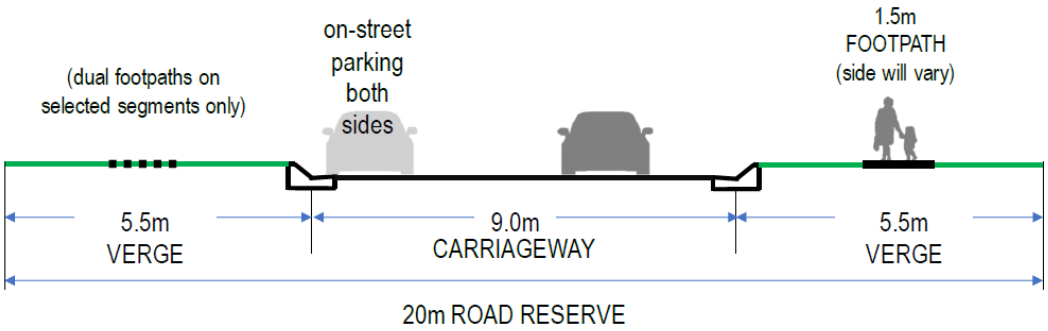
Collector Roads

Figure 4.2: Proposed Collector Road Network



The proposed plan of division includes a network of Collector roads (as shown in the above diagram), designed around the GELR. Collector roads will generally have a carriageway width of 9.0m (with the exception of the Collector Road form the east linking to Balmoral road, which will include two travelling lanes, 11.2m carriageway and 20m road reserve).

A 'typical' *Collector Road* is inserted below:



Collector Roads will generally entail:

- *Single two-way Carriageway*
- *9.0 metre carriage way*
- *20 metre road reserve*
- *Verge width 5.5m; and*
- *Facilitate a speed environment of 50 km/h.*

Gawler Council previously raised concerns with the width of Collector Type 1 Road, between the GELR Link Road and Calton Road, connecting to Cheek Avenue. It was considered that the carriageway width was not sufficient, particularly given that this road could potentially accommodate a bus with vehicle parking either side. However given that a reserve is proposed to the west of this road, it is considered that it is of suitable width, if future infrastructure is required.

It is acknowledged that the Council are satisfied with the proposed road reserve widths, however do not support an 11.2m wide carriageway for a Collector Road. Currently one Collector Road is proposed in the plan of division at 9.0m which forms a V-shape south of the GELR.
Further correspondence was sought in regards to the width of the proposed Collector Roads in the Plan of Division. GTA Consultants provided the following response:

'The proposed carriageway will facilitate on-street parking when required while providing two-way traffic movements. From a road safety perspective, the 9-metre-wide carriageway will assist in achieving voluntary compliance with the urban default speed limit, particularly when parking occurs, creating a road environment consistent with a 50km/h speed environment.
By adopting 11.2-metre-wide carriageways for minor collector roads, particularly when there are low levels of parking, there is a risk that vehicle speeds will significantly increase as a result of the wider and more open road environment. Under such circumstances it is not desirable to construct local area traffic management (LATM) as a means of enforcing the speed since collector roads should be kept free from such devices.'

On balance, it is considered that the proposed road layout is considered to be acceptable and will provide safe and efficient movement within the development.
Notwithstanding the above, a Condition is recommended to ensure that the final design and engineering specifications of road layout and design (i.e. carriageway width) shall be undertaken with the relevant council prior to the issue of a Certificate under Section 51 of the *Development Act 1993*.

Local streets

A series of local streets are also proposed throughout the development. Local streets will have a carriageway width of 7.5 metres and are proposed to be sited within a road reserve of 14.0 metres or 16.0 metres. This will enable cars to be parked on both sides of the road, and will allow passage of service (waste) and emergency vehicles (fire truck) road to pass through (width 3.3m).

Gawler Council support the proposed road reserve widths for local streets.

With regard to walking and cycling, the local streets are designed to support local walking trips with at least one side of road reserve incorporating a sealed footpath. As outlined in the Open Space section of this report there are also pedestrian and cycle pathways proposed across the plan of division which form a network of green linear corridors over the site.

Cul-de sacs

Cul-de-sacs are proposed in some sections of the development (typically where there is steeper terrain). Cul-de-sacs have been designed to incorporate an 18 metre turning circle, capable for refuse vehicles to enter and exit in a forward direction.

Laneways

Laneways are proposed at various locations within the development. Gawler Council raised concern with laneways exceeding 100 metres in length and noted that this could encourage a 'speed environment'. As such, the Applicant has confirmed that only one laneway will exceed 100 metres in length. This laneway will be fitted with traffic calming measures such as inset tree and vegetation planting in the carriageway. Typically laneways will have a minimum carriageway width of 6.0 metres with an 8.0 metre road reserve, which is considered to be sufficient for vehicles reversing from garages and provide adequate space for waste collection.

Access Places

Access places will also be accommodated in the plan of division and include short sections of road leading directly to dwellings. They will be of similar nature to a laneway design and have a minimum carriageway width of 6.0 metres with an 8.0 metre road reserve.

Traffic Generation

The proposed plan of division will increase traffic generation to the site and on surrounding roads. In particular traffic generation will be increased on roads surrounding the site including Calton road, Cheek Avenue, Sunnydale Drive and Balmoral Road. Calton Road is predicted to increase in traffic generation by an additional 2,500 vehicles per day.

The Gawler East Link Road will help to distribute some of the traffic generated away from the town centre and toward Main North Road in Evanston. This will assist with managing traffic generation within the site itself and reducing further impacts on Calton Road.

A plan has been prepared by the Applicant to demonstrate the predicted traffic volume effect. Please refer to map below:

Gawler Council raised concern with the proposed traffic modelling prepared with the GTA Report "Transport Impact Assessment Issue A" stating that it is at variance with the existing traffic modelling underpinning the Gawler East Traffic Interventions and Community Infrastructure Deed and associated traffic interventions.

Provision of Road Infrastructure

Throughout the assessment process, the Gawler Council have indicated their preference for infrastructure funding to be tied to the land via an Infrastructure Deed (Traffic Intervention and Community Infrastructure Deed) registered over the land via a Land Management Agreement, prior to any development authorisation being granted.

This Deed has never been signed. Springwood Development Nominees are unable to sign the deed based on the following reasons:

- *The deed is drafted such that the developer will be unable to deal with their lands (sell, divide or develop);*
- *All parties with an interest in the land, including easement holders, need to consent to the terms of the LMA; and*
- *If an easement holder declines or delays to consent to the terms of the LMA, Springwood Development Nominees Pty. Ltd. will be unable to sell, divide, develop and otherwise dispose of their land.*

As such, the Applicant's preference is to secure the critical infrastructure is delivered through the mechanism of a Separate Rate. A Separate Rate for traffic upgrades has been implemented by the Town of Gawler which applies to all development in the Residential (Gawler East) Zone (including Springwood). The Separate Rate covers the delivery of:

- *The Gawler East Link Road (GELR)*
- *Upgrades to certain roads in Gawler East (Traffic Interventions); and*
- *Community Infrastructure.*

As detailed in section 4.1 of this report, infrastructure is a critical part of all land division applications however it is improper to determine the merits of an application on the proviso of their being (or not) an agreement in place, between the council and the applicant, in relation to the funding of public infrastructure outside of the subject land.

Regulation 52 is the only regulation that addresses the prospect of works outside the subject land, the subject of a land division application. Specifically, Regulation 52 deals with existing or future requirements in relation to road widening and to that extent, the provision of land area required for road widening, not the securing of funding.

Notwithstanding that funding to execute the recommendations of the Gawler East Traffic Interventions study is a matter for the Council to pursue outside of the assessment and determination of this application, it is considered that a suitable mechanism is in place (Gawler east Separate Rates) to secure necessary infrastructure and to fund and deliver the required infrastructure for the proposed plan of division.

Parking

The proposed road network has been designed with on street parking for visitors, in the form of parallel parking bays. This would equate to approximately one on-street parking space for every two dwellings. This is in accordance with PDC 247 Council Wide Policy. An Indicative on-street parking plan was provided with the application to demonstrate that this could be achieved even where clusters of medium density allotments occur.

The Barossa Council queried whether a strategic approach has been adopted for the location of driveways and how this relates to the placement of street trees and on street car parking provision.

The location of driveways will be included in the detailed design stage for each stage of development. This will be dealt with via a Section 51 clearance and will be coordinated to ensure driveways do not interfere with street infrastructure and include the required parking provision on street.

Public Transport

There is currently limited public transport that serves the site.

The proposed plan of division includes a road network that is able to accommodate a bus network. Please refer to map below:

9.15 Native Vegetation

Objective 13: Retention of environmentally-significant areas of native vegetation.

PDC 37 Native vegetation and roadside vegetation should be preserved and replanted with local indigenous species where practical and should not be cleared if it

(a) Provides important habitat for wildlife
(b) Has a high plant species diversity or has rare or endangered plant species and plant associations;
(c) Has high amenity value;
(d) Contributes to the landscape quality of the area;
(e) Has high value as remnant of vegetation associations characteristic of a district or region prior to extensive clearance for agriculture;
(f) Is associated with sites of scientific, archaeological, historic or cultural significance; or
(g) Is growing in, or is characteristically associated with, a wetland environment.

PDC 39 When clearance is proposed, consideration should be given to :

(a) Retention of native vegetation for, or as:
  (i) corridors or wildlife refuges;
  (ii)amenity purposes;
  (iii)livestock shade and shelter; or
  (iv)protection from erosion along watercourses and the filtering of suspended solids and nutrients from run-off ;
(b) The effects of retention on farm management; and
(c) The implications of retention or clearance in fire control.

It is important to understand that whilst the Development Plan has policy speaking to the protection and enhancement of native vegetation, the governing bodies for native vegetation clearance and the management of threatened species and ecological communities are listed below:

Environment Protection and Biodiversity Conservation Act 1999

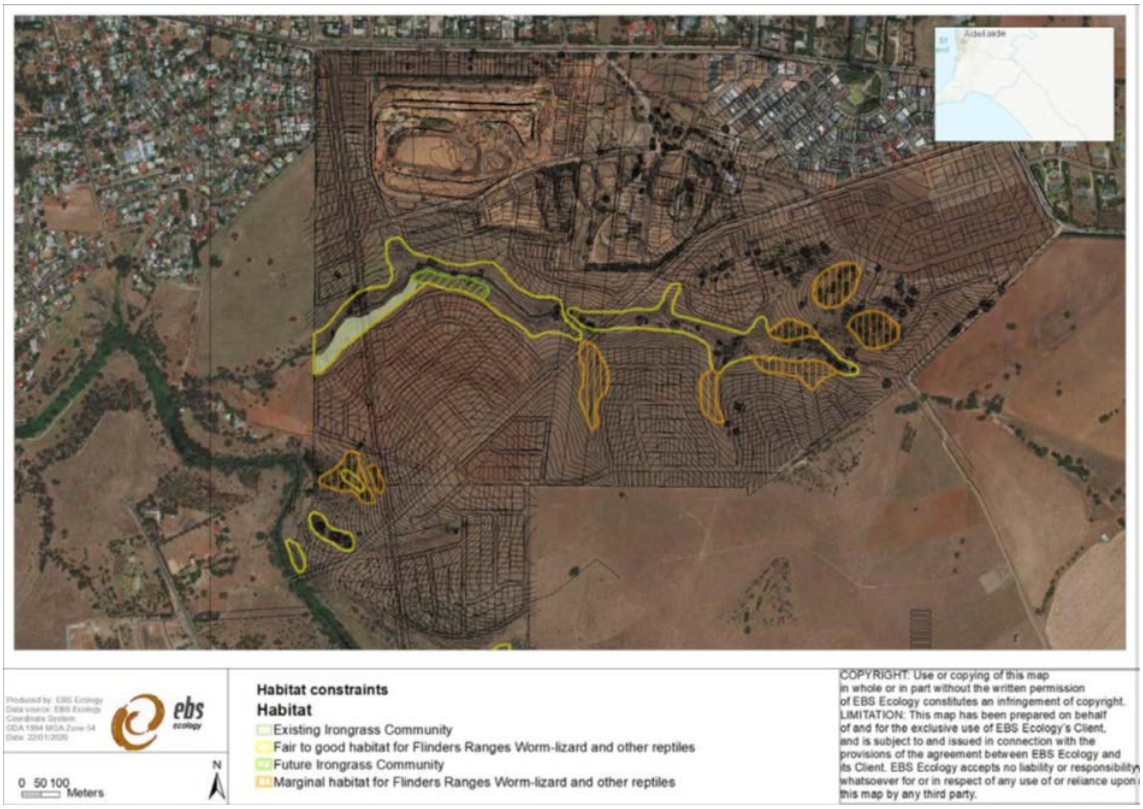
The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and accompanying Regulations provide a legal framework to protect and manage nationally and internationally important flora and fauna, ecological communities and heritage places – defined in the Act as 'matters of national environmental significance'. Listed threatened species and ecological communities is listed as one of the matters of environmental significance protected under the Act.

Native Vegetation Act 1991

Native vegetation is protected by the *Native Vegetation Act 1991 and Native Vegetation Regulations 2017.*

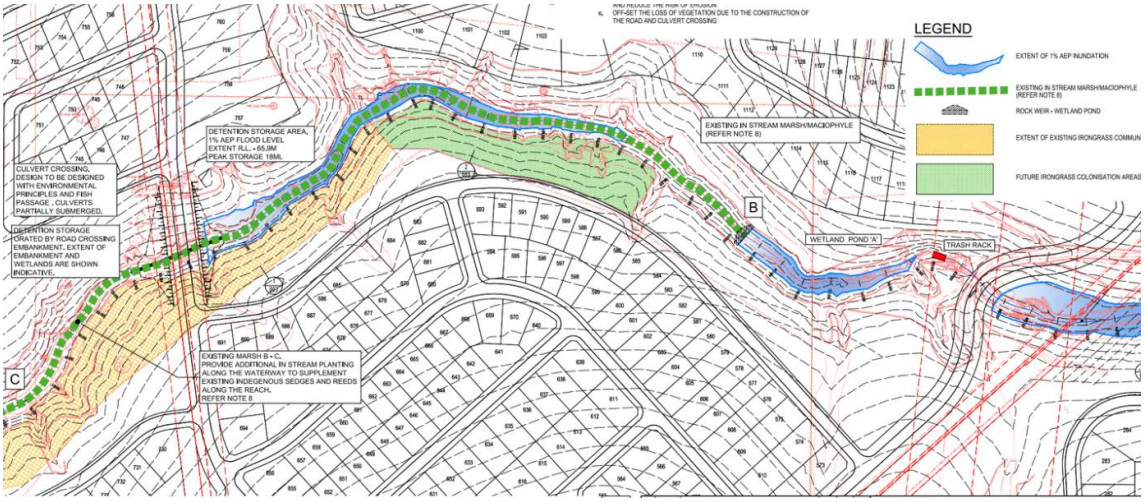
The proposed plan of division is accompanied with the Springwood Flora and Fauna Assessment dated March 2019. The report is an updated version of a previous ecological assessment which was carried out by Kellogg Brown and Root (KBR) in 2010 on behalf of the previous developers for the site.

The EBS report includes a Desktop Assessment and a Field Survey (conducted on 18 March 2019), to identify flora and fauna species and ecological communities of national environmental significance. The updated report concluded that the site has an overall low ecological value, given that it has been previously used for farming activities and the main vegetation on the site is pasture. The proposed plan of division has been designed to avoid areas of high native vegetation and ecological communities of national environmental significance, where possible as indicated in the map below:



Flora

One threatened ecological community is identified as being known to occur on the site. This is commonly referred to as Iron-grass (Lomandra) Temperate Grassland which exists on the southern edge of Spring Creek. Please refer to map below: (yellow=Iron-grass) (green=future Iron-grass colonisation area)



The EBS report was unable to provide an accurate observation of the Iron-grass condition, given the recent dry weather. Notwithstanding the above, the total size of the Iron-grass community within the project area is estimated to be 1.2ha.

The proposed plan of division has been designed to avoid the clearance of this area. However a small part will be impacted by the proposal where the proposed stormwater infrastructure is proposed. The total area of Iron-grass impacted by the development is estimated to be 0.12 ha.

It is also acknowledged that the proposed stormwater infrastructure will cause parts of the Iron-grass community in the Creek to be inundated by peak storm events. The duration of inundation is estimated at less than 2 hours for the 1% AEP post development storm event. No Iron-grass communities will be inundated for storms less than 50% (equivalent to a 2-year ARI).

EBS provided correspondence on the 22nd January that states '*It is considered that there won't be a significant direct or indirect impact on the Iron-grass (Lomandra) Temperate Grassland within the Project Area, provided management recommendations, made in relation to the future management of the area are implemented. These management recommendations, and the development of associated management plans, will be undertaken as part of the EPBC referral.'*

Furthermore, as indicated in the map above, an area has been set aside in the proposed plan of division to encourage the future colonisation of the Iron-grass community. This is estimated to be approximately 0.70ha in size.

Notwithstanding the above, a separate consent is required from the *Environment Protection and Biodiversity Conservation Act 1999*.

The Eucalyptus Porosa (Mallee box)

The Eucalyptus Porosa (Mallee box) tree is identified as remnant tree on the application site. Approximately 70 trees of this species are required to be removed as part of the proposed plan of division. As previously stated in this report, it is generally accepted that the removal of regulated/significant trees can occur with orderly development.

The Applicant has highlighted that the proposed clearance to native trees has followed the Mitigation Hierarchy which is a process generally applied to clear native vegetation for residential subdivisions, supported by the Native Vegetation Regulations (Regulation exemption 12, schedule 1, clause (35) – Residential subdivision. The proposed plan of division proposes to avoid areas of highest tree density, which provide the highest habitat values.

On Friday 29 November 2019, further information was requested with respect to confirmation of discussions with the Native Vegetation Council (NVC) regarding the 'approach' – *Mitigation Hierarchy* and process for native vegetation clearance approval for the project.

The Applicant provided a response on the 20th December 2019 from the Native Vegetation Council. Whilst the Native Vegetation did not assess the merits of the application, they did provide comment that the Mitigation Hierarchy is an accurate representation of the process to be applied for residential subdivisions under the *Native Vegetation Act 1991*.

Notwithstanding the above, prior to any native vegetation clearance occurring on the site, approval under the *Native Vegetation Act 1991* is required.

Fauna

Flinders Worm Lizard

The 2010 KBR study observed the Flinders Worm Lizard on the site, however no new observations have been recorded since the 2010 record. The proposal avoids the creation of allotments in all areas mapped on the plan to include high habitat for the Flinders Ranges worm-lizard, however will impact on some areas mapped as marginal habitat for the Flinders Ranges worm-lizard.

Given that the Flinders Worm Lizard is listed as a threatened species, a referral is required to the EPBC, as they are the legal body in charge of protecting and managing this species.

9.16 Site Contamination

Contaminated Land

OBJ 18 *Protection of human health and the environment wherever site contamination has been identified or is suspected to have occurred.*

OBJ 19 *Appropriate assessment and remediation of site contamination to ensure land is suitable for the proposed use and provides a safe and healthy living and working environment.*

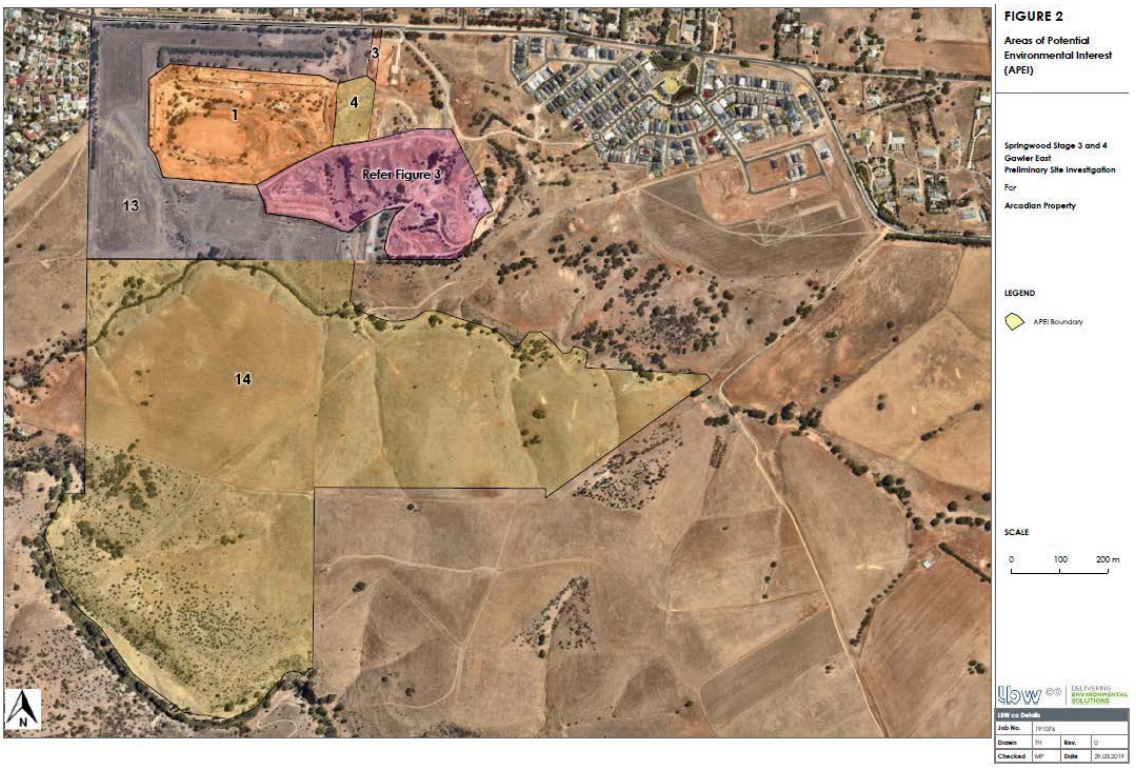
PDC 41 *Development, including land division, should not occur where site contamination has occurred unless the site has been assessed and remediated as necessary to ensure that it is suitable and safe for the proposed use.*

A Preliminary Site Investigation was provided with the application and produced by Lbw Co. The PSI identifies any potentially contaminating activities (PCA) on the site. The PSI was based on the following two components:

- *A desktop review of available site history information for the site and adjacent properties, to identify current or historical land uses which might be considered Potentially Contaminating Activities (PCAs); and*

- *An intrusive soil investigation to assess for the presence of chemicals of interest (COIs) in soil that may indicate the historical presence of PCAs.*

Please refer to maps below which highlights A*reas of Potential Environmental Interest* (APEI's).



Based on the above, the PSI report recommends the following:

- *Remediation of soil impacts associated with historical fuel and waste oil ASTs should be undertaken in APEI 6. Assessment of groundwater in this area is also*

recommended, to confirm the absence of potential harm to groundwater resulting from these impacts.

- *Further assessment of soil and/or groundwater should be undertaken in the vicinity of other PCAs (APEIs 6, 7, 10, and 11) to confirm the absence of risk to future receptors and suitability for the proposed sensitive land uses.*

- *No further investigation is recommended in APEIs 1-5, 8, 9, or 12-14.*

As such, no further investigation is warranted for the majority of the site – which is located in *APEIs 1-5, 8, 9, or 12-14.* This relates to this proposed plan of division.

The Applicant has submitted two separate Plans of Division (DA490/D025/19 & DA490/D027/19) to address the land contamination issues within (APEI 6, 7, 10, and 11). For these respected applications the applicant will be required to submit a Site Contamination Audit Report (SCAR), confirming that the land is suitable for its intended use.

Gawler Council raised concern with this approach given that it does not ensure that some allotments (9000 and 9004) within the proposed plan of division will be suitable for their future end use. However it should be noted that this application does not propose the subdivision of these allotments for residential use.

On balance, it is considered that the parent plan of division complies with objective 18-19 and PDC 41 of the Gawler Council's Development Plan.

9.17 Connection to Services

Residential (Gawler East) Zone

PDC 11 Public lighting should be provided to all public roads, laneways, paths and open spaces.
PDC 15 Transmission lines should be protected from encroachment through the provision of:

(a) a 30 metre wide corridor (15 metres each side from the centreline) for the 132kV line;
(b) a 50 metre wide corridor (25 metres each side from the centreline) for the 275kV line.

PDC 16 Residential allotments should not be created within the Major Transmission Infrastructure Corridors shown on Structure Plan Map Ga/1 (Overlay 1) Enlargement G, or within the existing easements for the 132kV and 275kV transmission lines.

• A 275kV transmission line currently runs north-south through the Development, parallel to the western boundary of the proposed Village Centre. This extends from the overall site's northern boundary to the southern boundary and is located within a 100m ElectraNet easement.

• A 132kV transmission line runs north-south through the site, approximately parallel to the site's western boundary. This line begins at the Cheek Avenue/ Calton Road intersection and extends to the southern boundary of the Development. The infrastructure is located centrally within a 30m ElectraNet easement.

No allotments are proposed within the 275 kV transmission easement area. Land located within this easement is proposed to be mainly landscaped open space.

No allotments are also proposed within 132 kV transmission easement area. The application was consulted with ElectraNet who raised no objection to the proposal.

Form of development

PDC 63 Development should be supplied with adequate energy, water, waste disposal and drainage facilities to serve the needs of users.

WGA have prepared a 'Site Services Report' for the subject site which demonstrates that the development can be efficiently connected to and serviced by essential infrastructure and services, subject to augmentation requirements of the various infrastructure providers.

10. CONCLUSION

In considering the merits of the proposal, significant regard was given to the residential zoning attributed to the site. The proposed configuration of allotments are deemed to be generally consistent with the residential layout provided in the Concept Plans included in the Gawler and Barossa Council Development Plans. The proposed plan of division will deliver a predominantly residential area comprising a range of low and medium density residential allotments in accordance with the zone objective.

It is considered that the road layout will provide safe and convenient access/egress for the development. Similarly, the infrastructure and drainage proposed is considered a reasonable approach to stormwater management given the nature and topography of the land.

The proposed plan of division has been designed to avoid areas of high native vegetation and ecological communities of national environmental significance, where practicable/possible.

Requirements have been drafted into the consent recommendation below to ensure that these negotiations must take place and be finalised (to the satisfaction of all parties) prior to Section 51 clearance being issued for any stage of the land division.

Given the matters outlined above, it is considered that the proposal is well aligned with the Development Plan policies for residential development and therefore warrants consent. It has been demonstrated that the majority of impacts can be managed within the confines of the subject land, with detailed engineering and infrastructure requirements being managed by way of the Statement of Requirements prior to the issue of a Certificate under Section 51 of the *Development Act 1993,* and supplemented with a future deed which is separate to this application.

Consequently, a recommendation is put below for the consideration of the SCAP to grant Development Plan Consent and Land Division Consent, subject to suggested conditions, land division requirements and advisory notes.

1. RECOMMENDATION

It is recommended that the State Commission Assessment Panel:

1) RESOLVE that the proposed development is NOT seriously at variance with the policies in the Development Plan.

2) RESOLVE that the State Commission Assessment Panel is satisfied that the proposal generally accords with the related Objectives and Principles of Development Control of the Gawler and Barossa Development Plans.

3) RESOLVE to grant Development Plan Consent (and Land Division Consent) to the proposal by Springwood Development Nominees for Land Division to create 1,201

allotments at Calton Road, Gawler in CT 6186/896, CT 6205/146, CT 6118/249, CT 6162/334, CT 6184/173 and CT 6212/430 subject to the following conditions of consent.

DEVELOPMENT PLAN CONSENT CONDITIONS

1. The development shall be undertaken and completed in accordance with the associated stamped plans and documentation, except where varied by conditions below (if any).

   REASON: *To ensure the development is undertaken in accordance with this consent.*

2. Construction of all road, stormwater and footpath infrastructure is to be in accordance with the following construction hold points with a minimum of 48 hours' notice given to relevant council to attend site:

   a. Stormwater Hold Points – Excavation; pit and pipe installation; and backfill material.

   b. Road Hold Points – Subgrade inspection, Subbase inspection, Basecourse inspection, and asphalt installation.

   c. Footpath Hold Points – Formwork prior to concrete pour.

   REASON: *To ensure that infrastructure is provided in an orderly manner.*

3. All fire tracks shall be designed to allow safe and convenient access for fire vehicles to adequately access dwellings for the purpose of fire protection and allow safe evacuation of the community in the event of a fire in accordance with the Ministers Code for Undertaking Development in Bushfire Protection Areas.

   REASON: *To ensure infrastructure is provided for the purpose of Bushfire fighting purposes.*

4. All roads shall be designed in accordance with the Ministers Code for Undertaking Development in Bushfire Protection Areas, where required, for safe and convenient movement of vehicles and have a sealed surface.

   REASON: *To ensure that Bushfire fighting service vehicles and personnel can operate within the site.*

5. All physical infrastructure services, including electricity and telecommunication services are to be provided underground.

   REASON: *To improve the character and amenity of the locality.*

7. Semi-mature native tree species (>1m in height) indigenous to the local area shall be planted on a 2 for 1 basis to compensate for the removal of each regulated tree and on a 3 for 1 basis for each significant tree. The replacement trees must not be a species listed in Regulation 6A(5)(b) of the *Development Regulations 2008*, or a tree belonging to a class of plant declared by the Minister under Chapter 8 Part 1 of the Natural Resources Management Act 2004. The trees shall be maintained in good condition at all times and replaced if deemed necessary by the relevant authority.

REASON: *To satisfy the requirements of Section 42(4) of the Development Act 1993.*

LAND DIVISION CONSENT CONDITIONS

2. The final design and engineering specifications shall be undertaken in consultation with the relevant council (Town of Gawler or The Barossa Council) and take into account:

    - the specifications prescribed in *Part 9, Division 2 – Prescribed requirements – general land division* of the *Development Regulations 2008; and*
    - the relevant council (Town of Gawler and The Barossa Council) design standards; and
    - the relevant Australian Standards.

    Prior to the issue of a Certificate under Section 51 of the *Development Act 1993,* the final design and engineering specifications in relation to relevant stage of development (i.e. the relevant stage for which clearance is being sought) shall be submitted be to the reasonable satisfaction of the State Commission Assessment Panel.

    REASON: *To ensure that infrastructure is provided to an appropriate standard.*

7. The financial requirements of the SA Water Corporation shall be met for the provision of water supply and sewerage services SA Water 2019/00266.

8. The augmentation requirements of the SA Water Corporation shall be met.

9. The necessary easements shall be vested to SA Water.

10. A final plan complying with the requirements for plans as set out in the Manual of Survey Practice Volume 1 (Plan Presentation and Guidelines) issued by the Registrar General to be lodged with the State Commission Assessment Panel for Land Division Certificate purposes.

11. All required road works shall be designed and constructed in accordance with Austroads Guides/Australian Standards and to DPTI's satisfaction. All associated costs (including project management and any necessary road lighting and drainage upgrades) shall be borne by the applicant.

7. Detailed civil engineering design plans and specifications prepared by a suitably qualified professional engineer in relation to relevant stage of development (i.e. the relevant stage for which clearance is being sought) shall be provided to the relevant council prior to the issue of Section 51 Clearance.

    REASON: *To ensure that civil design details are provided to the relevant council.*

8. A stormwater Management Plan, to be provided in stages (including provision for WSUD features), prepared by a suitably qualified hydrological engineer shall be provided to the relevant council, in consultation with and to the reasonable satisfaction of the relevant council, in relation to relevant stage of development (i.e. the relevant stage for which clearance is being sought) prior to the issue of Section 51 clearance for the relevant stage.

The stormwater management plan should consider that overall peak discharge rate from the land post-development shall be limited to the predevelopment flow rate for all storm events up to and including the 1 in 100-year ARI storm event with detention storage provided inside and outside of watercourse environments (where appropriate).

REASON: *To ensure impact on the environment is minimised as a result of development.*

9. The Applicant shall provide detailed landscape design drawings and specifications, prepared by a suitably qualified landscape architect, for all proposed landscape works in proposed road reserves and open space areas to be vested in the Town of Gawler and/or The Barossa Council ("council"). The detailed landscape design drawings and specifications, in relation to relevant stage of development (i.e. the relevant stage for which clearance is being sought), shall be to the satisfaction of the council prior to the issue of Section 51 Clearance.

REASON: *To ensure the urban environment is satisfactorily managed by the council*

10. All works proposed for the construction of proposed public roads and the proposed reserves must be completed or otherwise appropriately bonded, to the satisfaction of the relevant council, prior to Section 51 Clearance.

REASON: *to provide for the construction of satisfactory public roads and reserves.*

11. Maintenance access tracks shall be provided along the top of embankments to the satisfaction of the relevant council, in relation to relevant stage of development (i.e. the relevant stage for which clearance is being sought), prior to the issue of Section 51 Clearance in accordance with the following:

    - Access tracks shall be 3 metres in width and if forming part of a cycling connection shall be of asphalt type in accordance with Town of Gawler Standard Detail SK-203.
    - Access tracks shall be 3 metres in width and if not forming part of a cycling connection shall be of cement stabilised crushed rock type in accordance with Town of Gawler Standard Detail SK-203.
    - Include appropriate drainage systems, retaining structures and scour control measures to the satisfaction of the Town of Gawler.
    - Provide safe and convenient access to stormwater basins, stormwater water quality
    - Devices and any other public infrastructure in accordance with Australian Standard AS2890, Austroads Guidelines and ARRB Group 'Unsealed Roads Manual: Guidelines for Good Practice.'

REASON: *To ensure that infrastructure is provided in accordance with Council requirements.*

12. An allotment plan shall be provided to and approved by the relevant council showing the extent and the depth of filling on the allotments approved as part of this division.

A compaction and clean fill certificate issued by a suitably qualified engineer shall be provided to the reasonable satisfaction of Council, in relation to relevant stage of development (i.e. the relevant stage for which clearance is being sought), indicating that the compacted fill is suitable to support standard footings for residential development prior to the issue of Section 51 Clearance.

REASON: *To ensure the subject land is suitable for its intended use.*

ADVISORY NOTES

a. This Development Plan Consent will expire after 10 years from the date of this Notification, unless final Development Approval from Council has been received within that period or this Consent has been extended by the State Planning Commission.

b. The applicant is also advised that any act or work authorised or required by this Notification must be substantially commenced within 1 year of the final Development Approval issued by Council and substantially completed within 10 years of the date of final Development Approval issued by Council, unless that Development Approval is extended by the Council.

c. All local Residential Roads for traffic volumes up to 3,000 vehicles per day shall have a 14 metre wide road reserve with a 7.4 metre wide road carriageway and include a 1.5m wide concrete footpath constructed on one side of the roadway in accordance with 'Council Standard Detail SK-200' with mountable kerb and gutter in accordance with 'Council Standard Detail SK-304'.

d. All Collector Roads Type 1 for traffic volumes between 8,000 vehicles per day and 15,000 vehicles per day shall have a road reserve width of 22 metres and include 1.5 metre wide bike lanes, 3.5 metre wide traffic lanes, a 3 metre wide central median and 2.1 metre wide on-street parking to both sides of the roadway with 1.5 metre wide concrete footpath to both sides of the roadway in accordance with 'Council Standard Detail SK-200' and barrier kerb and gutter to 'Council Standard Detail SK-305'.

e. All Collector Roads Type 2 for traffic volumes between 3,000 vehicles per day and 8,000 vehicles per day shall have a road reserve width of 20 metres and include 2.1 metre wide onstreet parking to both sides of the roadway and 3.5 metre wide traffic lanes and a 1.5 metre wide concrete footpath to one side of the roadway in accordance with 'Council Standard Detail SK-200', a 3.0 metre wide shared path to one side of the roadway in accordance with 'Council Standard Detail SK-203', with barrier kerb and gutter to 'Council Standard Detail SK-305'.

f. All shared paths are to be 3m in width and constructed in accordance with Council 'Council Standard Detail SK-203'.

g. All roads shall be designed to facilitate safe and convenient movement of vehicles by achieving a sign posted speed environment of 50 kilometres per hour unless specified otherwise by the Town of Gawler.

h. Access roads within high pedestrian volume areas including town centre area shall be designed as shared streetscapes and create pedestrian friendly environments designed generally in accordance with the most recent 'Streets for People: Compendium for South Australian Practice'.

i. Stormwater detention and WSUD systems will be integrated within public open space areas and be designed to consider function, amenity, safety, future maintenance and be rationalised where possible.

j. A Soil Erosion and Drainage Management Plan (SEDMP) shall be provided to the council prior to the construction commencing. The SEDMP must be implemented in accordance with the 'Stormwater Pollution Prevention.

k. The applicant is reminded of their statutory obligations under the *Native Vegetation Act 1991* and the *Environment Protection and Biodiversity Conservation Act 1999* and shall comply with those obligations before undertaking the approved development.

l. All traffic control devices and roadway intersections shall be designed to relevant current Australian Standards, Austroads Guidelines, the Manual of Legal Responsibilities and Technical Requirements for Traffic Control Devices and to the satisfaction of the Town of Gawler.

m. Street name signs shall be in accordance with Councils Standard drawing SK-604.

n. The design traffic for the formed surface of roads shall be based on Chapter 12 of the Austroads Guide to Pavement Technology, Part 2: Pavement Structural Design should be utilised for pavement design and construction

o. Public street lighting and public area lighting should comply in all respects with the Australian Standard AS1158.

p. Light Emitting Diode (LED) Lighting should be provided to all public roads, laneways, cyclist paths and open spaces as well as around public facilities such as toilets, bus stops, seating, bins, and carparks.

q. All open space areas shall be designed in accordance with the Town of Gawler Open Space Guidelines.

r. Street trees shall be planted in accordance with Council Policy 7.12 (Street Tree Planting for New Land Divisions). The species and location of trees shall be to the satisfaction of Council and shall consider the common service trench location, street light location and setback from the kerb.

s. Irrigated areas shall be designed in accordance with the relevant council's Open Space Guideline and considering the sustainable use of water to the satisfaction of the relevant council.

t. Design should be developed considering Crime Protection through Environmental Design (CPTED) principles and a safety in design assessment provided to the satisfaction of the Town of Gawler.

u. "As constructed" drawings shall be provided to the relevant council prior to the date of Practical Completion in respect of all infrastructure constructed as part of the development. The drawings shall be provided in hard copy format and electronic "DWG" or "DXF" and "PDF" format.

v. Temporary turnaround areas and appropriate road and allotment drainage shall be provided to the reasonable satisfaction of the Town of Gawler to facilitate proposed staging or works.

w. All costs for the design and construction of all infrastructure shall be borne by the owner/applicant. Following a certificate of practical completion from relevant council the owner/applicant shall be responsible for all maintenance for a period to be agreed with the relevant council (defects liability period).

x. During construction, precautions shall be taken to prevent the pollution of stormwater by mud, silt, dust or other debris from the site in accordance with EPA Code of Practice for the Building and Construction Industry.

y. A Maintenance and Management Plan shall be prepared for any areas of open space that are proposed to be vested in a council.

z. Road pavement design and construction shall have a design life of 30-years, including allowance for predicted road traffic, future road construction traffic, residential construction traffic, future potential bus routes and the construction of future stages of the land division to the satisfaction of the council.

aa. All bridge structures shall be designed by a suitably qualified professional engineer in accordance with Australian Standard AS5100.

bb. Construction works associated with bridge structures shall be inspected and certified that it has been constructed in accordance with the approved plans and specifications by a suitably qualified and experienced structural engineer.

cc. All activities on the site should be undertaken cognisant of the *Local Nuisance and Litter Control Act 2016.*

dd. Approvals from all service authorities to modify services infrastructure are required to be obtained prior to commencement of construction and a copy of the approvals provided to the relevant council.

ee. Noise levels must comply with the Environment Protection (Noise) Policy 2007.

ff. The developer shall be responsible for liaison with SA Power Networks in respect to both public lighting and for the provision of an underground electricity service to all new allotments in the development.

gg. The appropriate Council Officer(s) shall be notified prior to commencing the various stages of infrastructure installation in order to inspect installation and traffic management.

hh. No retaining walls are approved as part of this land division application. Any retaining wall exceeding one (1) metre in height or combination of retaining wall and fence exceeding the height of 2.1 metres or any addition to an existing

retaining wall and/or fence exceeding the afore mentioned heights shall require Development Approval.

ii. No blasting shall occur on the subject land in accordance with AS 2885.

jj. Future land owners are advised that landscaping of road verges in front of private properties requires Council approval in accordance with Section 221 of the Local Government.

EPA Advisory Notes

kk. The applicant is reminded of its general environmental duty, as required by Section 25 of the *Environment Protection Act*, to take all reasonable and practicable measures to ensure that the activities on the whole site, including during construction, do not pollute the environment in a way which causes or may cause environmental harm.

ll. The applicant is reminded that due care should be taken to prevent or minimise adverse impacts and to appropriately manage stormwater runoff during construction and post-construction. Guidance can be found in the EPA's *Stormwater Pollution Prevention*

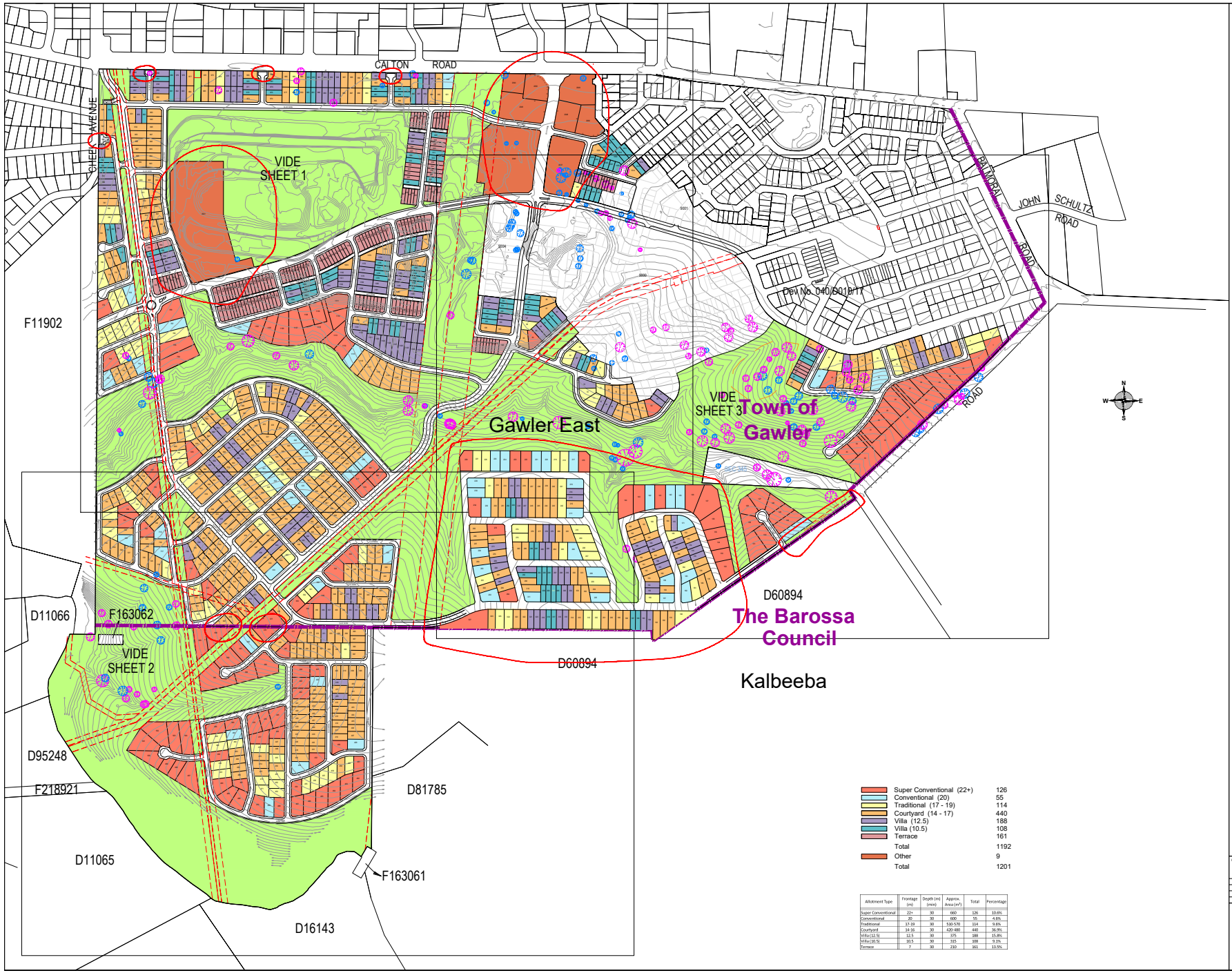
Code of Practice for the Building and Construction Industry:

http://www.epa.sa.gov.au/files/47790_bccop1.pdf

If during any site works, contamination is identified which poses actual or potential harm to the health or safety of human beings or the environment that is not trivial, taking into account the land use, or harm to water that is not trivial, the applicant may need to remediate the contamination in accordance with EPA guidelines.

EPA information sheets, guidelines documents, codes of practice, technical bulletins etc. can be accessed on the following web site: http://www.epa.sa.gov.au

00. The applicant has a right of appeal against the conditions which have been imposed on this Development Plan Consent. Such an appeal must be lodged at the Environment, Resources and Development Court within two months from the day of receiving this notice or such longer time as the Court may allow. The applicant is asked to contact the Court if wishing to appeal. The Court is located in the Sir Samuel Way Building, Victoria Square, Adelaide, (telephone number 8204 0289).



Allotment Type	Frontage (m)	Depth (m) (min)	Approx Area (m²)	Total	Percentage
Super Conventional	22+	30	660	126	10.6%
Conventional	20	30	600	55	4.6%
Traditional	17-19	30	510-570	114	9.6%
Courtyard	14-16	30	420-480	440	36.9%
Villa (12.5)	12.5	30	375	188	15.8%
Villa (10.5)	10.5	30	315	108	9.1%
Terrace	7	30	210	161	13.5%

ORIGINAL SHEET SIZE A0

Development No. 490/D026/19
Town of Gawler

Development No. 960/D025/19
The Barossa Council

Proposed Plan of Division
Allotment 2 in F7765
Allotment 1 in F13468
Allotment 9010 & 9011 in D114845
Allotment 9201 in Dev No. 490/D010/17
Allotment 4 in D28814
Hundred of Barossa
in the area named
GAWLER EAST & KALBEEBA

CT 6186/896 CT 6205/146
CT 6118/249 CT 6162/334
CT 6184/173 PT CT 6212/430

0 25 50 100 150 200 250 m
1:2500

SHEET 1 OF 4

AMENDED PLAN
11.09.2019
AMENDED PLAN
19.09.2019
AMENDED PLAN
20.11.2019

No. of proposed allotments	1201
Total area	185.6ha
Area of Development	168.5ha
Reserve area	69.55ha
Length of new roads	19.8k

Contour interval 2m.
Datum AHD.

Vide Titles for disposition of easements.

Road pavements shown are indicative only.

Not to be used for detailed engineering design.

Dimensions and areas are subject to survey.

Glenn Ian Hordacre
LICENSED SURVEYOR

REF:	A010816-CG
DWG NO.:	A010816-CG PROP1 REV G
REVISION:	G-1
DEL:	20.11.2019

Alexander & Symonds Pty Ltd
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ABN 93007 752 988

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W www.alexander.com.au
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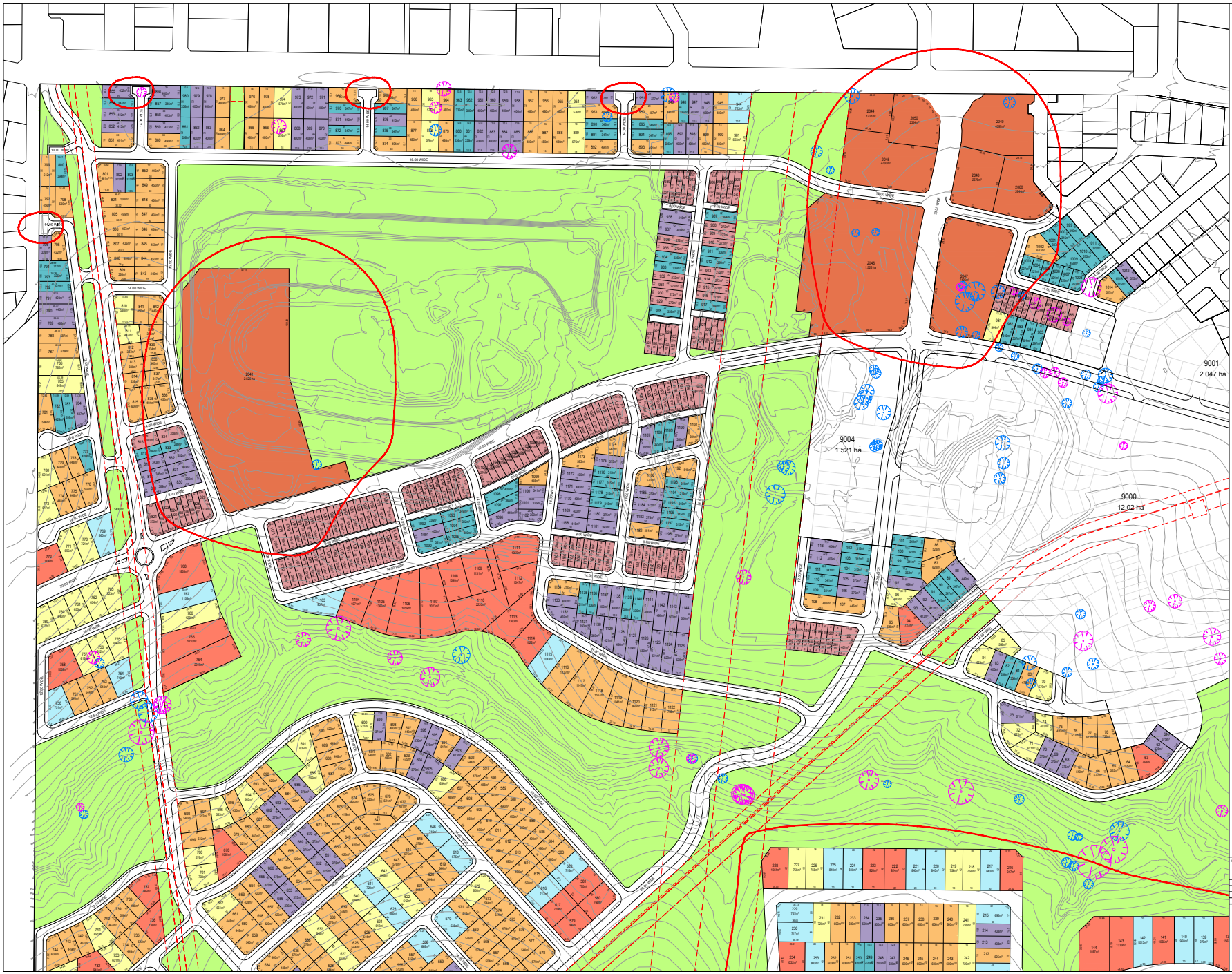

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SHEET 2 OF 4

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Significant tree
Regulated tree

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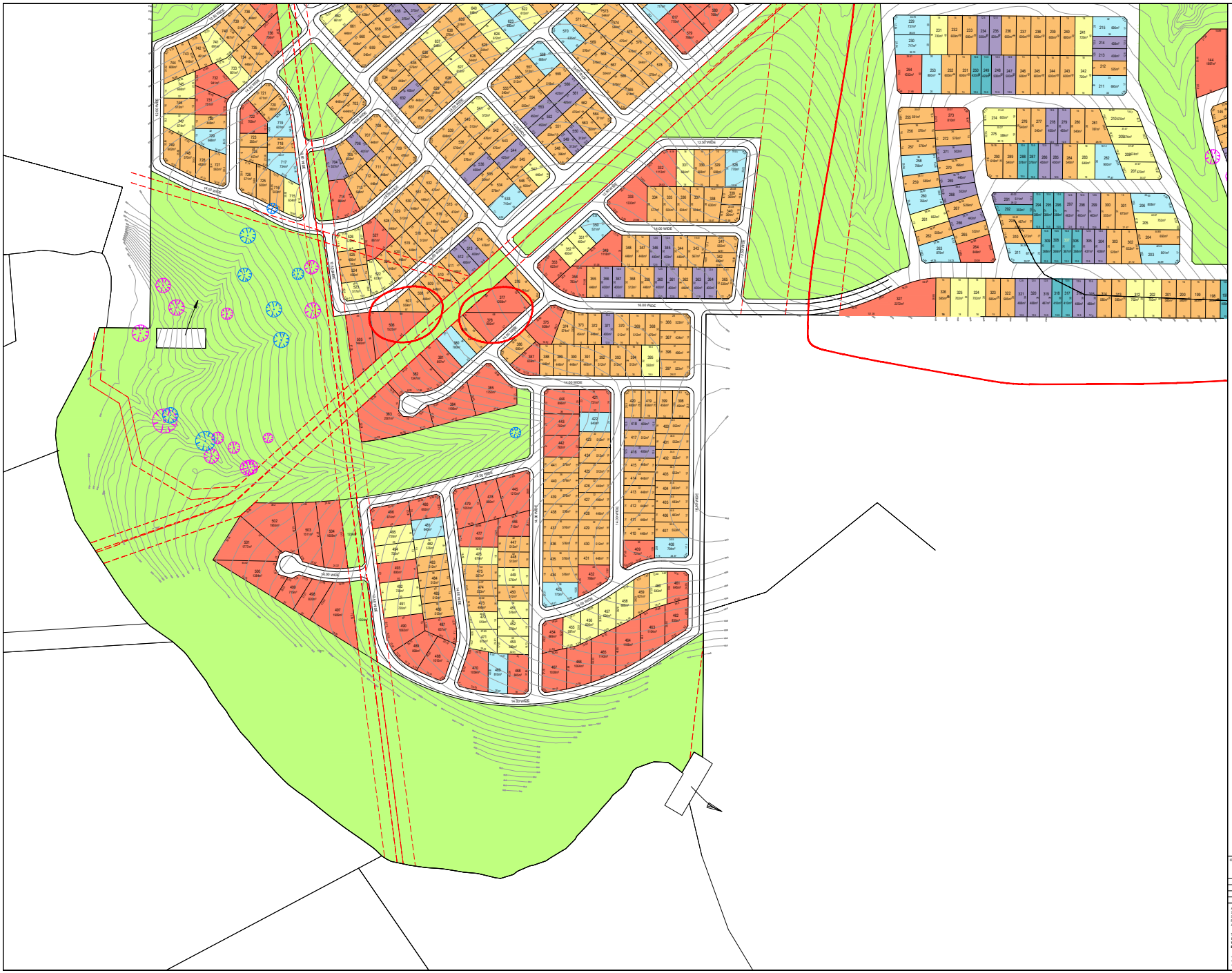

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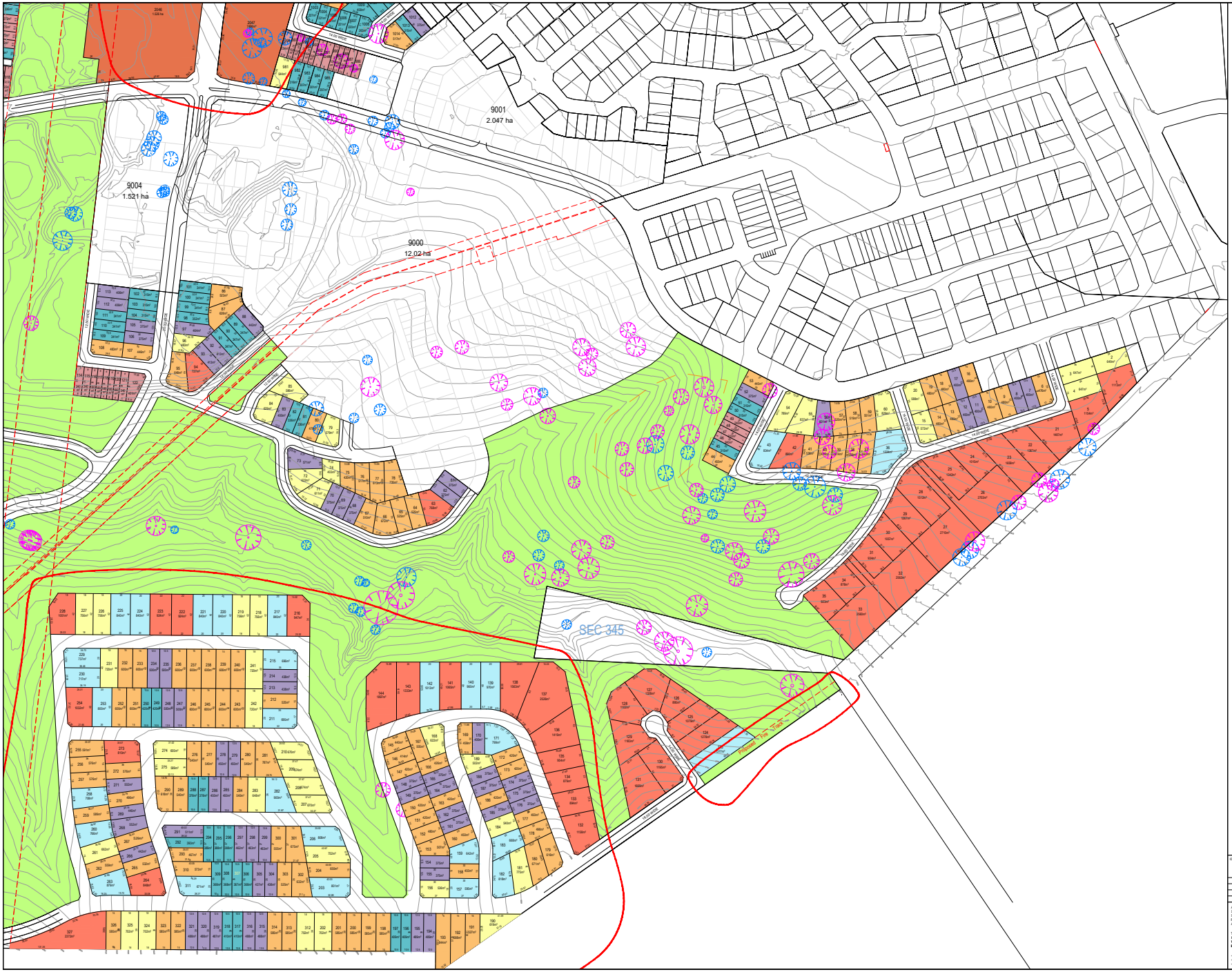

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SHEET 4 OF 4

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Landscape and Urban Design Masterplan
Springwood

for SCAP Application

Prepared by Tract for Springwood Communities

SPRINGWOOD
GAWLER EAST

Quality Assurance.

Springwood, Gawler
Landscape and Urban Design Master Plan
for SCAP Application

Prepared by Tract for Springwood Communities

Project Number
[316-0520-00-L-01-RP01]

Revision (see below)
[01]

Prepared By
Haley Irvine, Nathan Collins and Danielle McCann

Reviewed By
Orlando Harrison

Project Principal
Orlando Harrison

Date of Issue
12 June 2019

Revisions

Rev	Date	Details	Prepared By	Reviewed By	Project Principal
[00]	18 April 2019	Planning Comments	HI, NC, DM	OH	OH
[01]	12 Junel 2019	Clients Comments	HI, NC, DM	OH	OH

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Site Context & Background

Urban Design Masterplan

Urban Design Elements

316-0520-00-X-00-RP00_SCAP Report_Landscape and UD

Open Space Composition

Landscape Elements

Site Context & Background

1 Project Context

1.1 Introduction

Springwood will become more than just somewhere to live. It will be a place of inspiration and for many who call it home, a part of them, part of the fabric of their lives.

Springwood is an emerging residential community located on the periphery of the historic township of Gawler, in South Australia.

The site is currently being developed by Springwood Communities and will comprise a mixture of uses including residential, retail and education. Springwood is a 217.5 ha greenfield site where residential lots are proposed together with a village centre, education precinct, retirement village and substantial recreational facilities.

Portion of the subject site is located within the Residential (Gawler East) Zone and portion of the site is located within the Open Space Zone of both the Gawler (CT) Development Plan and the Barossa Council Development Plan. Portion of the land within Gawler is also located within Policy Area 3 - Mixed Use Centre of the Residential (Gawler East) Zone.

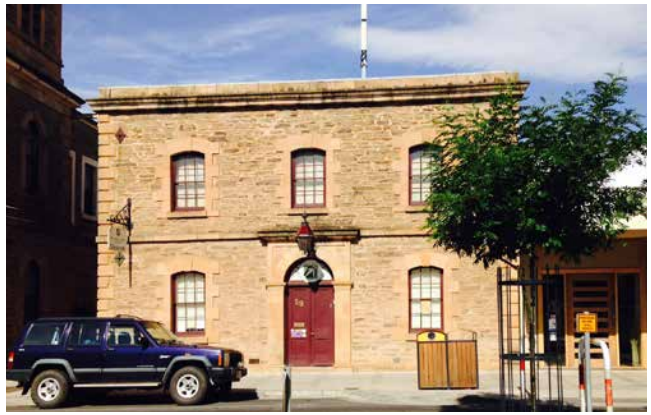
Located 1.5km east of the historic Murray Street in Gawler, Springwood provides a logical extension of the town in an easterly direction, adding to the lifestyle benefits and amenity provided within the township.

1.2 Purpose of this report

This Landscape and Urban Design Masterplan has been prepared to support the SCAP Planning Application – Package 1 for Springwood. The SCAP Planning Application – Package 1 includes:

- Land subdivision for the remaining portions of the Springwood development (approx.. 1500 lots on top of the approx.. 400 currently permitted). This includes residential areas, retail areas, community areas and the school area.
- Detailed application for the retail area (supermarket, speciality shops and associated car parks); and
- Detailed application for the sales centre with retail component.

This SCAP Planning Application process enables the development of a holistic and integrated masterplanning for the remaining portions of Springwood and seeks to provide greater certainty for its future development.



Historic Murray Street, Gawler

Historic Murray Street, Gawler

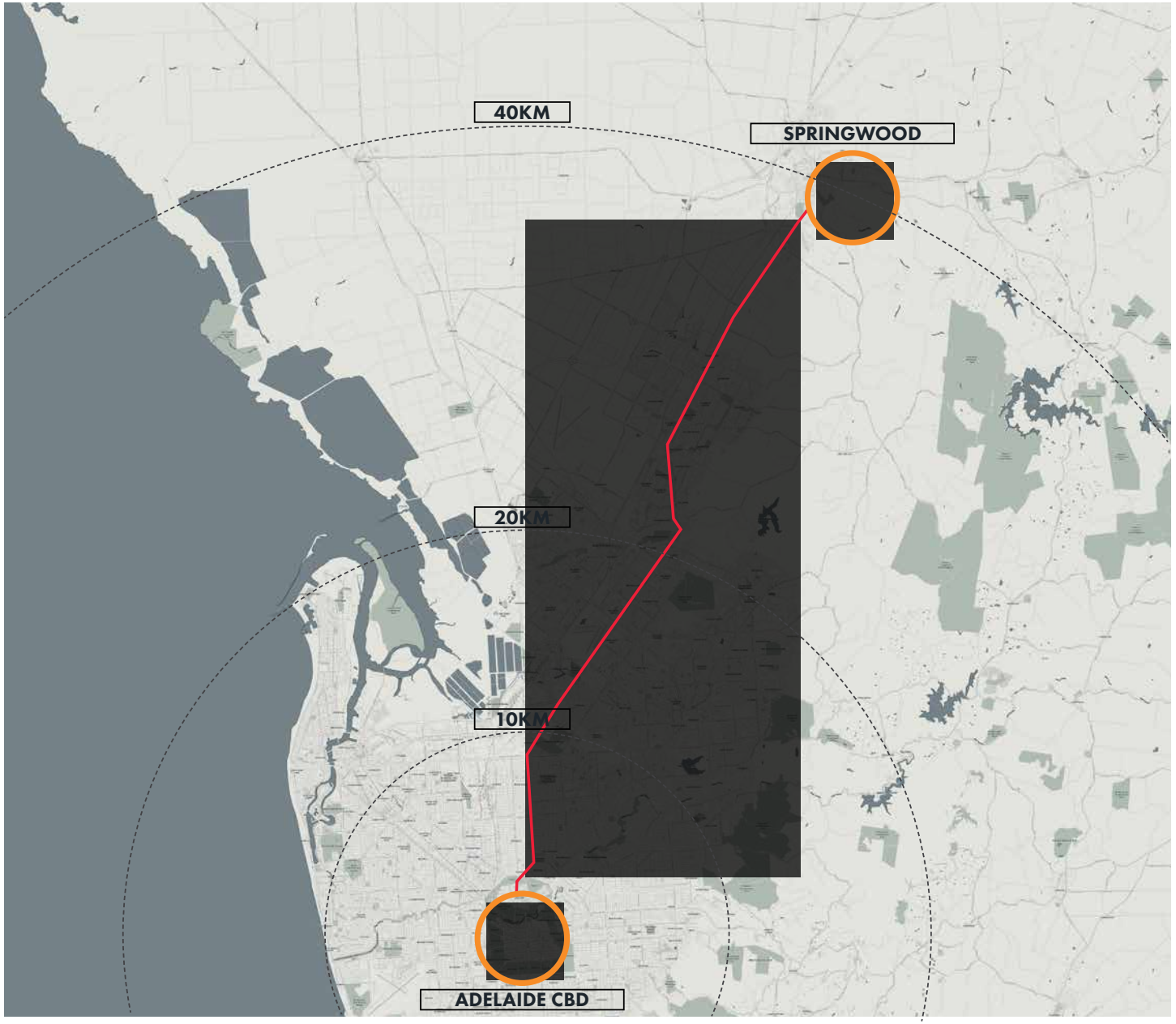
1.3 Regional Context

Gawler is the major regional centre for the wider Barossa and Lower Mid North Region of South Australia. Gawler is growing at a rate of nearly 2% per annum, twice the State average, with many families and newly retired people choosing to settle in the town which has a regional catchment at 90,000 people and growing. Gawler is a designated growth area identified by the South Australian Government.

Gawler is truly a '20 minute town'. Adelaide's Northern suburbs are 20 minutes away, either down Main North Road or via the new Gawler Expressway. The iconic Barossa Valley is also just 20 minutes away. South Australia's premier wine growing district – with numerous idyllic towns like Tanunda and Nuriootpa – the Barossa is recognised all over the world for the quality of it's produce.

The CBD is less than an hour's drive away, making Springwood a commutable distance into the city for work, rest or play. The township is serviced by an existing railway line, providing public transport access into the Adelaide CBD and northern suburbs.

Gawler is part of GigCity Adelaide, providing gigabit internet connection speeds (100 times faster than the national average) for start-ups, entrepreneurs and big businesses. GigCity will transform the Town of Gawler as an early adopter of technologies driving innovation and growth. This connectivity, coupled with the digital advisors in residence programs and business mentoring, networking and education, will provide a significant advantage to our local and regional entrepreneurs and start-ups who are competing in the local, national and global digital economy.



Springwood, in proximity to Adelaide

1.4 Site Context

Springwood is located along Calton Road, to the east of the township of Gawler. The site is complex and large in scale, at over 200 hectares in size.

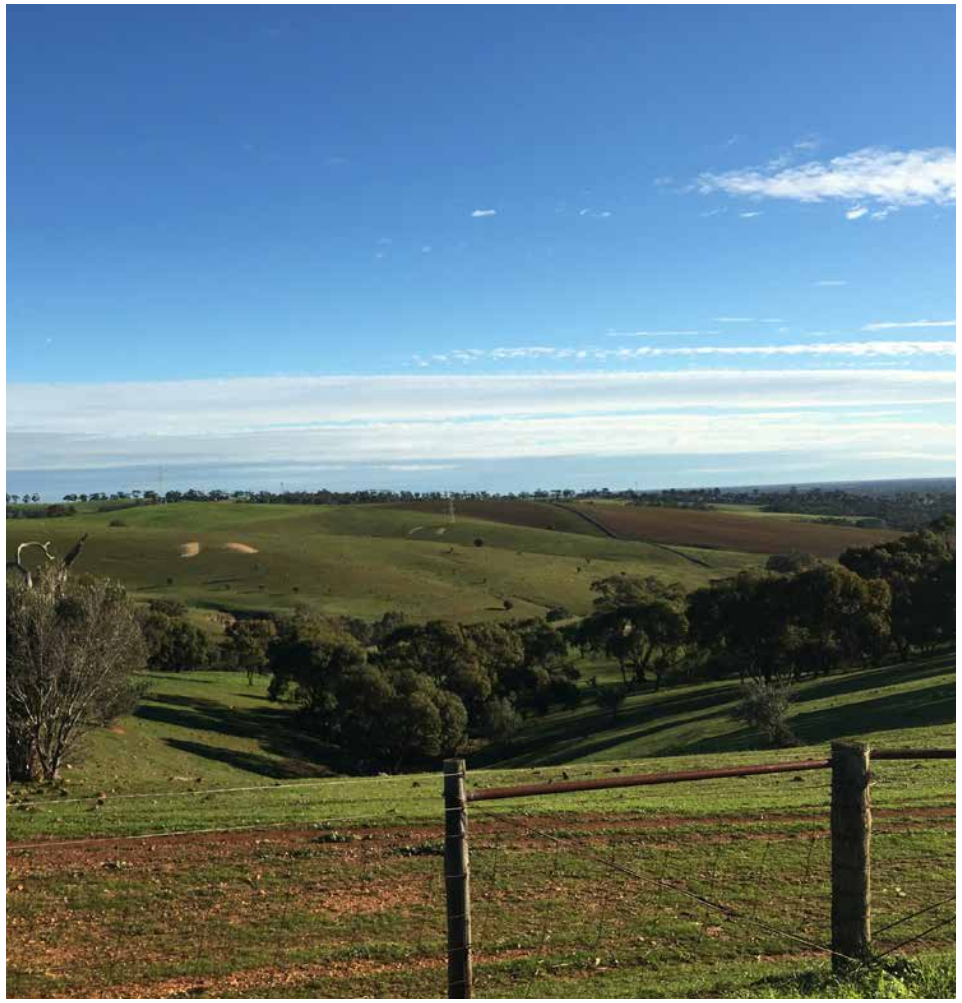
Key factors that have shaped the urban design and landscape masterplan for the site include:

- Proposed connections onto existing Calton Road and Balmoral Road.
- The development of Cheek Avenue extension, including integration with existing homes to the west of the easement.
- Sequence, timing and costs in relation to construction of Gawler East Link Road, as well as final construction levels.
- Potential integration of an SA Power Networks substation site.
- Integration with the existing development (delivered by Lend Lease) and Highfield (currently being delivered by Springwood Communities).
- Considered location of diverse housing outcomes.
- Sensitive consideration and built form response to the interfaces with Calton Road and along the Springwood Creek corridor.
- Springwood Creek environment and interfaces, including fire considerations and built form response, and the recreational opportunities for a network of trails connecting conservation, drainage and waterway areas of the site.
- Development of a local open space and shared path network to provide easy access between residential neighbourhoods and key services and amenities.
- Responding to the national and state significant vegetation that is to be retained.
- Providing a sensitive landscape interface with Para Woodlands.
- Appropriately responding to the slope across the site and towards the creek corridor including the usability of open spaces, build form response and potential for views.
- Consideration of existing easements including SEA Gas, Water, Electricity and other, and providing appropriate interfaces.
- Provision of a school site and the community facilities.
- Integrating the Former Quarry into the site in an authentic and considered way.
- Proximity to Gawler Town Centre and existing services and amenities.

Former Quarry

Para Woodlands Interface

Slopes and easements



Slopes towards Springwood Creek

The Springwood site and immediate surrounds

Urban Design Masterplan

2 Urban Design Masterplan

Located in the foothills of Gawler East, Springwood is rapidly developing as an aspirational village-style community which builds upon the natural attributes, history and community spirit of Gawler.

2.1 The Approach

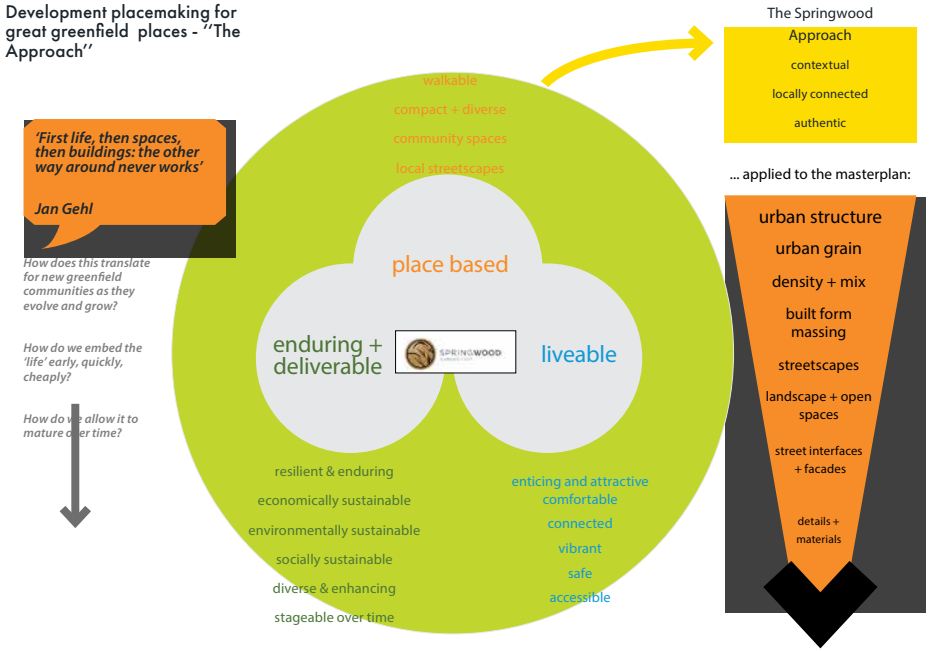
The approach for developing the masterplan for Springwood has been a place-making approach - one that aims to strengthen the connection between people and place.

A place making approach considers the physical, cultural, and social qualities of a place and fosters their ongoing evolution.

This means introducing new opportunities and offering new interpretations of existing places and spaces, as well as ensuring valued characteristics are embedded into the future character of the site.

The masterplan for Springwood aims to capture the imagination and energy of the surrounding community and to serve as a catalyst for broader change. It aims to generate pride of place and ownership of the development within the context of Gawler and the region.

It aims to ensure Springwood will become more than just somewhere to live. It will be a place of inspiration and for many who call it home, a part of them, part of the fabric of their lives.



2.2 Urban Design Principles

The development of the masterplan has been guided by the a set of urban design principles that are intended to provide both foundation standards for good design and place specific design principles that reinforce the broader vision for the Springwood community. While the masterplan design is likely to evolve as the project is implemented, these underlying principles should remain as a constant.

The page opposite provides a summary of the urban design principles that underpin the masterplan for Springwood, while the following pages provide further details for each principle.

1.
craft a diverse new community linked to Gawler, the Barossa and Adelaide

2.
activate unparalleled green open spaces and places

3.
design a 'lifestyle centre' with an identity as a refreshing escape from city life

4.
embed and showcase environmental + social sustainability for gawler

5.
embed and grow a village centre at the heart of Springwood

6.
create identity and local attractors from the existing vegetation and creekbed

7.
develop a school, recreation & adventure play precinct

8.
offer new levels of diverse housing choices, sizes and types

what this means for springwood..

- A diversity of community events centred on the Village Centre and Quarry precinct
- Multiple development stages, precincts and housing types to attract 4G community
- EV Charging Station

- A closed local loop of feature pedestrian and cycle Links
- Multi-age play options as attractors for families
- A linked 'ecosystem' of open spaces
- 'branded' bike + walking trails with contemporary wayfinding (online+signage)
- Creek Corridor

- Relaxing local atmosphere
- Market separation from 'urban' competitors
- Targeted partners as the development grows
- Emphasise the duality of location to embed the "escape"

- Suitable local planting scheme
- Visual W.S.U.D strategy + branding
- Rainwater harvesting
- Community gardens (early commencement already)
- Community building strategies - work hub, community safety net

- Dedicated areas for community events
- A regular local calendar of events.... early!
- Social centre (Display+Sales centre)
- Community Facilities
- Delivery of early retail

- Retain intrinsic qualities of the site, work with the topography
- Walkways along Spring Creek - attract visitors from beyond Springwood
- Brand the parks, reserves and linear trails - communicate this online, social media and app

- Communicate delivery of school - high quality education and recreation facilities
- Local adventure play - regional attractor
- Stageable, unique open space/adventure play opportunities

- Diverse lot types caters for a wide market
- Allows residents to age in place
- A 'home' for everyone - emphasise differentiators
- Gradually grow the 4G community
- Working with the topography

2.3 The Plan

The Springwood masterplan takes advantage of the sites unique location to provide a diverse and attractive lifestyle estate. Springwood promotes active movement, through generous open spaces, trails and paths, cycling infrastructure, and active playing fields, the plan is oriented around movement and socialisation, creating community networks for the whole family.

The key elements of the plan are outlined below, and further detailed in the following chapter.

Place and Community

- Childcare and primary school facilities, creating a family friendly environment
- Diverse housing produce that responds to the slope of the land, whilst providing opportunity for medium density and low maintenance living in and around the village centre
- Revitalises the former sand quarry into an education and active recreation precinct
- Orients residential allotments to front open space, and capitalise on the abundant public reserves and rolling topography of the site and surrounds

Open Space

- Enhancing Springwood Creek, and embracing the natural landscape of the site
- Provides a range of open space types in each residential neighbourhood, including programmed play areas along with natural space and linear trails along easements.

Village Centre

- Centrally located commercial, retail and community focused Village Centre
- Capitalise on the increased vehicle traffic coming through Springwood, between Adelaide and the Barossa Valley, and increase the value and activity of the Village Centre

Residential

- Diverse housing product in a range of locations to cater for all family types
- Housing that captures views and responds to slope, allows for incredible outlooks and high amenity
- Low maintenance housing near the village centre, along with larger sloping blocks provides for variety in housing choice

Access and Movement

- Central Gawler East Link Road (GELR) providing an important east-west link through the site, bringing Adelaide CBD closer to residents
- Allows for public transport access to all residents, as roads have been designed to accommodate buses

Services and Drainage

- Capitalises on the opportunities present in the power line and gas/water easement to create a network of highly valued linear walking and cycling trails
- Incorporates high quality water treatment, detention and filtration, to ensure that water run off entering Springwood Creek is to a high standard

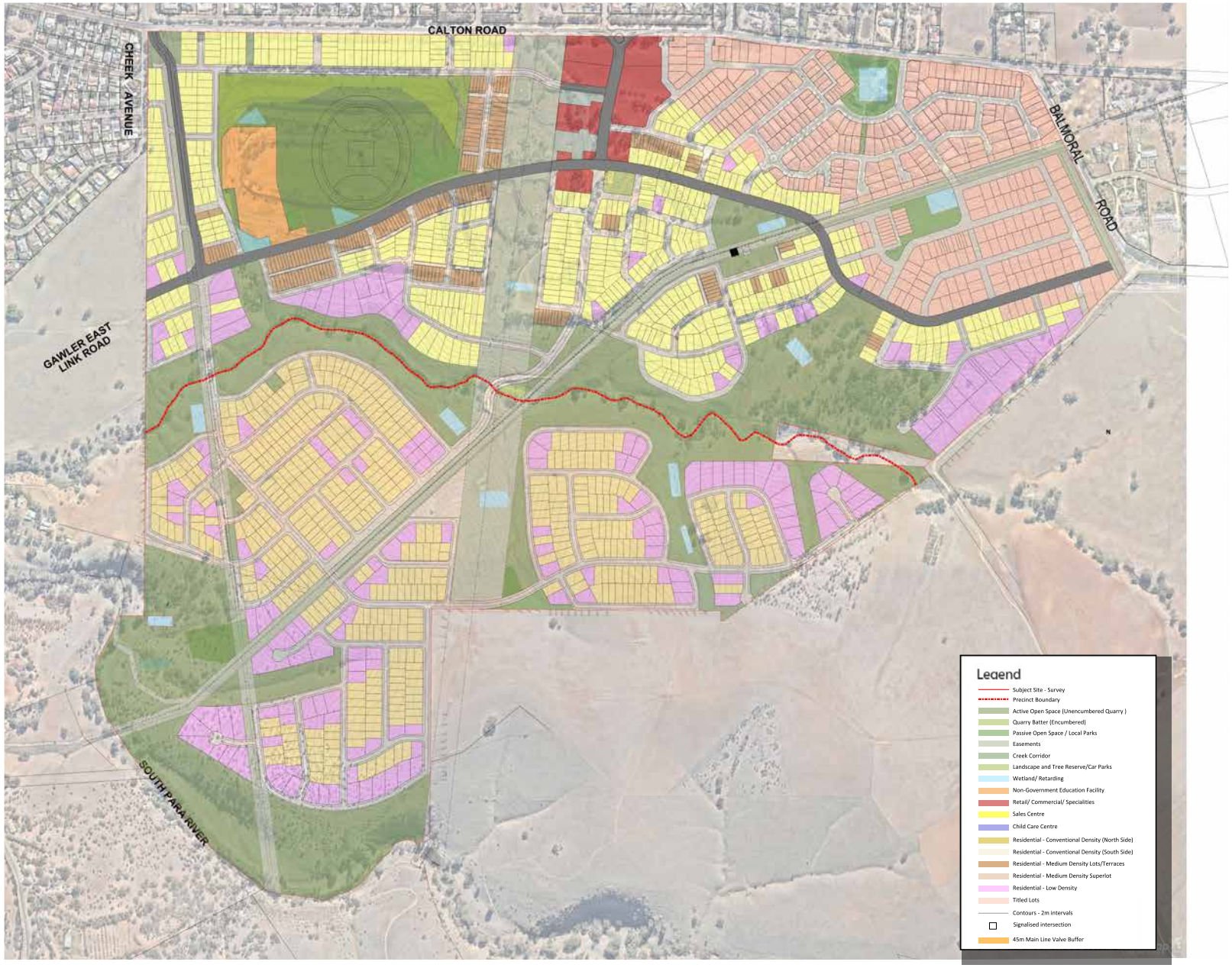


Figure 1. Springwood Masterplan

Urban Design Elements

3 Place and Community

Springwood is a unique development within the northern growth corridor, in that it emphasises and embraces the natural topography of the land, and the enormous amount of open spaces for residents to utilise. This sense of place allows residents to recognise the place that they live as unique, and embrace the lifestyle choices that they have made.

By fostering these important "place" elements, it is always easier for community groups to form and to enjoy the open spaces and active lifestyles together.

Additionally, as the community within and surrounding Springwood grows, the need for services and amenity will increase. The village centre will be a place for people, known for its intrinsic qualities as a destination and as the 'heart' of Springwood. It will support a range of retail, commercial and community uses clustered around the Main Street / Gawler East Link Road intersection. The village centre will be well connected to the community with a network of pedestrian and cycle paths providing both site and broader links.

To enhance the "place" and "community" elements at Springwood, the plan has been designed to:

- Cluster key amenities and services to create a distinctive village centre and a destination for the local community to engage in a range of activities.
- Create places and spaces to allow the community to come together.
- Provide a point of difference in the quarry precinct, with a unique backdrop for sporting and education facilities.
- Identify neighbourhoods through the changes in levels and connection to open space.
- Create distinct neighbourhoods that attract and suit different buyers / various appeal, enhance legibility and celebrate the site.
- Embrace the existing topography and natural elements on the site, ensuring that they are integrated into the development of Springwood to create a sense of place that is authentic and unique.
- Integrate key destinations into a network of shared trails.

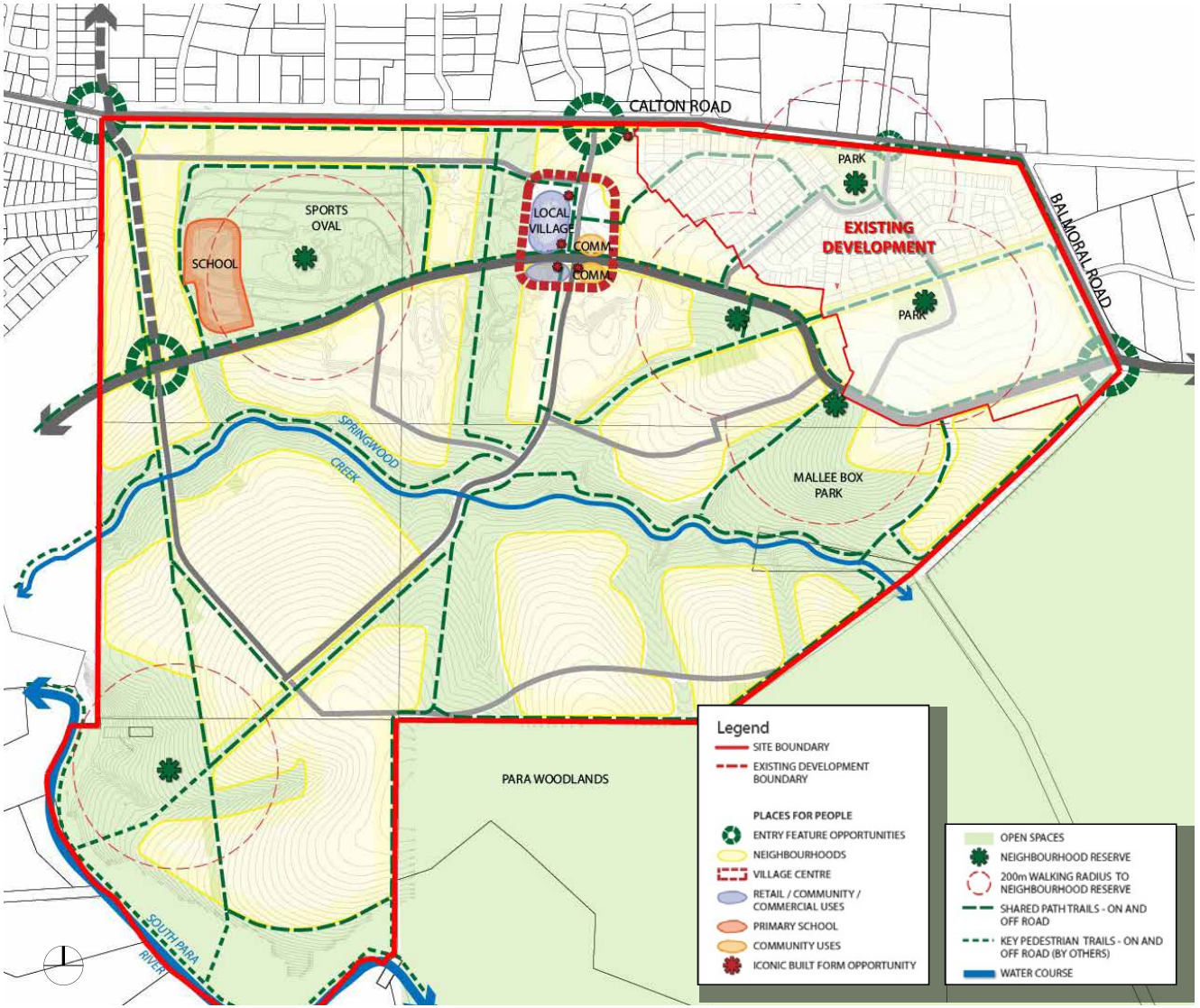


Figure 2. Springwood: Place and Community Masterplan

4 Open Space

Open space is critical in any residential community, in that it can foster active lifestyles, improve health and well being, whilst also allowing natural ecological systems to flourish, increasing the biodiversity of the area.

An important element of the structure of the masterplan are the creek corridors and utility easements that will form an integrated open space network across the community, connecting residents to the school, village centre and major neighbourhood reserves, environmental features and regional parks such as Para Woodlands. Open spaces also define and distinguish residential neighbourhoods, improving the liveability and attractiveness of the development for future residents.

A range of open space types allow future residents to enjoy formal active recreation, age group specific play spaces, informal play spaces, and natural environment systems such as the Springwood Creek.

To enhance the "Open Space" elements at Springwood, the plan has been designed to:

- Provide significant areas of open space (linear open space and public open space recreation).
- Provide an integrated open space network that retains and enhances the key features of Springwood and defines its urban structure.
- Create strong connections between open space and key destinations i.e. schools, the village centre, open space reserves, Springwood Creek etc.
- Recognise Springwood Creek as a key open space destination.
- Ensure open space is located within 200m of all residents and centrally within neighbourhoods - safe and easy to access.
- Drainage requirements integrated as part of the broader open space network.
- Ensure streets are located to capture views to open space.
- Enhance the quarry as a key landscape feature and distinctive backdrop to open space.
- Provide landscape treatments that recognise the significant amount of open space provided and ensure that these can be sustainably maintained by Council in the long term.

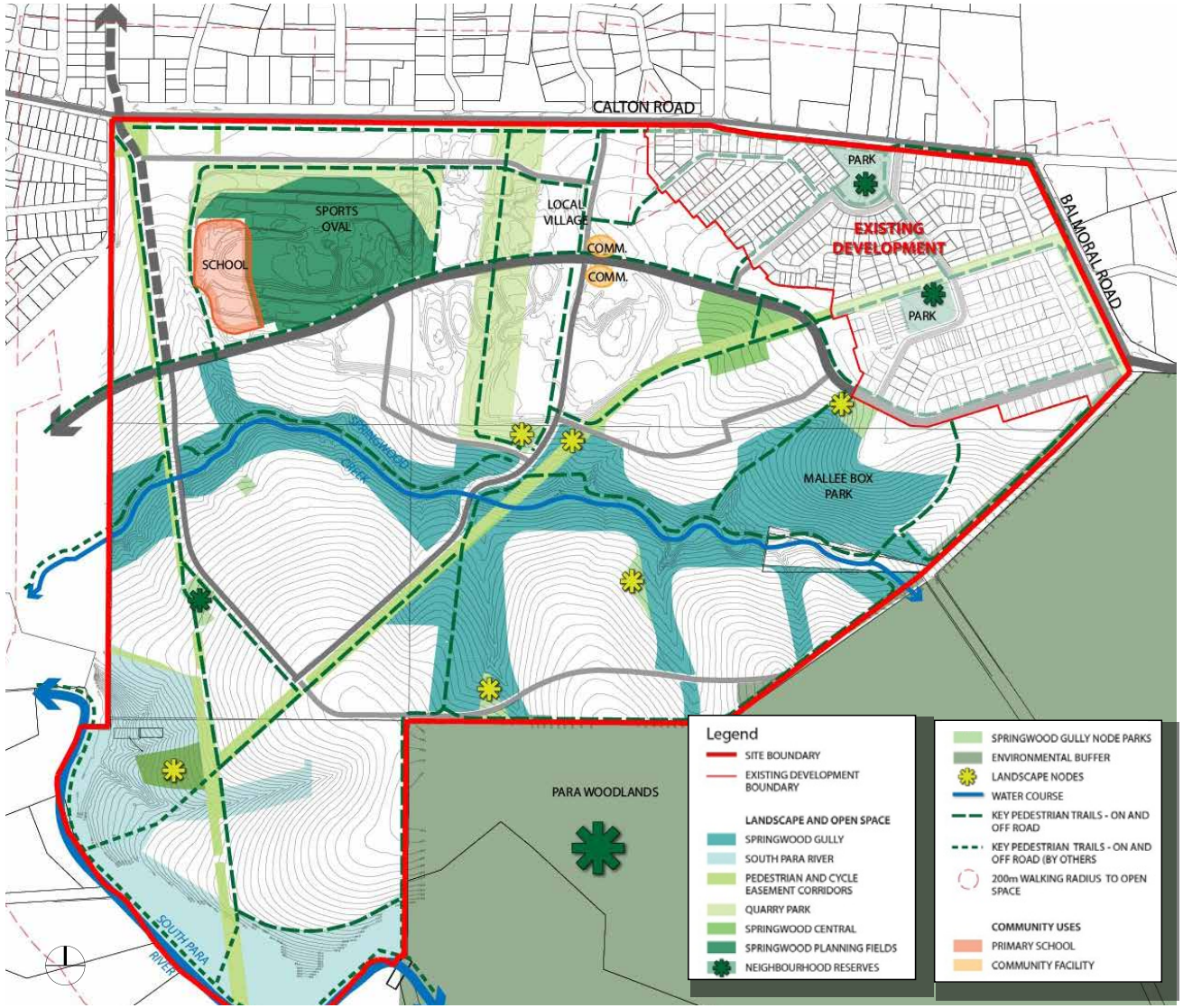


Figure 3. Springwood: Open Space Masterplan

5 The Village Centre

At the heart of the new Springwood community is a central village centre, that will provide for everyday conveniences, along with creating opportunities to socialise and foster community pride and participation.

The village centre will be a thriving hub of retail, commercial and community activity. While presently the mix of uses is flexible this will enable the centre to develop and evolve with the growing Springwood community. Possible uses that could be located in the Village Centre include health and medical uses, coffee shops, office spaces, community based co-working/flexible working spaces, community uses/meeting rooms, and many more uses that can encourage activity in the Village Centre. Making sure that this range of potential uses is diverse will emulate the diversity of people that Springwood invites into this community to live and grow.

To enhance the "Village Centre" elements at Springwood, the plan has been designed to:

- Retail: Managing the early delivery of retail, and the subsequent stageable growth of the village centre offering
- Car Parking: Provision of car parking initially for the supermarket and convenience offering, with staged expansion as the village centre grows and evolves.
- Community Facility: Potential to explore additional facilities, including child care
- Town Park: Enables community gatherings and events, while also providing for initial activity as the development progresses
- Residential: Provides residential density in proximity to the Village Centre in order to maximise the benefit for future residents who want to downsize or those not requiring a detached home.

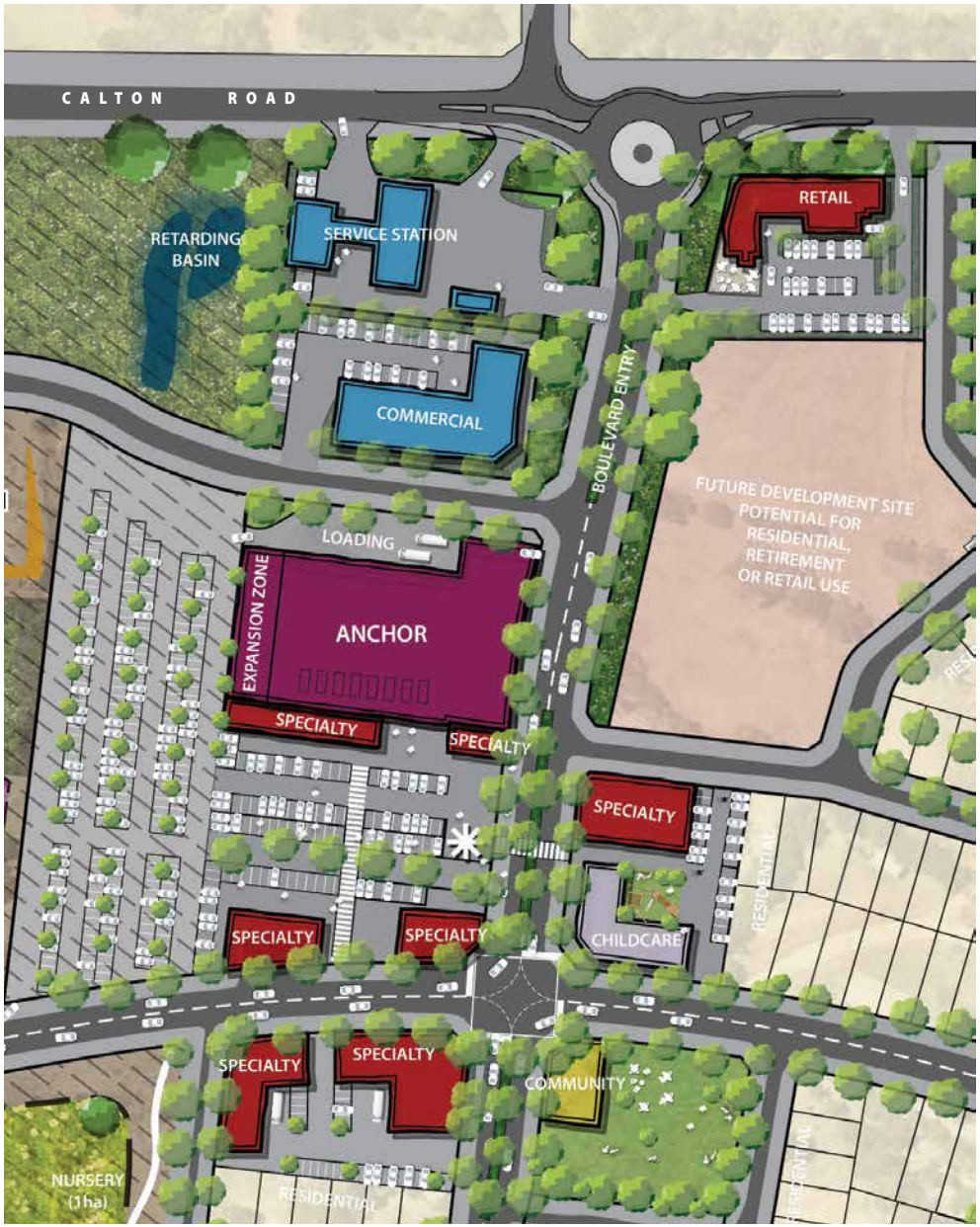


Figure 4. Springwood: Village Centre Masterplan

5.3.1 Retail Uses

The Village Centre will provide a number of retail offerings.

In developing a design and allowing for retail uses within the village centre, the master plan:

- Entry and arrival experience - Direct off Calton Road, with opportunity to establish a strong landscape identity and character for Springwood
- Anchor: Initially 2,600 sqm supermarket with potential expansion up to 3,000 sqm
- Additional sleeved 1,500sqm of retail directly wrapped around the anchor supermarket
- Main Street: providing a highly pedestrianised zone, dense street tree planting, central median to slow traffic and for pedestrian refuge
- Town Plaza: located on the corner of Main Street and the Gawler East Link Road in association with the community building/interim sales office
- Additional Commercial/ Retail: Fronting GELR and main intersection - uses potentially medical centre, pharmacy, etc

5.3.2 Community Facilities

The village centre is more than just a retail and commercial place where transactions occur; it is a space for people to play, recreate, socialise, and relax. There are many planned spaces in Springwood that people can enjoy, however the destination based convenience and town park will be complimented by a child care centre and a future community building (which in the interim will provide for a sales office).

In developing a design and allowing for community facilities within the village centre, the master plan:

- Locates key community buildings on the anchor corners of the GELR and Main Street.
- Co-locates the child care conveniently with the anchor supermarket, allowing for less driving around in peak hours
- Provides a semi public space adjacent to the community facilities that in the short term will complement its use and provide a social space for community activities.

Figure 5. Springwood: Anchor Retail render (supplied, Brown Falconer)

6 Residential

Springwood will have a variety of housing types available for potential residents that suit a myriad of family types and lifestyle requirements. Areas around the Village Centre and School provide opportunities for smaller and more affordable housing ensuring more people have access to core services such as shops and public transport. Additionally this housing type will provide housing choice and diversity for the community and will become important as the household sizes reduce and as the population of Gawler ages.

In addition to smaller housing types, a range of conventional residential typologies and larger lots are included at Springwood.

Larger residential allotments are provided, primarily south of Springwood Creek and on steeper slopes. These larger lots allow a more generous lifestyle offering for residents, while still being in close proximity to services and schools. Where located on steeper slopes, residential built form might need to be adapted to suit through appropriate design, benching, battering, and retaining.

Medium Density

- Proximity to Village Centre, community facilities, and primary school
- Suitable for young families, down-sizers, or retirees
- Located nearby to parks and playgrounds
- Located along key pedestrian, cycle and shared path trails
- Located along the GELR, providing direct access into Adelaide northern suburbs, and the CBD

Conventional Density

- Conventional built form and block size
- Suitable for families with room for a backyard
- Located around public parks and playgrounds
- Located along key pedestrian, cycle and shared path trails

Low Density

- Larger homes, and bigger backyards
- Suitable for larger families
- Proximate to nearby parks and playgrounds
- Long views across natural creeks and over rolling hills
- Benching and battering required – potential retaining walls

Steep Sloping Site

- These parcels are the largest available at Springwood
- Generally constrained by slope, requiring benching, battering, and retaining for a home site to be created.
- May require custom home design depending on slope
- Premium long views across the surrounding rolling hills
- Springwood creek interface, with rural style fencing blending into the natural environment

Medium Density Housing

Conventional Density Housing

Larger Blocks on Sloping sites

Figure 6. Springwood: Residential Precincts Masterplan

7 Access and Movement

The master plan aims to provide a movement network that connects people to where they want to go and ensures people of all ages and abilities can sustainably, safely and easily move throughout Springwood. The plan includes a range of pedestrian and cycle, public transport and vehicular connections to support this access and movement.

7.1 Pedestrian and Cycle Movement

The plan identifies a number of shared paths across the development, providing safe off road walking and cycling environments for residents and visitors to use. The plan also has provision to connect into the Jack Bobridge Track in the north-east, and into the Dead Man's Pass Reserve cycling trails in the south-west. The plan takes advantage of the generous service easements and open space reserves that provide a framework for the development and connect residents to key services and amenities.

7.2 Public Transport

An important part of any new community is providing access for everyone to get to work, school, or the shops each week. The plan facilitates the provision of bus services along key streets at Springwood. The road network has been designed in conjunction with transport engineers to ensure that the routes shown can be achieved, and will connect all of the key pieces of Springwood together, in addition to the wider Gawler catchment.

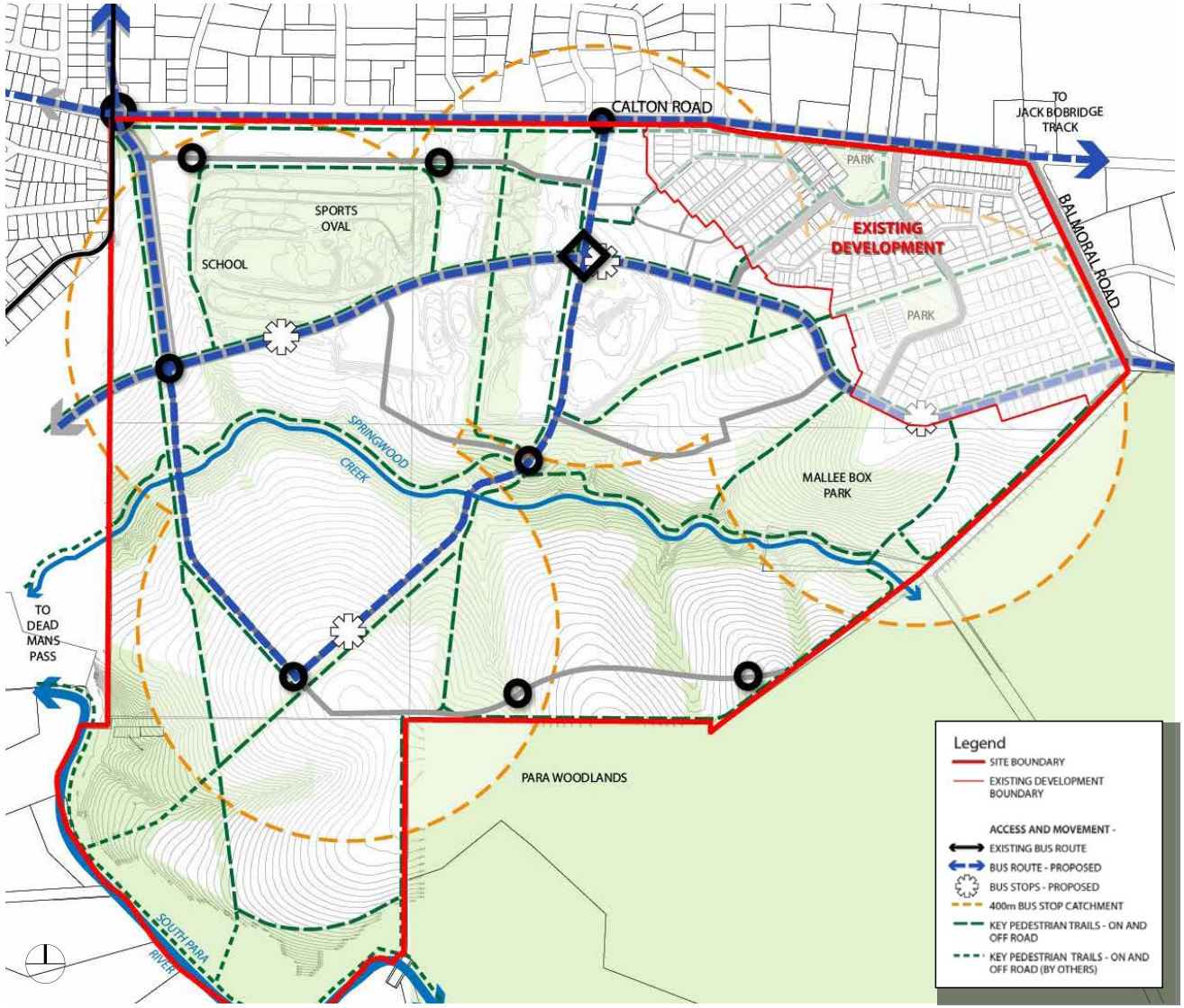


Figure 7. Springwood: Public Transport and Pedestrian Movement Masterplan

7.3 Vehicular Movement

Vehicle movements throughout Springwood will utilise a number of key local road, connector roads, or the Gawler East Link Road (GELR). The road network has been designed to accommodate quick and convenient access into the different residential precincts within the plan. Importantly, the street network provides for safe and efficient access between residential neighbourhoods, the village centre and other key destinations, while major traffic movements are focused onto key roads and connector streets, reducing through traffic on local streets.

The road network responds to drainage / topography requirements, allowing for suitable drainage treatments to develop within the road reserve area. The layout also considers fire threats by providing road buffers to the Para Woodlands in order to allow fire fighting vehicles access if ever they are required.

Vehicle access from the Gawler East Link Road will bring residents and visitors into the area, enhancing retail and commercial activity in the Village Centre. Other key routes include travelling west along Calton Road through to Gawler, and east through to the Barossa Valley Way.

The northern section of the GELR, 'Main Street', will be a different type of environment than the balance of the GELR. The Main Street will deliberately slow traffic down in order to increase pedestrian and cyclist safety, while also using the signalised intersection as a suitable way to slow traffic and allow people to cross the road. Main Street will interface with the child care centre and the supermarket and core retail environment, which benefits from increased pedestrian traffic and slower vehicle speeds.

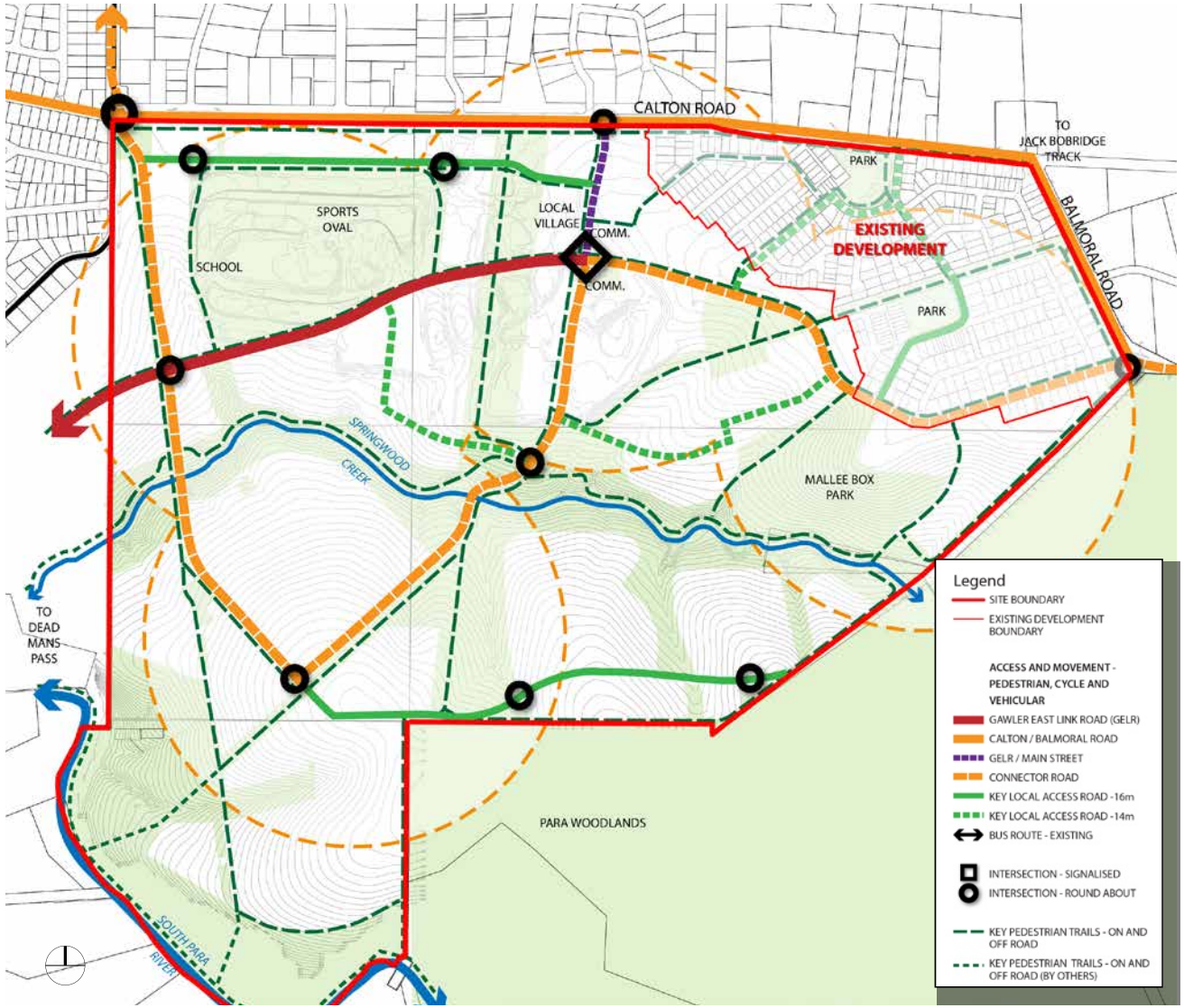


Figure 8. Springwood: Vehicle Movement Masterplan

8 Services/ Drainage

The Springwood site contains a large number of easements, relating to existing SAPN power-lines, future SAPN power-lines, SEAGas underground gas pipe, and SA Water above ground water pipes. Whilst there are some constraints around developing in and around these assets, there are some unique opportunities as well, such as increased open space provision, and opportunities for informal trail networks.

Future drainage requirements have also been incorporated into the plan and coordinated with road networks, open spaces and topographical elements.

The plan has had regard to these services and drainage constraints by:

- Coordinating the provision of services, infrastructure and drainage within Springwood.
- Enabling water management systems that provide for the treatment and conservation of water and enhance the environmental and recreational qualities of Springwood.
- Water treatment located where it is needed.
- Understanding amenity, and the unwanted visual and amenity impacts of service infrastructure have been minimised where possible.
- Integrating service infrastructure and easements into the broader open space and linear trail network throughout the site.
- Providing multi functional use of spaces, where appropriate, including the use of the service easement adjacent to the Village Centre for car parking, etc.
- Locating buffers to services where appropriate.
- Staging development to respond to drainage, service and infrastructure timing.

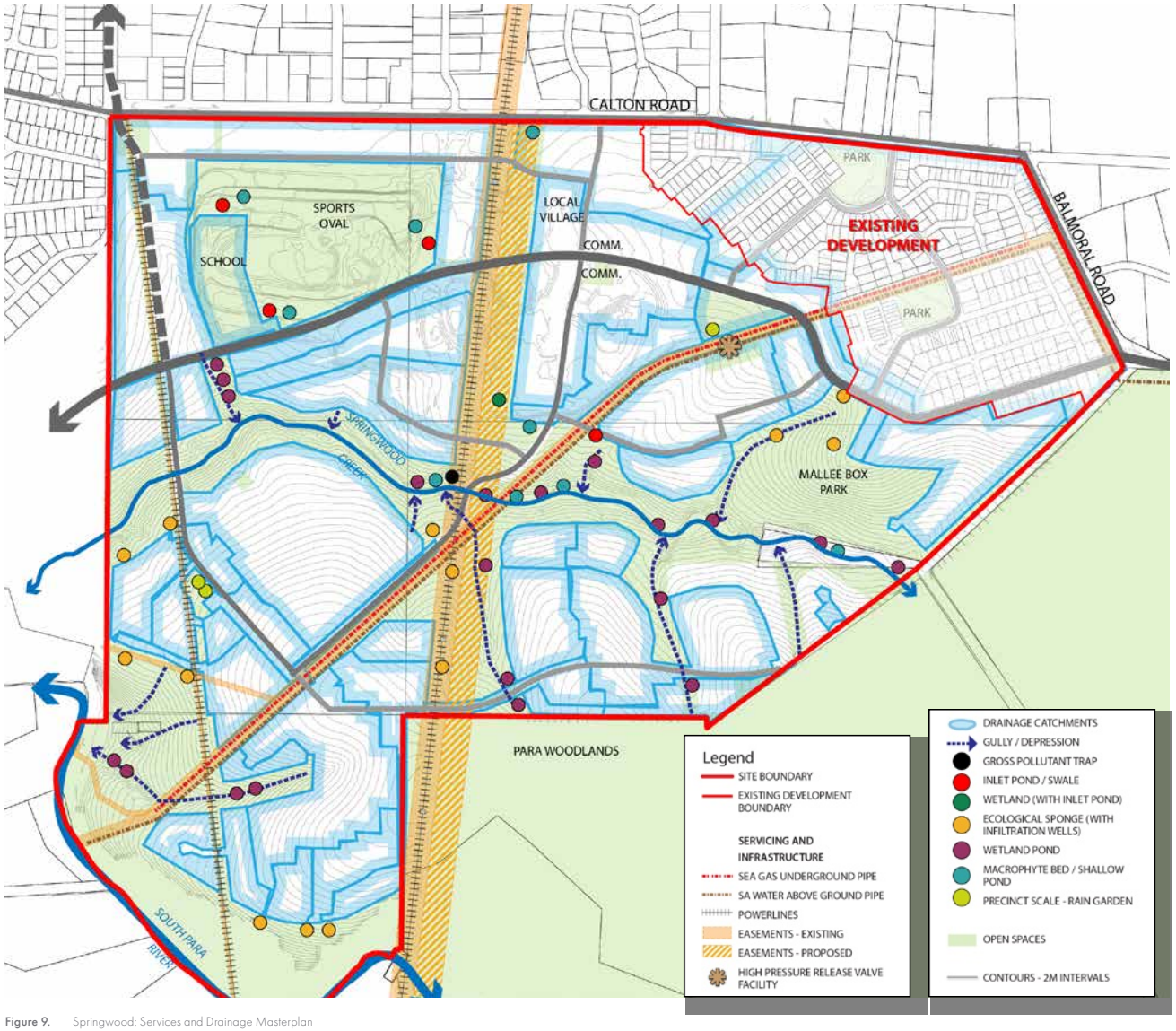


Figure 9. Springwood: Services and Drainage Masterplan

8.1 SeaGas + SA Water

The linear easements through Springwood provide a great opportunity to located off road shared trails and landscaping elements.

These corridor can be typically treated by locating other, more formal open spaces along the easement in order to provide some more formalised and destination based activity, which can create a safer, more 'observed' environment for people to use.

The other strategy is to locate an edge road along the easement, which brings people and cars along that corridor, which can be perceived as a safer environment that more people use. Both options have been used throughout Springwood, with dwellings providing passive surveillance across the open space and enhancing the overall perceived safety of the area.

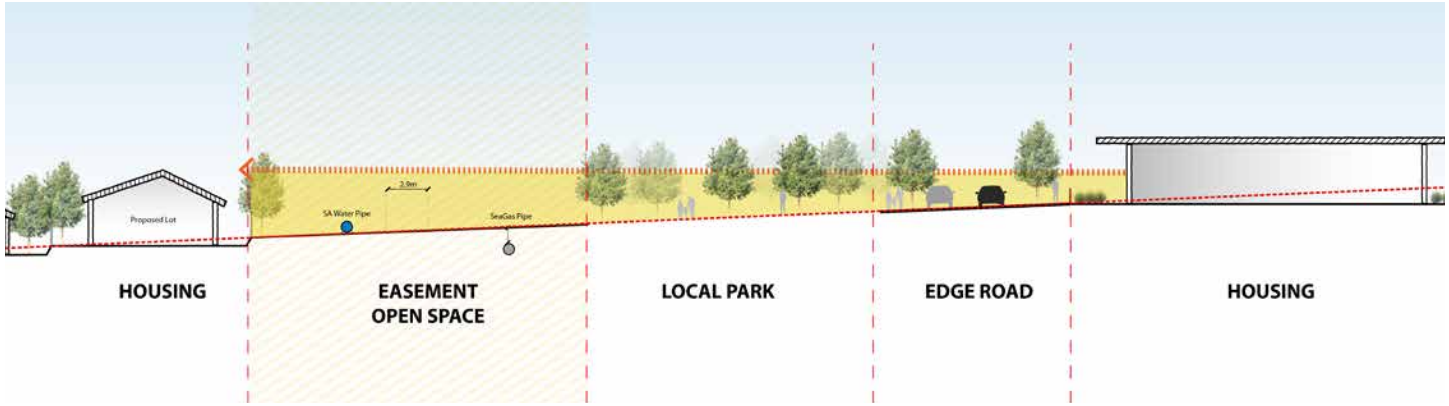


Figure 10. Easement + local park + local road interface

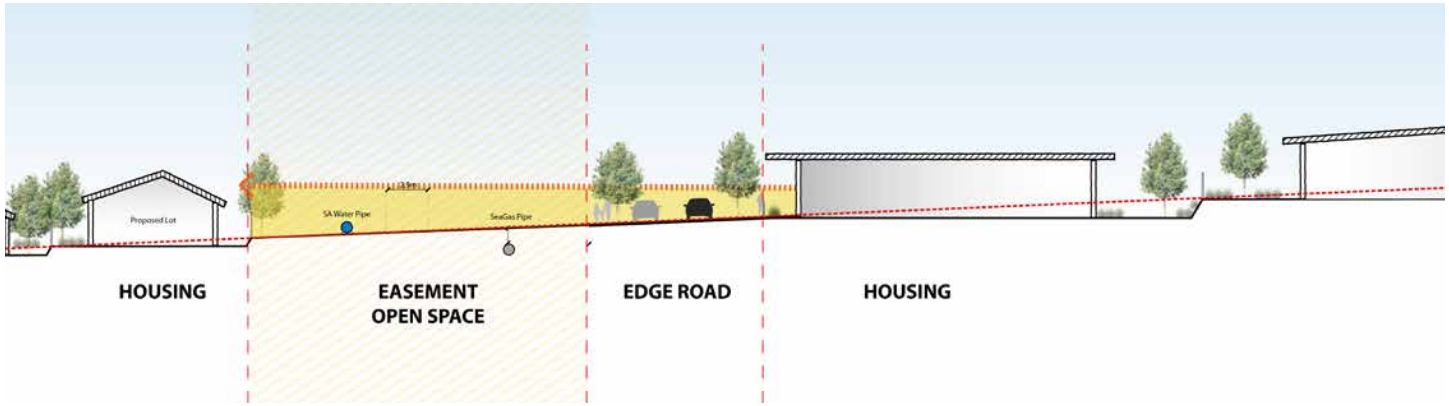


Figure 11. Easement + local road interface

Open Space Composition

9 Open Space Hierarchy

9.1 Introduction

Springwood is situated upon a landscape with a long history of primary production (agriculture) and industry (quarry). Exposed undulating hills, dissected by post and wire fences and punctuated with small stands of old Eucapyts is all that remains of a strong agricultural legacy.

The dramatic topography created, in part, through the exposure of the underlying geology is a remnant of a once active quarry. A wide open scar extends the length of a large section of the valley; its eroded faces and rocky slopes are revealed in stark contrast to the natural features immediately surrounding industrial ruins and once heavily used gravel tracks.

The diversity of landscape forms and features offers the opportunity to develop a series of interesting landscape typologies which respond to the remnant vegetation and pre-european ecologies whilst also acknowledging the industrial and agrarian history of the site. The underlying goal of this masterplan is to leave a legacy of green, interlinked spaces with a generous capacity to balance both the needs of a growing and thriving community whilst also providing opportunities for increased biodiversity.

Overall principles

- Celebrate and expose the unique post-industrial/ agrarian landscape and natural land forms.
- Improve environmental values through targeted weed removal and re-vegetation initiatives that reinforce remnant species
- Create a safe and walkable neighbourhood
- Encourage an active community with a range of passive and active open spaces and linkages
- Integrated storm-water and landscape approach that leverages infrastructure for improved amenity outcomes

Strategic Context

The open space hierarchy has been developed using the 'Town Of Gawler Open Space Guideline' Oxigen (sic), Rev E, 2016. We note this document has not been formally endorsed.

Existing site photos

Figure 12. Open space masterplan showing hierarchy

10 Corridors - Gullies and Steep Creeks

10.1 Springwood Gully

Springwood Gully acts a distinctive green spine to the interlinked open space network. It provides key pedestrian and cyclist routes through the development, whilst its stunning scenic value is enjoyed by both users and residents overlooking the gully. Users will be able to engage with a mixture of naturalistic and agrarian landscapes as they traverse the unique gully landscape on a mixture of formal and informal trails.

A series of respite and orientation nodes will be situated at regular intervals along the reserve where the topography allows. These nodes will be similar in character to a neighbourhood reserve, providing minor seating, shelter, turf and feature planting . It is anticipated the higher amenity of the nodes will allow for passive recreation and act as a launch and orientation point for active users of the path network.

Key design features of Springwood Gully;

- Minor revegetation and tree planting to reinforce remnant Mallee Box Woodland and River Red Gum Woodlands
- Irrigation will be limited to higher amenity node areas
- Sealed walking trail along the upper perimeter of reserve to allow for a loop course. It is envisaged that this trail will use footpaths where adjacent to the road with connecting trails along the reserve where grades allow.
- Unsealed adventure trails closer to the creek and into gullies where grade permits
- Some amenity planting and re-vegetation to road interfaces and rear lot fencing

Key design features of the Springwood Gully Nodes;

- Orientation signage to path networks
- Seating
- Drinking fountain
- Cycle repair station
- Shelter and BBQ/ picnic settings at larger nodes
- Amenity planting and turf to allow for passive recreation and leisure activities

Figure 13. Springwood Gully Reserve and node parks

Figure 14. Mountain bike trails and compacted gravel paths

Figure 16. Creation of habitat and biodiversity

Figure 15. Water Sensitive Urban Design and stormwater treatment measures

10.2 South Para River

The South Para River is a section of the larger South Para River system. The design and character of the South Para River reserve will acknowledge its role in a broader regional network of river systems and its strong links to the Springwood Gully Reserve. Users will be able to engage with a mixture of naturalistic and agrarian landscapes as they traverse the unique gully landscape on a mixture of formal and informal trails.

A larger respite and orientation node will be provided that will provide minor seating and shelter. It is anticipated the higher amenity of this node will allow for passive recreation and act as a launch and orientation point for active users of the path network of the greater open space network.

Key design features of the South Para River;

- Minor re-vegetation and tree planting to reinforce remnant vegetation associations.
- Irrigation will be limited the amenity node areas
- Sealed walking trails to upper perimeter of reserve to allow for a loop course
- Unsealed adventure trails along creek corridors and into gullies where grade permits
- Some amenity planting and re-vegetation to road interfaces and rear lot fencing

Key design features of the Node;

- Orientation signage to path networks
- Seating
- Shelter and picnic setting

Figure 17. South Para River and node park

Figure 19. Typical node design

Figure 21. Protection of natural assets and key vistas

Figure 18. South Para River and node park

Figure 20. Compacted gravel paths through existing landscape features

Figure 22. Landscaped verges, tree planting and compacted gravel

11 Corridors - Pedestrian + Cycle

11.1 Pedestrian and Cycle easement corridors

Linear, green corridors cross the site and are subject to easement restrictions. These include the North South corridor hosting SAPN overhead power lines and the East West link carrying a SA Water above ground trunk main and the underground SEAGAS gas main.

The environmental and community value of these easement spaces will be maximised, accommodating both pedestrian and cyclist traffic whilst providing access to the interlinked open space networks, village centre and community facilities via a sealed path network.

Low maintenance planting through the strategic placement of a mix of native species and direct/hydroseeding will create a pleasant reserve which is capable of hosting leisure activities, enriching biodiversity and providing a green outlook to houses that front the corridor.

Key design features;

- 1.5m sealed paths to minor linkages
- 3.0m shared use paths to major routes of travel
- Planting selections which promote biodiversity with irrigation for establishment only
- Irrigated higher amenity planting at entry points and interfaces with roads
- Orientation signage to path networks
- Limited tree planting will be achieved within the easements due to utility easement restrictions, however existing trees will be retained and supplemented with dense tree planting to verges adjacent the easement corridors.

Precedent images

Figure 23. Pedestrian and Cycle Easement corridors

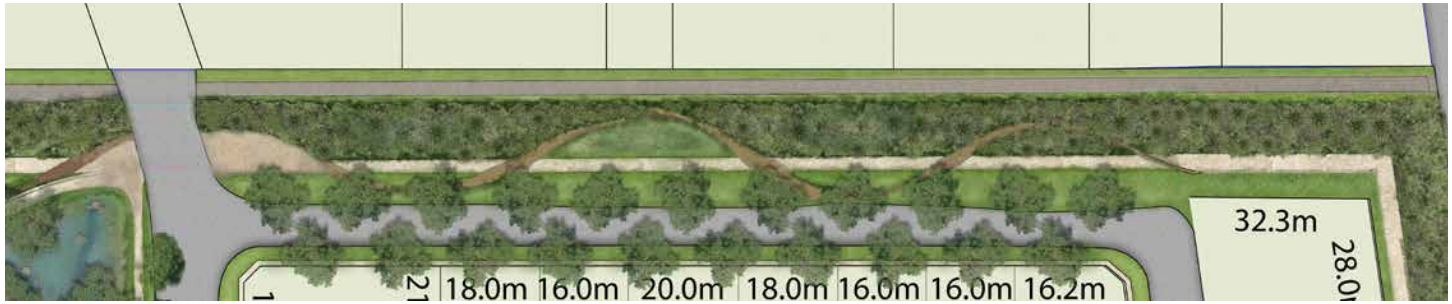


Figure 24. Schematic Design of the pedestrian and cyclist corridor

11.2 Quarry Park

The future Quarry Park will be a celebration of the post industrial nature of the reserve. Home to dramatic topography and self seeded plant communities, the reserve provides a unique opportunity to acknowledge the quarry history of the site and create a place for adventure and exploration.

SAPN power lines restrict the opportunities for significant tall trees within the easement, the design will keep the self seeded tree copes and understorey that has established in the remnant quarry spoil sites and, where appropriate enhance these plantings with targeted re-vegetation and weed eradication.

Minor grading and trimming will be undertaken to the site to ensure safety, and an accessible path network that improves permeability and linkages through to the village centre, adjacent residential areas and Springwood Gully Reserve.

Key design features;

- Retain post-industrial quarry landforms and self seeded tree copses and emerging vegetation and highlight with interpretive signage
- Make safe extreme grades or unstable ground
- Focused re-vegetation planting to interface with residential and commercial development
- Compacted gravel path network to supplement on street footpath networks and facilitate north/ south movement to Springwood Gully Reserve
- Minor unsealed adventure path network to explore landforms
- Create opportunity for a future, regional mountain bike park that creates links between Springwood Gully Reserve and South Para River
- Opportunity for establishment of a community gardens or plant nursery

Figure 25. Self sown landscapes

Figure 26. Interpretive signage

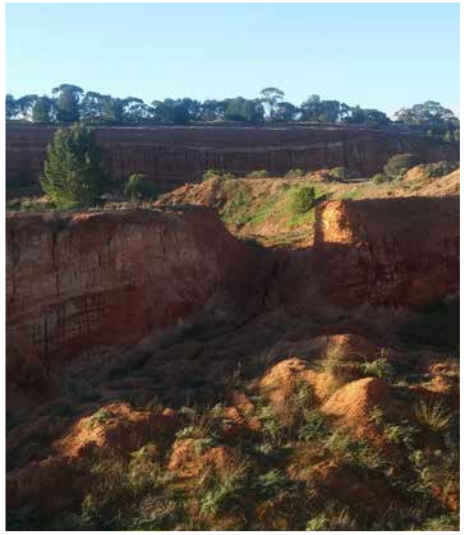


Figure 27. Current condition of disused quarry

Figure 28. Sealed paths where appropriate

Figure 29. Opportunities for active recreation

Figure 30. Concept plan

12 Parks and Reserves - District

12.1 Springwood Village Centre Park

Springwood Village Centre Park is a large reserve on the east west pedestrian and cycling corridor. Its position has been dictated by existing utility buffer requirements and will link to the village centre with a wide verge and shaded walk.

The site provides a significant opportunity to create a mix of active recreational opportunities to complement other passive reserves in the location. It will be a multi generational space and a touch point for the community to gather, exercise or just relax.

Key features of the reserve will be a fenced dog park, minor play based around a bio-retention swale, all weather rubble jogging and walking loop and a pump track for bmx riders. A large shelter, picnic tables and BBQ will encourage multi generational usage of the reserve, welcoming all with amenity for both active and passive use.

An accessible ramp will allow users to cross the above ground trunk main and link the northern and southern portions of the park creating a vantage point for walkers to survey the reserve.

Key design features;

- Fenced dog parks and agility course
- Minor fitness walking track to perimeter / Fitness equipment and distance markers
- Pump track and parkour play
- Minor landforms to minimise infrastructure and allow pedestrian crossing of trunk main
- Shade, open areas of turf
- Picnic, BBQ and shelter facilities

Figure 32. Dog park facilities

1. Picnic/BBQ Shelter, high amenity planting planting
2. Open areas of turf
3. Dog park facilities
4. Path network
5. Copse trees, understory planting
6. Courts/sport node
7. Pump track/BMX
8. Avenue treatment consistent with development
9. Entry node
10. Nature play & reveg plantings
11. Stormwater capture/WSUD

Figure 33. Active recreation

Figure 31. Concept plan

Figure 34. Pump track/bmx facilities

Figure 35. Picnic shelter and shade structures

Figure 36. Outdoor furniture, threshold treatments and connected path network

12.2 Springwood Playing Fields

Springwood playing fields will be the focus of sporting hub for the Springwood community and a future school facility. Situated adjacent the village centre and nestled into the dramatic cliff face of the old quarry, the oval will be a sheltered and unique space for the community to participate in organised sports and passive recreation.

A central feature is the AFL oval, with space to accommodate several netball/ basketball courts and play elements integrated around the edges. A WSUD swale will be integrated into the design and create a buffer between the oval and the quarry face. Running tracks will weave around the edge of the ovals and be linked into the broader pedestrian network.

The exact quantum of organised sporting facilities will be considered in the detailed design phase when more is known about the requirements of the future education facilities and in collaboration with Council to ensure the facilities support the region wide sporting strategy.

Key design features;

- Oval and courts to facilitate club sports
- Seating and shelter to support ovals and courts
- Adventure play for all ages
- Shelters / Picnic/ BBQ
- Rubble fitness loop and fitness equipment

Figure 37. Adventure play

Figure 38. Exercise equipment

Figure 39. Picnic facilities, bicycle and connected paths

1. Picnic/BBQ Shelter, high amenity planting planting
2. Play Elements, integrated WSUD
3. AFL oval
4. High amenity entry node
5. Courts/sport hub
6. High amenity tree planting
7. Revegetation and erosion control (steep slopes)
8. Avenue treatment consistent with development
9. Stormwater capture/WSUD

Figure 40. Quarry Park and Playing Fields

13 Parks and Reserves - Neighbourhood

13.1 Neighbourhood Reserves

Springwood has two neighbourhood reserves, noting that the amenity nodes within the Springwood Gully and South Para Reserves will provide supplementary neighbourhood green space. Highfield reserve is currently under construction and will be complemented by a similar reserve on the western side of Springwood.

Highfield reserve forms the template for the reserve in the West with mix of open turfed kick-about, minor picnic and shelter facilities and harnessing storm-water infrastructure to create high amenity, natural creek lines.

Key design features;

- Spatial integration of detention basin, play-space and kick-about areas to provide a diversity of recreational use
- Planting strategy to respond to various landscape functions, including WSUD, usable open space and canopy cover through tree planting
- Adoption of CPTED principles and community-centred design
- Robust and enduring contemporary design

Figure 43. Ornamental trees and formalised understory verge plantings

Figure 44. Varied surface treatments, delineated spaces and informal seating

Figure 45. Play equipment, robust planting and canopy trees

Figure 42. Highfield Reserve and Springwood West

Figure 41. Artists impression of Highfield Reserve

14 Entry Statements

14.1 Entrance Statements

Main entries to the site will be celebrated with signage and planting to signify the entrance to the Springwood and create a clear and legible hierarchy for vehicle and pedestrians.

An existing entrance at the Springwood Central reserve and fencing to Calton Road provides a blue print for future entries.

Entries will use existing trees where available to frame low level signage walls, feature planting and turf within wider verges.

The boundary fencing will be a continuation of the fencing styles already in place on Calton Road, with a mixture of timber post and rail fencing, stone-clad pillars and corrugated sheeting to create a low maintenance and attractive interface boundaries.

Figure 46. Entry and boundary fences

Figure 47. Consistent tree planting along significant vehicular corridors

Figure 48. Formalised understory planting

Figure 49. Entry signage, consistent use of stone treatments

Figure 50. Formalised amentiy planting

Landscape Elements

15 Street Tree Strategy

15.1 Residential Street Trees

The residential street tree planting palette provides a diversity of species and are responsive to constraints such as the overall scale of the street and placement of adjacent infrastructure including driveways, lightpoles and other underground services. The over-arching aim across the development is to provide a cool, shaded microclimate thereby encouraging a walkable neighborhood culture and a reduction in the heat island effect.

Trees will be used to control the microclimate and shade buildings and road ways, with the aim to achieve a 20% canopy coverage rate.

Where there are wide frontages and large verges, a selection of legacy tree planting will, over time, create a leafy, cultivated township look and feel. A selective combination of medium to large exotic street trees and proven performers in the Gawler Township area will provide a consistent tree hierarchy within the development, and create identifiable streets, each with a distinctive character.

Where there are compact residential allotments, deciduous trees will provide shade and dappled light during summer, creating a local microclimate that is suitable for smaller streets.

Chinese Pistachio
Pistacia chinensis

A non- fruiting deciduous tree, up to 10m in height, with a rounded canopy. It has fern-like foliage that turns from bright green to crimson red in autumn. It is tolerant of a range of soil conditions. This tree is recommended for small verges and under powerlines, and is SA Water approved.

Jacaranda
Jacaranda mimosifolia

A deciduous tree, up to 12m in height, with a spreading canopy. It has fern-like foliage and profuse purple flowers that appear in spring and summer. This tree is recommended for medium width verges and is SA Water approved.

Callery Pear
Pyrus calleryana 'Bradford/Chanticleer'

A deciduous tree, up to 12m in height, with a dense canopy. Dark green foliage is thick and glossy, becoming red, orange and purple in autumn. White blossom flowers appear in spring. This tree is recommended for small and medium verges.

Golden Rain Tree
Koelreuteria bipinnata

A deciduous tree,up to 10m in height, with a broad canopy. It has bright yellow flowers in summer. This tree is tolerant of a range of climatic conditions. It is recommended for small verges and under powerlines. It is ETSA and SA Water approved.

Japanese Elm
Zelkova serrata 'Green Vase'

A decidious tree, up to 12m in height, with a vase-shaped canopy. It has bright, green foliage that turns red and yellow in autumn. This tree is tolerant of a range of climatic conditions. Is recommended for small verges.

Chinese Elm
Ulmus parvifolia

A semi-decidious tree, up to 12m in height, with a rounded canopy. It has fine, dark green foliage and inconspicuous flowers.

This tree is tolerant of a wide range of climatic conditions and is recommended for planting under powerlines. It is approved by SA Water.

Nettle Tree
Celtis australis

A deciduous tree, up to 10m in height, with a rounded, dense canopy of glossy, green foliage. Flowers are insignificant.

This tree is suitable for a range of conditions and soils, and is drought tolerant. It is recommended for medium verges and is SA Water approved.

Green Ash
Fraxinus pennsylvanica 'Urbanite'

A deciduous tree, up to 10m in height, with a dense canopy. It has dull green coloured foliage that turns bronze in autumn. This tree is tolerant of a range of soil and climatic conditions and is recommended for medium verges.

Turkey Oak
Quercus cerris

A handsome deciduous oak that grows to 10m at maturity, whose glossy leaves are ornately lobed, and change to a buttery yellow during autumn. Hardy mediterranean Oak hardy and tolerant to sea spray and ground salinity

Carob Tree
Ceratonia siliqua

An evergreen tree, up to 8m in height, with dense canopy of dark green foliage. Edible seed pods are produced in older specimens. This tree is highly tolerant of drought conditions and a range of soil types. It is recommended for medium verges.

Low Fruiting White Cedar
Melia azedarach 'Elite'

A deciduous tree, up to 10m in height, with an umbrella-shaped canopy. It has lush, green foliage that turns golden yellow in autumn. This variety has been selected for its low flowering and fruiting habit.

This tree is recommended for medium sized verges.

Fig. 1 Figure Title Example

15.2 Boulevards and Entry Feature Trees

Larger boulevards, entry statements and roundabouts offer a larger scale and wider verges to plant street trees.

Larger trees will be used to create a unique identity and reinforce the street hierarchy. Smaller accent trees from the residential streets selection can also be used to create favourable pedestrian conditions and add seasonal variation, colour and interest.

Iron Bark

Eucalyptus sideroxylon var. sideroxylon

A tall, handsome tree with destinctively dark brown to black coloured bark. Approximately 15-20m tall by 8-10m wide, Iron Bark trees are useful in locations which require a dominant, 'Australian Native' aesthetic

Smooth Barked Apple

Angophora costata

A tall, handsome tree with mottled, smooth bark. Approximately 10-18m high by 8-10m wide and useful for avenues or entry statements which require a species with a consistent, upright form.

Spotted Gum or Lemon Scented Gum

Corymbia maculata, C citriodora

A large Australian native, Corymbia species are renown for their scultpural form and smooth, cream coloured bark. At approximately 20-30m high x 10-15m wide this species is applicable for applications such as large boulevards and entry statements.

White Cedar

Melia azederach

A tree for a variety of applications, White Cedar is suitable for harsh conditions. Medium size at approximately 7x4 metres with a moderate growth rate.

English Oak & Pin Oak

Quercus robur & Q palustris

English Oak is a deciduous, well structured tree with lustrous dark green foliage. Grows to approximately 10x9 metres at maturity. Moderately fast growth rate eventually growing into a broad symmetrical shaped canopy. The Pin Oak is taller and narrower with good autumn colour, suitable for narrower streets.

Kurrajong/Bottle Tree

Brachychiton acerifolius (or populneus, rupestris)

A distinctive, sculptural tree with a 'bulging' trunk and poplar-like leaves producing good shade. These are 'legacy' trees with a slow growth rate, however, particularly useful for harsh conditions or in regions prone to extended dry periods.

Fig. 2 Figure Title Example

15.3 Parkland Trees

The generous and diverse open spaces of Springwood offer a chance to plant larger legacy trees within the parklands.

Within the river reserves the opportunity to restore the ecology of the remnant dominant plant associations, the ***Mallee Box Woodland*** and ***Eucalyptus Camaldulensis Open Woodland.***

Restoring the traditional tree layer along the creek corridor will have a positive effect on restoring the ecology of the post productive landscape and strengthening the overall health of the regional river and creek system.

Significant scenic and amenity value can also be derived from these trees to support the development of a diverse array of recreational and leisure activities within parks and gardens.

South Australian Blue Gum

Eucalyptus leucoxylon ssp leucoxylon

A rugged, South Australian native tree useful for copse plantings or applied as a singular, feature tree. Broad, dappled canopy with mottled brown bark of varying shades.

River Red Gum

Eucalyptus camaldulensis

A rugged, South Australian native tree useful for copse plantings or applied as a singular, feature tree. Broad, dappled canopy with mottled brown bark of varying shades. A resilient, legacy tree with a timeless character.

Mallee Box

Eucalyptus porosa

A medium Eucalypt endemic to the Gawler region. This species has grey, fissured bark and is often multi-stemmed. Useful for copse plantings, wind breaks or areas prone to erosion such as gullies or detention basins.

Chinese Elm

Ulmus parvifolia

The Chinese Elm is a proven performer in harsh conditions requiring a robust, shade tree. Selected for it resilience, this species is popular in urban environments requiring a medium scale of canopy cover.

English Oak

Quercus robur

English Oak is a deciduous, well structured tree with lustrous dark green foliage. Grows to approximately 10x9 metres at maturity. Moderately fast growth rate eventually growing into a broad symmetrical shaped canopy.

Japanese Pagoda Tree

Sophora japonica

Delicate foliage and yellow flowers, this medium scale tree is useful for small to medium streetscapes. Approximately 10x8 metres at maturity.

Fig. 3 Figure Title Example

16 Plant Species Strategy

16.1 Riparian corridors, WSUD & stormwater interventions

The topography within the development is characterised by exposed undulating hills, gullies and narrow channels which cncentrate seasonal run-off during wetter months.

There are many opportunities within these areas to capture surface run-off, or hold back water, thereby re-hydrating surrounding soils for longer periods. These water-sensitive interventions require a design strategy of plantings and infrastructure which is responsive to the scale and character of the landform and a changing climate.

Species selection is based upon the Town of Gawler BMP and consists of native varieties with the following characteristics;

- Able to withstand prolonged inundation within a detention basin or reservior
- Suitable for areas recieving partial inundation (ephemeral) or susceptible to long periods of dry
- Provide filtration of stormwater, arrest sediment and reduce the outflow of polutants
- Promote biodiversity through the creation of habitat
- Reduce evaporation through canopy cover and dense planting within particular regions
- An extensive variety of species to acommodate the risk of natural attrition and ongoing self propagation of successful species

Botanic Name	Common Name
Acacia salicina	Native Willow
Alternanthera denticulata	Lesser Joyweed
Asperula conferta	Common Woodruff
Atriplex suberecta	Lagoon Saltbush
Baumea arthrophylla	Swamp Twig-rush
Baumea juncea	Bare Twig-rush
Bolboschoenus caldwellii	Salt Club-rush
Bolboschoenus medianus	Marsh Club-rush
Callistemon sieberi	River Bottlebrush
Calystegia sepium	Large Bindweed
Carex bichenoviana	Notched Sedge
Carex inversa var. inversa	Knob Sedge
Centella cordifolia	Native Centella
Cotula australis	Common Cotula
Cycnogeton procerum	Water-ribbons
Cyperus gymnocaulos	Spiny Flat-sedge
Cyperus vaginatus	Stiff Flat-sedge
Dichondra repens	Kidney Weed
Distichlis distichophylla	Emu-grass
Duma florulenta	Lignum
Eleocharis acuta	Common Spike-rush
Eleocharis sphacelata	Tall Spike-rush
Epilobium hirtigerum	Hairy Willow-herb
Eragrostis infecunda	Blown-grass
Eucalyptus camaldulensis ssp. camaldulensis	River Red Gum
Eucalyptus largiflorens	River Box
Ficinia nodosa	Knobb Club-rush
Geranium retrorsum	Grassland Geranium
Gonocarpus elatus	Hill Raspwort
Gonocarpus elatus	Hill Raspwort
Haloragis acutangula	Smooth Raspwort
Haloragis aspera	Rough Raspwort
Hydrocotyle verticillata	Shield Pennywort
Juncus kraussii	Sea Rush
Juncus pallidus	Pale Rush
Juncus pauciflorus	Loose-flower Rush
Juncus subsecundus	Finger Rush
Juncus usitatus	Common Rush
Leptospermum lanigerum	Silky Tea-tree
Lobelia anceps	Angled Lobelia
Lythrum hyssopifolia	Lesser Loosestrife
Malva preissiana	Australian Hollyhock
Thyridia repens	Creeping Monkey-flower
Myoporum montanum	Native Myrtle
Myoporum petiolatum	Sticky Boobialla
Myriophyllum sp.	Milfoil
Nitraria billardierei	Nitre-bush
Phragmites australis	Common Reed
Potamogeton pectinatus	Fennel Pondweed
Pseudognaphalium luteoalbum	Jersey Cudweed
Samolus repens	Creeping Brookweed
Schoenoplectus subulatus	Shore Club-rush
Schoenoplectus validus	River Club-rush
Selliera radicans	Shiny Swamp-mat
Setaria jubiflora	Warrego Summer-grass
Triglochin striata	Streaked Arrowgrass

Asperula conferta

Baumea spp

Bolboschoenus spp

Triglochin striatum

Centella cordifolia

Cotula australis

Dichondra repens

Distichilis distichophylla

Eleocharis sphacelata

Facinia nodosa

Juncus spp

Juncus spp

Leptospermum lanigerum

Phragmites australis

Schoenoplectus validus

Sellieria radicans

16.2 Steep Banks and Erosion Control

Due to the steepness of the site, a plant palette has been developed to assist in the mitigation of erosion.

Plants selected within this category are selected to be in line with the aspirations of policies under development by the Town of Gawler and to suit a few performance criteria including;

- Resilient and drought hardy, able to survive in arid conditions without supplementary watering
- Broad habit or dense coverage to provide a healthy coverage over exposed soils
- Provide a healthy habitat for birds, insects and small mammals
- Healthy root systems which bind the topsoil and mitigate wind erosion

Botanic Name	Common Name
Austrostipa spp	Spear Grass
Chloris truncata	Windmill Grass
Dodonaea viscosa spatulata	Sticky Hop Bush
Einadia nutuns	Climbing Saltbush
Eucalyptus porosa	Mallee Box
Enchyleana tomentosa	Ruby Saltbush
Enneapogon nigricans	Blackheads
Eremophila longifolia	Weeping Emu Bush
Eucalyptus porosa	Mallee Box
Goodenia albiflora	White goodenia
Lomandra spp	Mat Rush
Maireana brevifolia	Short-leaf Blue Bush
Pimelea glauca	Smooth Riceflower
Pittosporum angustifolium	Native Apricot
Rhagodia parabolica	Fragrant Saltbush
Rhagodia spinescens	Spiny Saltbush
Rhytidosperma spp	Wallaby Grass
Santalum acuminatum	Quandong
Senna artemisioides	Desert Senna
Themeda triandra	Kangaroo Grass

Figure 51. Diverse planting of riparian species within basins & WSUD

Figure 52. Direct seeding of native grass species in areas at risk of erosion

Acacia spp

Austrostipa spp

Dodonaea viscosa

Einadia nutans

Enchyleana tomentosa

Rhagodia spp

Themeda triandra

Chloris truncata

Figure 53. Native macrophytes able to withstand harsh conditions without the need for supplementary watering

16.3 Road Corridor and Gateways

The Springwood development consists of a variety of street types and heirarchies dependant on scale and urban density. The landscape design approach is to create vehicular corridors and urban interfaces which enhance the visual appeal of the development and contribute to an amenity which is both green and sustainable.

The species selection includes varieties which are readily available, and suitably resilient to an exposed environment adjacent hard surfaces which are often hot

Botanic Name	Common Name
Agapanthus sp	Cultivar
Callistemon viminalis spp	Culitvars
Chrysocephalum apiculatum	Native Everlasting
Correa alba	White Correa
Correa reflexa	Dusky Bells
Cotyledon orbiculata	Blue Waves
Dianella revoluta	Revelation
Eremophila glabra	Prostrate Yellow
Grevillea lanigera	Mt Tamboritha
Grevillea rhyolitica x juniperina	Cherry Clusters
Grevillea rosmarinafolia	Crimson Villea
Helichrysum petiolare	Cultivar
Leptospermum sp	Foreshore
Lomandra longifolia	Katrinus Delux
Nandina domestica	Cultivar
Orthrosanthus multiflorus	Morning Iris
Poa labillardieri	Tussock Grass
Tulbaghia sp	Cultivar
Westringia fruticosa	Smokey
Lavandula hybrid	Cultivar

Agapanthus (small culitvars)

Callistemon (small cultivars)

Correa pulchella & reflexa

Hardenbergia (compact variety)

Dianella revoluta

Eremophila spp

Grevillea spp

Lomandra (cultivars)

Nandina spp

Poa spp

Westringia spp

Leptospermum (cultivar)

16.4 Usable Open Space

Of predominantly an Australian native character, the Usable Open Space plant palette is designed for parks and rererves requiring a premium level of treatment.

Plantings are to be strategically located at points of key visual interest and along boundaries which delineate a change of land use. Areas which might recieve this degree of landscape treatment include design elements such as pedestrian nodes, key interections, verges with avenues of trees and adjacent path networks.

The species selection includes a mix of heights and habits to create varied textures when planted in a formal arrangement. These particular garden beds are to be irrigated and mulched.

Botanic Name	Common Name
Callistemon viminalis spp	Cultivar
Chrysocephalum apiculatum	Native Everlasting
Correa alba	White Correa
Correa reflexa	Dusky Bells
Dianella revoluta	Revelation
Eremophila glabra	Prostrate Yellow
Grevillea lanigera	Mt Tamboritha
Grevillea obtusifolia	Gin Gin Gem
Grevillea rhyolitica x juniperina	Cherry Clusters
Grevillea rosmarinafolia	Crimson Villea
Grevillea thelemanniana	Mini Marvel
Lomandra fluviatilis	Shara
Lomandra longifolia spp	Cultivar
Orthrosanthus multiflorus	Morning Iris
Poa labillardieri	Tussock Grass
Rhagodia parabolia	Fragrant Saltbush
Westringia fruticosa	Smokey
Leptospermum	Cultivar

Callistemon spp

Chrysocephalum apiculatum

Correa pulchella & reflexa

Correa spp (cultivars)

Dianella revoluta

Eremophil glabra

Grevillea spp

Lomandra (cultivars)

Orthrosanthus multiflorus or Patersonia occidentalis

Poa spp

Rhagodia spp

Westringia spp

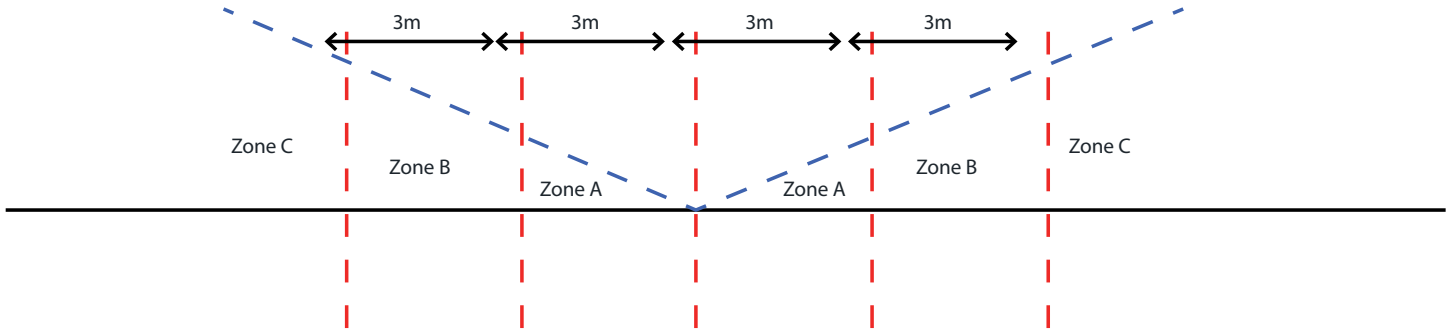
16.5 Seagas & SA Water Easement

Approved species for Seagas & SA water easements.

Zone A
Cottonbush (Maireana aphylla)
Native Pigface (Carpobrotus rossii)
Sticky Goodenia (Goodenia varia)
Ruby Saltbush (Enchylaena tomentosa)
Common Tussock-grass (Poa labillardieri)
Spear Grass (Austrostipa sp.)
Wallaby Grass (Austrodanthonia spp.)
Kangaroo Grass (Themeda triandra /T. australis)
Love Grass (Eragrostis sp.)
Flax-lilies Dianella sp.
Knobby Club-rush (Ficinia nodosa)
Flat-sedge (Cyperus vaginatus)
Samphire

Zone B
Sticky Hop-bush (Dodonaea viscosa)
Sweet Bursaria (Bursaria spinosa)
Erect Hakea (Hakea carinata)
Seaberry Saltbush (Rhagodia candolleana)
Twiggy Bush-pea (Pultenea largiflorens)
Coastal Lignum (Muehlenbeckia gunnii)
Old man saltbush (Atriplex nummularia)
Marsh Saltbush (Atriplex paludosa)
Low Chenopod Shrubs (Maireana decalvans, M.brevifolia, M.enchylaenoides, M.aphylla)
Nitre Bush (Nitraria billardierei)
Coast Bitter-bush (Adriana klotzschii)

Zone C
Drooping Sheoak (Allocasuarina verticillata)
River Box (Eucalyptus largiflorens)
Mallee Box (Eucalyptus porosa)
Southern Cypress Pine (Callitris preissii)
Grass Tree (Xanthorrhoea semiplana)
Golden Wattle (Acacia pycnantha)
River Sheoak (Casuarina cunninghamiana)Dryland Tea-tree (Melaleuca lanceolata)



Zone A SPECIES

Zone B SPECIES

17 Materials Palette

17.1 Surfaces

Bike Paths: Asphalt

Feature: Site won quarry rock

Exposed Aggregate Concrete to match footpaths

Compacted Rubble Paths and verges

17.2 Lighting

Post top pedestrian lighting

Sport lighting

17.3 Furniture

Wayfinding Signage

Focus Seat, bench and picnic

Repurposed Timber Seating

Standard Bin

Informal Timber Bollard

Hoop Bike Rack

Picnic Setting

Highfield Shelter

Contact Tract

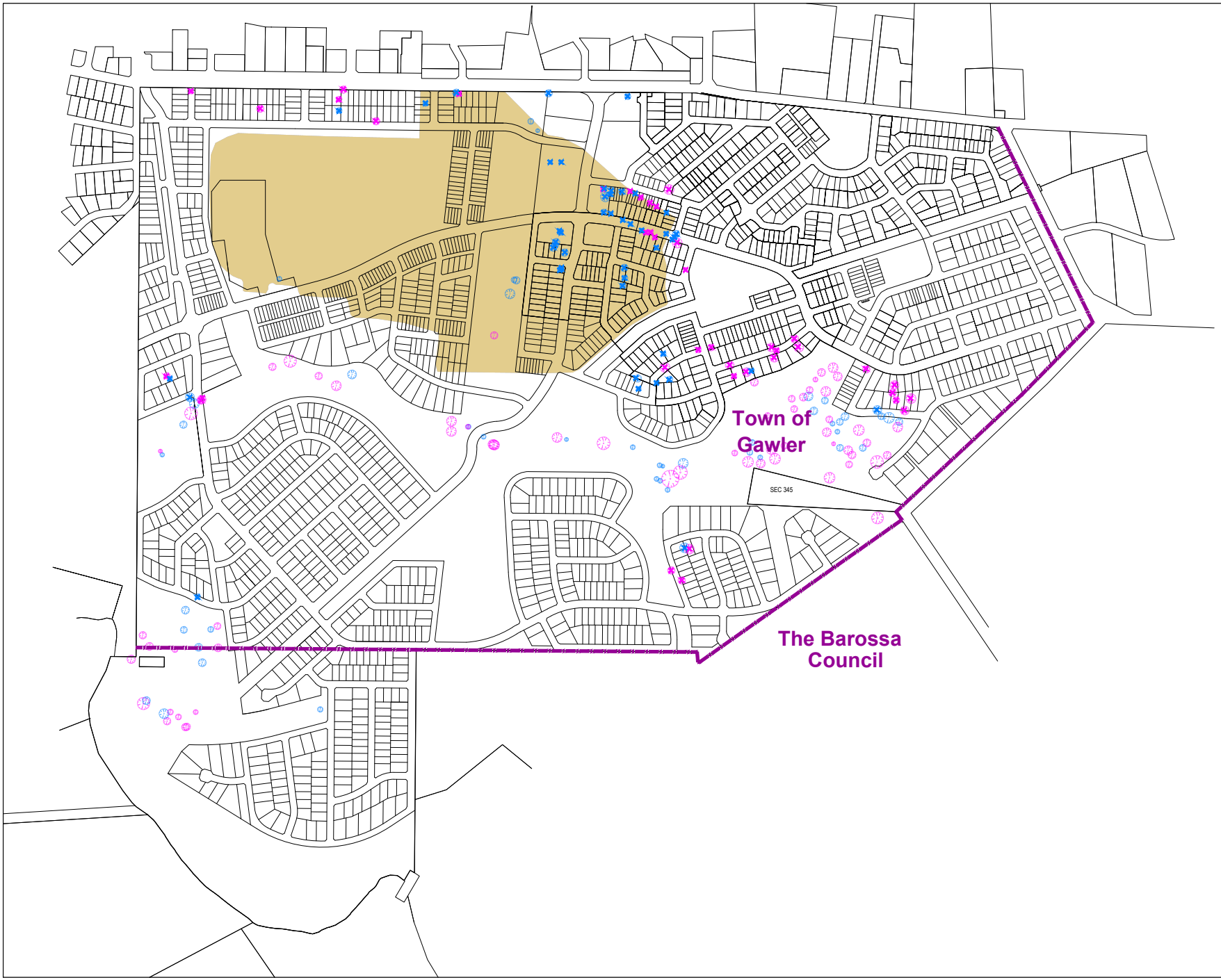
Melbourne
Level 6, 6 Riverside Quay, Southbank
VIC, Australia 3006
61 3 9429 6133
melbourne@tract.net.au

Brisbane
Level 2, 127 Creek Street,
Brisbane
QLD, Australia 4000
61 7 3002 6400
brisbane@tract.net.au

Sydney
Level 8, 80 Mount Street,
North Sydney
NSW, Australia 2060
61 2 9954 3733
sydney@tract.net.au

Adelaide
7-11 Moger Lane,
Adelaide
SA, Australia 5000
61 8 8223 1324
adelaide@tract.net.au

Geelong
39 Gheringhap Street,
Geelong
VIC, Australia 3220
61 3 5221 0105
geelong@tract.net.au



Development No. / /
Town of Gawler

Development No. / /
The Barossa Council

Tree Retention Plan
Allotment 2 in F7765
Allotment 1 in F13468
Allotment 9010 & 9011 in D114845
Allotment 7030 in D119118
Allotment 4 in D28814
Hundred of Barossa
in the area named
GAWLER EAST & KALBEEBA

CT 6156/896 CT 6205/146
CT 6118/249 CT 6162/334
CT 6184/173 PT CT 6212/430

0 25 50 100 150 200 250 m
1:2500

N
W E
S

Significant trees to be retained 160
Significant trees to be removed 40
Total number of Significant trees 200

Regulated trees to be retained 136
Regulated trees to be removed 47
Total number of Regulated trees 183

Denotes Area of existing uncontrolled fill to be removed

Dimensions and areas are subject to survey.

Original Sheet Size A0

Glenn Ian Hordacre
LICENSED SURVEYOR

REF: A010816	
DWG NO: A010816-CG TREE PLAN REV C	
REVISION: C	
DEL: 13.06.2019	

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11 King William Street Kent Town,
South Australia 5067
PO Box 1000 Kent Town, SA 5071
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+ Property + Land Development +
+ Construction + Mining +
+ Spatial Information Management +

Alexander Symonds Surveying Consultants

Development No. / /
Town of Gawler

Development No. / /
The Barossa Council

Staging Plan
Allotment 2 in F7765
Allotment 1 in F13468
Allotment 9010 & 9011 in D114845
Allotment 7030 in D119118
Allotment 4 in D28814
Hundred of Barossa
In the area named
GAWLER EAST & KALBEEBA

CT 6186/806 CT 6205/146
CT 6110/249 CT 6162/334
CT 6164/173 PT CT 6212/430

0 25 50 100 150 200 250 m
1:2500

Dimensions and areas are subject to survey.

© ALEXANDER & SYMONDS PTY. LTD. Original Sheet Size A3
Glenn Ian Hordacre
LICENSED SURVEYOR

REF:	A010816
DWG NO.:	A010816-CG STAGINGPLAN REV D
REVISION:	C
DEL:	21.11.2016

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+ Property + Land Development +
+ Construction + Mining +
+ Spatial Information Management +

Government of South Australia
Department of Planning, Transport and Infrastructure

Product	Register Search
Date/Time	03/06/2016 10:47AM
Customer Reference	
Order ID	20160603003780
Cost	$27.25

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Registrar-General

Certificate of Title - Volume 6118 Folio 249

REAL PROPERTY ACT, 1886
South Australia

Parent Title(s)	CT 6110/238
Dealing(s) Creating Title	DDA 11994431
Title Issued	09/09/2013
Edition	2
Edition Issued	16/03/2016

Estate Type

FEE SIMPLE

Registered Proprietor

ROBERT LIONEL AMES
OF CARE WILLIAMS BUCK GPO BOX 11050 ADELAIDE SA 5001

Description of Land

ALLOTMENT 2 FILED PLAN 7765
IN THE AREA NAMED GAWLER EAST
HUNDRED OF BAROSSA

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED QQ (TG 9512518)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED B TO THE MINISTER FOR INFRASTRUCTURE (T 1371274)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED M TO TRANSMISSION LESSOR CORPORATION OF 1 UNDIVIDED 2ND PART (SUBJECT TO LEASE 9061500) AND ELECTRANET PTY. LTD. OF 1 UNDIVIDED 2ND PART (T 1829640)

SUBJECT TO RIGHT(S) OF WAY OVER THE LAND MARKED L (T 1371274)

TOGETHER WITH FREE AND UNRESTRICTED RIGHT(S) OF WAY OVER THE LAND MARKED N

Schedule of Dealings

Dealing Number	Description
11764743	AGREEMENT UNDER DEVELOPMENT ACT 1993 PURSUANT TO SECTION 57A
12459905	AGREEMENT UNDER DEVELOPMENT ACT, 1993 PURSUANT TO SECTION 57(2)

Notations

Dealings Affecting Title

NIL

Priority Notices

NIL

Notations on Plan

NIL

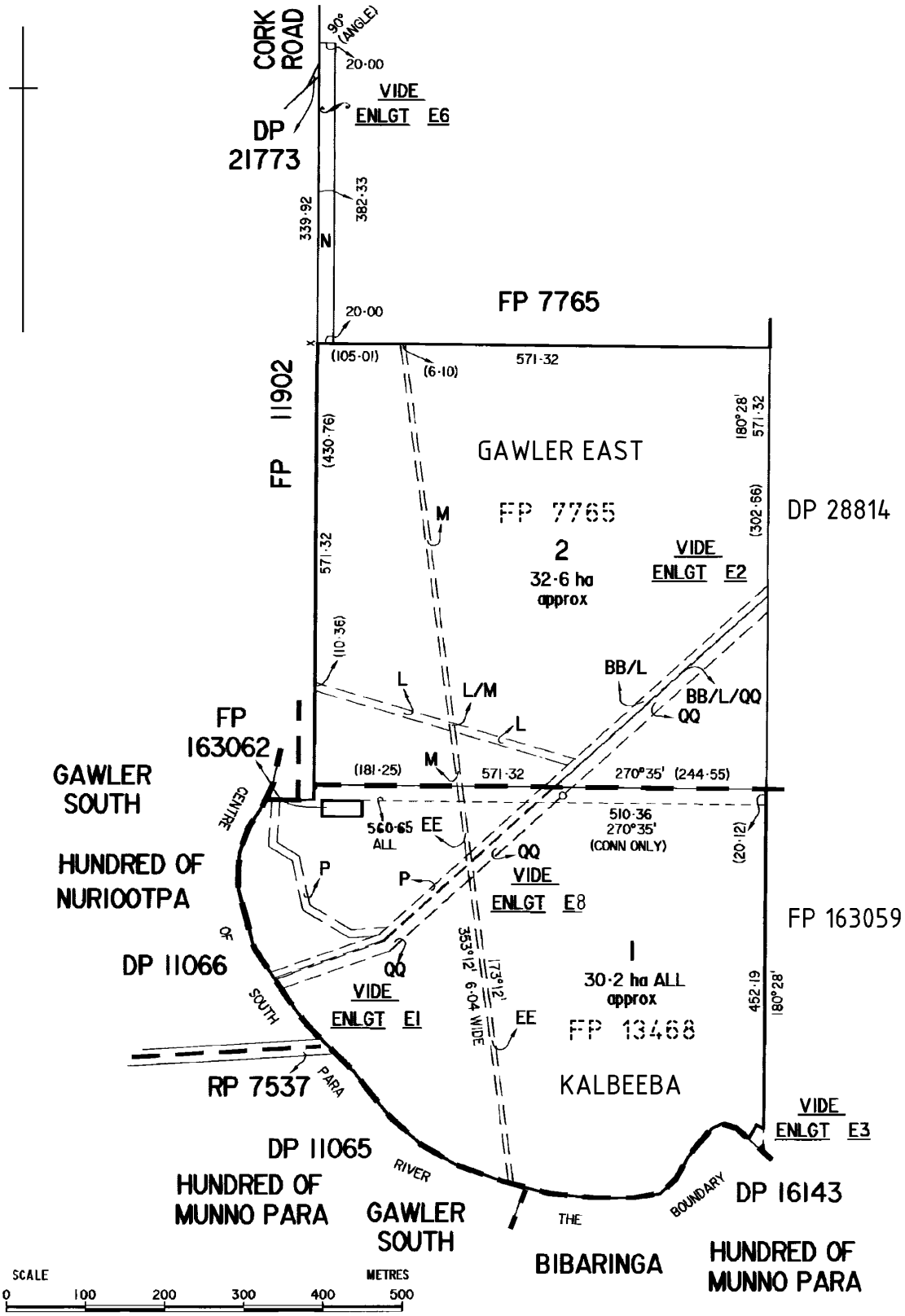
Registrar-General's Notes

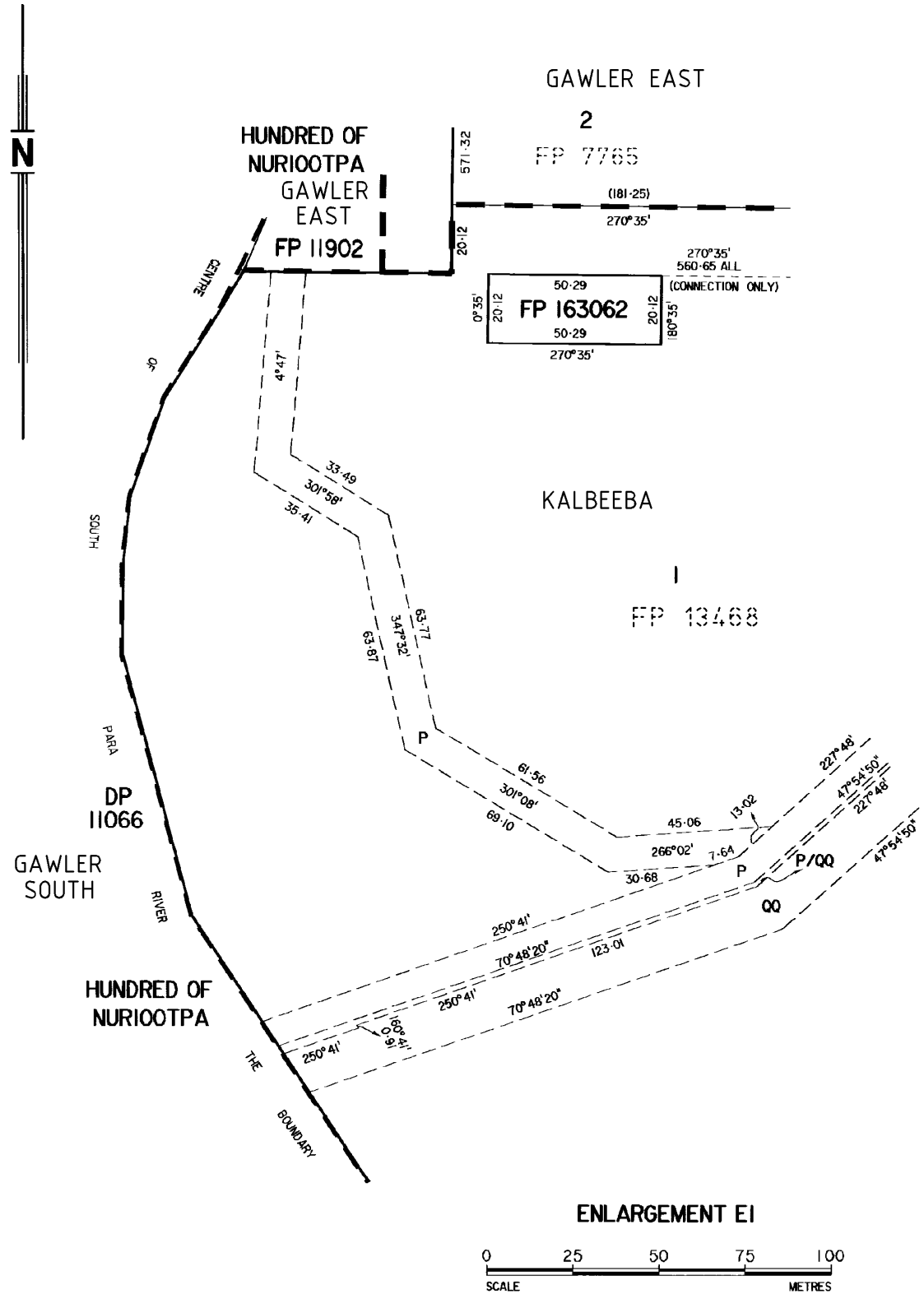
APPROVED G9/2012

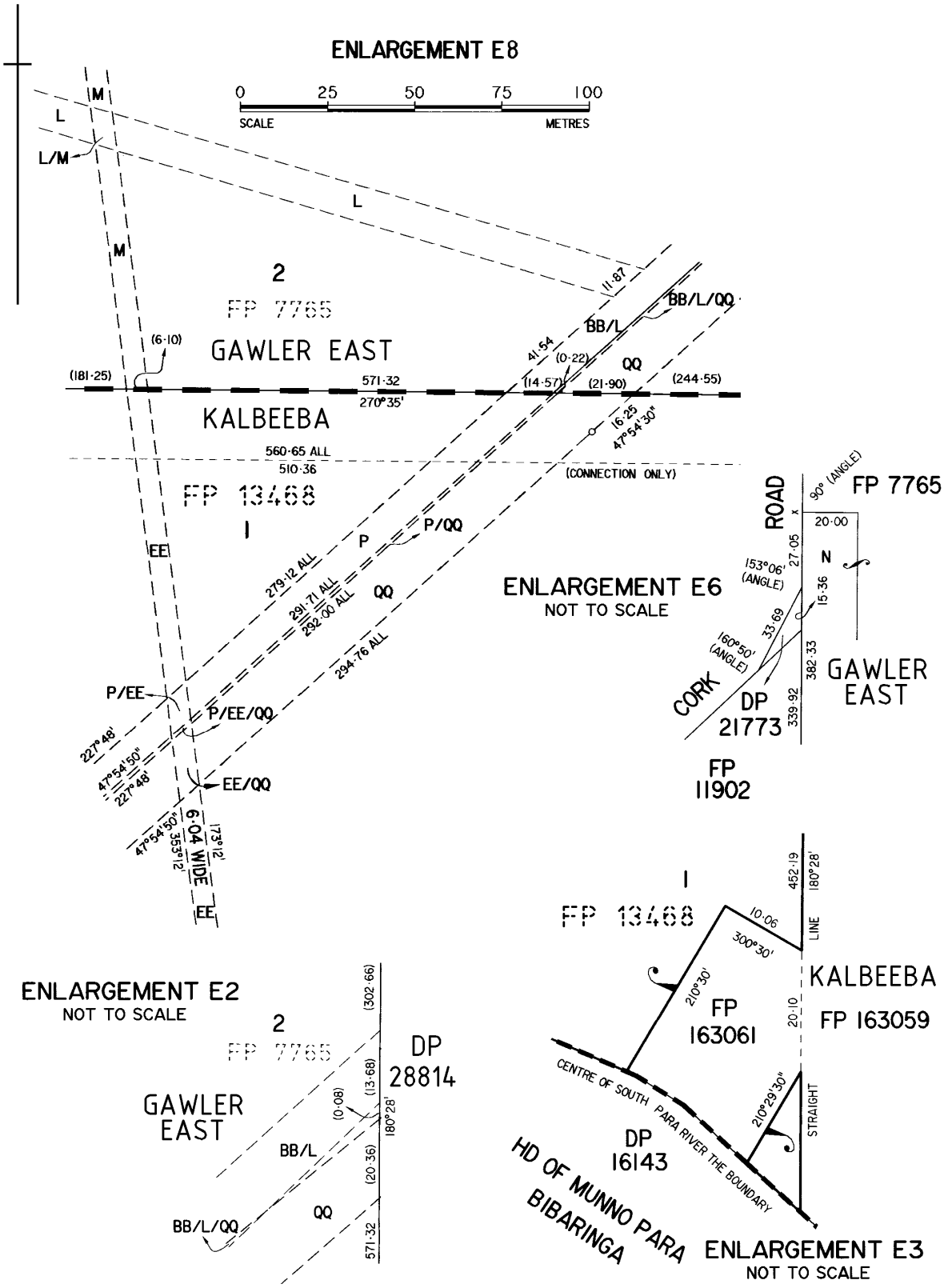
Administrative Interests

NIL

* Denotes the dealing has been re-lodged.







Product	Title Details
Date/Time	05/04/2016 06:39AM
Customer Reference	del
Order ID	20160405000032
Cost	$9.60

Certificate of Title

Title Reference	CT 6162/334
Status	CURRENT
Easement	YES
Owner Number	13091095
Address for Notices	CARE WILLIAM BUCK GPO BOX 11050 ADELAIDE SA 5001
Area	53.15HA (CALCULATED)

Estate Type

Fee Simple

Registered Proprietor

LEANNE HEATHER BRUGGEMANN
OF C/- WILLIAM BUCK GPO BOX 11050 ADELAIDE SA 5001
1 / 24 SHARE

HEATHER DAWN AMES
OF C/- WILLIAM BUCK GPO BOX 11050 ADELAIDE SA 5001
21 / 24 SHARE

BRENTON ROBERT AMES
OF C/- WILLIAM BUCK GPO BOX 11050 ADELAIDE SA 5001
1 / 24 SHARE

KAREENA DAWN PRIESTLEY
OF C/- WILLIAM BUCK GPO BOX 11050 ADELAIDE SA 5001
1 / 24 SHARE

Description of Land

ALLOTMENT 4 DEPOSITED PLAN 28814
IN THE AREA NAMED GAWLER EAST
HUNDRED OF BAROSSA

Last Sale Details

There are no sales details recorded for this property

Constraints

Encumbrances

Dealing Type	Dealing Number	Beneficiary
AGREEMENT	11764743	MINISTER FOR HOUSING AND URBAN DEVELOPMENT
AGREEMENT	12459905	TOWN OF GAWLER

Stoppers

NIL

Valuation Numbers

Valuation Number	Status	Property Location Address
4926915747	PROPOSED CURRENT	Lot 7022 BALMORAL ROAD, GAWLER EAST, SA 5118
4926915755	PROPOSED CANCELLED	Lot 4 CALTON ROAD, GAWLER EAST, SA 5118
4926915763	PROPOSED CANCELLED	Lot 4 CALTON ROAD, GAWLER EAST, SA 5118

Notations

Dealings Affecting Title

NIL

Notations on Plan

NIL

Registrar-General's Notes

APPROVED G9/2012

Administrative Interests

NIL

REAL PROPERTY ACT, 1886
South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 6184 Folio 173

Parent Title(s) CT 6118/242

Creating Dealing(s) TR:N 12599901

Title Issued 30/11/2016 **Edition** 1 **Edition Issued** 30/11/2016

Estate Type

FEE SIMPLE

Registered Proprietor

ROBERT LIONEL AMES
OF 140 STURT HIGHWAY BURONGA NSW 2739

Description of Land

ALLOTMENT 1 FILED PLAN 13468
IN THE AREA NAMED KALBEEBA
HUNDREDS OF BAROSSA AND MUNNO PARA

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED EE TO DISTRIBUTION LESSOR CORPORATION (SUBJECT TO LEASE 8890000) (T 1871963)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED P TO SOUTH AUSTRALIAN WATER CORPORATION (T 1502740)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED QQ (TG 9512518)

SUBJECT TO RIGHT(S) OF WAY OVER THE LAND MARKED D TO SOUTH AUSTRALIAN WATER CORPORATION (T 1502740)

Schedule of Dealings

Dealing Number	Description
11764743	AGREEMENT UNDER DEVELOPMENT ACT 1993 PURSUANT TO SECTION 57A
12582992	MORTGAGE TO NATIONAL AUSTRALIA BANK LTD. (ACN: 004 044 937)

Notations

Dealings Affecting Title NIL

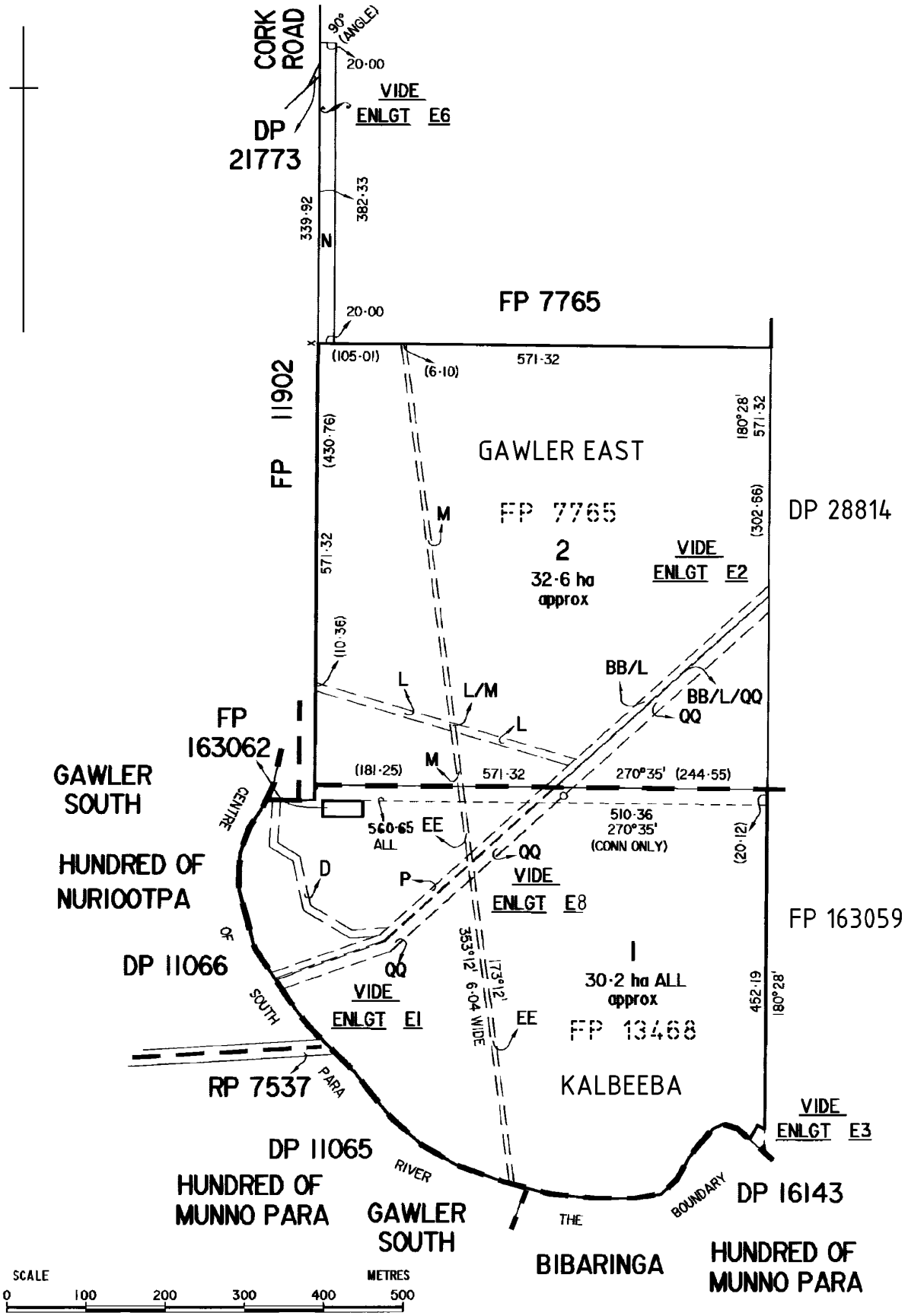
Priority Notices NIL

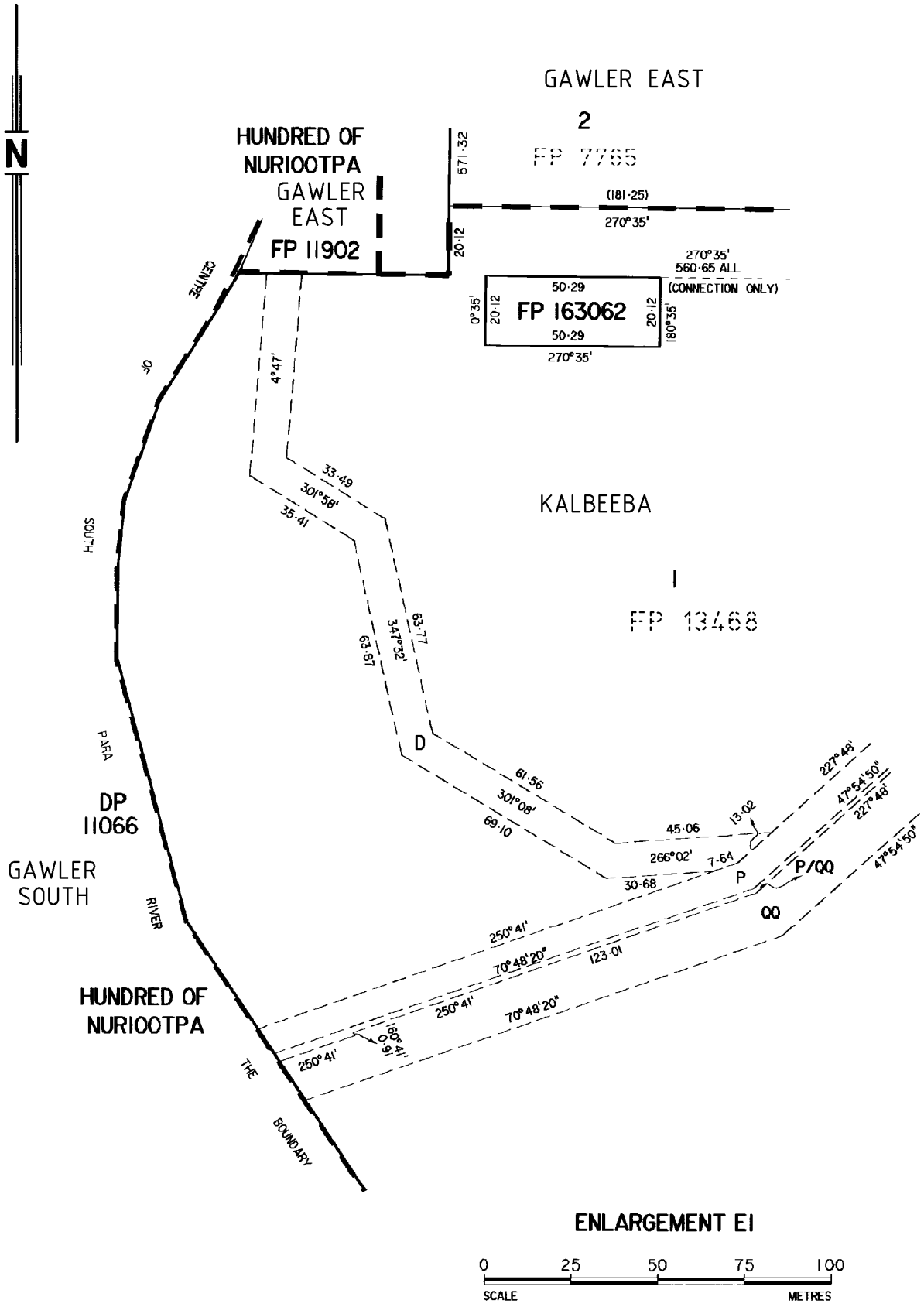
Notations on Plan NIL

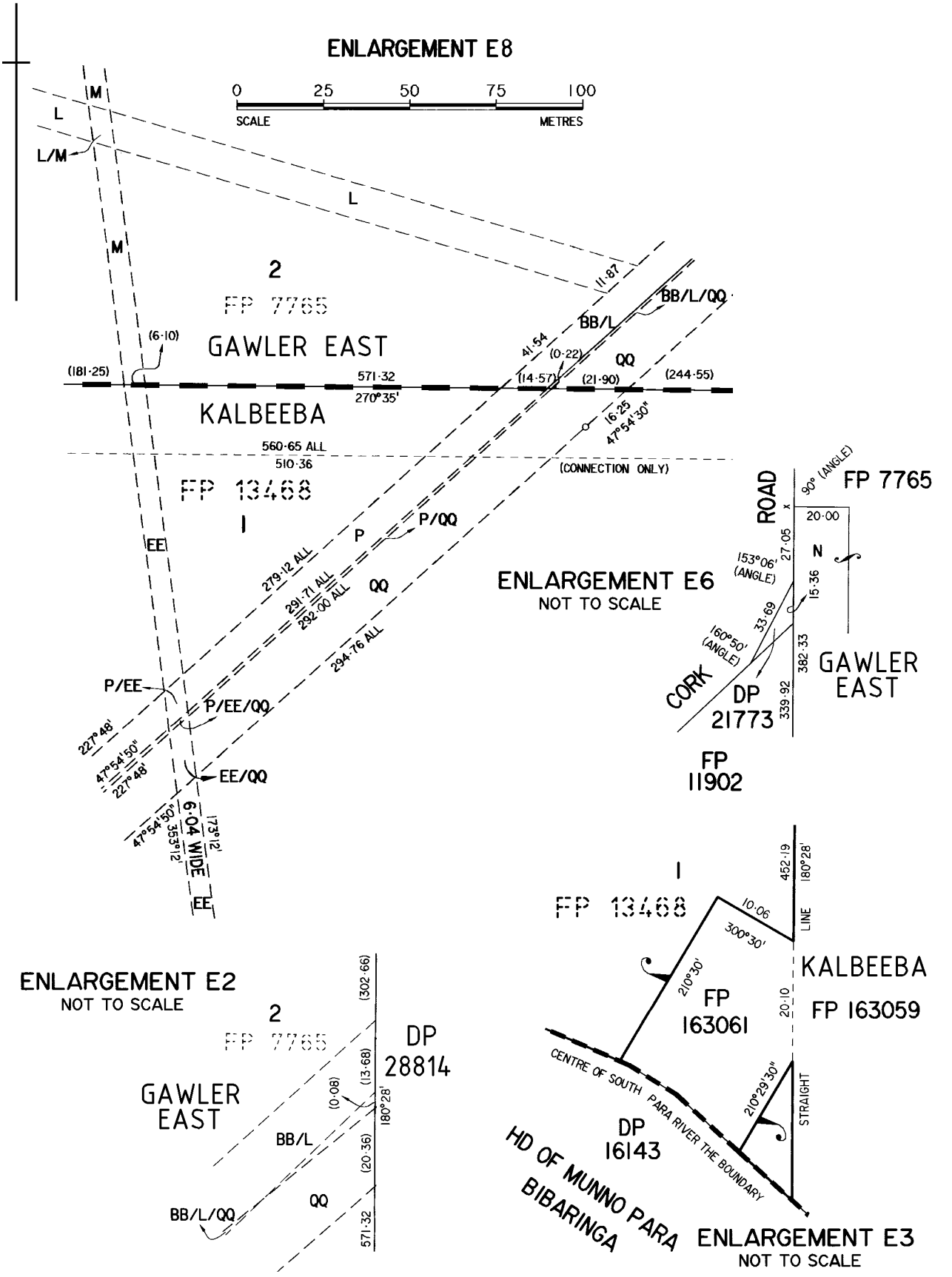
Registrar-General's Notes

APPROVED G9/2012

Administrative Interests NIL







REAL PROPERTY ACT, 1886
South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 6186 Folio 896

Parent Title(s)	CT 5868/500				
Creating Dealing(s)	RTC 12673685				
Title Issued	10/02/2017	**Edition**	1	**Edition Issued**	10/02/2017

Estate Type

FEE SIMPLE

Registered Proprietor

FIVE AMES FARMING PTY. LTD. (ACN: 609 760 536)
OF GPO BOX 11050 ADELAIDE SA 5001

Description of Land

ALLOTMENT 9011 DEPOSITED PLAN 114845
IN THE AREA NAMED GAWLER EAST
HUNDRED OF BAROSSA

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED B ON D114845 TO TRANSMISSION LESSOR CORPORATION OF 1 UNDIVIDED 2ND PART (SUBJECT TO LEASE 9061500) AND ELECTRANET PTY. LTD. OF 1 UNDIVIDED 2ND PART (T 1829640)

SUBJECT TO FREE AND UNRESTRICTED RIGHT(S) OF WAY OVER THE LAND MARKED D ON D114845

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED H ON D114845 FOR DRAINAGE PURPOSES TO THE COUNCIL FOR THE AREA (223LG RPA)

Schedule of Dealings

Dealing Number	Description
11764743	AGREEMENT UNDER DEVELOPMENT ACT 1993 PURSUANT TO SECTION 57A
12459905	AGREEMENT UNDER DEVELOPMENT ACT, 1993 PURSUANT TO SECTION 57(2)
12466584	MORTGAGE TO LEND LEASE COMMUNITIES (GAWLER) PTY. LTD. (ACN: 139 895 195)

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

REAL PROPERTY ACT, 1886
South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 6205 Folio 146

Parent Title(s)	CT 6186/895				
Creating Dealing(s)	VE 12885392				
Title Issued	26/03/2018	**Edition**	2	**Edition Issued**	06/07/2018

Estate Type

FEE SIMPLE

Registered Proprietor

FIVE AMES FARMING PTY. LTD. (ACN: 609 760 536)
OF 63 GAWLER TERRACE GAWLER SOUTH SA 5118

Description of Land

ALLOTMENT 9010 DEPOSITED PLAN 114845
IN THE AREA NAMED GAWLER EAST
HUNDRED OF BAROSSA

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A ON D114845 TO THE MINISTER FOR INFRASTRUCTURE (T 1374106)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED C ON D114845 TO TRANSMISSION LESSOR CORPORATION OF 1 UNDIVIDED 2ND PART (SUBJECT TO LEASE 9061500) AND ELECTRANET PTY. LTD. OF 1 UNDIVIDED 2ND PART (T 2370109)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED E ON D114845 TO ELECTRANET PTY. LTD. (TG 12371822)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED T ON D114845 (TG 9662213)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED U ON D114845 (TG 10297076)

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED H ON D114845 FOR DRAINAGE PURPOSES TO THE COUNCIL FOR THE AREA (223LG RPA)

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED J ON F252234 FOR ELECTRICITY SUPPLY PURPOSES TO DISTRIBUTION LESSOR CORPORATION (SUBJECT TO LEASE 8890000) (223LG RPA)

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED K(T/F) ON F252234 FOR ELECTRICITY SUPPLY PURPOSES TO DISTRIBUTION LESSOR CORPORATION (SUBJECT TO LEASE 8890000) (223LG RPA)

Schedule of Dealings

Dealing Number	Description
11764743	AGREEMENT UNDER DEVELOPMENT ACT 1993 PURSUANT TO SECTION 57A
12459905	AGREEMENT UNDER DEVELOPMENT ACT, 1993 PURSUANT TO SECTION 57(2)
12915311	MORTGAGE TO NATIONAL AUSTRALIA BANK LTD. (ACN: 004 044 937)

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

REAL PROPERTY ACT, 1886
South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 6212 Folio 430

Parent Title(s) CT 6212/266

Creating Dealing(s) RTU 12970764

Title Issued 22/08/2018 **Edition** 1 **Edition Issued** 22/08/2018

Estate Type

FEE SIMPLE

Registered Proprietor

SPRINGWOOD DEVELOPMENT NOMINEES PTY. LTD. (ACN: 609 351 671)
OF L 1 22-26 VARDON AVENUE ADELAIDE SA 5000

Description of Land

ALLOTMENT 7030 DEPOSITED PLAN 119118
IN THE AREA NAMED GAWLER EAST
HUNDRED OF BAROSSA

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A ON D119118 TO SOUTH AUSTRALIAN WATER CORPORATION (T 1374106)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED H.S ON D119118 (TG 9839646)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED J ON D119118 (TG 12970760)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED R ON D119118 (TG 10045651)

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED D ON D119118 FOR DRAINAGE PURPOSES TO THE COUNCIL FOR THE AREA (223LG RPA)

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED F ON D119118 FOR SEWERAGE PURPOSES TO SOUTH AUSTRALIAN WATER CORPORATION (223LG RPA)

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED N ON D119118 FOR DRAINAGE PURPOSES TO THE COUNCIL FOR THE AREA (223LG RPA)

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED P(T/F) ON D119118 FOR ELECTRICITY SUPPLY PURPOSES TO DISTRIBUTION LESSOR CORPORATION (SUBJECT TO LEASE 8890000) (223LG RPA)

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED W ON D119118 FOR WATER SUPPLY PURPOSES TO SOUTH AUSTRALIAN WATER CORPORATION (223LG RPA)

Schedule of Dealings

Dealing Number	Description
11764743	AGREEMENT UNDER DEVELOPMENT ACT 1993 PURSUANT TO SECTION 57A
12459905	AGREEMENT UNDER DEVELOPMENT ACT, 1993 PURSUANT TO SECTION 57(2)
12915302	MORTGAGE TO NATIONAL AUSTRALIA BANK LTD. (ACN: 004 044 937)

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

ekistics

'SPRINGWOOD' PLANNING STATEMENT

Land Division at Calton Road, Gawler East

Prepared for:
Springwood Development Nominees Pty Ltd

Date:
14 June 2019

ekistics

Proprietary Information Statement

Document Control

Revision	Description	Author	Date
V1	Draft Planning Statement	RAD	6 June 2019
V2	Revised Draft Planning Statement	RAD	13 June 2019
V3	Final Planning Statement	RAD	14 June 2019

Approved by: R Dwyer  Date: 14/06/19

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Contents

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Schedule of Abbreviations

AEP	Annual Exceedance Probability
COI	Chemicals of Interest
DEW	Department for Environment and Water
DPTI	Department of Planning Transport & Infrastructure
EPA	Environment Protection Authority
GELR	Gawler East Link Road
MLV	Main Line Valve
PCA	Potential Contamination Activity
PSA	Preliminary Site Assessment
SCAP	State Commission Assessment Panel
SISD	Safe Intersection Sight Distance
SMS	Safety Management Study
WSUD	Water Sensitive Urban Design

1. Executive Summary

Category	Details
PROJECT	'Springwood' Land Division
ADDRESS OF SITE	Calton Road, Gawler East, SA 5118
CERTIFICATES OF TITLE	• Volume 6186 Folio 896 (Allotment 9011, DP 114845) • Volume 6205 Folio 146 (Allotment 9010, DP 114845 • Volume 6212 Folio 430 (Allotment 7030, DP 119118) • Volume 6118 Folio 249 (Allotment 2, FP 7765) • Volume 6162 Folio 334 (Allotment 4, DP 28814) • Volume 6162 Folio 334 (Allotment 4, DP 28814) • Volume 6184 Folio 173 (Allotment 1, FP 13468)
SITE AREA	• 186.1 hectares
FRONTAGE	• Calton Road 1,013.66 metres • Cheek Avenue 230 metres (approx.)
LOCAL GOVERNMENT	• Town of Gawler • The Barossa Council
RELEVANT AUTHORITY	• State Commission Assessment Panel (SCAP) – Schedule 10 Cl. 20
PRE-LODGEMENT PANEL MEETINGS	• 28 March 2019 • 21 May 2019
DEVELOPMENT PLAN	• Gawler (CT) (consolidated 20 February 2018) • The Barossa Council (consolidated 1 November 2018)
ZONING	• Residential (Gawler East) Zone (Gawler (CT) Development Plan) • Open Space Zone (Gawler (CT) Development Plan) • Residential (Gawler East) Zone (Barossa Council Development Plan) • Open Space Zone (Barossa Council Development Plan)

POLICY AREA/PRECINCT	• Mixed Use Centre Policy Area 3 (for portion of site only) (Gawler (CT) Development Plan)
EXISTING USE	• Primary Production / Vacant
PROPOSAL DESCRIPTION	Land division creating an additional 1,415 allotments with associated bulk earth works, landscaping and removal of 47 Regulated Trees and 40 Significant Trees. The land division is proposed to occur over four (4) separate development applications as follows: • Application 1: 188 lots (Adjacent existing Sea Gas 'main line valve') • Application 2: 22 lots (Environmental audit land east) • Application 3: 24 lots (Environmental audit land west) • Application 4: 1,181 lots (Balance of site)
STATUTORY AGENCY REFERRALS	• Environment Protection Authority (EPA) • The Town of Gawler • The Barossa Council
PUBLIC NOTIFICATION	Category 1
OPERATIVE PERIOD OF CONSENT	Given the scale of the overall project, the Applicant seeks, as part of the application for Development Plan Consent, that the relevant authority extend the operative period of consent for the development to facilitate the staged construction of the project. In particular, it is requested that the period prescribed under Regulation 48(1)(b)(i) of the Regulations for the substantial completion of the project be extended to a period of 10 years from the operative date of the Development Plan Consent.
APPLICANT	Springwood Development Nominees Pty Ltd
CONTACT PERSON	Richard Dwyer– Ekistics Planning and Design – (08) 7231 0286
OUR REFERENCE	00740

2. Introduction / Background

This planning statement has been prepared in support of a proposal by Springwood Development Nominees Pty Ltd for a land division creating an additional 1,415 allotments on land located adjacent Calton Road, Gawler East. The proposal will be split into four (4) separate yet concurrent land division applications as follows:

Table 2.1 *Development Application Composition*

Application	DA Reference Number	Allotments	Description
1	DA490/D028/19	188	Land adjacent existing Sea Gas 'Main Line Valve'
2	DA490/D025/19	22	Land subject to Environmental Audit – East
3	DA490/D027/19	24	Land subject to Environmental Audit – West
4	DA490/D026/19 (Town of Gawler) DA960/D025/19 (The Barossa Council)	1,181	Balance of land

This Planning Statement is provided in support of each development application listed above.

This Planning Statement provides information about the subject land and proposed development and addresses the merits of the proposal against the relevant provisions of:

- The 'Mixed Use Centre Policy Area', the 'Residential (Gawler East) Zone', The 'Open Space Zone' and the most relevant 'Council Wide' provisions within the Gawler (CT) Development Plan; and
- The 'Residential (Gawler East) Zone', the 'Open Space Zone' and the most relevant 'Council Wide' provisions within the Barossa Council Development Plan.

For the purposes of this statement, the '*Development Act 1993*' will be referred to as the 'Act' and the '*Development Regulations 2008*' will be referred to as the 'Regulations'.

This Planning Statement has been prepared on the basis of the Proposed Plans of Division and supporting documentation summarised below:

- ***Appendix 1***: Land Tenure Plan and Certificates of Title
- ***Appendix 2***: Plan of Division & Staging Plan (combined applications)
- ***Appendix 3***: Proposed Plan of Division for DA490/D026/19 (Town of Gawler) and DA960/D025/19 (The Barossa Council) prepared by Alexander Symonds

- *Appendix 4*: Proposed Plan of Division for DA490/D028/19 prepared by Alexander Symonds
- *Appendix 5*: Proposed Plan of Division for DA490/D025/19 prepared by Alexander Symonds
- *Appendix 6*: Proposed Plan of Division for DA490/D027/19 prepared by Alexander Symonds
- *Appendix 7*: Master Plan prepared by Tract
- *Appendix 8*: Traffic Impact Assessment prepared by GTA
- *Appendix 9*: Flora & Fauna Assessment prepared by EBS Ecology & Kellogg Brown and Root
- *Appendix 10*: Stormwater Management Plan prepared by WGA
- *Appendix 11* Site Services Report prepared by WGA
- *Appendix 12*: Roads and Earthworks Report prepared by WGA
- *Appendix 13*: Plan Nominating Regulated / Significant Tree Removal
- *Appendix 14*: Preliminary Site Assessment (PSI) prepared by LBWco;
- *Appendix 15* Legal Opinion (Botten Levinson)

3. The Subject Site and Locality

3.1 The Subject Site

The subject land measures 186.1 hectares in area and has a road frontage to Calton Road of 1,013.66 metres and a frontage to Cheek Avenue of approximately 235 metres.

The subject land is located within both the Town of Gawler and the Barossa Council and is located to the east of the Gawler township.

The subject land comprises the following Certificates of Title (refer to ***Appendix 1***):

- Volume 6186 Folio 896 (Allotment 9011, DP 114845)
- Volume 6205 Folio 146 (Allotment 9010, DP 114845
- Volume 6212 Folio 430 (Allotment 7030, DP 119118)
- Volume 6118 Folio 249 (Allotment 2, FP 7765)
- Volume 6162 Folio 334 (Allotment 4, DP 28814)
- Volume 6184 Folio 173 (Allotment 1, FP 13468)

There are a number of easements affect the subject land including (but not limited to):

- A 275kV transmission line within a 100 metre wide ElectraNet easement that runs north-south through the development site;
- A 132kV transmission line within a 30 metre wide ElectraNet easement that runs north-south through the site, approximately parallel to the site's western boundary;
- A DN750 MSCL potable water main (known as the Barossa Trunk Main) currently, is located within a 10.06 metre wide easement through the site, running between Balmoral Road and Eckerman Ave; and
- A 450mm diameter high pressure gas transmission pipeline, owned and operated by South East Australia Gas Pty Ltd (SEA Gas), is located within a 15m wide easement that runs parallel to the Barossa Trunk Main, in a northeast to southwest direction between Balmoral Road and the site's western boundary.

Figure 3.1 *Subject Site (Source: GTA Consultants)*

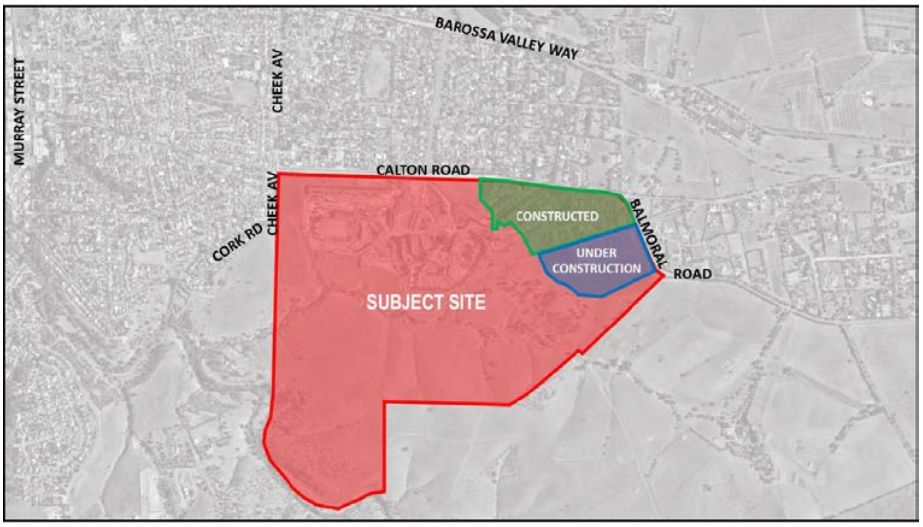
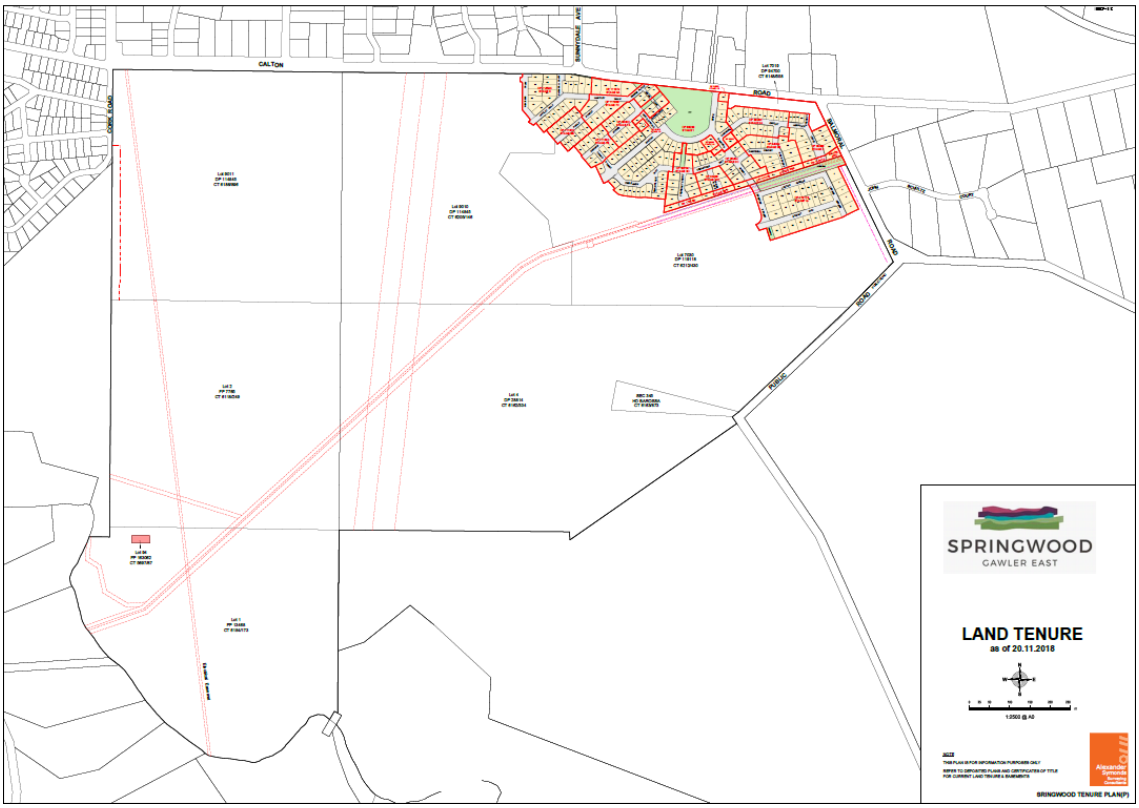


Figure 3.2 *Subject Site – Land Tenure*



The subject land is currently vacant and utilised for the purposes of Primary Production (grazing and agriculture).

The north-east portions of the site have however been significantly altered by historic quarrying activities associated with the excavation of sand. Excavated sand was previously processed on-site with a washing plant where fines (silt and clay) were separated from the sand and deposited into a series of sedimentation pods and a drying pond. The material was periodically excavated from the pond and stockpiled on-site or sold as a product. It is understood that sand mining activities ceased operations in 2000.

The natural topography of the site comprises undulating hills, increasing in steepness towards the South Para River to the south-west of the site. In developable areas the site has grades ranging between 5 -18%.

Where not influenced by historical quarrying activities, areas of the site slope steeply towards a number of valleys. Those on the majority of the site discharge to a tributary of the South Para River (Spring Creek) that runs east-west roughly through the central portion of the site. Valleys on the south-west corner of the site discharge directly to the South Para River, which runs immediately to the south-west.

As discussed, existing major infrastructure currently intersects the site including:

- An above-ground 750mm diameter Barossa Trunk Main;
- 450mm diameter high pressure SEA Gas transmission pipeline and associated 'main line valve';
- 275kV overhead electricity power lines within a 100 metre wide easement; and
- 132 kV overhead electricity power lines within a 30 metre wide easement.

Portions of the subject site are highlighted in the images below:

Figure 3.3 *Subject Site (existing swale and vegetation)*

Figure 3.4 *Existing Quarry to north-west of site*

Figure 3.5 *Subject site (including Quarry, Barossa Trunk Main and 275 kV overhead powerlines*

Figure 3.6 *Existing SEA Gas Main Line Valve facility*

Figure 3.7 *Barossa Trunk Main Intersecting the Subject Site*

3.2 The Locality and Surrounding Development

Land surrounding the subject site currently comprises residential development to the north, north-west and east with low-intensity cropping and grazing to the south, south-west, and south-east.

The existing 'Springwood Sales and Information Centre' is located to the east of the site fronting Easton Drive, opposite the existing Springwood reserve and playground.

Figure 3.8 *Springwood Sales and Information Centre*

Figure 3.9 *Springwood Reserve / Playground*

3.2.2 *Existing Local Road Network*

The local road network within the locality includes:

- Calton Road:

  Calton Road is a collector road providing east-west access from the Gawler central business district to the west, and rural regions to the east. The road comprises a two-way, two-lane carriageway approximately 6.8 metres wide with a lane of traffic in either direction. The carriageway is set within a reserve at least 16 metres wide. The road is under the care and control of the Town of Gawler between the town centre and Sunnydale Avenue. East of Sunnydale Avenue, the road is under the care and control of The Barossa Council.

  Traffic volumes on Calton Road are approximately 8,600 vehicles per day to the west of the site, and 3,500 vehicles per day at the east of the site

- Easton Drive:

  Easton Drive is a collector street comprising a single carriageway approximately 7.5 metres wide. Based on approval for 218 dwellings (not including those fronting Calton Road) in the currently approved stages in Springwood, it is predicted a traffic volume of approximately 1,800 vehicles per day when the currently approved development is complete and occupied (including Highfield stages).

- Gawler East Link Road (GELR):

  The Springwood development located in Gawler East will provide the terminus of the GELR as part of its road network with the GELR linking to Calton Road. The GELR is a new sub-arterial road that will provide a link for traffic to the east of the Gawler town centre between Calton Road in Gawler East to Main North Road in Evanston. This road will service both the existing and future communities of the Gawler East development zone and beyond, as well as reduce the impact of traffic generated from growth on the Gawler Town Centre.

  The GELR will pass through the proposed Springwood town centre located 200 metres to the south of Calton Road. Further development of Springwood will see the GELR become part of the Springwood collector road network with a new four-way intersection proposed in the town centre. The intersection will be developed as part of the urban design and placemaking for the town centre and will provide key pedestrian access in the town centre. The intersection is proposed to be signalised.

- Balmoral Road:

  Balmoral Road is a collector road connecting Calton Road to Williamstown Road and is under the care and control of the Barossa Council. Within the vicinity of the site, the road comprises a two-way, two-lane carriageway approximately 6.6 metres wide with a lane of traffic in either direction. The carriageway is set within a road reserve approximately 17 metres wide.

  The traffic volume on Balmoral Road is estimated at approximately 3,500 vehicles per day.

- Cheek Avenue:

  Cheek Avenue is a local road providing access to existing residential properties and is under the care and control of the Town of Gawler. Cheek Avenue links between Calton Road and Barossa Valley Way to the north. Within the vicinity of the site, on the south side of Calton Road, Cheek Avenue comprises a two-way, two-lane carriageway approximately 7.4 metres and is set within a reserve approximately 18 metres wide.

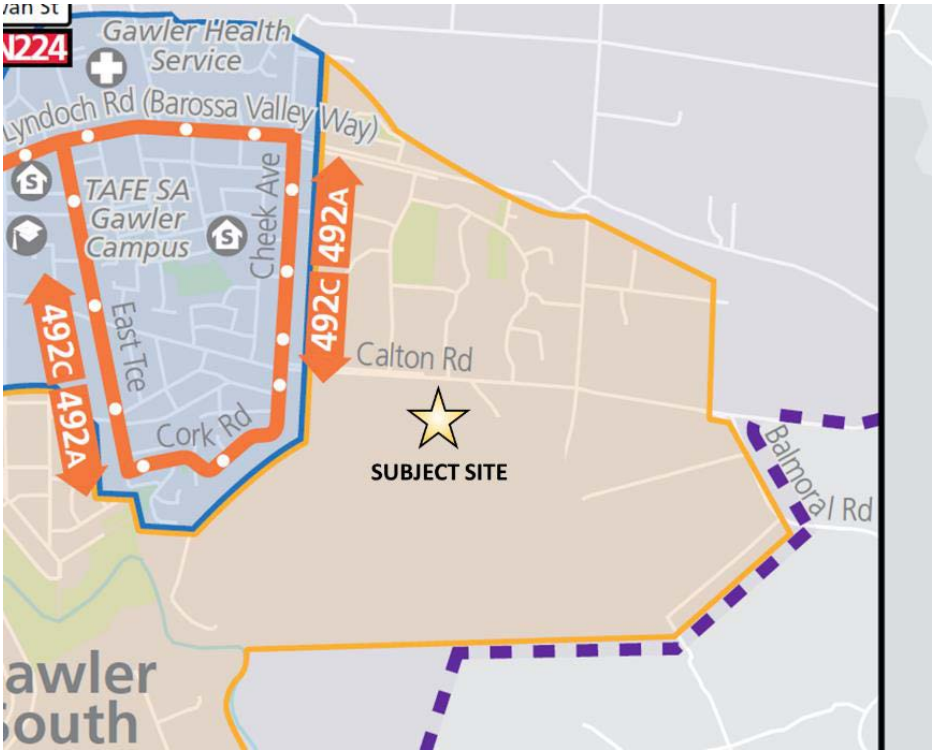
  Traffic volumes on Cheek Avenue north of the site are approximately 2,000 vehicles per day.

3.2.3 *Public Transport*

There are currently no public transport services along Calton Road, adjacent to the site. Services may run along the Gawler East Link, however there is no publicly available information at present to indicate if this will be the case.

The closest service is the 492A and 492C – Gawler East Circuit which passes along Cheek Avenue connecting to Gawler Town Centre and Railway Station. The nearest public transport stops to the site are located on Cheek Avenue approximately 154 metres and 170 metres north and south of Calton Road respectively (refer to ***Figure 3.10*** below)

Figure 3.10 *Public Transport Map (Source: GTA Consultants)*



3.2.4 *Pedestrian & Cycle Connections*

Pedestrian paths are provided on the west side of Cheek Avenue but are not provided along any other roads bounding the subject site.

There are no formal cycle facilities provided on or off-road within the vicinity of the subject site.

4. Proposed Development

4.1 Description

The proposed development involves the creation of 1,415 allotments from six (6) existing Certificates of Title (1,409 additional lots) together with associated bulk earth works, landscaping and removal of 47 Regulated Trees and 40 Significant Trees.

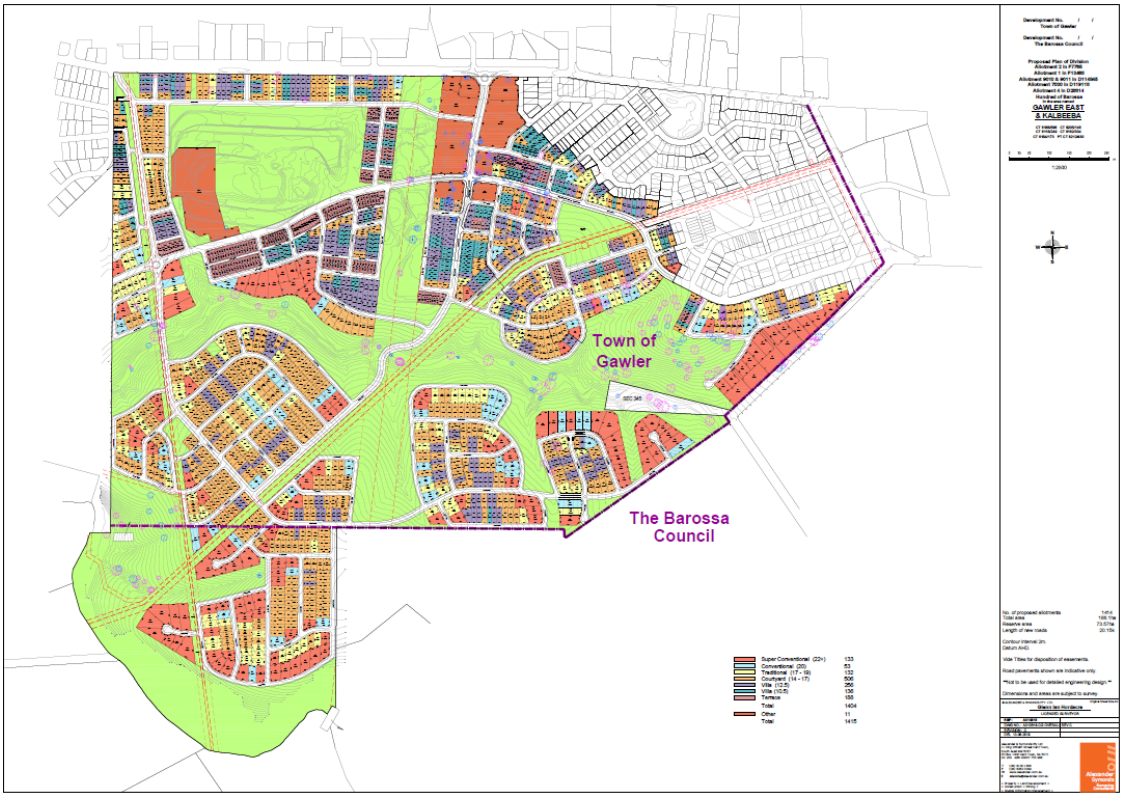
The division of land is proposed over four (4) separate development applications as specified in ***Table 2.1*** and summarised below:

- Application 1: 188 lots (Adjacent existing Sea Gas 'Main Line Valve');
- Application 2: 22 lots (Environmental audit land east);
- Application 3: 24 lots (Environmental audit land west); and
- Application 4: 1,181 lots (Balance of site).

The allotments are proposed for future residential and non-residential land uses with a range of allotments of varying sizes that will be serviced by an internal road network as outlined in the proposed Plans of Division (refer to each Plan of Division prepared by Alexander Symonds in ***Appendix 2, 3, 4, 5 & 6*** respectively).

A plan combining each respective land division is provided in ***Appendix 2*** and reproduced in ***Figure 4.1*** below.

Figure 4.1 *Combined Overall Plan of Division*



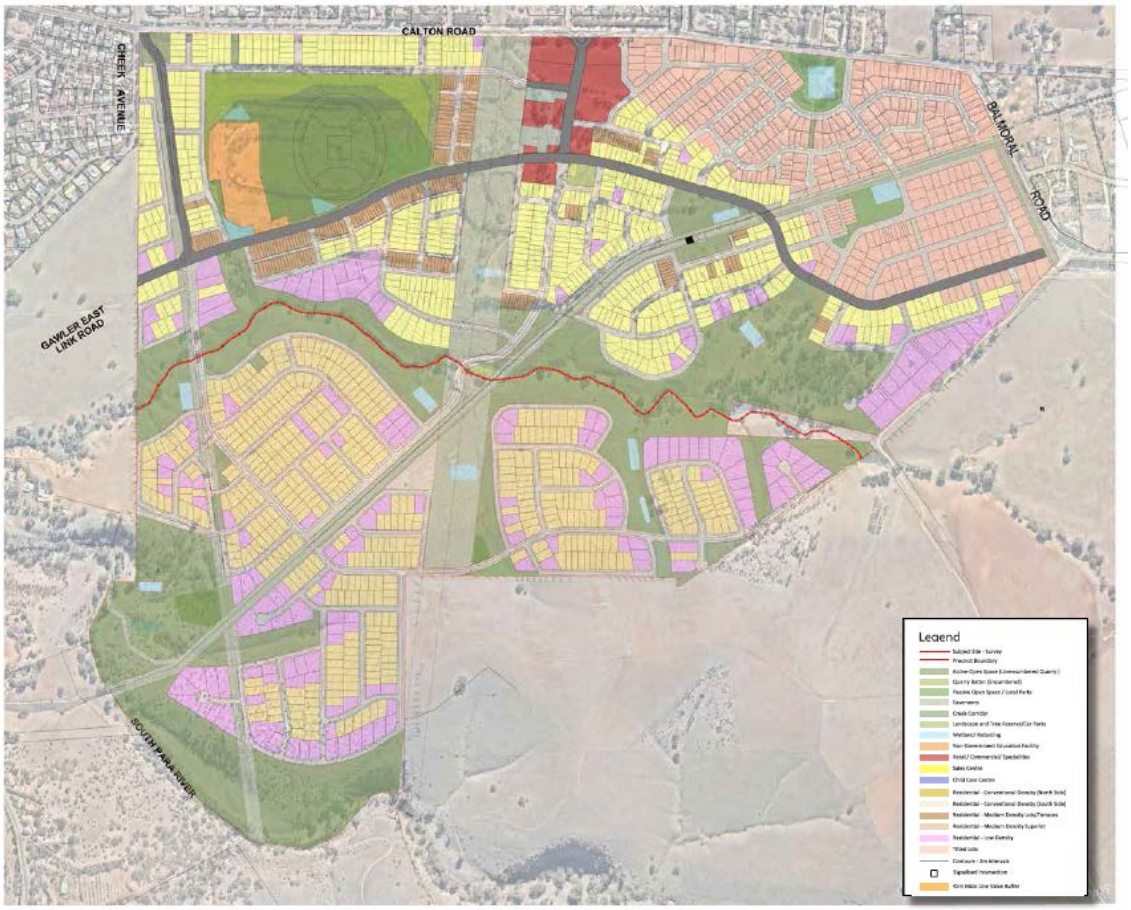
4.2 Design Philosophy

The proposed subdivision layout has been carefully considered and designed by Tract, experienced urban design subdivision specialists.

The proposed sub-division layout and design has also been informed by a '*Landscape and Urban Design Masterplan*' for Springwood also prepared by Tract (refer to ***Appendix 7***).

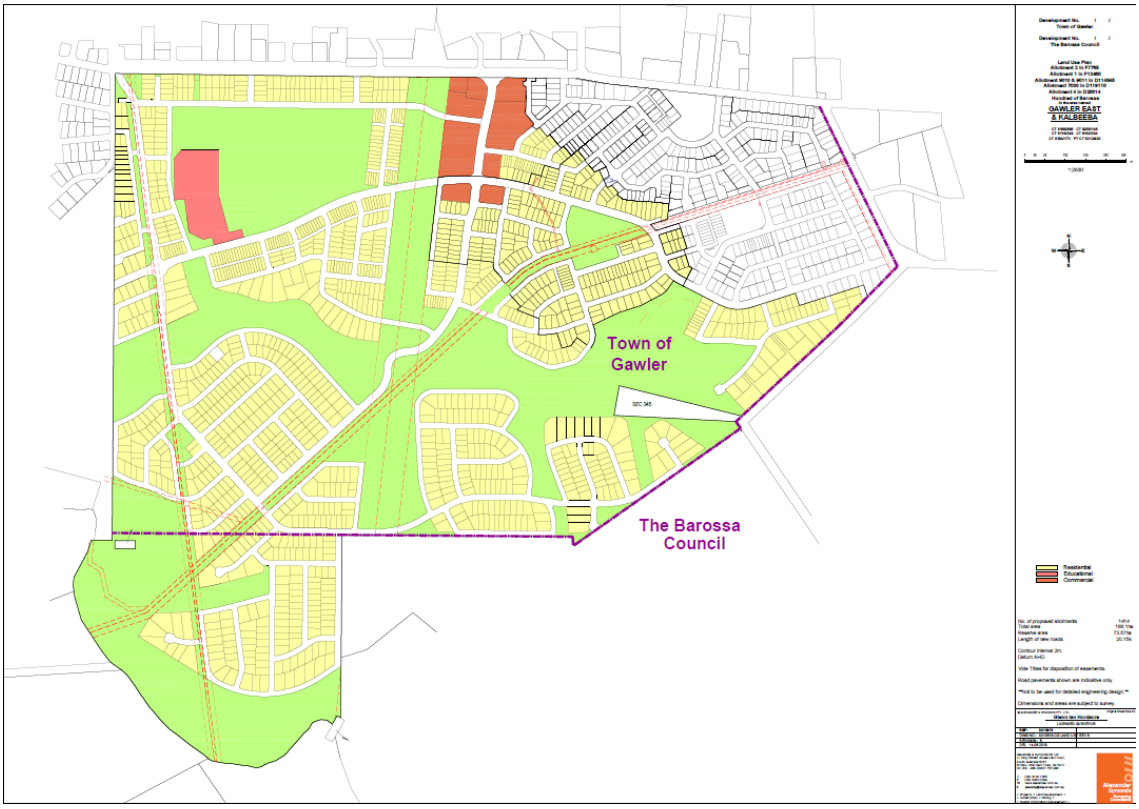
The Master Plan concept is reproduced in ***Figure 4.2*** below.

Figure 4.2 *Springwood Urban Design Master Plan*



A plan showing the future intended use (residential / commercial/ educational) of the allotments in the Proposed Plan(s) of division is provided in ***Appendix 2*** and is reproduced in ***Figure 4.3*** below.

Figure 4.3 *Proposed Plan of Division – Land Use*



Tract have identified the following Master Plan **objectives** for Springwood:

1. Craft a diverse new community linked to Gawler, the Barossa and Adelaide;
2. Activate unparalleled green open spaces and places;
3. Design a 'lifestyle centre' with an identity as a refreshing escape from city;
4. Embed and showcase environmental & social sustainability for Gawler;
5. Embed and grow a village centre at the heart of Springwood;
6. Create identity and local attractors from the existing vegetation and creek bed;
7. Develop a school, recreation and adventure play precinct; and
8. Offer new levels of diverse housing choices, sizes and types.

The key elements of the Springwood Masterplan prepared by Tract include:

Place and Community

- Childcare and primary school facilities, creating a family friendly environment;
- Diverse housing product that responds to the slope of the land, whilst providing opportunity for medium density and low maintenance living in and around the village centre;
- Revitalises the former sand quarry into an education and active recreation precinct; and
- Orients residential allotments to front open space and capitalise on the abundant public reserves and rolling topography of the site and surrounds.

Open Space

- Enhancing Springwood Creek, and embracing the natural landscape of the site; and
- Provides a range of open space types in each residential neighbourhood, including programmed play areas along with natural space and linear trails along easements.

Village Centre

- Centrally located commercial, retail and community focused Village Centre;
- Capitalise on the increased vehicle traffic coming through Springwood, between Adelaide and the Barossa Valley, and increase the value and activity of the Village Centre

Residential

- Diverse housing product in a range of locations to cater for all family types;
- Housing that captures views and responds to slope, allows for incredible outlooks and high amenity; and
- Low maintenance housing near the village centre, along with larger sloping blocks provides for variety in housing choice.

Access and Movement

- Central Gawler East Link Road (GELR) providing an important east-west link through the site, bringing Adelaide CBD closer to residents; and
- Allowance for public transport access to all residents, as roads have been designed to accommodate buses.

Services and Drainage

- Capitalises on the opportunities present in the power line and gas/water easement to create a network of highly valued linear walking and cycling trails; and
- Incorporates high quality water treatment, detention and filtration, to ensure that water run off entering Springwood Creek is to a high standard.

4.2.2 The Village Centre

At the heart of the new Springwood community is a central village centre, that will provide for everyday conveniences, along with creating opportunities to socialise and foster community pride and participation.

The village centre will be a thriving hub of retail, commercial and community activity. Possible uses that could be located in the Village Centre include a supermarket, integrated retail fuel outlet, health and medical uses, coffee shops, office spaces, community based coworking/ flexible working spaces, community uses/meeting rooms, child care and many more uses that can encourage activity in the Village Centre.

4.2.3 Education Precinct

A future school (Educational Establishment) is proposed to be located to the north west of the subject site and is anticipated to accommodate up to 1,000 students.

4.2.4 Residential Typologies

Springwood will have a variety of housing types available for potential residents that suit a myriad of family types and lifestyle requirements. Areas around the Village Centre and School provide opportunities for smaller and more affordable housing ensuring more people have access to core services such as shops and public transport. This housing type will also provide housing choice and diversity for the community and will become important as the household sizes reduce and as the population of Gawler ages.

In addition to smaller housing types, a range of conventional residential typologies and larger lots are included at Springwood.

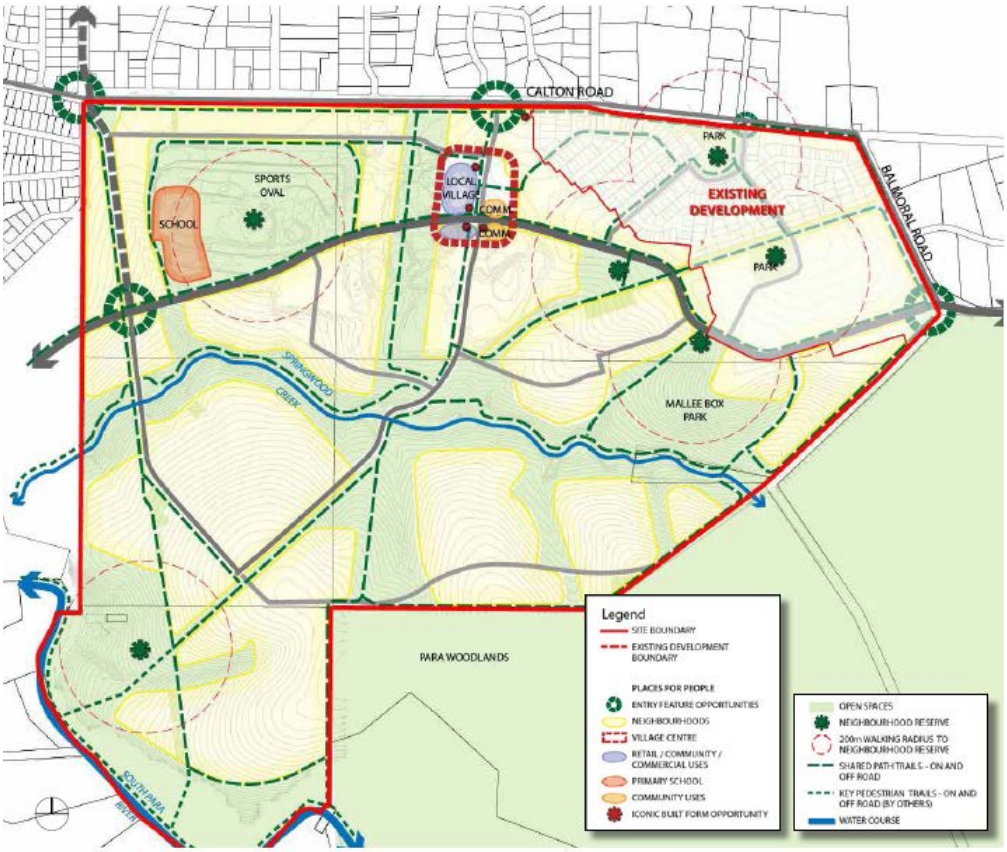
Larger residential allotments are provided, primarily south of Springwood Creek and on steeper slopes. These larger lots allow a more generous lifestyle offering for residents, while still being in close proximity to services and schools. Where located on steeper slopes, residential built form might need to be adapted to suit through appropriate design, benching, battering, and retaining (refer to ***Section 4.8*** below).

A summary of the breakdown and composition of residential allotment typologies is provided in ***Table 4.1*** below with the structure and distribution of residential typologies identified spatially in ***Figure 4.4*** below.

Table 4.1 *Residential Typology / Composition*

Allotment Type	Frontage (m)	Number #	Percentage (%)
Super Conventional	22+	133	9.5%
Conventional	20	53	3.8%
Traditional	17-19	132	9.4%
Courtyard	14-17	506	36%
Villa	12.5	256	18.2%
Villa	10.5	136	9.7%
Terrace	-	188	13.4%
TOTAL	-	1,404	100%

Figure 4.4 *Springwood Residential Precincts Master Plan*



4.3 Public Open Space / Reserves

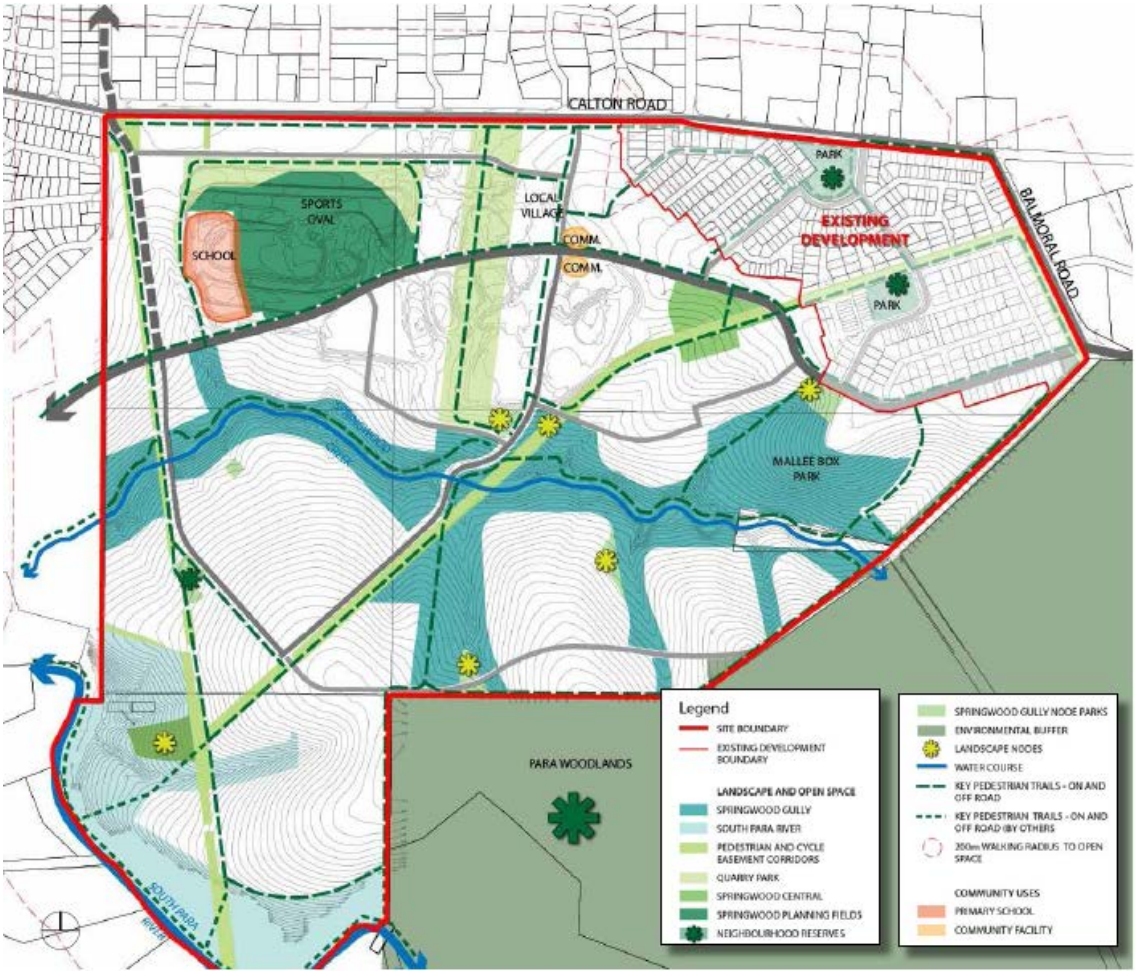
The '*Landscape and Urban Design Masterplan*' for Springwood prepared by Tract (refer to ***Appendix 7***) addresses the composition of open space in Springwood including the proposed open space hierarchy and structure as well as proposed landscape elements including a street strategy, plant species strategy and materials palette etc.

Springwood has been designed with a range of open space typologies to allow future residents to enjoy formal active recreation, age group specific play spaces, informal play spaces, and natural environment systems such as Spring Creek.

To enhance the 'Open Space' elements at Springwood, the Proposed Plan of division has been designed to:

- Provide significant areas of open space (linear open space and public open space recreation) with a total of 73.57 hectares of land divested as open space reserve representing 39.5% of the site dedicated as open space (significantly exceeding the statutory requirements of 12.5%);
- Provide an integrated open space network that retains and enhances the key features of Springwood and defines its urban structure;
- Create strong connections between open space and key destinations i.e. schools, the village centre, open space reserves, Spring Creek etc.;
- Recognise Spring Creek as a key open space destination;
- Ensure open space is located within 200m of all residents and centrally within neighbourhoods - safe and easy to access;
- Drainage requirements integrated as part of the broader open space network;
- Ensure streets are located to capture views to open space; and
- Enhance the quarry as a key landscape feature and distinctive backdrop to open space.

Figure 4.5 *Springwood Open Space Master Plan*



Although not formally endorsed, the proposed open space hierarchy has been developed using the '*Town Of Gawler Open Space Guideline*' Oxigen (sic), Rev E, 2016.

Key landscape elements in the open space hierarchy include:

- Corridors – Gullies and Steep Creeks
  - » Springwood Gully
  - » South Para River
- Corridors – Pedestrian and Cycle
  - » Pedestrian and Cycle Easement Corridors
  - » Quarry Park
- Parks and Reserves – District

  - Springwood Village Centre Park
  - Springwood Playing Fields
- Parks and Reserves – Neighbourhood
  - Neighbourhood Reserves
- Entry Statements

Key features of each element of the proposed landscape hierarchy is described below.

4.3.2 Corridors – Gullies and Steep Creeks

There are two (2) distinct open space corridors following steep creeks and gullies within the subject site. Each is addressed respectively.

Springwood Gully (Spring Creek):

Springwood Gully acts a distinctive green spine to the interlinked open space network. It provides key pedestrian and cyclist routes through the development, whilst its stunning scenic value is enjoyed by both users and residents overlooking the gully. Users will be able to engage with a mixture of naturalistic and agrarian landscapes as they traverse the unique gully landscape on a mixture of formal and informal trails..

A series of respite and orientation nodes will be situated at regular intervals along the reserve where the topography allows

Key design features of Springwood Gully include:

- Minor revegetation and tree planting to reinforce remnant Mallee Box Woodland and River Red Gum Woodlands;
- Irrigation will be limited to higher amenity node areas;
- Walking trail along the upper perimeter of reserve to allow for a loop course;
- Unsealed adventure trails closer to the creek and into gullies where grade permits; and
- Some amenity planting and re-vegetation to road interfaces and rear lot fencing;

Key design features of the Springwood Gully Nodes include:

- Orientation signage to path networks;
- Seating;
- Drinking fountain;
- Cycle repair station;
- Shelter and BBQ/ picnic settings at larger nodes; and
- Amenity planting and turf to allow for passive recreation and leisure activities.

Figure 4.6 *Springwood Gully Reserve and Node Parks*

Figure 13. Springwood Gully Reserve and node parks

South Para River

The South Para River is a section of the larger South Para River system. The design and character of the South Para River reserve will acknowledge its role in a broader regional network of river systems and its strong links to the Springwood Gully Reserve. Users will be able to engage with a mixture of naturalistic and agrarian landscapes as they traverse the unique gully landscape on a mixture of informal and formal trails.

A larger respite and orientation node will be provided that will provide minor seating and shelter. It is anticipated the higher amenity of this node will allow for passive recreation and act as a launch and orientation point for active users of the path network of the greater open space network.

Key design features of the South Para River include:

- Minor re-vegetation and tree planting to reinforce remnant vegetation associations;
- Irrigation will be limited the amenity node areas;
- Sealed walking trails to upper perimeter of reserve to allow for a loop course;
- Unsealed adventure trails along creek corridors and into gullies where grade permits; and
- Some amenity planting and re-vegetation to road interfaces and rear lot fencing.

Key design features of the 'Node' include;

- Orientation signage to path networks;
- Seating;
- Drinking fountain;
- Shelter and BBQ/ picnic setting; and
- Amenity planting and turf to allow for minor passive recreation.

Figure 4.7 *South Para River and Node Park*

4.3.3 Corridors – Pedestrian and Cycle

Pedestrian and Cycle Easement Corridors

Linear, green corridors cross the site and are subject to easement restrictions. These include the North South corridor hosting SAPN overhead power lines and the East West link carrying a SA Water above ground trunk main and the underground SEA Gas main.

The environmental and community value of these easement spaces will be maximised, accommodating both pedestrian and cyclist traffic whilst providing access to the interlinked open space networks, village centre and community facilities via a sealed path network.

Low maintenance planting through the strategic placement of a mix of native species and direct/hydroseeding will create a pleasant reserve which is capable of hosting leisure activities, enriching biodiversity and providing a green outlook to houses that front the corridor.

Key design features include:

- 1.5m sealed paths to minor linkages;
- 3.0 m shared use paths to major routes of travel;
- Planting selections which promote biodiversity with irrigation for establishment only; and
- Irrigated higher amenity planting at entry points and interfaces with roads; and
- Orientation signage to path networks.

Limited tree planting will be achieved within the easements due to utility easement restrictions, however existing trees will be retained and supplemented with dense tree planting to verges adjacent the easement corridors.

Figure 4.8 *Pedestrian and Cycle Easement Corridors*

Quarry Park

The future Quarry Park will be a celebration of the post industrial nature of the reserve. Home to dramatic topography and self seeded plant communities, the reserve provides a unique opportunity to acknowledge the quarry history of the site and create a place for adventure and exploration.

SAPN power lines restrict the opportunities for significant tall trees within the easement, the design will keep the self seeded tree copes and understorey that has established in the remnant quarry spoil sites and, where appropriate enhance these plantings with targeted re-vegetation and weed eradication.

Minor grading and trimming will be undertaken to the site to ensure safety, and an accessible path network that improves permeability and linkages through to the village centre, adjacent residential areas and Springwood Gully Reserve.

Key design features include:

- Retain post-industrial quarry landforms and self seeded tree copses and emerging vegetation and highlight with interpretive signage;

- Make safe extreme grades or unstable ground;
- Focused re-vegetation planting to interface with residential and commercial development;
- Compacted gravel path network to supplement on street footpath networks and facilitate north/ south movement to Springwood Gully Reserve;
- Minor unsealed adventure path network to explore landforms;
- Create opportunity for a future, regional mountain bike park that creates links between Springwood Gully Reserve and South Para River; and
- Opportunity for establishment of a community gardens or plant nursery.

Figure 4.9 *Quarry Park -Concept Plan*

4.3.4 *Parks and Reserves – District*

There are two (2) proposed 'District Level' parks within the Springwood master plan. Each is addressed respectively.

Springwood Village Centre Park

Springwood Village Centre Park is a large reserve on the east west pedestrian and cycling corridor. Its position has been dictated by existing utility buffer requirements and will link to the village centre with a wide verge and shaded walk.

The site provides a significant opportunity to create a mix of active recreational opportunities to complement other passive reserves in the location. It will be a multi-generational space and a touch point for the community to gather, exercise or just relax.

Key features of the reserve will be a fenced dog park, minor play based around a bio-retention swale, all weather rubble jogging and walking loop and a pump track for BMX riders.

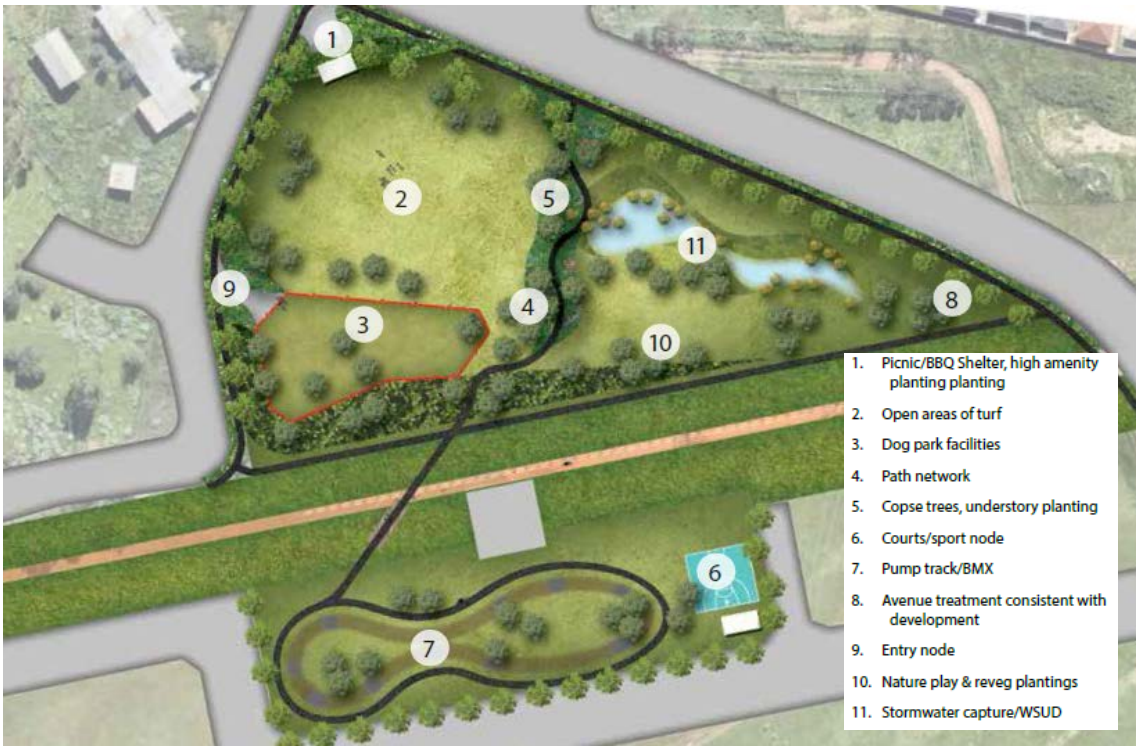
A large shelter, picnic tables and BBQ will encourage multi-generational usage of the reserve, welcoming all with amenity for both active and passive use.

An accessible ramp will allow users to cross the above ground trunk main and link the northern and southern portions of the park creating a vantage point for walkers to survey the reserve.

Key design features include:

- Fenced dog parks and agility course;
- Minor fitness walking track to perimeter / Fitness equipment and distance markers;
- Pump track and parkour play;
- Minor landforms to minimise infrastructure and allow pedestrian crossing of trunk main;
- Shade, open areas of turf; and
- Picnic, BBQ and shelter facilities.

Figure 4.10 *Springwood Village Centre Park – Concept Plan*



Springwood Playing Fields

Springwood playing fields will be the focus of sporting hub for the Springwood community and a future school facility. Situated adjacent the village centre and nestled into the dramatic cliff face of the old quarry, the oval will be a sheltered and unique space for the community to participate in organised sports and passive recreation.

A central feature is the AFL oval, with space to accommodate several netball/ basketball courts and an adventure play space around the edges. A WSUD swale will be integrated into the design and create a buffer between the oval and the quarry face. Running tracks will weave around the edge of the ovals and be linked into the broader pedestrian network.

The exact quantum of organised sporting facilities will be considered in the detailed design phase when more is known about the requirements of the future education facilities and in collaboration with Council to ensure the facilities support the region wide sporting strategy.

Key design features include:

- Oval and courts to facilitate club sports;
- Seating and shelter to support ovals and courts;
- Adventure play for all ages;

- Shelters / Picnic/ BBQ; and
- Rubble fitness loop and fitness equipment.

The delivery of this space and its associated community facilities is contemplated by the Town of Gawler Council as part of its Gawler East community infrastructure separate rate mechanism. Funding of this element will be provided through investment made by this Town of Gawler Community Fund.

Figure 4.11 *Springwood Playing Fields - Concept Plan*

4.3.5 Parks and Reserves – Neighbourhood

Springwood has two (2) neighbourhood reserves, noting that the amenity nodes within the Springwood Gully and South Para Reserves will provide supplementary neighbourhood green space.

Highfield reserve is currently under construction and will be complemented by a similar reserve on the western side of Springwood.

Highfield reserve forms the template for the reserve in the West with mix of open turfed kick-about, minor picnic and shelter facilities and harnessing storm-water infrastructure to create high amenity, natural creek lines.

Key design features include:

- Spatial integration of detention basin, play-space and kick-about areas to provide a diversity of recreational use;

- Planting strategy to respond to various landscape functions, including WSUD, usable open space and canopy cover through tree planting;
- Adoption of CPTED principles and community-centred design; and
- Robust and enduring contemporary design.

Figure 4.12 *Springwood West Neighborhood Reserve - Concept Plan*

4.3.6 Entry Statements

Main entries to the site will be celebrated with signage and planting to signify the entrance to the Springwood and create a clear and legible hierarchy for vehicle and pedestrians.

An existing entrance at the Springwood Central reserve and fencing to Calton Road provides a 'blue-print' for future entries.

Entries will use existing trees where available to frame low level signage walls, feature planting and turf within wider verges.

The boundary fencing will be a continuation of the fencing styles already in place on Calton Road, with a mixture of timber post and rail fencing, stone-clad pillars and corrugated sheeting to create a low maintenance and attractive interface boundaries.

Figure 4.13 *Entry Statements*

Figure 4.14 *Existing Springwood Entry Statement*

4.3.7 Tree Planting Strategy

Residential Street Trees

The residential street tree planting palette provides a diversity of species and are responsive to constraints such as the overall scale of the street and placement of adjacent infrastructure including driveways, light poles and other underground services. The over-arching aim across the development is to provide a cool, shaded microclimate thereby encouraging a walkable neighbourhood culture and a reduction in the heat island effect.

Trees will be used to control the microclimate and shade buildings and road ways, with the aim to achieve a 20% canopy coverage rate.

Where there are wide frontages and large verges, a selection of legacy tree planting will, over time, create a leafy, cultivated township look and feel. A selective combination of medium to large exotic street trees and

proven performers in the Gawler Township area will provide a consistent tree hierarchy within the development, and create identifiable streets, each with a distinctive character.

Where there are compact residential allotments, deciduous trees will provide shade and dappled light during summer, creating a local microclimate that is suitable for smaller streets.

Proposed residential street trees include:

- Chinese Pistachio (*Pistacia chinensis*);
- Jacaranda (Jacaranda mimosifolia);
- Callery Pear (*Pyrus calleryana 'Bradford / Chanticleer*);
- Golden Road Tree (*Koelreuteria bipinnata*);
- Japanese Elm (*Zelkova serrata 'Green Vase'*);
- Chinese Elm (*Ulmus parvifolia*);
- Nettle Tree (*Celtis australis*);
- Green Ash (*Fraxinus pennsylvanica 'Urbanite'*)
- Turkey Oak (*Quercus cerris*);
- Carob Tree (*Ceratonia siliqua*);
- Low Fruiting White Cedar (*Meilia azedarach 'Elite'*)

Boulevard & Entry Feature Trees

Larger boulevards, entry statements and roundabouts offer a larger scale and wider verges to plant street trees.

Larger trees will be used to create a unique identity and reinforce the street hierarchy. Smaller accent trees from the residential streets selection can also be used to create favourable pedestrian conditions and add seasonal variation, colour and interest.

Proposed boulevard and entry feature trees include:

- Iron Bark (*Eucalyptus sideroxylon var. sideroxylon*);
- Smooth Barked Apple (*Angophora costata*);
- Spotted Gum or Lemon Scented Gum (*Corymbioa maculate, C citriodora*);
- White Cedar (*Melia azedarach*);
- English Oak and Pin Oak (*Quercus robur & Q palustris*);
- Kurrajon / Bottle Tree (*Brachychiton acerifolius*);

Park Land Trees

The generous and diverse open spaces of Springwood offer a chance to plant larger legacy trees within the parklands.

Within the river reserves the opportunity to restore the ecology of the remnant dominant plant associations, the Mallee Box Woodland and Eucalyptus Camaldulensis Open Woodland.

Proposed parkland trees include:

- South Australian Blue Gum (*Eucalyptus leucoxylon ssp leucoxylon*);
- River Red Gum (*Eucalyptus camadulensis*)
- Mallee Box (*Eucalyptus porosa*);
- Chinese Elm (*Ulmus parvifolia*);
- English Oak (*Quercus robur*);
- Japanese Pagoda Tree (*Sophora japonica*)

4.4 Traffic and Access

GTA have undertaken a Traffic Impact Assessment of the proposed Plan of division which is provided as ***Appendix 8*** of this report.

This report sets out an assessment of the anticipated transport implications of the proposed development, including consideration of the following:

- Existing traffic and parking conditions surrounding the site;
- Parking demand likely to be generated by the proposed development;
- Suitability of the proposed parking in terms of supply (quantum) and layout;
- Traffic generation characteristics of the proposed development;
- Proposed access arrangements for the site; and
- Transport impact of the development proposal on the surrounding road network.

4.4.1 External Infrastructure

The Town of Gawler - Gawler East Interventions Assessment Report (June 2018, Tonkin Consulting) identified external infrastructure required to cater for future growth in Gawler East and surrounding areas based on the Springwood development. The external infrastructure recommended on adjacent roads is shown in ***Table 4.2*** and ***Figure 4.15*** below. Further infrastructure upgrades are proposed on the surrounding road network but these are not discussed for the purposes of this assessment.

Table 4.2 *Summary of External Infrastructure Adjacent the Site (Source: GTA Consultants)*

	Location	Treatment
1	Calton Road Up-Grade - Cheek to Project entrance	Upgrade to Kerbed collector road
2	Calton Road / Link Road Intersection at Hamilton Reserve (Part of DPTI delivered Gawler East Link Road project)	Roundabout
3	Calton Road / Link Road Intersection at Cheek Avenue	Roundabout
4	Calton Road Upgrade – Project entrance to Balmoral Road	Widen through to junction
5	Proposed Collector (Highfield) Road / Balmoral Road Intersection	T-Junction
6	Calton Road / Balmoral Road Junction	Junction Upgrade

The Town of Gawler has implemented a separate rate for traffic upgrades which applies to all development in the Residential (Gawler East) Zone (including Springwood) which will fund these required upgrades throughout the life of all development in this Zone.

Figure 4.15 *Agreed External Road Upgrades for Springwood (Source: GTA Consultants)*

4.4.2 *Site Access*

Vehicle access to the development site will generally be limited to the proposed collector road and/or GELR network as follows:

1. New link at Cheek Avenue and Calton Road intersection;
2. Calton Road at the proposed town centre;
3. Collector Road (in previous approved Highfield precinct) to Balmoral Road
4. Gawler East Link Road (GELR) to west of site

However local street access is proposed at the following locations:

5. Two local street junctions on Calton Road between Cheek Avenue and Calton Collector Road;
6. One local street access to Cheek Avenue south for residential access.

Emergency fire access has been considered as follows:

7. Emergency access (in the event of bush fire) is proposed to link the south-eastern portion of the site to Balmoral Track to enable alternative access to the east if the collector roads to the west of this precinct is not accessible.

These points of access are shown in ***Figure 4.16*** below.

Figure 4.16 *External Access for Proposed Subdivision (Source: GTA Consultants)*

The upgrades for the external access points for the proposed subdivision has been considered in line with the Town of Gawler '*Gawler East Interventions Assessment Report*' (Tonkin Consulting, June 2018). Details of each location is referenced in ***Section 4.4.1*** above.

4.4.3 Proposed Road Network

Local Collector Roads

A collector road network will be developed within the site based on integration with the Gawler East Link Road (GELR) and collector roads developed for the existing Springwood development.

The GELR is under construction and will provide a travelling lane in each direction separated by a median, bicycle lanes and footpath (generally on northern side).

The Calton north-south Link Road connector will also provide one lane in each direction, a raised median, parking bays and bicycle lanes on each carriageway.

The collector roads will generally comprise a single two-way carriageway 9.0 metres wide within a 20 metre road reserve. A verge of 5.5 metres one each side will provide for footpaths and driveways between boundary and kerb, and streetscaping. The proposed collector road from the east linking to Balmoral Road will however continue to the town centre in the same configuration as approved for the Highfield precinct in the existing Springwood Development (i.e. comprising an 11.2 metre carriageway with two travelling lanes and a parking lane on each side within a 20 metre road reserve).

The collector roads will be designed to facilitate a speed environment of 50km/h.

There will generally be a footpath on one side of the collector roads given most segments will have dwellings on one side only. Some segments will have dwellings on both sides and these will have a dual footpath arrangement.

Where the collector roads intersect within the site, the intersection will be in the form of a roundabout except for the commercial centre where the intersection will be signalised.

The proposed collector road network is shown in ***Figure 4.17*** with a typical collector road cross section shown in ***Figure 4.18***.

Figure 4.17 *Proposed Collector Road Network (Source : GTA Consultants)*

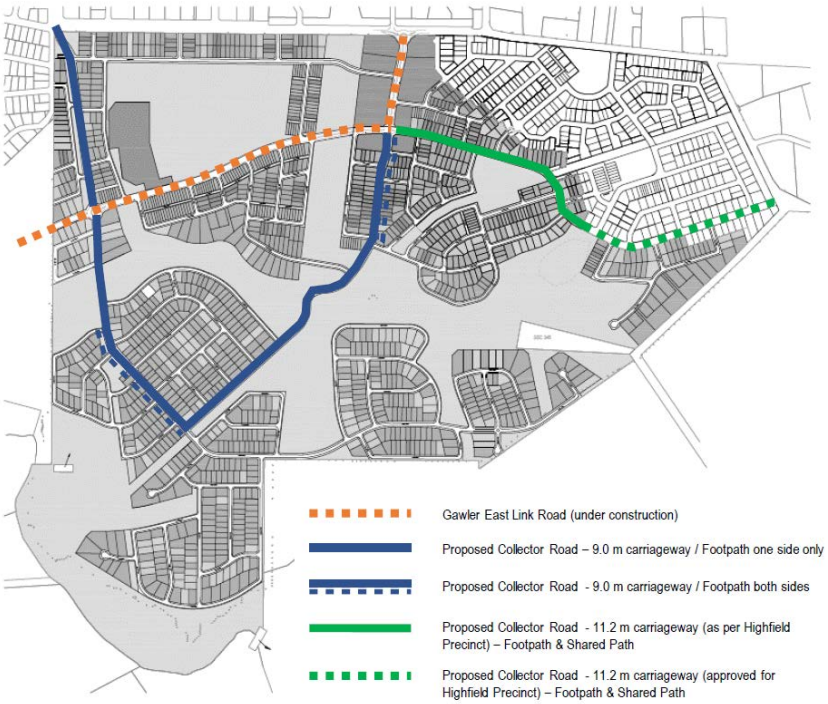
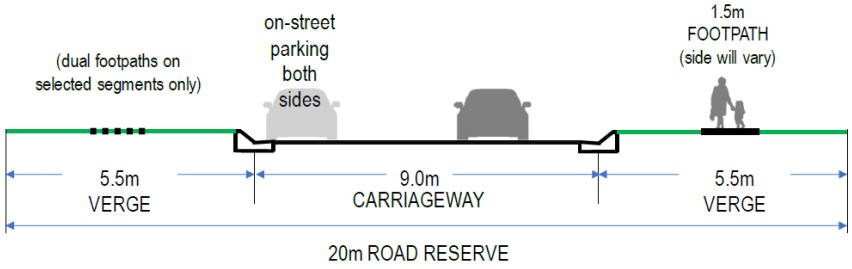


Figure 4.18 *Proposed Collector Road Cross Section (Source: GTA Consultants)*



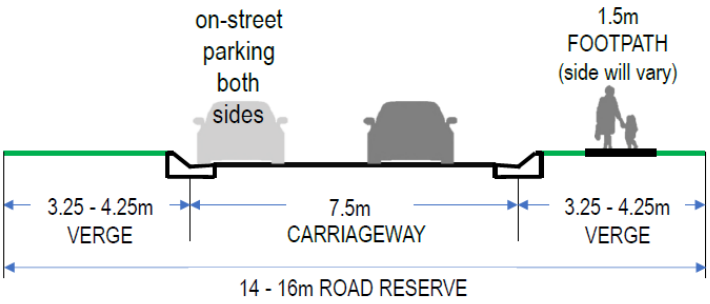
Local Streets

The proposed land division will utilise local streets with carriageway widths of 7.5 metres within 14.0 or 16.0 metre road reserves. This will be suitable to permit parking on both sides of the street while retaining a clear lane for through traffic.

Verges approximately 3.25 metres wide (or 4.25 metres wide) will be provided which is sufficient for footpaths and other service infrastructure.

The proposed local street cross section is shown in ***Figure 4.19***.

Figure 4.19 *Proposed Local Street Cross Section*



Generally, most streets in the proposed land division have straight sections less than 250 metres in length due to proposal to introduce re-aligned T-intersections. These streets will generally assist in creating a speed environment of less than 50km/h, and closer to 35km/h where streets are less than 150 metres long.

The local Road network will also include 'Roundabouts' and 'Realigned T-Intersections' to assist with traffic management and the achievement of a safe and low speed environment along local streets.

Cul-de-sacs

The development will incorporate cul-de-sacs with circular turning areas of 18 metre diameter. The dimensions will enable a refuse vehicle to enter in a forward direction, turn and then exit the cul-de-sac in a forward direction.

Access Places and Laneways

Within the development there will be short and narrow sections of road that will be used for dwelling access, these roads are defined as Access Places. There will also be laneways in some locations which will facilitate vehicular access to properties. Both Access Places and Laneways will be designed with a minimum carriageway of 6.0 metres with an 8.0 metre road reserve (which provides 1 metre clearance on either side) which will be suitable to assist vehicles reversing from garages facing the lane way, and also provide space for bin placement if rear collection is proposed. The additional width will also allow for placement of lighting, services and planting if desired.

Access places are typically short sections of road leading directly to dwellings. They range in length from up to 50 metres depending upon the number of allotments being serviced. Larger vehicles may reverse into these areas to service the properties, such as refuse collection, or alternatively the bins may be positioned to the main street for collection.

4.4.4 Intersection Sight Distance

GTA has undertaken a review of the horizontal alignment of the approaches to each intersection and is generally satisfied the proposed intersections within the development will be able to provide the minimum horizontal sight distance required for the low speed environment.

Some roads within the site will be subject to steeper gradients and vertical sight distance should therefore be assessed at the preliminary and detailed design stages to ensure adequate sight distance is maintained.

4.4.5 Parking

On-street parking for visitors will typically comprise parallel parking adjacent the kerb and proposed road widths are satisfactory for on-street parking to be located on both sides of the road

The proposed verge widths along the local collector street will also enable indented parallel parking bays to be provided (if required).

With appropriate design and positioning of driveway crossovers the proposed subdivision should achieve a rate of one parking space per every two dwellings.

4.4.6 Street Gradients

For local streets, it is generally accepted that gradients should not exceed 10% along a street, particularly if the street forms part of a bus route. Gradients of up to 15% are satisfactory for short sections of the street when the street is for local access only.

The land division is characterised by hilly terrain with a number of valleys (water courses) running through the site. For the most part, the gradient along the streets will not exceed 10% however there are a few streets where a gradient up to 15% is likely. These are estimates and the final grades of the streets will be subject to detailed design. The proposed layout has been developed to minimise the requirement for any grades greater than 10% where possible.

4.4.7 Service Vehicles

Heavy vehicles will use the proposed road network for occasional waste collection with possible service deliveries to commercial areas made using semi-trailer vehicles up to 19 metres. The proposed road network will be capable of providing appropriate access subject to detailed design of intersections and junction to ensure safe and appropriate turning movements are available.

The short cul-de-sac streets will enable refuse trucks to turn to enter and exit in a forward direction.

There are some streets and access places which will require heavy vehicles to reverse as there is no space available for a turnaround at the end. The length of reversing is however generally less than 60 metres which is an accepted length for reversing movements by occasional services vehicles (i.e. less than daily occurrence and typically weekly at maximum) in low volume residential street networks.

4.4.8 Public Transport

Opportunity for bus routes within the site will exit with the collector road network suitable for bus services if required. These routes are shown in Figure ***4.20.***

Figure 4.20 *Road Network Available for Bus Network*

4.4.9 Walking and Cycling Network

The internal street network will be designed as a slow speed environment which will enable vehicles and cyclists to share the carriageway.

Footpaths are proposed on both sides of the internal local street network to support local walking trips. Cyclists that are not confident to share the road with vehicles will also be permitted to travel on the footpaths.

The proposed subdivision has been designed with generally one footpath on each street as a minimum, with dual footpaths on some segments of collector roads. Access places and laneways will not have formal footpaths.

An off-street path network will also be developed as part of the open space design.

4.4.10 Traffic Generation, Distribution & Impact

The proposed development will increase traffic volumes on roads surrounding the site including Calton Road, Cheek Avenue, Sunnydale Drive and Balmoral Road. However, the integration of the Gawler East Link Road (GELR) to connect from the site to Main North Road in Evanston will assist to ameliorate the impact of traffic from this site. The GELR has been planned for some time and is now under construction, which gives more certainty to the traffic predictions for the proposed development.

The GELR will cater for most of the traffic generated by the proposed development and provide an alternative for traffic to exit Gawler to the south without impacting the existing Gawler town centre (Murray Street in particular).

The proposed development will also facilitate traffic management for the existing Gawler town centre by providing alternative through routes from Barossa Valley Way (to the north) via Cheek Avenue and Sunnydale Drive to avoid Murray Street. Hence, there will be redistribution of traffic from the north/east of Gawler to the Springwood site and GELR. Calton Road in particular will experience a reduction in through traffic (from Balmoral Road) with traffic entering Springwood to utilise the GELR as a more efficient bypass to Evanston.

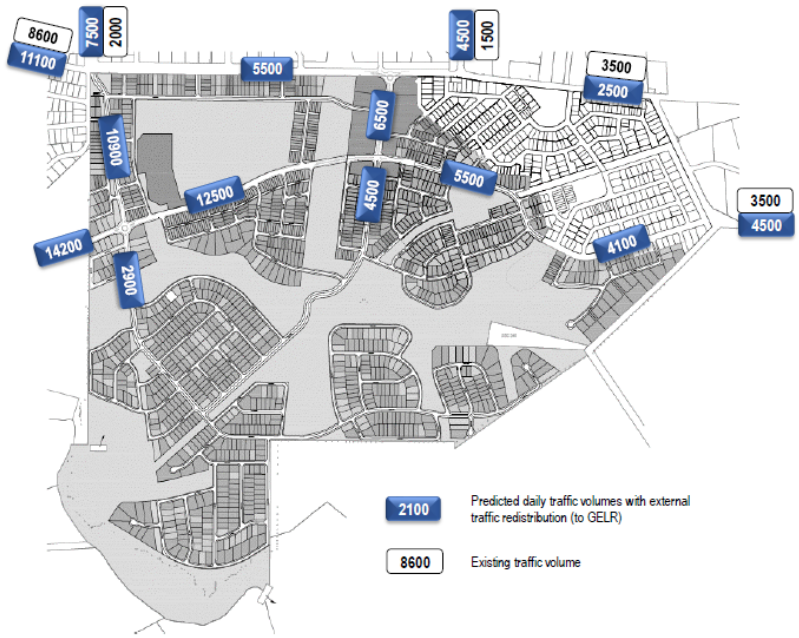
Whilst there will be some reduction in through traffic on Calton Road, there will be new traffic generation from the site utilising Calton Road to access existing town centre facilities (retail, commercial, community, entertainment) which will offset any reductions in traffic. An increase in traffic on Calton Road is expected with an additional 2,500 vehicles per day above existing volumes. Calton Road will remain within the capacity of a two lane road.

These impacts have been considered by the Town of Gawler in the Gawler East Interventions Assessment Report (June 2018, Tonkin Consulting). This assessment resulted in a range of upgrades identified to cater for the growth from Springwood on the adjacent road network. The external works required adjacent the site are listed in Section 4.4.1 above. These interventions will be undertaken based on a separate rate declared by Council on the Gawler East development areas.

The overall impact of the proposed development will be within the range identified in the Gawler East Interventions Assessment. Hence the impact of the development is well known and is planned to be managed effectively.

The predicted traffic volumes on the existing and proposed new road network following full development of the sub-division are identified spatially in ***Figure 4.21*** below.

Figure 4.21 *Predicted traffic Volumes (completed development)*



GTA have concluded that:

- The anticipated traffic volumes on the internal and external roads adjacent the site will remain within acceptable levels for operational capacity, and will be managed by pre-planned external infrastructure upgrades at a number of intersections based on an agreement between the developer, Council and DPTI; and
- Overall, whilst the impact of the proposed development is high with regards to anticipated traffic volumes in the site and surrounding area, these will be effectively managed through infrastructure upgrades at intersections and road segments and ameliorate the impact on the surrounding community and road network.

4.5 Flora and Fauna (Biodiversity)

A 'Flora and Fauna Assessment' has been prepared by EBS Ecology and is attached at ***Appendix 9***. This report reviews and supplements an existing biodiversity assessment prepared by Kellogg Brown and Root (KBR) on behalf of Delfin Lend Lease (the previous developers of the site).

The original report prepared by KBR is appended to the EBS Ecology Report involved rigorous ecological assessments of the area in November 2008 and then seasonally through to 2010 and utilised both flora and fauna survey methods. This included the use of pitfall trapping to analyse inconspicuous species such as small reptiles and mammals. A number of ecological constraints were identified within this report and this directed the future planning of the Springwood Development with a view to avoiding key biodiversity areas where possible.

The review by EBS Ecology was undertaken to update changes (if any) to species of conservation significance and if the ecological conditions present at the time of the 2010 survey were still relevant to the current Springwood Masterplan. The desktop assessment involved searching Commonwealth and State databases to identify threatened species potentially occurring or known from the proposed Springwood Development site, as well as relevant matters of national environmental significance and other matters protected under the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) and the *National Parks and Wildlife Act, 1972* (NPW Act). A review of other available background information sources such as Naturemaps was also conducted.

A field survey was also conducted on 18 March 2019 and included a roaming fauna survey and was largely focussed on ground-truthing the ecological values as presented in KBR (2010).

EBS Ecology concluded in their assessment that the subject land has an overall low ecological value with pasture the dominant vegetation type present which commonly had high weed cover as part of the composition.

4.5.1 *Flora Communities*

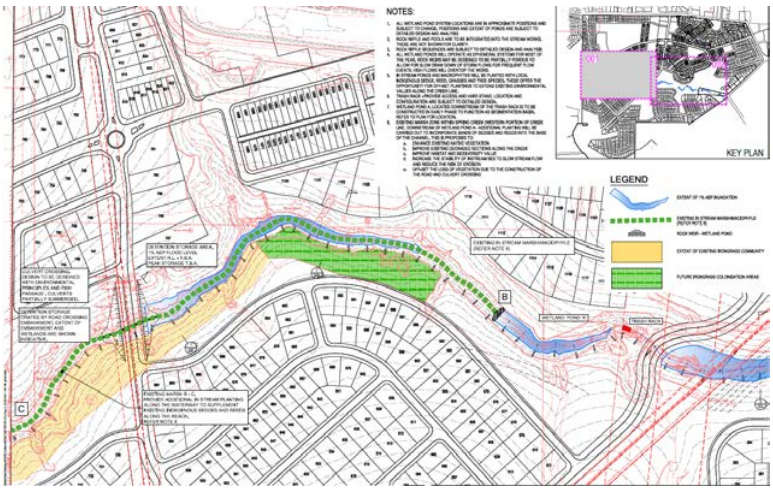
Iron-grass Temperate Grassland

Iron-grass Temperate Grassland was observed by KBR (2010). The size and condition of the community meet the requirements of condition class B as described in the EPBC Policy Statement 3.7 (DEWR 2007). If development or adverse impact on this area was likely to occur, then the proposal will require referral to the Department of the Environment and Energy (DoTEE).

This vegetation community was observed as still being present and in relatively good condition in terms of tussock density and size. Notwithstanding, EBS Ecology confirmed that it was not possible to make an accurate assessment as the herbaceous species diversity during the site visit due to poor seasonal conditions. Importantly the proposed plan of division avoids the area and will not impact directly on this Threatened Ecological Community.

The Stormwater Management Plan prepared by WGA attached in ***Appendix 10*** demonstrates the existing extent of the Iron-grass community has been surveyed, mapped and plotted onto a plan showing the detention storage extents. This plan, reproduced in ***Figure 4.22*** below, demonstrates that the iron-grass community (shown orange) will not be impacted by proposed stormwater infrastructure. It also demonstrates how the proposed stormwater infrastructure supports regeneration of this vegetation community via nomination of a potential future iron-grass colonisation area (shown green). Refer to ***Section 4.6*** below). The proposed stormwater strategy does result in some inundation of the Iron-grass community however no iron-grass communities are inundated for storms of less than 0.5 EY (equivalent to a 2 -year ARI).

Figure 4.22 *Iron-Grass Community not impacted by Stormwater Infrastructure*



Eucalyptus *porosa* scattered trees

EBS Ecology identified that Scattered Eucalyptus *porosa* (Mallee Box) trees are dominant on the northern slopes of the South Para River anabranch with a few other scattered remnants in other sections of the site. These trees are subject to the *Native Vegetation Act, 1991*.

There are permitted clearance activities authorised under the *Native Vegetation Regulations, 2017.* The Regulations outline the circumstances where clearing native vegetation is permitted, outside of the clearance controls in the *Native Vegetation Act 1991*. A clearance application can occur under the Native Vegetation Regulation exemption 12(35) – Residential subdivision.

A separate 'Scattered Tree Assessment' clearance application will therefore be required to the Native Vegetation Council for the removal of up to 70 individual Eucalyptus porosa (Mallee Box) trees. This separate application will identify the mitigation measures undertaken to avoid clearance of native vegetation including:

- The sub-division layout avoiding the areas of highest vegetation cover (where practical) and maintaining over 70ha of the site in open space reserves;
- Commitment to preparation of a Vegetation Management Plan (VMP) and a Construction Environmental Management Plan (CEMP) to assist with management of issues such as declared and environmental weeds, translocation or seed management of areas of indigenous grasses and species deemed suitable as well as processes proposed to enhance the existing degraded vegetation communities within the retained areas; and
- Potential SEB Offsets (if required) to compensate for any residual adverse impacts associated vegetation clearance.

4.5.2 Fauna

EBS Ecology noted that the largest impact on fauna will be associated with rehabilitation of the quarry and the consequent impacts on avifauna. Rehabilitation and major earthworks are a necessity in order to make the quarry precinct safe. Remediation of the high wall of the quarry must be undertaken to manage some of the geotechnical risks and it is unlikely that mitigation actions can be undertaken for Rainbow Bee-eater, Peregrine Falcon, White-winged Chough and Fairy Martin and these species will be displaced from the site. Given the man-made nature of the quarry, this feature has been a temporary habitat structure and it is expected that species will adapt to changes again with each of these species having differing opportunities to re-locate in the region. This includes greater use of other habitats, both natural and man-made such as woodland, sand quarries and natural cliff and rock outcrops in the region.

Flinders Worm Lizard

An opportunistic observation of this species was made within the area by KBR (2010) and has not been recorded onsite since. No new records for this species have been made within the Gawler area since that observation. While the species is likely to be in low density, they are widespread and any retention of habitat is of high conservation value. The Proposed Plan of Division has avoided the creation of allotments in all areas mapped as high habitat value within the 2010 KBR report.

Peregrine Falcon

KBR observed Peregrine Falcon using the site as a roosting and hunting area. A pair was observed in a roost site within the high wall of the quarry precinct and hunting over the adjacent areas of the quarry and Mallee Box

woodland south of the quarry fence line over 2008 to 2010. There was no evidence of past or current nesting / breeding in the quarry or elsewhere. The March visit confirmed likely ongoing use by this species which, while not observed directly, there was significant whitewash on the walls of the quarry suggesting the quarry walls were being used as roosting and resting habitat (but not nesting).

Rainbow Bee-eater

Rainbow Bee-eater (*Merops ornatus*) was previously recorded across the area and noted onsite at the time of the 2019 survey. This species (previously listed as a migratory) is now listed only as a marine species under the EPBC Act which means protection is limited to Commonwealth Marine Areas.

Given Commonwealth Marine Areas are not present within the Springwood Development Area a referral for this species is not required.

4.6 Stormwater Management

4.6.1 Stormwater Management Plan

A Stormwater Management Plan (SMP) has been prepared by WGA and is attached in ***Appendix 10***

The adopted stormwater strategy applies environmental stormwater management practices in the form of Water Sensitive Urban Design (WSUD) to manage stormwater quality and frequent flow runoff from the proposed urban development.

This strategy achieves stormwater quantity and quality standards while also ensuring that post development erosion risks would be appropriately addressed to protect and improve habitat values across the project.

The stormwater management strategy has been prepared in consultation with the Department of Environment and Water (DEW) and the Environment Protection Authority (EPA) and is also based on direct engagement with the Town of Gawler representatives including consideration of draft studies provided by Council.

The stormwater strategy includes:

- Constructed wetland systems accommodating extended detention storages to treat and manage quality and quantity of stormwater;
- Remediation of Spring Creek along the degraded sections to improve the ecology & biodiversity and control in stream velocities post development. This includes the creation of a sequence of rock riffles and pools along the base of Spring Creek to ensure long term erosion stability and robustness when the adjacent catchment is developed. These techniques would be designed to mimic natural waterway design to include:
  - » Incorporation of grade control structures (rock riffles);
  - » Ensuring velocities are managed appropriately to prevent bed and bank erosion;

  - Revegetation at proposed wetland pools to facilitate filtering, sediment deposition, nutrient uptake, erosion control, while also providing opportunities for increasing biodiversity and habitat value, and visual amenity; and
  - Supplementary vegetation planting within the existing marsh using indigenous species (remnant species) to improve environmental value, mitigate flow velocity and improve the health of the marsh.
- The integration of the above features into passive recreation areas for community benefit and visual interest;
- Using the treatment train approach to stormwater management through the inclusion of:
  - Trash rack within Spring Creek to provide a regional scale trap to facilitate interception of debris and coarse sediments (including access for maintenance);
  - Wetland ponds, wetland systems, biofiltration basin, rain gardens and ecological sponge systems;
  - Infiltration wells for rear of allotments (where these back onto gullies and Spring Creek) that are designed to cater for roof runoff only and incorporate trickle flow outlets to ensure storages are available to mitigate frequent rain events;
  - Linear wetland pools and reed beds (macrophyte zones) integrated into the base of Spring creek;
  - Each stormwater management system designed to incorporate frequent flow management into their extended detention zone (to release trickle flow over a 2 to 3-day period to reduce the responsiveness of the urban catchment to Spring Creek).
- Preservation of the Nationally Threatened iron-grass community and ensuring that the stormwater strategy does not encroach on this area and supports planning for regeneration of this area (refer to *Section 4.5.1* above and to *Figure 4.22*);
- Preservation of remnant vegetation areas and faunal group habitats and through additional planting with indigenous species of local provenance to enhance degraded areas;
- Protection of areas of high biological value, including the retention of trees and planting for appropriate regeneration, particularly as part of the waterway remediation and stormwater treatment elements;
- Mitigation of the 1% AEP post development flow from the overall proposed catchment down to the 1% AEP pre-development flow rate, with the resulting outcomes:
  - Storage volume = 18ML
  - The extent of inundation of the iron-grass community varies and is dependent upon where it occurs over the lower extents of its existing covered area;

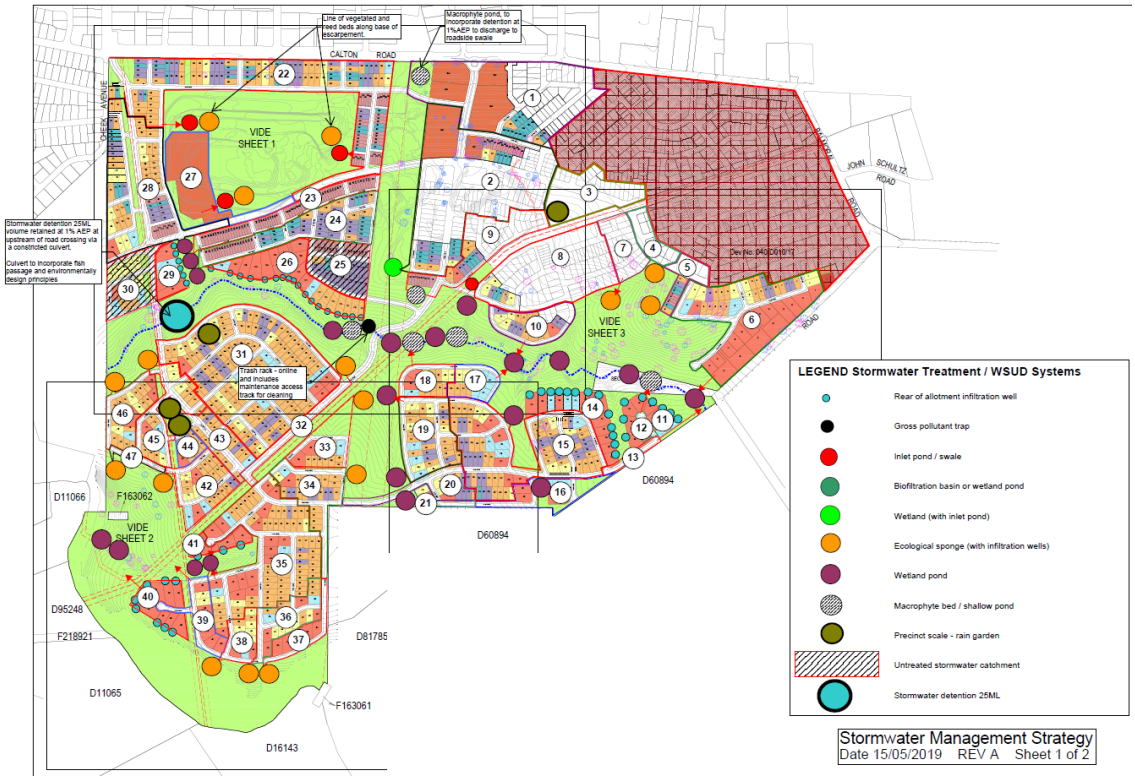
- The extent of the iron-grass community varies between RL 58.50 to RL 73.00, with most of it lying above RL 63.00;
- No iron-grass communities are inundated for storms of less than 0.5 EY (equivalent to a 2-year ARI);
- Duration of inundation is estimated at less than 2 hours for the 1% AEP post development storm event;
- Peak 1% AEP storm event water level RL 65.9m AHD;
- Storage is achieved within Spring Creek without the requirement to excavate or disturb the existing profile and vegetation (noting that the disturbance is confined to the footprint of the new road crossing only); and
- The culvert crossing would be designed using environmental principles and incorporate fish passage through the design of a partially submerged culvert.

The stormwater management strategy, utilizing sections of Springwood Creek as temporary flow management buffers, is supported by EBS Ecology. Suitable sections of Spring Creek that are devoid of native vegetation have been used for retention and riffle banks. In an area of increasing urbanization, extremely low remnancy of native vegetation, historical records of migratory wetland birds and indirect pressures such as climate change, EBS Ecology confirmed that any efforts to increase the extent and frequency of ephemeral or semi -riparian zones is welcomed from an ecological perspective.

EBS Ecology have also confirmed that culverts associated with these structures are not expected to provide significant habitat fragmentation or restriction of biodiversity corridor values provided by Springwood Creek based on the likely fauna community structure expected within the future urban area.

The proposed stormwater management solution is demonstrated spatially in Appendix A of the Stormwater Management Plan prepared by WGA and is reproduced in ***Figure 4.23*** below.

Figure 4.23 *Stormwater Management Strategy*



4.6.2 *Interim Stormwater Solution*

An interim stormwater management strategy has also been developed to suit the construction / implementation of the various projected Stages of development. The basis of this includes:

- Using post development treatment systems as part of the construction phase sediment capture by excavating these systems for sediment capture, then reverting to post construction phase treatment systems;
- Installation of a sedimentation basin (Basin A) within Spring Creek (located upstream of the marsh zone) which would intercept sediments during construction stages (note: this basin is provided as a last interception point); and
- A Soil Erosion and Drainage Management Plan (SEDMP) to be developed for each stage.

4.7 Service Infrastructure

A 'Site Services Report' has been prepared by WGA and is provided in ***Appendix 11***.

The Site Services Report has been prepared to identify existing infrastructure availability and capacity and identify required infrastructure augmentation or upgrade works required to service the proposed sub-division.

- Potable Water – SA Water;
- Wastewater – SA Water;
- Electricity Supply – SA Power Networks (SAPN);
- Gas – APA Group (APA) and South East Australia Gas Pty Ltd (SEA Gas);
- Telecommunications – Opticomm;
- Stormwater – Town of Gawler/ City of Barossa.

Existing Infrastructure capacity and augmentation requirements to services the proposed future development are addressed respectively below.

4.7.1 Potable Water

The existing potable water network includes:

- A DN750 MSCL potable main, known as the Barossa Trunk Main running on a SW-NE alignment between Balmoral Road and Eckerman Ave which services Gawler and the northern portion of the greater metropolitan area (refer to ***Figure 3.7***);
- Existing Potable Water mains in Calton Road including:
  - A DN450 MSCL potable water main within the southern verge of Calton Road, which has been confirmed as abandoned;
  - An SA Water owned DN650 MSCL potable water main within the southern verge of Calton Road, located between the proposed Development boundary and the abandoned DN450; and
  - An SA Water owned DN450 MSCL potable water main within the northern verge of Calton Road;
- A potable water main in Cheek Avenue operated by SA Water (DN150 AC);
- Two (2) potable water mains within Balmoral Road, both DN450 MSCL, with one located in each of the verges (the main within the eastern verge connects into the Barossa Trunk Main);
- An SA Water owned potable water network has been installed within the existing Springwood Development on a staged basis; and
- A DN375 PVC-M potable water main will be installed in association with the Gawler East Link Road (currently under construction).

SA Water has advised that the proposed development can be serviced via the existing potable water infrastructure within Calton Road, the Gawler East Link Road and the existing Springwood network to the north-east of the site.

SA Water is currently updating their internal potable water concept plans for the proposed development (based on the proposed road and allotment layout) and this would be used as the basis for detailed stage design for the Development.

It is noted that the Barossa Trunk Main is installed within a 10.06 metre wide registered SA Water easement (albeit the position of the pipe within the easement tends to vary and is not located centrally). The positioning of future road crossings over this infrastructure has been strategically considered in the design of the subdivision recognising that the trunk main is currently above ground. On this basis, crossing points have been chosen at existing gullets, where the trunk main has been diverted underground. These points are currently used as farming access tracks.

During detailed design of any future road crossing, consideration would be given to minimum vertical clearances relative to the trunk main for both roads and services. SA Water would be involved in the auditing of design and construction of any future crossing points.

The intent would be to construct roads vested to the Town of Gawler (Council), which would extinguish the existing easement for the width of the road reserve, while retaining the easement on either side.

Importantly, no development is proposed over the existing SA Water easement (except for the road crossings). Road reserves are proposed abutting the existing easement. SA Water has previously advised that the minimum offset from a new allotment boundary to the centreline of the Barossa Trunk Main would need to be 6.60 metres and this can be achieved in all locations through the proposed Development.

4.7.2 Wastewater (Sewer)

The existing waste water network includes:

- A combined pumping (DN100/ DN150 PVC) and gravity (DN225 PVC) sewer system exists within Calton Road (this was installed in 2015 as part of the existing Springwood Development and is owned and operated by SA Water);
    - » Two pump stations were installed as part of this work, one just east of Cockshell Avenue and another located between Sunnydale Avenue and Easton Drive.
    - » This system conveys wastewater to the west of the proposed Development, and ultimately discharges to a pump station located in Paterson Terrace
- Cheek Avenue contains a single gravity sewer drain operated by SA Water (DN150 PVCU), which conveys wastewater north to Holness Avenue;
- An SA Water owned sewer network has been installed within the existing Springwood Development on a staged basis and this network currently drains to the Calton Road sewer, servicing 387 allotments (both built and future dwellings); and
- A DN225 PVC gravity main will be installed within the Calton Road Connector (between Calton Road and the Gawler East Link Road).

SA Water has advised that a portion of the proposed development can be serviced via the existing wastewater infrastructure within Calton Road.

SA Water requirements to service the development include:

- The Paterson Terrace Pump Station Upgrade (which was completed prior to the Calton Road Sewer installation), increased the sewer network capacity to cater for 660 residential allotments (inclusive of the 387 residential allotments created as part of the existing Springwood Development); and
- Future development beyond 660 residential allotments would trigger a sewer pumping network to be installed, extending from the site's western boundary to the gravity main installed within the Gawler East Link Road and Potts Road (note: this gravity main is under construction at the time of this report, as part of the Gawler East Link Road project).

A combination of gravity sewer and internal pumping mains would be required to convey wastewater to the following collection points:

- Calton Road – connections can be made to the existing Springwood wastewater network, or directly to the gravity sewer in Calton Road (only until the 660-allotment threshold is reached); and
- A new pump station would be installed to convey wastewater north, to the Development's western boundary, and connect to the future pumping main infrastructure within the Gawler East Link Road.

SA Water is currently updating their internal sewer concept plans for the proposed development (based on the proposed road and allotment layout) and this would be used as the basis for detailed stage design for waste water infrastructure.

4.7.3 Electricity Supply

The existing electricity network includes:

- A 275kV transmission line within a 100 metre ElectraNet easement running north-south through the Development;
- A 132kV transmission line within a 30 metre ElectraNet easement running north-south through the site, approximately parallel to the site's western boundary;
- An SAPN 11kV high voltage overhead line in Calton Road (north verge) that runs parallel to the proposed Development's northern boundary;
- An SAPN 11kV high voltage overhead line in Cheek Avnue (west verge) that runs parallel to the proposed Development's western boundary and transitions to a high voltage underground cable at Cork Road;
- An SAPN 11kV high voltage overhead line in Balmoral Road (west verge) that runs parallel to the proposed Development's eastern boundary with multiple connection points to Calton Road and Balmoral Road; and
- A high voltage underground electrical distribution network, owned by SAPN, has been installed throughout the existing Springwood Development to the north-east of the site.

The electrical underground network for the proposed Development would be installed on a staged basis as part of the common service trench. It will be necessary to install high voltage feeders throughout the development.

SAPN has advised that a future substation may be sought within the development boundary, with the exact timing and configuration to be determined based on an assessment of loading requirements.

Importantly, no allotments have been proposed within the 275 kV transmission easement area. Short sections of road, perpendicular to the transmission line, have been proposed to cross beneath the alignment. These would be designed to the minimum vertical and horizontal clearances required by ElectraNet. Development within this zone would consist of mainly landscape/ open space area, in order to comply with the requirements set out in ElectraNet's '*Land Use Guidelines for Electricity Transmission Corridors*,' 2013.

In addition, no allotments have been proposed within the 132 kV transmission easement area. A new road is however proposed to run parallel to this transmission line, south from Cheek Avenue and beyond the Gawler East Link Road. The alignment for this road has also been determined by applying the minimum clearance requirements set out in ElectraNet's '*Land Use Guidelines for Electricity Transmission Corridors,'* 2013.

Finally, it is noted that A minimum 15m horizontal clearance can be achieved between future street lighting and the existing transmission lines based on the chosen road alignments.

4.7.4 Gas

The existing gas network includes:

- A 450mm diameter high pressure gas transmission pipeline (15,306 kPa), owned and operated by South East Australia Gas Pty Ltd (SEA Gas), running through the site in a north-east to south-west direction (parallel to the Barossa Trunk Main) in a 15 metre wide easement;
- A 280mm high pressure gas main exists within Calton Road (installed prior to Stage 1 of the existing Springwood Development) that is owned and operated by APA Group; and
- An APA Group owned gas network has been installed within the existing Springwood Development that currently connects to the Calton Road 280mm high pressure main.

APA Group has advised that new development in the subdivision can be serviced via the existing gas infrastructure. No headworks have been identified as being required, however there will be a 125mm high pressure gas main link required from Calton Road to the proposed Development's western boundary to be undertaken on a staged basis. New gas infrastructure will be installed within the common service trench and progressively extended through each stage of the development

Importantly, a Safety Management Study (SMS) workshop was carried out in 2017 to assess the relationship between the Springwood Master Plan and the SEA Gas Pipeline. The findings of the SMS were taken into consideration throughout the master planning process to assist the pipeline regulator to meet its obligations under '*AS 2885.2008, Pipelines – Gas and Liquid Petroleum*'.

The proposed subdivision layout takes into consideration the existing SEA Gas Pipeline and associated easement as follows:

Road Crossings:

Road crossings have been proposed at three locations coinciding with the SEA Gas Pipeline. These crossings would need to be designed in accordance with AS 2885 and SEA Gas requirements and will likely require concrete protection to protect the pipeline from vehicle loading and future excavation. Side protection will also be considered if there is a likelihood of directional boring in future for services maintenance or installation.

This has been successfully achieved in earlier stages of the Springwood development.

Utility Crossings

Utility crossings for other services required to cross the SEA Gas Pipeline would be designed to comply with the appropriate standards and to achieve the necessary clearances. Designs would be approved by SEA Gas and give consideration to future connection points and potential maintenance requirements to minimise the risk of future excavation in the vicinity of the pipeline.

This has been successfully achieved in earlier stages of the Springwood development.

Use of Easement Land

No development has been proposed over the easement, with the exception of road crossings.

It has been advised that open space is a permissible land usage, including landscape and shared paths.

Main Line Valve Buffer

The main line valve (MLV) compound (shown in ***Figure 3.6***), requires a buffer zone a minimum of 45m between the associated vent stack and the nearest residence as a noise protection measure, and as a hazardous area exclusion zone to remove ignition sources from the area during routine annual maintenance. The proposed subdivision layout has designated open space within this zone only.

Further, within the Main Line Valve compound there is an Emergency Vent for the SEA Gas pipeline. This vent is designed to rapidly evacuate gas in the event of a pipeline emergency. The Safety Management Study notes that residential dwellings should not be located within a buffer zone of approximately 220m from an emergency vent. A 220m buffer zone would currently sit outside of the existing SEA Gas easement and we understand that it is the intention of SEA Gas to therefore relocate this vent to ensure its ongoing compliance with AS2885. We understand that SEA Gas and its regulator (The Department of Energy and Mining) has identified and secured rights over an appropriate site for this relocated vent. Accordingly, no allowance has been made for this buffer zone.

4.7.5 Telecommunications

The existing telecommunications network includes:

- Opticom cable within Calton Road which services the existing Springwood Development; and
- An Opticomm owned in-service pit and pipe network within the existing Springwood Development which currently connects to cable installed within the Calton Road verge.

Through liaison with Opticomm, it has been confirmed that the proposed development is within the capacity of their existing network. The head end equipment installed during Stage 1 of the existing Springwood Development to the north-east was designed to account for future allotments associated with the proposed sub-division.

4.8 Earthworks

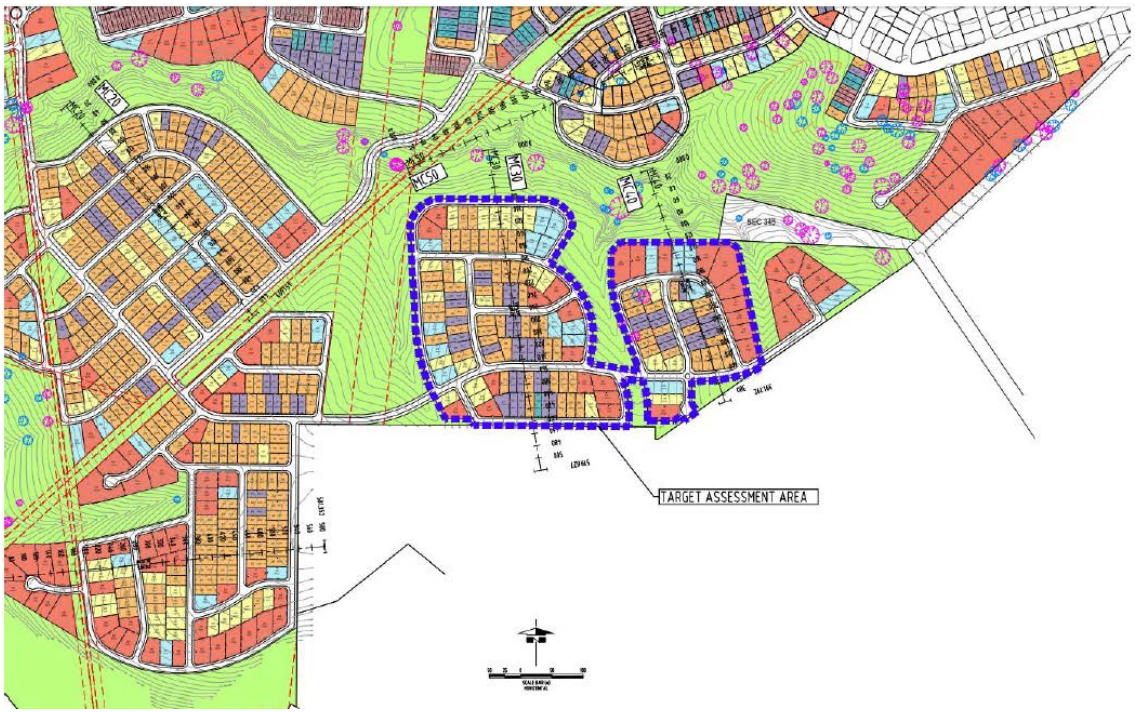
WGA have prepared a 'Roads and Earthworks Report' attached at ***Appendix 12.*** This report has been prepared to review the level of required earthworks to be undertaken in steep locations and to demonstrate that the proposed plan of division can be developed to achieve:

- Grade compliant driveway arrangements;
- Grade compliant road long sections; and
- Suitable allotment grading/ retaining.

WGA reviewed the steepest and most challenging area of the site where the natural topography is defined by steep grades in both the north-south and east-west directions. The area chosen comprises approximately 130 lots and is south of the central drainage channel, abutting the proposed southern boundary (refer to ***Figure 4.24***). A preliminary roads and earthworks model was undertaken to demonstrate that suitable road and allotment grades can be achieved.

The longitudinal grades across the target area range between 5 -18%.

Figure 4.24 *Target Roads and Lot Grading Assessment Area (WGA 2019)*



4.8.2 Road Grading

Based on the Town of Gawler '*Standards and Requirements for Land Development/ Land Division*,' July 2012, the following criteria generally applies with regard to longitudinal grading:

- On a steeply graded site, the maximum grade can be 10%;
- Steeper sites will require discussion with Council; and
- The minimum longitudinal grade is to be 0.67%.

In order to comply with Council standards, a maximum grade of 10% has been adopted where practical. In an effort to rationalise the road grading against the allotment grading, short sections of 12.5% have been proposed. This complies with the requirements set out in *Guide to Road Design Part 3: Geometric Design* (Austroads 2016), and is considered appropriate given the relatively short lengths, steep natural topography and forecast traffic usage.

Intersection grading has been designed to comply with *Guide to Road Design Part 4: Intersections and Crossings: General* (Austroads 2009b). This is based on minimum Safe Intersection Sight Distance (SISD) requirements.

Longitudinal sections have also been prepared by WGA for each road throughout the assessment area (refer to ***Appendix 12***)

WGA provide a summary of road grading through the development as follows:

- Maximum achieved longitudinal grade = 12.5%;
- Minimum achieved longitudinal grade = 0.67%, and
- The proportion of roads graded steeper than 1 in 10 has been determined to be approximately 25% of the assessment area.

WGA also note that the proposed road grading would also result in compliant grades for gravity services.

4.8.3 Driveway Arrangements

Driveways are generally proposed on the downstream side of each allotment to maximise serviceability for gravity services including sewer and stormwater. Maximum driveway gradients have been used for the purpose of this assessment, as it reduces the level difference between allotments sharing a rear boundary.

Maximum driveway grades have been determined based upon the Town of Gawler '*Standards and Requirements for Land Development/ Land Division,*' July 2012 and AS2890.1-2004 *Parking Facilities – Off Street Carparking*. These requirements prevent scraping for a B85 design vehicle and can be summarised as follows:

- Council footpath gradient maximum 1 in 40 (2.5%);
- Driveway gradient maximum 1 in 5 (20%);
- Transitions are required where change in grade exceeds 1 in 8 (12.5%);
- Minimum transition is 2.0m;

- Maximum change in grade at a crest is 1 in 8 (12.5%); and
- Maximum change in grade at a sag is 1 in 6.7 (15%).

4.8.4 Allotment Grading

Allotment grading across the site has been determined through a rationalised road grading design and utilising maximum driveway gradients over a 6.0m garage setback for each allotment. A preliminary earthworks plan and sections through the site are provided in ***Appendix 12***.

Allotments have been orientated based on the natural topography, such that the more prevalent level differences between allotments are found at the shared rear boundary as opposed to the shared side boundary. This maximises flexibility in building design to deal with the fall within individual allotments, given the depth of allotments far exceeds the width.

The worst-case height differential between two allotments within the assessment area was determined by WGA to be 7.5 m.

To effectively manage the height differential across adjoining allotments, WGA has proposed an approach where rear retaining walls are installed on the common boundary between allotments to reduce the total level difference. By delivering a consistent grade from the rear retaining to the garage setback, a worst-case allotment grade of 10% can be delivered. This grade can then be managed through building design of individual lots. By constructing a 2.0m high wall on the common boundary, each allotment would then have less than 3. metres of level difference to consider through building design.

This represents the worst-case value, and in many areas throughout the broader development, the entire height differential can be managed through a single rear retaining wall, or by terraced walls of varying heights. Other options could also include installation of batters within allotments, split level buildings etc.

The eastern portion of the assessment area proposes allotments adjoining the drainage reserve. These allotments are relatively large in area, and it is likely that a combination of retaining and batters would be utilised to manage levels through the lots. This can be achieved without encroaching into the reserve to the north.

4.8.5 Cut to Fill Balance

Any surplus material sourced from within the existing sand mine site as well as surplus material generated from the construction of subdivision stages around the broader development could be utilised to backfill the deeper sections of the former sand extraction pit with engineered fill.

4.9 Regulated and Significant Trees

There are a total of 183 Regulated Trees and 200 Significant Trees across the subject site (i.e. 383 trees in total).

The majority of these trees (296 trees or 77%) are proposed to be retained across the site in open space reserves to be ultimately vested in Council.

A total of 47 Regulated Trees and 40 Significant Trees are proposed to be removed (87 trees in total representing 23% of all Regulated and Significant trees on site). The trees are proposed to be removed to accommodate the proposed subdivision and future development including the requirement to undertake bulk earthworks. Approximately 37 trees (43%) that are proposed to be removed comprise self-seeded re-growth on uncontrolled fill from the historic quarry that operated in the north-western corner of the site. This uncontrolled fill is required to be removed and compacted to accommodate future site development and therefore the removal of these trees is unavoidable.

A plan prepared by A&S surveyors nominating Regulated and Significant Trees that are proposed to be removed as well as areas across the site comprising 'uncontrolled fill' is *attached* in ***Appendix 13*** and reproduced in ***Figure 4.25*** below.

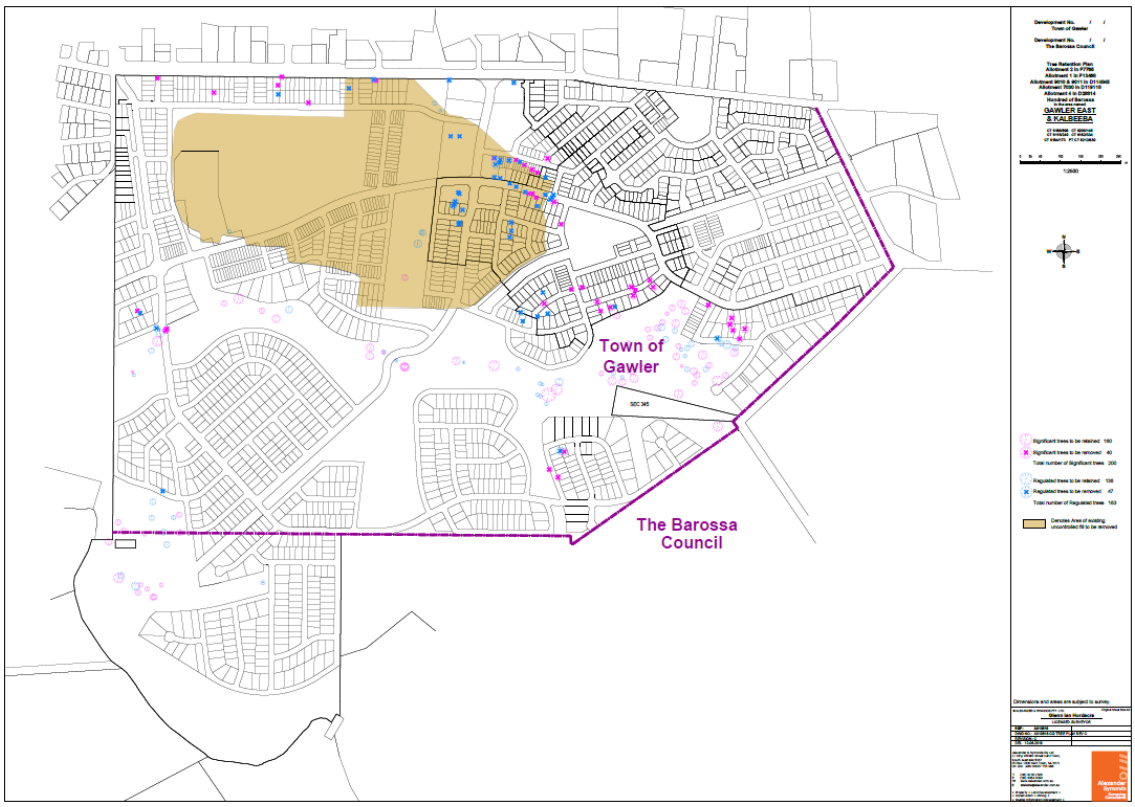
The proposed removal of Regulated and Significant Trees also needs to be assessed in the context that 73.57 hectares of land (or 39.5% of the site) is proposed to be divested as open space reserve with significant areas allocated for the preservation of Mallee Box Woodland and Iron-Grass (*Lomandra*) Temperate Grassland.

In accordance with Section 42(4) of the *Development Act, 1993* and Section 117 of the *Development Regulations, 2008* the proposed tree planting Strategy (as outlined in Section 4.3.7 above) will result in the planting of a significant number of trees that will exceed the statutory requirement to replace a Regulated Tree with two (2) trees and replace a Significant Tree with three (3) trees. Replacement tress will be in the form of:

- Street Trees including a combination of medium to large exotic street trees and proven performers in the Gawler Township; and
- Parkland trees within the river reserves that will assist to restore the ecology of the remnant dominant plant associations including the Mallee Box Woodland and Eucalyptus *Camaldulensis* Open Woodland.

In accordance with the *Native Vegetation Act, 1991*, any proposed clearance of native vegetation (other than Regulated or Significant Trees) will also require separate approval from the Native Vegetation Council (NVC) unless the trees are exempt under the *Native Vegetation Regulations, 2017*.

Figure 4.25 *Regulated and Significant Tree Removal*



4.10 Preliminary Site Investigation (PSI)

A Preliminary Site Investigation (PSI) has been prepared by LBWco and is attached as ***Appendix 14***.

A PSI was prepared to identify any potentially contaminating activities (PCAs) that may impact upon the proposed future use of the land.

The PSI included two primary components:

- A desktop review of available site history information for the site and adjacent properties, to identify current or historical land uses which might be considered Potentially Contaminating Activities (PCAs); and
- An intrusive soil investigation to assess for the presence of chemicals of interest (COIs) in soil that may indicate the historical presence of PCAs.

The objectives of the PSI were to:

- Identify current or historical PCAs at the site;
- Provide a desktop assessment of risk with respect to the likelihood that any PCAs identified could have caused site contamination, with respect to potential future land uses; and

- Identify areas of the site requiring further investigation in order to assess whether potential contamination could pose an unacceptable risk to future site users.

Based on a desktop review of current and historic site information, a site inspection, and intrusive soil assessment, LBWco prepared a summary CSM for PCAs and other activities that were undertaken or inferred to have occurred at and near the subject site. The conclusions of the assessment were as follows:

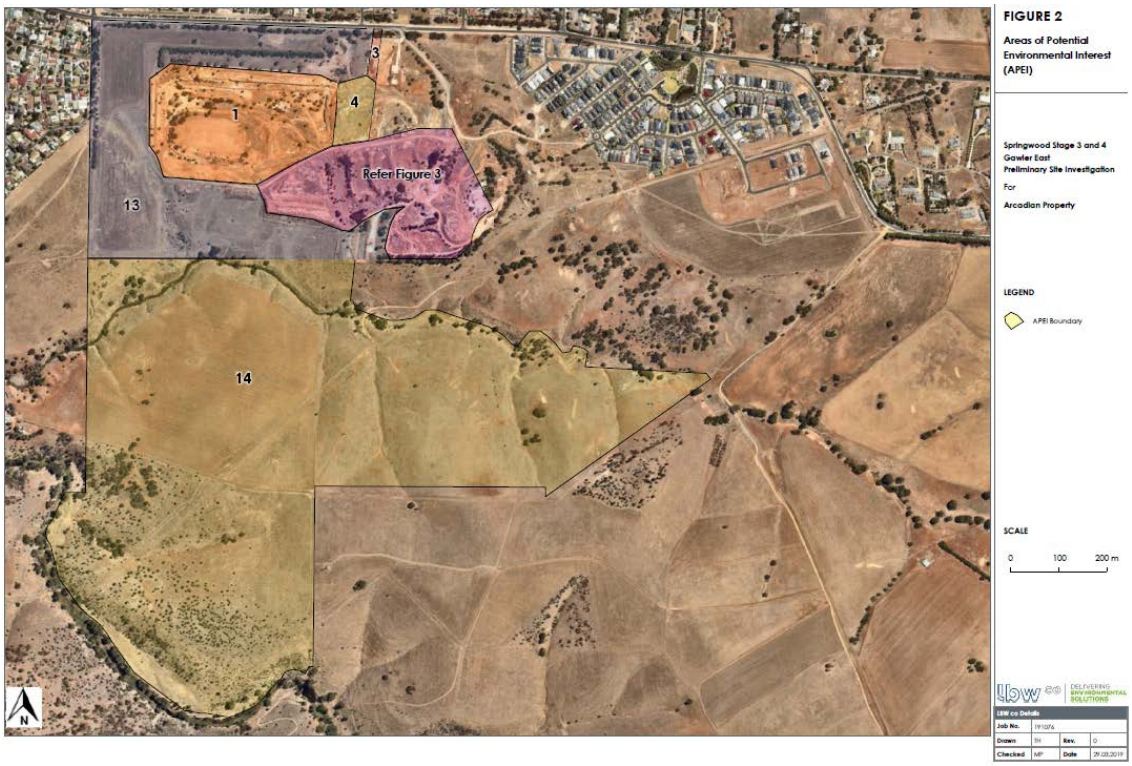
- Prescribed PCAs identified to have historically occurred on-site included the following:
  - » Liquid organic chemical storage in above-ground storage tanks (ASTs) in identified Areas of Potential Environmental Interest (APEI) 6 and 7; and
  - » Concrete batching in APEI 11.
- Prescribed off-site PCAs with the potential to result in site contamination included liquid organic chemical storage in underground storage tanks (USTs) on the farmhouse immediately east of APEIs 10 and 11;
- Non-prescribed PCAs identified for the site included the storage of small volumes of chemicals within and adjacent to the APEI 6 workshop sheds;
- No on-site or off-site PCAs were identified that may materially affect APEIs 1-5, 8, 9, or 12-14;
- A localised area of identified soil contamination, adjacent to the historical location of fuel and waste oil storage tanks in APEI 6, may pose a moderate risk to future receptors; and
- Other PCAs identified are considered likely to pose a low potential concern to future site receptors.

On this basis, LBWco have recommended that:

- Remediation of soil impacts associated with historical fuel and waste oil ASTs should be undertaken in APEI 6. Assessment of groundwater in this area is also recommended, to confirm the absence of potential harm to groundwater resulting from these impacts.
- Further assessment of soil and/or groundwater should be undertaken in the vicinity of other PCAs (APEIs 6, 7, 10, and 11) to confirm the absence of risk to future receptors and suitability for the proposed sensitive land uses.
- No further investigation is recommended in APEIs 1-5, 8, 9, or 12-14.

Plan showing the respective APEI areas are provided in ***Figure 4.26*** below.

Figure 4.26 *Areas of Potential Environmental Interest (APEI) (Source LBW-co)*



Based on the advice and recommendations of LBWco portion of the overall subdivision located within APEI 6, 7, 10, and 11 have been included within two separate Plans of Division (DA490/D025/19 & DA490/D027/19). For these development applications for Development Plan Consent and Land Division Consent it is the applicant's intention to engage an accredited Site Contamination Auditor under the *Environment Protection Act, 1993* and *Environment Protection Regulations, 2009* to prepare a Site Contamination Audit Report (SCAR).

On this basis, for the applications affecting APEI 6, 7, 10, and 11 the applicant would accept a suitable and appropriate condition of approval that Section 51 clearance not be provided for each application until such time as a 'Site Contamination Audit Report' (SCAR) has been provided by a suitably qualified and registered Site Contamination Auditor confirming that the land is suitable for its intended use.

Adopting this approach, SCAP, the Town of Gawler Council and the EPA can be satisfied that individual allotments for future development in APEI 6, 7, 10, and 11 can-not be created until a SCAR has been provided by a suitably accredited Site Contamination Auditor demonstrating that the land is suitable for its intended use.

Given the findings of LBWco that no further investigations are warranted or recommended in APEIs 1-5, 8, 9, or 12-14 (the majority of the site), it is not proposed to appoint a Site Contamination Auditor for the balance of allotments created under DA960/D025/19, DA490/D026/19 or DA490/D028/19.

4.11 Staged Construction

Development Plan consent is being sought for the overall project. However, because of the scale of the project, the project will be constructed in stages.

A staging plan for the development prepared by Alexander Symonds Surveyors is provided in ***Appendix 2***.

4.12 Operative Period of Consent

Given the scale of the overall project, the Applicant seeks, as part of the application for Development Plan Consent, that the relevant authority extend the operative period of consent for the development to facilitate the staged construction of the project.

In particular, it is requested that the period prescribed under Regulation 48(1)(b)(i) of the Regulations for the substantial completion of the project be extended to a period of 10 years from the operative date of the Development Plan Consent.

5. Procedural Requirements

5.1 Relevant Authority

By letter dated 15 November 2019 the State Coordinator General appointed the State Commission Assessment Panel (SCAP) as The Relevant Authority to assess and determine the Development Applications in accordance with Schedule 10(20) of the *Development Regulations, 2008*.

5.2 Nature of Development

The proposed development is perhaps best described as a land division creating an additional 1,415 allotments with associated bulk earth works, landscaping and removal of 47 Regulated Trees and 40 Significant Trees.

The land the subject of the proposed land division straddles two Council areas: the Town of Gawler and The Barossa Council.

The portion of the land in the Barossa Council area is split into two Zones: The Open Space Zone and the Residential (Gawler East) Zone. Land division (and associated removal of Regulated trees) is not classified as complying or non-complying in the Barossa Council Open Space Zone or the Residential (Gawler East) Zone and is therefore a merit form of development in each Zone.

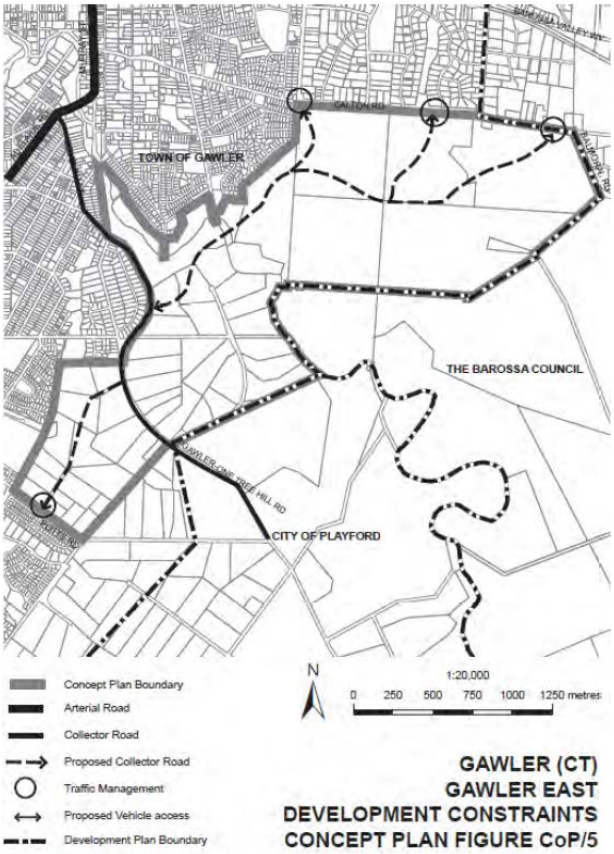
The portion of land in the Town of Gawler is also split into two zones: the Open Space Zone and the Residential (Gawler East) Zone. Land division is not classified as complying or non-complying in the Town of Gawler Open Space Zone and is therefore a merit form of development in that Zone

The classification of land division in the Residential (Gawler East) Zone in the Town of Gawler depends on Principle of Development Control (PDC) 37 which states that development for the following is non-complying:

> *Development in the form of land division in the area defined by the Gawler East Development Constraints Concept Plan Figure CoP/5 is non-complying if:*
>
> *(a) there exist 1000 allotments within the area defined by the Gawler East Development Constraints Concept Plan Figure CoP/5; and*
>
> *(b) the following infrastructure has not been completed in full:*
>
> *(i) a collector* road between Calton Road and One Tree Hill Road;
>
> (ii) *a collector road between One Tree Hill Road and Potts Road;*
>
> *(iii) an upgrade of Potts Road and its intersection with Main North Road to accommodate traffic flows associated with further continued development.*

The area defined by the Gawler East Development Constraints Concept Plan is reproduced in ***Figure 5.1*** below.

Figure 5.1 *Concept Plan Figure CoP/5 (Gawler (CT) Development Plan)*



A legal opinion provided by Botten Levinson dated 16 October 2018 is attached in ***Appendix 15*** and provides advice on whether the land division component of the proposed development is a merit or non-complying form of development. The legal opinion provided by Botten Levinson concludes that:

> *The proposed land division component of the Springwood Master Planned Community in Gawler East is not a non-complying development and is properly classified as a merit development.*

This is on the basis that Alexander Symonds have advised that there are currently 421 allotments (even including council reserves and sewer pump station allotments) that exist within the area defined by Concept Plan Figure CoP/5 applying the above definition (as at 12 June 2019). The number of allotments proposed in this land division is irrelevant to determining how many allotments exist within the area defined by Concept Plan Figure CoP/5.

No regard should be had to:

1. Allotments proposed to be created as part of a lodged but undetermined development application; or

2. Allotments that have been granted development approval but for which the relevant plan of division has not yet been deposited in the Lands Titles Office.

It is therefore clear that the non-complying trigger does not currently apply by virtue of paragraph (a). The number of allotments proposed in this land division is not relevant.

Whether the proposed land division component is non-complying depends on whether it triggers the application of this provision of the Residential (Gawler East) Zone in the Gawler Development Plan.

Paragraph (a) and (b) are clearly required to be read conjunctively. That is, the circumstances in both paragraphs must apply to a proposed land division for it to be non-complying in the Zone.

Since paragraph (a) does not apply to the proposed land division, there is no need to consider the application of paragraph (b), as the non-complying trigger will not apply no matter the outcome.

Accordingly, the proposed development should be correctly processed as a Consent use for assessment on merit.

5.3 Public Notification

Schedule 9 Clause 5 of the *Development Regulations 2008* states that the division of land constitutes a 'Category 1' form of development subject to the following:

> *The division of land (including for the construction of a road or thoroughfare) where the land is to be used for a purpose which is, in the opinion of the relevant authority, consistent with the objective of the zone or area under the relevant Development Plan, other than where the division will, in the opinion of the relevant authority, change the nature or function of an existing road.*

Given the proposed development involves the division of land for a purpose consistent with the objectives of each of the Relevant Zones applying to the land and given the proposed land division will not 'change the nature or function of an existing road', the proposed development should be correctly processed as a '**Category 1**' form of development.

5.4 Agency Referrals

The following development applications must be referred to the **Environment Protection Authority** (EPA) pursuant to Schedule 8 of the *Development Regulations*, 2008 – given each of these development applications is an *Activity of Environmental Significance* pursuant to section 4(b) of Schedule 21 of the *Development Regulations*, 2008 (i.e. The applications involve the division of land creating 50 or more allotments for residential purposes):

- DA960/D025/19 (The Barossa Council) & DA490/D026/19 (Town of Gawler); and
- DA490/D028/19 (The Town of Gawler).

Given that the State Planning Assessment Panel (SCAP) is the relevant Planning Authority and the subject site is located within both the Town of Gawler and The Barossa Council, we understand the proposed development applications will be referred to both the **Town of Gawler** and **The Barossa Council**.

Pursuant to Section 29(3) of the *Development Regulations, 2008*, we understand that the proposed land division may also be referred to other Government Agencies for their consideration and comment, including:

- The SA Water Corporation;
- The Department of Energy and Mining; and
- The Department of the Premier and Cabinet (DPC).

6. Development Plan Assessment

6.1 Overview

The subject land is located within the Town of Gawler and The Barossa Council. The relevant and applicable Development Plans are the Gawler (CT) Development Plan (consolidated 20 February 2018) and The Barossa Council Development Plan (Consolidated 1 November 2018).

The subject land is located within the following Zones:

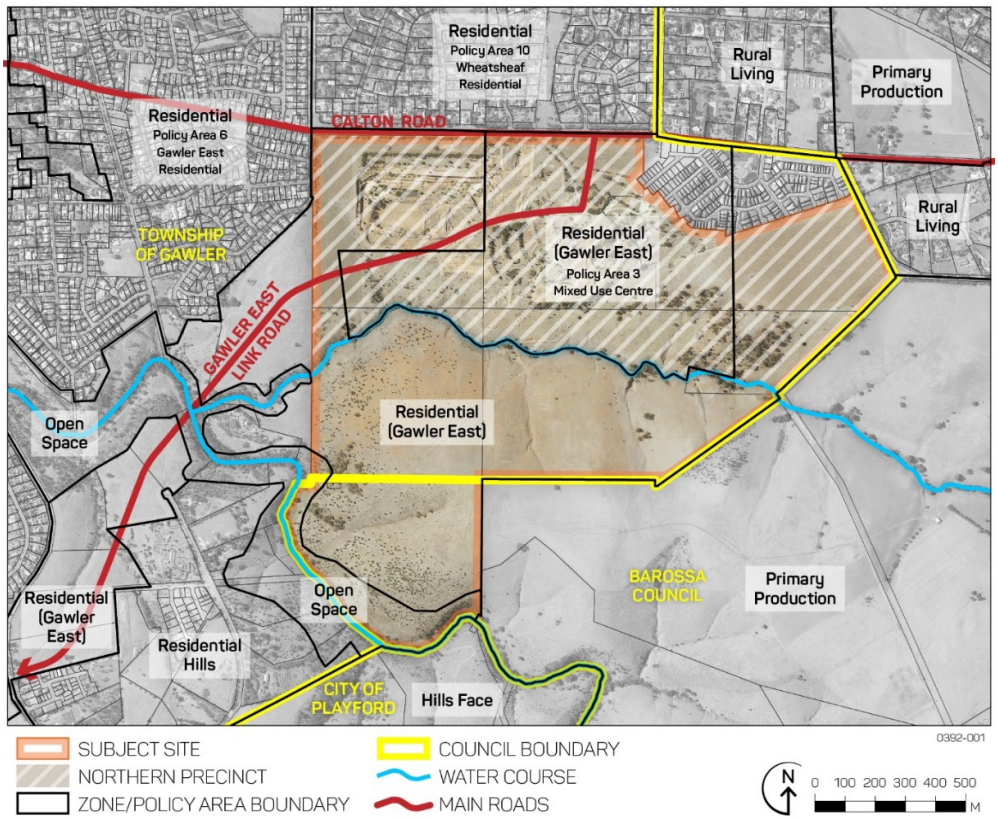
- Residential (Gawler East) Zone (Gawler (CT) Development Plan)
- Open Space Zone (Gawler (CT) Development Plan)
- Residential (Gawler East) Zone (Barossa Council Development Plan)
- Open Space Zone (Barossa Council Development Plan)

Portion of the subject land is located within the following Policy Area:

- Mixed Use Centre Policy Area 3 (Gawler (CT) Development Plan).

A plan showing the Zoning and Policy Areas applicable to the subject site and surrounds is provided in ***Figure 6.1***.

Figure 6.1 *Zoning and Policy Areas*



6.2 Zone and Council Wide Provisions

The following provides an assessment of the proposal against the relevant provisions of each Development Plan with a focus on the applicable Zone and Policy Areas. Given there is significant policy repetition both within and between each Development Plan, only the most relevant policy provisions have therefore been addressed to limit repetition.

This assessment has been grouped under a series of headings as they relate to specific policy 'topics' within each Development Plan.

6.2.1 Land Division

The Residential (Gawler East) Zone in the Gawler Development Plan includes the following Principle of Development Control with respect to the division of land:

> ***Residential (Gawler East) Zone - Gawler***
>
> ***PDC 9*** *Land division:*
>
> *(a) should not exceed 1000 allotments until at least the following infrastructure indicated by Structure Plan Map Ga/1 (Overlay 1) Enlargement G has been constructed:*
>
> *(i) a collector road between Calton Road and One Tree Hill Road; and*
>
> *(ii) a collector road between One Tree Hill Road and Potts Road; and*
>
> *(iii) an upgrade of Potts Road and its intersection with Main North Road to accommodate the traffic flows associated with further continued development.*
>
> *(b) should not prejudice the construction of the collector road indicated by Structure Plan Map Ga/1 (Overlay 1) Enlargement G.*

The area defined by the Gawler East Development Constraints Concept Plan is reproduced in ***Figure 6.2*** below.

As a matter of law, an allotment will exist if it is:

1. Comprised in an existing certificate of title; or
2. Separately defined in a Deposited Plan or other public map; or
3. Separately defined in a plan of division that has been deposited or accepted for filing in the Lands Titles Office.1

Practically, an allotment will not exist until a plan of division is deposited in the Lands Titles Office and a title for that allotment is issued.

Alexander Symonds surveyors have confirmed that currently there are only 421 allotments (as at 12 June 2019) that exist within the Gawler East area concept plan boundary.

Within the 2015-16 Budget, the State Government announced $55 million for the construction of the Gawler East Link Road (GELR) Project. DPTI is currently constructing this road which is scheduled for completion in the

first quarter of 2020. Therefore, this critical piece of infrastructure will be installed and operational within 6 months – well before 1,000 allotments will have been formally created in the Gawler East area (with Section 51 clearances issued) in association with the proposed Plans of Division.

6.2.2 Land Use

The proposed development is a land division that will create 1,415 allotments for residential, commercial and educational purposes, along with associated roads, infrastructure and public reserves.

The proposed land use is consistent with Objective 1 of the Residential (Gawler East) Zone in both the Gawler and Barossa Development Plan as well as Objective 1 of the 'Mixed Use Centre Policy Area 3' of the Gawler Development Plan which seek a range of low and medium-density dwellings, with associated infrastructure, retail, commercial, recreational, educational and community development in a master-planned community.

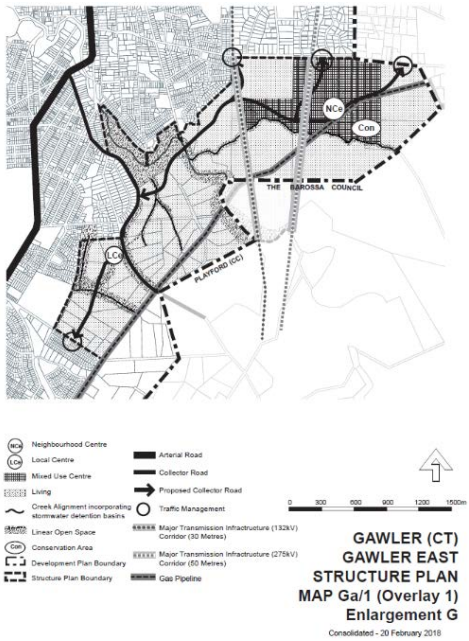
Residential (Gawler East) Zone - Gawler

OBJ 1 *A predominately residential area comprising a range of low and medium-density dwellings, with associated infrastructure, retail, commercial, recreational, educational and community development in master-planned locations in accordance with Structure Plan Map Ga/1 (Overlay 1) Enlargement G.*

Residential (Gawler East) Zone - Barossa

OBJ 1 *A predominately residential area comprising a range of low and medium-density dwellings, with associated infrastructure, retail, commercial, recreational, educational and community development in master-planned locations in accordance with Concept Plan Map Baro/15 - Gawler East.*

Figure 6.2 *Gawler East – Structure Plans – Gawler & Barossa Councils*



Mixed Use Centre Policy Area 3

OBJ 1 *A functional and diverse zone accommodating a mix of commercial, retail, recreation, community, residential, office, consulting rooms and educational uses.*

In addition, Principle of Development Control (PDC) 1 in the Residential (Gawler East) Zone in both the Gawler and Barossa Development Plan envisages a range of land uses that are likely to be developed on the subject land as a consequence of the proposed land division.

Residential (Gawler East) Residential Zone

PDC 1 *The following forms of development are envisaged in the zone:*

Affordable housing

Community facilities

Domestic outbuilding in association with a dwelling

Domestic structure

Dwelling

Dwelling addition

Dwelling with associated home based business uses

Non-residential use that serves the local community, for example:

- child care facility
- health and welfare service
- open space
- primary and secondary school
- recreation area
- shop, office or consulting room

Supported accommodation.

Importantly, the proposed sub-division layout accommodates future medium density residential development as well as future commercial development (commercial, retail, office & consulting room development) within the 'Mixed Use Centre Policy Area 3'.

The proposed sub-division layout also accommodates a future educational establishment to the north-west of the site within the Residential (Gawler East) Zone noting that a primary and secondary school are non-residential land uses specifically envisaged within this Zone.

In accordance with PDC 17 of the Residential (Gawler East) Zone in the Gawler Development Plan proposed allotments accommodating future housing within the Village Centre (within the *Mixed Use Centre Policy Area 3)* and fronting areas of active pubic open space (i.e. Future playing fields) achieve higher residential densities.

Residential (Gawler East) Zone - Gawler

PDC 17 *Housing with an average site area for dwellings less than 250 square metre should be located within the Mixed Use Centre Policy Area and Local Centre Policy Area or within walking distance of public open space, local shops and public facilities.*

Finally, all land within the 'Open Space Zone' of both the Gawler and Barossa Development Plans is proposed to be divested as public open space reserves. In accordance with Objective 1 of the Open Space Zone in both the Gawler and Barossa Development Plan the proposed Plans of Division will create open space areas that will accommodate a range of activities including passive and active recreation land uses as well as habitat conservation and restoration.

Open Space Zone (Gawler & Barossa)

PDC 1 *A zone:*

(a) in which the open space character is preserved to provide a visual contrast to the surrounding urban area

(b) comprising open space that accommodates a range of public and private activities in an open and natural setting, including:

(i) passive and active recreation land uses

(ii) habitat conservation and restoration.

6.2.3 Land Division Design

There are numerous provisions in the Development Plan which broadly seek to guide the form, design and layout of land divisions. The more relevant provisions of the Gawler Development Plan are addressed respectively below.

Land division

OBJ 45 *Land division in appropriate localities to create a compact urban area.*

PDC 126 *Land should not be divided:*

(a) in a manner which would prevent the satisfactory future division of the land, or any part thereof;

(b) if the proposed use, or the establishment of the proposed use, is likely to lead to undue erosion of the land or land in the vicinity thereof;

(c) unless wastes produced by the proposed use of the land, or any use permitted by the principles of development control, can be managed so as to prevent pollution of a public water supply or any surface or underground water resources;

(d) if the size, shape and location of, and the slope and nature of the land contained in, each allotment resulting from the division is unsuitable for the purpose for which the allotment is to be used;

(e) if any part of the land is likely to be inundated by tidal or floodwaters and the proposed allotments are to be used for a purpose which would be affected detrimentally when the land is inundated;

(f) where the proposed use of the land is the same as the proposed use of other existing allotments in the vicinity, and a substantial number of the existing allotments have not been used for that purpose;

(g) if it would cause an infringement of any provisions of relevant building legislation or any by-law or regulation made thereunder; or

(h) where existing significant trees or remnant vegetation will be removed or compromised.

PDC 127 When land is divided:

(a) any reserves or easements necessary for the provision of public utility services should be provided;

(b) stormwater should be capable of being drained safely and efficiently from each proposed allotment and disposed of from the land in a satisfactory manner;

(c) a water supply sufficient for the purpose for which the allotment is to be used should be made available to each allotment;

(d) provision should be made for the disposal of waste waters, sewage and other effluents from each allotment without risk to health;

(e) roads or thoroughfares should be provided where necessary for safe and convenient communication with adjoining land and neighbouring localities;

(f) each allotment resulting from the division should have safe and convenient access to the carriageway of an existing or proposed road or thoroughfare at all times;

(g) proposed roads should be graded, or be capable of being graded to connect safely and conveniently with an existing road or thoroughfare;

(h) for urban purposes, provision should be made for suitable land to be set aside for usable local open space; and

(i) if it borders a watercourse the land immediately adjoining the watercourse should become public open space, with a public road fronting the open space and be rehabilitated for appropriate public use.

Residential: Residential Land Division

PDC 233 *Land division design should:*

(a) link with the surrounding urban environment;

(b) facilitate shared use of public facilities with adjoining communities;

(c) provide access to public open space (through provision of land or linkages to existing open space);

(d) protect significant vegetation;

(e) minimise impact on landform and drainage systems;

(f) retain State, local heritage items and contributory items and the historic layout of pattern of development of historic areas;

(g) keep flood prone land free from development;

(h) ensure appropriate evacuation routes are available either in the form of public roads or public land that is located outside of flood prone land known to be subject to inundation by flood waters;

(i) promote solar access for dwellings and private open space;

(j) encourage personal safety;

(k) minimize impact of vehicular traffic; and

(l) promote water reuse and local detention of stormwater.

The Proposed Plans of Division are directly aligned with Council Wide PDC 126, 127 & 233 of the Gawler Development Plan given:

- Proposed allotments have been designed with a suitable size, shape and configuration with an appropriate gradient to accommodate future intended land uses and development;
- Allotments have been designed with a suitable stormwater strategy to manage stormwater quality and frequent flow runoff from each allotment;
- The development can be efficiently and economically serviced by essential infrastructure and services, subject to the augmentation requirements of the various infrastructure providers.
- The proposed Plans of Division have been designed to accommodate safe and convenient vehicle access circulation, access and linkages to the surrounding road network;

- Suitable land has been set aside for useable public open space (a total of 73.57 hectares of land representing 39.5% of the site);
- Land immediately adjacent Spring Creek and the South Para River is dedicated as public open space reserve with Spring Creek proposed to be remediated to improve ecology and biodiversity and a high proportion of proposed public open space fronted by a public road to promote public access and use.

In accordance with Council Wide PDC 128 of the Gawler Development Plan the proposed Plans of Division also incorporate a public open space reserve at the interface with the South Para River with the closest residential allotment approximately 75 metres from the top of the bank of the River.

> ***PDC 128*** *Where land which has a frontage onto the Gawler River, North Para River and South Para River is divided, a reserve at least 30 metres wide, when measured from the top of the bank, should be provided along such a frontage.*

In accordance with Residential Land Division PDC 234 & 235 of the Gawler Development Plan the proposed Plan of Division has been designed with allotments of varying sizes to promote housing diversity (refer to ***Table 4.1***) with each residential allotment configured to accommodate a future dwelling with associated open space, car parking and vehicle access.

> ***PDC 234*** *Residential allotments should have an appropriate area and dimensions for:*
>
> *(a) siting and construction of a dwelling and ancillary outbuildings;*
>
> *(b) private outdoor space; and*
>
> *(c) convenient vehicle access and parking.*
>
> ***PDC 235*** *Residential allotments of varying size to encourage housing diversity.*

6.2.4 Hazards

SEA Gas Infrastructure

The Development Plan seeks development that appropriately responds to potential hazards.

As discussed, a 450mm diameter high pressure gas transmission pipeline (15,306 kPa), owned and operated by South East Australia Gas Pty Ltd (SEA Gas) runs through the site in a north-east to south-west direction (parallel to the Barossa Trunk Main) in a 15 metre wide easement.

The Residential (Gawler East) Zone Desired Character Statement in the Gawler Development Plan refers to the presence of the SEA GAS pipeline as follows:

> *A high pressure gas transmission pipeline traverses the zone as shown on Concept Plan Map Baro/15 - Gawler East. It is required that development located within the zone comply with AS2885 (Pipeline Gas and Liquid Petroleum) to ensure minimum pipeline safety requirements have been met.*

A Safety Management Study (SMS) workshop was carried out in 2017 to assess the relationship between the Springwood Master Plan and the SEA Gas Pipeline. The findings of the SMS were taken into consideration

throughout the master planning process to assist the pipeline operator to meet its obligations under '*AS2885.2008, Pipelines – Gas and Liquid Petroleum*'.

The proposed subdivision layout takes into consideration the existing SEA Gas Pipeline and associated easement as addressed in ***Section 4.7.4*** above.

Site Contamination

Council Wide Objective 18 and 19 and PDC 41 of the Gawler Development Plan states:

> *Contaminated Land*
>
> ***OBJ 18*** *Protection of human health and the environment wherever site contamination has been identified or is suspected to have occurred.*
>
> ***OBJ 19*** *Appropriate assessment and remediation of site contamination to ensure land is suitable for the proposed use and provides a safe and healthy living and working environment.*
>
> ***PDC 41*** *Development, including land division, should not occur where site contamination has occurred unless the site has been assessed and remediated as necessary to ensure that it is suitable and safe for the proposed use.*

To address the potential for site contamination, a Preliminary Site Investigation (PSI) has been prepared by LBWco and is attached as ***Appendix 14***. The PSI was prepared to identify any potentially contaminating activities (PCAs) that may impact upon the proposed land uses.

The PSI included two primary components:

- A desktop review of available site history information for the site and adjacent properties, to identify current or historical land uses which might be considered Potentially Contaminating Activities (PCAs); and
- An intrusive soil investigation to assess for the presence of chemicals of interest (COIs) in soil that may indicate the historical presence of PCAs.

The findings of the PSI are addressed in ***Section 4.10*** above and conclude that the majority of the site is not anticipated to have PCA's and only a small portion of the overall subdivision (located within APEI 6, 7, 10, and 11) will require a Site Contamination Audit Report (SCAR) by an accredited Site Contamination Auditor confirming that the land is suitable for its intended use.

LBWco recommend that no further investigations are warranted for the balance (majority) of the site.

Bushfire Protection

Portion of the subject site within the Open Space Zone of both the Gawler and Barossa Development Plan is located within a 'High Bushfire Risk Area'.

The balance of the site within the Residential (Gawler East) Zone of the Barossa Council is located within a 'Medium Bushfire Risk Area'.

The eastern portion of the site in the Residential (Gawler East) Zone of the Gawler Council that currently accommodates Mallee Box vegetation is also located within a 'Medium Bushfire Risk Area'.

The Balance of the land in the Residential (Gawler East) Zone of the Gawler Council is located within a 'General Bushfire Risk Area'.

Relevant Development Plan provisions relating to bushfire are reproduced below.

Residential (Gawler East) Zone

PDC 27 *To protect against bushfire, dwellings should not be sited within 40 metres of a slope greater than 20 degrees, where the length of the slope is greater than 10 metres and covered by unmanaged vegetation.*

General Section (Gawler)

Bushfire protection

PDC 13 *Buildings and structures should be located away from areas that pose an unacceptable bushfire risk as a result of one or more of the following:*

(a) vegetation cover comprising trees and/or shrubs;

(b) poor access;

(c) rugged terrain;

(d) inability to provide an adequate building protection zone; or

(e) inability to provide an adequate supply of water for fire-fighting purposes.

PDC 17 Land division for residential or tourist accommodation purposes within areas of high bushfire risk should be limited to those areas specifically set aside for these uses.

PDC 18 *Where land division does occur it should be designed to:*

(a) minimise the danger to residents, other occupants of buildings and fire fighting personnel;

(b) minimise the extent of damage to buildings and other property during a bushfire;

(c) ensure each allotment contains a suitable building site that is located away from vegetation that would pose an unacceptable risk in the event of bushfire; and

(d) ensure provision of a fire hazard separation zone isolating residential allotments from areas that pose an unacceptable bushfire risk by containing the allotments within a perimeter road or through other means that achieve an adequate separation.

PDC 19 *Vehicle access and driveways to properties and public roads created by land division should be designed and constructed to:*

(a) facilitate safe and effective operational use for fire-fighting and other emergency vehicles and residents; and

(b) provide for two-way vehicular access between areas of fire risk and the nearest public road.

Form of development

PDC 60 *Development should minimise the potential for personal and property damage arising from natural hazards including landslip, bushfires and flooding.*

The proposed Plans of division have been designed to protect against bushfire and bushfire risk by:

- Areas of high bushfire risk are proposed to be retained in public open space reserves and not developed for residential purposes;
- A high proportion of land divested as public open space reserve is accessible via perimeter roads which separates vegetation from future dwellings and provides vehicle access to vegetated areas for fire-fighting and other emergency vehicles; and
- A permeable road network is proposed and provides two-way vehicular access between areas of fire risk noting that an emergency fire access is also proposed to link the south-eastern portion of the site to Balmoral Track (to enable alternative access to the east if the collector roads to the west of this precinct is not accessible).

Flooding

It is noted that no portion of the subject site within proposed to accommodate future allotments for Residential, commercial or educational purposes is located within a Hazard Floor Risk Area pursuant to the *Gawler Flood Prone Areas Figure FI/8*.

The following Council Wide provisions of the Gawler Development Plan relating to flooding are reproduced below.

Hazards

OBJ 27 *Maintenance of the natural environment and systems by limiting development in areas susceptible to flooding.*

OBJ 28 *Development located away from areas that are vulnerable to, and cannot be adequately and effectively protected from, the risk of flooding.*

PDC 64 *Development should be excluded from areas that are vulnerable to, and cannot be adequately and effectively protected from, flooding.*

PDC 65 *There should not be any significant interference with natural processes in order to reduce the exposure of development to the risk of natural hazards.*

Flooding

PDC 66 *Development should not occur on land where the risk of flooding is likely to be harmful to safety or damage property.*

PDC 68 *Development, including earthworks associated with development, should not:*

(a) impede the flow of floodwaters through the land or other surrounding land; or

(b) increase the potential hazard risk to public safety of persons during a flood event; or

(c) aggravate the potential for erosion or siltation or lead to the destruction of vegetation during a flood; or

(d) cause any adverse effect on the floodway function; or

(e) increase the risk of flooding of other land; or

(f) obstruct a watercourse.

PDC 71 *Development should avoid the discharge or deposit of waste, wastewater and waste treatment systems (including processes such as seepage, infiltration or carriage by wind, rain, stormwater or by the rising of the water table) onto land or into any waters that are subject to inundation by a 1 in 100 year average return interval flood event.*

PDC 72 *Development should not occur where essential services cannot be economically provided and maintained having regard to flood risk or where emergency vehicle access would be prevented by a 1 in 100 year average return interval flood event.*

A Stormwater Management Plan (SMP) has been prepared by WGA and is attached in ***Appendix 10***

WGA have proposed regional flood detention storage to manage the pre- and post-development flows for the proposed urban development catchment.

The stormwater quantity management parameters for the total development are based on the fundamental requirement to manage the pre and post development flow rates leaving the site through Springwood Creek, prior to entering the South Para River. The preliminary size for flood detention storage has been determined on the basis to limit the critical peak flow from the posed fully developed urban catchment for the 1% AEP Annual Exceedance Probability (AEP) outflow rate equivalent to a 1% AEP pre-developed flow rate.

The flood detention storage is to be located at the western (downstream) end of the Springwood Creek that bisects the proposed development site. A roadway crossing will be used to create the embankment for the flood storage, while a low flow pipe controls the rate of outflow.

The proposed subdivision has therefore been carefully designed to managed stormwater to protected against the risk of flooding that may be harmful to safety or damage property.

Sloping Land

The proposed sub-division has been designed to respond to the natural topography and slope across the site with a design response that manages the steep slopes to the alignment of Spring Creek and South Para River whilst orientating allotments to maximise potential for views.

The proposed Plans of Division addresses site slope with the following design measures:

- Incorporation of steep sloping land (predominantly around Spring Creek) within open space reserves;
- Nomination of larger allotments on topographically steeper slopes to assist to satisfactorily deal with earthworks and driveway gradients;
- Allotments have been orientated based on the natural topography, such that the more prevalent level differences between allotments are found at the shared rear boundary as opposed to the shared side boundary (to maximises flexibility in building design to deal with the fall within individual allotments, given the depth of allotments far exceeds the width);
- Installation of rear retaining walls on the common boundary to reduce the height differential to be managed by the individual allotments.
- A road network that follows site contours with proposed roads cut below natural level in order to create a more uniform grade through the site, resulting in more even level differences between allotments rather than extremes;
- Maximum driveway grades have been determined based upon the Town of Gawler '*Standards and Requirements for Land Development/ Land Division*,' July 2012 and AS2890.1-2004 Parking Facilities – Off Street Carparking (refer to Roads and Earthworks Report in ***Appendix 12***);
- Roads have been designed with road grading designed to achieve:
  - Maximum achieved longitudinal grade = 12.5% (majority 10% or lower);
  - Minimum achieved longitudinal grade = 0.67%; and
- Use of cut and fill to balance site grades (with excess cut over fill available for use to remediate the historic sand mine).

The proposed treatment of site topography is therefore generally aligned with the following provisions of the Gawler Development Plan relating to sloping land.

> ***Residential (Gawler East) Zone – Desired Character Statement***
>
> *The slope of the land will dictate the location of particular dwelling types, with some more compact dwelling types located on relatively flat sites, whilst more traditional dwelling types will be located on those portions of the site with moderate to high slope. Greater setbacks are envisaged on topographically steep sites in order to satisfactorily deal with earthworks and driveway gradients.*

Sloping land

OBJ 89 *Development on sloping land designed to minimise environmental and visual impacts and protect soil stability and water quality.*

PDC 327 *Development and associated driveways and access tracks should be sited and designed to integrate with the natural topography of the land and minimise the need for earthworks.*

PDC 328 *Development and associated driveways and access tracks, including related earthworks, should be sited, designed and undertaken in a manner that:*

(a) minimises their visual impact;

(b) reduces the bulk of the buildings and structures;

(c) minimises the extent of cut and/or fill;

(d) minimises the need for, and the height of, retaining walls;

(e) does not cause or contribute to instability of any embankment or cutting;

(f) avoids the silting of watercourses;

(g) protects development and its surrounds from erosion caused by water run-off.

PDC 330 *Development sites should not be at risk of landslip.*

PDC 331 *Development on steep land should include site drainage systems to minimise erosion and avoid adverse impacts on slope stability.*

PDC 332 *Steep sloping sites in unsewered areas should not be developed unless the physical characteristics of the allotments enable the proper siting and operation of an effluent drainage field suitable for the development intended.*

6.2.5 Traffic and Access

The Desired Character Statement of the Residential (Gawler East) Zone of the Gawler Development Plan provides specific guidance on the design and configuration of the proposed collector road network within the Springwood subdivision as follows:

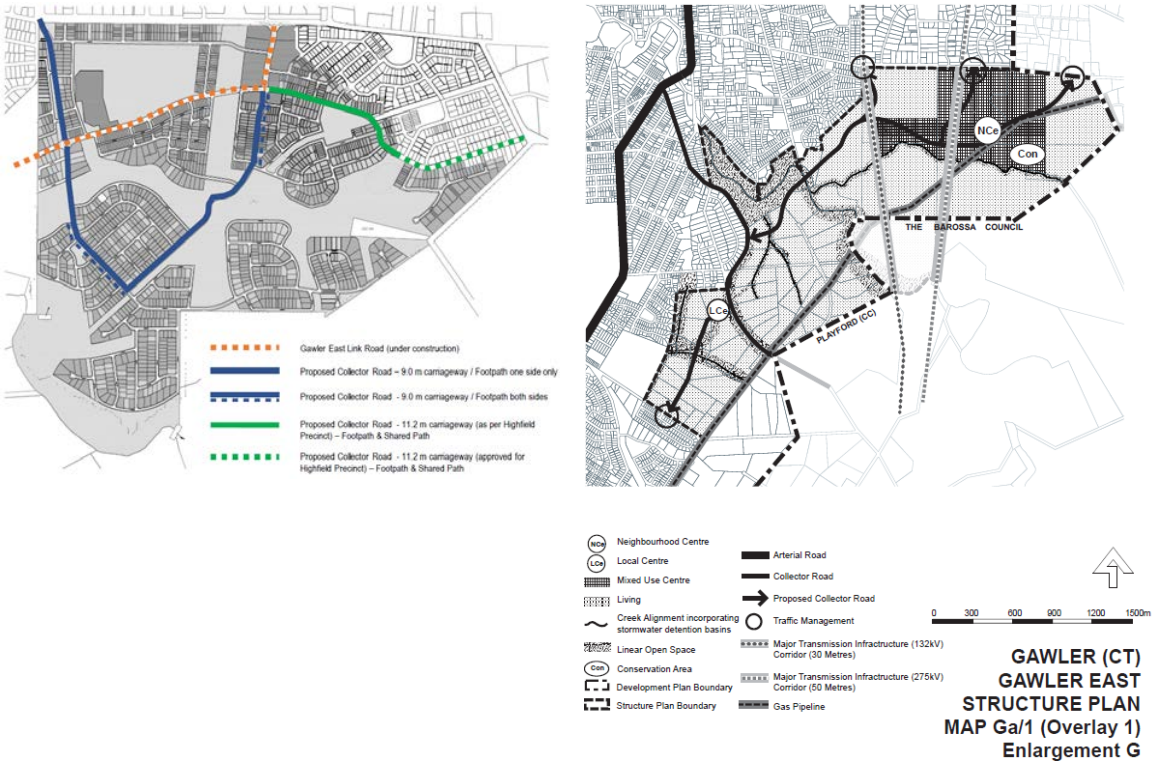
Residential (Gawler East) Zone

Desired Character

The collector road shown on Structure Plan Map Ga/1 (Overlay 1) Enlargement G is intended to have a boulevard character comprising wide footpaths and cycle paths on both sides and substantive street tree plantings. Dwellings will front and address the road with setbacks to contribute to the boulevard character.

As discussed in Section 4.4.3 above, access to the development site will be via the GELR and a proposed collector road network that is directly aligned with *Structure Plan Map Ga/1 (Overlay 1) Enlargement G* of the Gawler Development Plan. This is demonstrated spatially in ***Figure 6.3*** below.

Figure 6.3 *Proposed Collector Road Network reflecting Gawler East Structure Plan*



The proposed collector roads will generally comprise a single two-way carriageway 9.0 metres wide within a 20 metre road reserve. A verge of 5.5 metres one each side will be provide for footpaths and driveways between boundary and kerb, and streetscaping. The proposed collector road from the east linking to Balmoral Road will however continue to the town centre in the same configuration as approved for the Highfield precinct in the existing Springwood Development (i.e. comprising an 11.2 metre carriageway with two travelling lanes and a parking lane on each side within a 20 metre road reserve).

The proposed Collector Roads will therefore be developed with a boulevard character comprising wide footpaths and cycle paths and opportunity for substantive street tree plantings in accordance with the Zone Desired Character Statement. A cross section of the proposed Collector Roads is provided in ***Figure 4.18*** above and within the GTA Traffic Impact Assessment provided in ***Appendix 8***.

The Residential (Gawler East) Zone of the Gawler Development Plan also incorporates PDC 5 and PDC 10 relating to the design and configuration of road reserves and rear lanes. Each principle is addressed respectively.

PDC 15 *Road reserves should be of a width, design and alignment that can:*

(a) provide for safe and convenient movement and parking of vehicles and other users according to projected vehicle volumes, speeds and the character of the road;

(b) accommodate bus routes where required;

(c) provide for shared, on-street parking bays for nearby residents and visitors wherever practical to achieve unrestricted movement along collector roads;

(d) allow vehicles to enter or reverse from an allotment or garage in a single movement, allowing for cars parked on the opposite side of the road (where applicable) or fixed infrastructure on the street;

(e) allow for the efficient movement of service and emergency vehicles; and

(f) accommodate street planting, landscaping, street furniture and utilities infrastructure.

GTA have confirmed that the proposed land division will utilise local streets with carriageway widths of 7.5 metres within 14.0 or 16.0 metre road reserves. This will be suitable to permit parking on both sides of the street while retaining a clear lane for through traffic. Verges approximately 3.25 metres wide (or 4.25 metres wide) will be provided which is sufficient for footpaths and other service infrastructure. A proposed cross section for local streets is provided in ***Figure 4.19*** above.

The proposed collector road network will provide suitable bus access (if required) and the proposed road network will be capable of providing appropriate access for service vehicles and emergency vehicles subject to detailed design of intersections and junction to ensure safe and appropriate turning movements are available.

PDC 10 *Rear lanes should:*

(a) have a minimum reserve width of 6.5 metres;

(b) be limited in length to a maximum of 100 metres;

(c) have a minimum carriageway width of 5.5 metres;

(d) include protuberances to accommodate landscaping and lighting should not exceed 1.0 metre;

(e) landscaping should be in the form of tall vertical trees in preference to low level shrubs;

(f) be designed to accommodate garbage trucks and emergency service vehicles.

GTA have confirmed that there are laneways in some locations which will facilitate vehicular access to properties. Proposed laneways will be designed with:

- An 8.0 metre road reserve exceeding 6.5 m as specified by PDC 10;
- A minimum carriageway of 6.0 metres exceeding 5.5m as specified by PDC 10; and

- Adequate width to accommodate a space for bin placement (if rear collection is proposed) and placement of lighting, services and planting if desired.

Other relevant provisions of the Gawler Development Plan relating to transport, traffic and access are also reproduced as follows:

Form of development

PDC 62 *Development should not create conditions which are likely to exceed the capacity of existing roads, public utilities, and other community services and facilities.*

Transportation and Access

PDC 360 *Driveways, access tracks and parking areas should be designed and constructed to:*

(a) follow the natural contours of the land;

(b) minimise excavation and/or fill;

(c) minimise the potential for erosion from run-off;

(d) avoid the removal of existing vegetation;

(e) be consistent with Australian Standard AS 2890 Parking facilities.

PDC 370 *A Traffic Impact Study should be undertaken to determine the potential impact of developments on the surrounding arterial road network. Works that are required as a direct result of providing safe and efficient access to any proposed development should be provided.*

Transportation (Movement of People and Goods)

OBJ 99 *A network of roads, paths and tracks, which accommodates satisfactorily a variety of vehicular, cycle and pedestrian traffic.*

PDC 376 *Development and associated points of access and egress should not create conditions that cause interference with the free flow of traffic on adjoining roads.*

PDC 379 *A Traffic Impact Study should be undertaken to determine the potential impact of developments on the surrounding arterial road network. The 'User Pays' principle should apply for any works that are required as a direct result of providing safe and efficient access to any proposed development.*

PDC 383 *Roads should be designed in accordance with the following hierarchy of roads:*

(a) arterial and major collector roads bounding residential neighbourhoods to which no property access is generally provided;

(b) local crossing roads serving to collect local residential traffic and as a convenient bus route, and on which centre, school and key neighbourhood facilities are located; and

(c) local streets and access places serving principally a property access function.

PDC 384 *Road design should:*

(a) economically provide for the anticipated traffic levels and assigned access function;

(b) provide adequately for service and emergency vehicle access and turning;

(c) provide an appropriate level of on-street parking.

PDC 238 *Traffic's impact on residential environments should be minimised by integrated movement networks. In particular, no ribbon commercial development along arterial roads unless indicated by zone policies or structure plans.*

PDC 244 *New residential areas should have a road network that allows for use by buses and convenient interconnection with adjoining areas (and bus routes).*

PDC 245 *Residential roads should have a width, alignment and allotment impact that:*

(a) provides for safe and convenient movement and parking for the projected volumes of vehicles and other users;

(b) allows vehicles to enter or reverse from an allotment or site in a single movement allowing for a car parked on the opposite side of the street;

(c) accommodates street tree planting, landscaping and street furniture;

(d) accommodates the location, construction and maintenance of stormwater drainage and public utilities; and

(e) provides unobstructed, safe and efficient vehicular access to individual lots and sites.

PDC 246 *Land division design should make provision for:*

(a) utility services and stormwater drainage within the street reserve;

(b) junctions and intersections which allow for safe and convenient vehicle movements;

(c) limited street length and/or distance between bends and slow points to restrict traffic speeds and volumes;

(d) adequate sight distances for motorists at intersections, junctions, pedestrian and cyclist crossings, crossovers to allotments, and bus zones.

GTA have undertaken a review and assessment of the traffic and access arrangements proposed by the land division and have confirmed that the proposed road network will satisfy the requirements of the relevant Austroads standards and guidelines (refer to ***Appendix 8***).

The assessment undertaken by GTA has confirmed that:

- The proposed collector road network will provide accessibility around and through the site for daily traffic, pedestrian and cyclists demands;
- The proposed local streets will comprise single carriageway roads and laneways which will provide appropriate two way access and on-street parking (not laneways) suitable for the proposed residential density;
- The subdivision will facilitate safe access with multiple access road routes generally in the event of an emergency (although the southern portion will require an access track linkage to Balmoral Road given lack of alternative routes to emergency access due to terrain and private property to the west);
- The proposed road network will cater for occasional service vehicles including waste collection, maintenance and delivery vehicles as would be expected in a residential development, with cul-de-sacs at a number of locations suitable for waste collection vehicles to turn (some smaller streets will require these vehicles to reverse to exit but these manoeuvres will be limited within generally accepted parameters);
- The site will generate a high level of traffic on a daily basis with internal generation by the proposed uses, but also attraction form other areas to the proposed town centre and education site;
- The proposed road network will facilitate a redistribution of traffic away from Murray Street in the Gawler town centre to utilise the bypass effects of the GELR;
- The anticipated traffic volumes on the internal and external roads adjacent the site will remain within acceptable levels for operational capacity, and will be managed by pre-planned external infrastructure upgrades at a number intersections based on an agreement between the developer, Council and DPTI;
- Overall, whilst the impact of the proposed development is high with regards to anticipated traffic volumes in the site and surrounding area, these will be effectively managed through infrastructure upgrades at intersections and road segments and ameliorate the impact on the surrounding community and road network.

6.2.6 Open Space

The following provisions of the Gawler Development Plan are relevant with respect to the provision and design of public open space.

Residential (Gawler East) Zone

OBJ 4 *Open space systems designed to provide multiple use reserve areas that promote water management, habitat retention and enhancement, and recreational linkages.*

Desired Character

The form and distribution of major open space will be influenced by the need for stormwater detention, treatment and re-use given limitations on the potable water supply for the area. It will also be influenced by the location of drainage corridors, and the need to integrate with

existing corridors, including the eastern escarpment at Evanston Park. Public open space areas will need to accommodate both active and passive recreation opportunities and the retention of identified habitat areas of significance.

A network of linear parks including cohesive pedestrian and bicycle movement corridors and visual links will be established between the new development and adjoining natural creek lines, public recreation areas, local shopping and community services and surrounding road networks.

Portion of the southern boundary of the zone is located adjacent to the Para Woodland Reserve. It is essential that development form an appropriate interface with the Para Woodland Reserve.

The interface will vary in width as appropriate to meet the above criteria and will comprise of a combination of roads, paths, public open space and, where appropriate, areas of natural character for stormwater management.

PDC 8 *Land division should accommodate open space and movement networks that provide for strong connections and safe and convenient access to public facilities, public transport and potential future development of adjoining sites.*

Open Space and Recreation

OBJ 65 *The creation of a network of linked parks, reserves, recreational trails and recreation areas at regional and local levels.*

OBJ 68 *The provision of open space in the following hierarchy:*

(a) State

(b) Regional

(c) District

(d) Neighbourhood

(e) Local.

PDC 188 *District level parks should be at least 3 hectares in size, and provided within 2 kilometres of all households that they serve.*

PDC 189 *Neighbourhood parks should be at least 0.5 hectares and generally closer to 1 hectare in size, and provided within 500 metres of households that they serve.*

PDC 190 *Local parks should be*

(a) a minimum of 0.2 hectares in size;

(b) centrally located within a residential area, close to schools, shops and generally within 300 metres of households that they serve.

PDC 191 *No more than 20 percent of land allocated as public open space should:*

(a) have a slope in excess of 1-in-4;

(b) comprise creeks or other drainage areas;

unless the public open space forms part of a regional integrated open space network.

PDC 195 *Open spaces and recreation areas should be located and designed to maximise safety and security by:*

(a) ensuring that within urban areas, their edges are overlooked by housing, commercial or other development that can provide effective informal surveillance;

(c) locating play equipment where it can be informally observed by nearby residents and users during times of use;

Residential Public Open Space

PDC 249 *Public open space should be of a size, dimension and location that:*

(a) facilitates a range of active and passive recreational activities;

(b) allows movement of pedestrians and cyclists;

(c) incorporates existing significant vegetation, rocks, streams, wildlife habitat and other sites of natural or cultural value;

(d) links habitats, wildlife corridors, public open spaces and existing recreation facilities; and

(e) enables effective stormwater management.

Public open space reserves within the proposed subdivision have been designed to provide a range of open space typologies in each residential neighbourhood, including programmed play areas along with natural space and linear trails along easements. Public open space has also been designed to enhancing Spring Creek, and embrace the natural landscape of the site.

As discussed in ***Section 4.3*** above, public open space reserves have been designed to:

- Provide significant areas of open space (linear open space and public open space recreation) with a total of 73.57 hectares of land divested as open space reserve representing 39.5% of the site dedicated as open space (significantly exceeding the statutory requirements of 12.5%);
- Provide an integrated open space network that retains and enhances the key features of Springwood and defines its urban structure;
- Create strong connections between open space and key destinations i.e. schools, the village centre, open space reserves, Springwood Creek etc.;

- Recognise Springwood Creek as a key open space destination;
- Ensure open space is located within 200m of all residents and centrally within neighbourhoods - safe and easy to access;
- Incorporate drainage requirements integrated as part of the broader open space network;
- Ensure streets are located to capture views to open space;
- Enhance the quarry as a key landscape feature and distinctive backdrop to open space; and
- Give consideration to sustainability for future Council maintenance.

6.2.7 *Natural Resources & Conservation*

The more relevant provisions of the Gawler Development Plan relating to natural resources and conservation are reproduced and addressed below.

Conservation

OBJ 11 *Conservation, preservation, enhancement or improvement of scenically attractive areas, including land adjoining scenic routes and riverine environments.*

PDC 32 *The natural character of the North and South Para Rivers and Gawler River valleys should be retained and restored where affected by previous development.*

PDC 33 *Development should be undertaken with the minimum effect on natural features, land adjoining water or scenic routes or scenically-attractive areas.*

Land adjacent the South Para River and Spring Creek is proposed to be divested as open space reserve.

In addition, Spring Creek is proposed to be remediated to improve the ecology and biodiversity and control in stream velocities post development. This will include the creation of a sequence of rock riffles and pools along the base of Spring Creek to ensure long term erosion stability and robustness when the adjacent catchment is developed. These techniques would be designed to mimic natural waterway design and include:

- Incorporation of grade control structures (rock riffles);
- Ensuring velocities are managed appropriately to prevent bed and bank erosion;
- Revegetation to facilitate filtering, sediment deposition, nutrient uptake, erosion control, while also providing opportunities for increasing biodiversity and habitat value, and visual amenity; and
- Supplementary vegetation planting within the existing marsh using indigenous species (remnant species) to improve environmental value, mitigate flow velocity and improve the health of the marsh.

The natural character of the South Para River and Spring Creek will therefore be preserved and restored and these corridors will act as a distinctive green spine to the interlinked open space network.

Further, in accordance with Gawler Development Plan 'Conservation' principles of Development Control the Proposed Plans of division have been designed to provide significant areas of dedicated open space

(representing 39.5% of the site) that have been specifically designed and configured to preserve and assist with the regeneration of important vegetation communities including Iron-grass Temperate Grassland and Scattered Eucalyptus *porosa* (Mallee Box) trees.

In particular, the Stormwater Management Plan prepared by WGA attached in ***Appendix 10*** demonstrates that the iron-grass community will not be impacted by proposed stormwater infrastructure. It also demonstrates how the proposed stormwater infrastructure supports regeneration of this vegetation community via nomination of a potential future iron-grass colonisation area (refer to ***Section 4.6*** above).

In addition, the generous and diverse open space allocation offers the opportunity to plant larger legacy trees within the reserves and parklands. The river reserves provide the opportunity to restore the ecology of the remnant dominant plant associations including the Mallee Box Woodland and Eucalyptus *Camaldulensis* Open Woodland.

Restoring the traditional tree layer along the creek corridor will have a positive effect on restoring the ecology of the post productive landscape and strengthening the overall health of the regional river and creek system.

PDC 34 *Trees of historical or local significance and single trees or groups of trees of particular visual significance should be preserved and protected against disfigurement. If it is necessary to fell these trees, replanting should proceed as part of the development.*

PDC 37 *Native vegetation and roadside vegetation should be preserved and replanted with local indigenous species where practical and should not be cleared if it:*

(a) provides important habitat for wildlife;

(b) has a high plant species diversity or has rare or endangered plant species and plant associations;

(c) has high amenity value;

(d) contributes to the landscape quality of an area;

(e) has high value as a remnant of vegetation associations characteristic of a district or region prior to extensive clearance for agriculture;

(f) is associated with sites of scientific, archaeological, historic, or cultural significance; or

(g) is growing in, or is characteristically associated with, a wetland environment.

PDC 38 *Native vegetation should not be cleared if such clearance is likely to:*

(a) create or contribute to soil erosion;

(b) decrease soil stability and initiate soil slip;

(c) create, or contribute to, a local or regional soil salinity problem;

(d) lead to the deterioration in the quality of surface waters; or

(e) create or exacerbate the incidence or intensity of local or regional flooding.

PDC 39 *When clearance is proposed, consideration should be given to:*

(a) retention of native vegetation for, or as:

(i) corridors or wildlife refuges;

(ii) amenity purposes;

(iii) livestock shade and shelter; or

(iv) protection from erosion along watercourses and the filtering of suspended solids and nutrients from run-off;

(b) the effects of retention on farm management; and

(c) the implications of retention or clearance on fire control.

PDC 40 *Local indigenous plant species should be considered for landscaping, screening buffer planting and revegetation activities.*

6.2.8 Regulated & Significant Trees

The following provisions of the Gawler Development Plan are relevant to the assessment of the removal of Regulated and Significant Trees.

Significant Trees

OBJ 88*: Conservation of significant trees in Metropolitan Adelaide which provide important aesthetic and environmental benefit.*

PDC 322 *Where a significant tree:*

(a) makes an important contribution to the character or amenity of the local area; or

(b) is indigenous to the local area and/or a species is listed under the National Parks and Wildlife Act 1972 as a rare or endangered native species; or

(c) represents an important habitat for native fauna; or

(d) is part of a wildlife corridor of a remnant area of native vegetation; or

(e) is important to the maintenance of biodiversity in the local environment; or

(f) forms a notable visual element to the landscape of the local area;

development should preserve these attributes.

PDC 323 *Development should be undertaken with the minimum adverse affect on the health of a significant tree.*

PDC 324 *Significant trees should be preserved and tree-damaging activity should not be undertaken unless:*

(a) in the case of tree removal;

(1) (i) the tree is diseased and its life expectancy is short; or

(ii) the tree represents an unacceptable risk to public or private safety; or

(iii) the tree is within 20 metres of a residential, tourist accommodation or habitable building and is a bushfire hazard within a Bushfire Protection Area; or

(iv) the tree is shown to be causing or threatening to cause substantial damage to a substantial building or structure of value; and all other reasonable remedial treatments and measures have been determined to be ineffective.

(2) it is demonstrated that all reasonable alternative development options and design solutions have been considered to prevent substantial tree-damaging activity occurring.

(b) in any other case;

(i) the work is required for the removal of dead wood, treatment of disease, or is in the general interests of the health of the tree; or

(ii) the work is required due to unacceptable risk to public or private safety; or

(iii) the tree is within 20 metres of a residential, tourist accommodation or habitable building and is a bushfire hazard within a Bushfire Protection Area; or

(iv) the tree is shown to be causing, or threatening to cause damage to a substantial building or structure of value; or

(v) the aesthetic appearance and structural integrity of the tree is maintained; or

(vi) it is demonstrated that all reasonable alternative development options and design solutions have been considered to prevent substantial tree-damaging activities occurring.

PDC 325 *Development involving ground work activities such as excavation, filling, and sealing of surrounding surfaces (whether such work takes place on the site of a significant tree or otherwise) should only be undertaken where the aesthetic appearance, health and integrity of a significant tree, including its root system, will not be adversely affected.*

PDC 326 *Land should not be divided or developed where the division or development would be likely to result in a substantial tree-damaging activity occurring to a significant tree.*

Regulated Trees

OBJ 73*: The conservation of regulated trees that provide important aesthetic and/or environmental benefit.*

OBJ 74*: Development in balance with preserving regulated trees that demonstrate one or more of the following attributes:*

(a) significantly contributes to the character or visual amenity of the locality;

(b) indigenous to the locality;

(c) a rare or endangered species;

(d) an important habitat for native fauna.

PDC 224 *Development should have minimum adverse effects on regulated trees.*

PDC 225 *A regulated tree should not be removed or damaged other than where it can be demonstrated that one or more of the following apply:*

(a) the tree is diseased and its life expectancy is short;

(b) the tree represents a material risk to public or private safety;

(c) the tree is causing damage to a building;

(d) development that is reasonable and expected would not otherwise be possible;

(e) the work is required for the removal of dead wood, treatment of disease, or is in the general interests of the health of the tree.

PDC 226 *Tree damaging activity other than removal should seek to maintain the health, aesthetic appearance and structural integrity of the tree.*

As discussed in Section 4.9 above there are a total of 186 Regulated Trees and 160 Significant Trees across the subject site (i.e. 386 trees in total) and the majority of these trees (296 trees or 77%) are proposed to be retained across the site in open space reserves to be ultimately vested in Council.

A total of 47 Regulated Trees and 40 Significant Trees are proposed to be removed (87 trees in total representing 23% of all Regulated and Significant trees on site). The trees are proposed to be removed to accommodate the proposed subdivision and future development including the requirement to undertake bulk earthworks.

Approximately 37 trees (over 43%) that are proposed to be removed comprise self-seeded re-growth on uncontrolled fill from the historic quarry that operated in the north western corner of the site. This uncontrolled fill is required to be removed and compacted to accommodate future site development and therefore the removal of these trees is unavoidable.

The proposed removal of Regulated and Significant Trees should be assessed in the context that 73.57 hectares of land (or 39.5% of the site) is proposed to be divested as open space reserve with significant areas allocated for the preservation of Mallee Box Woodland and Iron-Grass (*Lomandra*) Temperate Grassland.

6.2.9 Services and Infrastructure

The following provisions of the Residential (Gawler East) Zone of the Gawler Development Plan are relevant with respect to the provision and management of required services infrastructure.

Residential (Gawler East) Zone

PDC 11 *Public lighting should be provided to all public roads, laneways, paths and open spaces.*

PDC 15 *Transmission lines should be protected from encroachment through the provision of:*

(a) a 30 metre wide corridor (15 metres each side from the centreline) for the 132kV line;

(b) a 50 metre wide corridor (25 metres each side from the centreline) for the 275kV line.

PDC 16 *Residential allotments should not be created within the Major Transmission Infrastructure Corridors shown on Structure Plan Map Ga/1 (Overlay 1) Enlargement G, or within the existing easements for the 132kV and 275kV transmission lines.*

It is noted that no allotments have been proposed within the 275 kV transmission easement area. Short sections of road, perpendicular to the transmission line, have been proposed to cross beneath the alignment and these would be designed to the minimum vertical and horizontal clearances required by ElectraNet. Development within this easement would consist of mainly landscape/ open space areas in order to comply with the requirements set out in ElectraNet's '*Land Use Guidelines for Electricity Transmission Corridors*,' 2013.

No allotments have been proposed within the 132 kV transmission easement area. A new road is proposed to run parallel to this transmission line (south from Cheek Avenue and beyond the Gawler East Link Road) and the alignment for this road has been determined by applying the minimum clearance requirements set out in ElectraNet's '*Land Use Guidelines for Electricity Transmission Corridors,'* 2013;

A minimum 15m horizontal clearance can be achieved between future street lighting and the existing transmission lines based on the chosen road alignments.

The following Council Wide provisions of the Gawler Development Plan are relevant with respect to the provision and management of required services infrastructure.

Form of development

PDC 63 *Development should be supplied with adequate energy, water, waste disposal and drainage facilities to serve the needs of users.*

Infrastructure

OBJ 36 *Infrastructure provided in an economical and environmentally sensitive manner.*

OBJ 37 *Infrastructure, including social infrastructure, provided in advance of need.*

OBJ 38 *Suitable land for infrastructure identified and set aside in advance of need.*

OBJ 39 *The visual impact of infrastructure facilities minimised.*

OBJ 40 *The efficient and cost-effective use of existing infrastructure.*

OBJ 41 *The protection of existing infrastructure.*

PDC 94 *Development should only occur only where it provides, or has access to, relevant easements for the supply of infrastructure.*

PDC 98 *In areas where no reticulated water supply is available, buildings whose usage is reliant on a water supply should be equipped with an adequate and reliable on-site water storage system.*

PDC 100 *Electricity infrastructure should be designed and located to minimise its visual and environmental impacts.*

Waste

PDC 397 *Artificial wetland system for the storage of treated wastewater, such as wastewater lagoons, should be:*

(a) sufficiently separated from adjoining sensitive uses to minimise potential adverse odour impacts;

(b) sited and designed to minimise potential public health risks arising from the breeding of mosquitoes.

PDC 398 *Development that produces any sewage or effluent should be connected to a waste treatment system that complies with (or can comply with) the relevant public and environmental health legislation applying to that type of system.*

PDC 399 *The methods for, and siting of, effluent and waste storage, treatment and disposal systems should minimise the potential for environmental harm and adverse impacts on:*

(a) the quality of surface and groundwater resources;

(b) public health;

(c) the amenity of a locality;

(d) sensitive land uses.

PDC 400 *Waste treatment should only occur where the capacity of the treatment facility is sufficient to accommodate likely maximum daily demands including a contingency for unexpected high flows and breakdowns.*

PDC 401 *Any on-site wastewater treatment system/ re-use system or effluent drainage field should be located within the allotment of the development that it will service.*

PDC 402 *A dedicated on-site effluent disposal area should not include any areas to be used for, or could be reasonably foreseen to be used for, private outdoor open space, driveways, car parking or outbuildings.*

WGA have prepared a 'Site Services Report' for the subject site (***Appendix 11***) which demonstrates that the development can be efficiently and economically serviced by essential infrastructure and services subject to the augmentation requirements of the various infrastructure providers.

6.2.10 Stormwater

The following Council Wide provisions of the Gawler Development Plan are relevant with respect to stormwater management and the protection, enhancement and remediation of important local environmental values.

Residential (Gawler East) Zone

PDC 14 *Detention and/or retention basins should incorporate good design techniques that:*

(a) allow sediments to settle so as to treat stormwater prior to discharge into watercourses or the marine environment;

(b) ensure human health and safety, particular with respect to high velocity drainage points;

(c) ensures the control of mosquitoes and nuisance insects (eg midges); and

(d) where wetlands are used for the cleaning of stormwater it is advisable that the storage is able to retain the 25 year, 24 hour rainfall event.

Form of development

PDC 58 *Urban development should be confined to areas within the urban boundary of Metropolitan Adelaide and be based on principles of ecologically sustainable development (ESD) that includes water sensitive urban design (WSUD), energy efficiency, biodiversity protection and enhancement, natural resource protection, waste, minimisation, indoor and outdoor environmental quality and sustainable selection and use of materials.*

Natural Resources

OBJ 52 *Retention, protection and restoration of the natural resources and environment.*

OBJ 54 *The ecologically sustainable use of natural resources including water resources, ground water, surface water and watercourses.*

OBJ 55 *Natural hydrological systems and environmental flows reinstated, and maintained and enhanced.*

OBJ 56 *Development consistent with the principles of water sensitive design.*

OBJ 57 *Development sited and designed to:*

(a) protect natural ecological systems;

(b) achieve the sustainable use of water;

(c) protect water quality, including receiving waters;

(d) reduce runoff and peak flows and prevent the risk of downstream flooding;

(e) minimise demand on reticulated water supplies;

(f) maximise the harvest and use of stormwater;

(g) protect stormwater from pollution sources.

OBJ 58 *Storage and use of stormwater which avoids adverse impact on public health and safety.*

OBJ 59 *Native flora, fauna and ecosystems protected, retained, conserved and restored.*

OBJ 60 *Restoration, expansion and linking of existing native vegetation to facilitate habitat corridors for ease of movement of fauna.*

OBJ 61 *Minimal disturbance and modification of the natural landform.*

OBJ 62 *Protection of the physical, chemical and biological quality of soil resources.*

OBJ 63 *Protection of areas prone to erosion or other land degradation processes from inappropriate development.*

PDC 144 *Development should be undertaken with minimum impact on the natural environment, including air and water quality, land, soil, biodiversity, and scenically attractive areas.*

PDC 145 *Development should ensure that South Australia's natural assets, such as biodiversity, water and soil, are protected and enhanced.*

PDC 146 *Development should not significantly obstruct or adversely affect sensitive ecological areas such as creeks and wetlands.*

PDC 147 *Development should be appropriate to land capability and the protection and conservation of water resources and biodiversity.*

PDC 148 *Development should be designed to maximise conservation, minimise consumption and encourage reuse of water resources.*

PDC 149 *Development should not take place if it results in unsustainable use of surface or underground water resources.*

PDC 150 *Development should be sited and designed to:*

(a) capture and re-use stormwater, where practical;

(b) minimise surface water runoff;

(c) prevent soil erosion and water pollution;

(d) protect and enhance natural water flows;

(e) protect water quality by providing adequate separation distances from watercourses and other water bodies;

(f) not contribute to an increase in salinity levels;

(g) avoid the water logging of soil or the release of toxic elements;

(h) maintain natural hydrological systems and not adversely affect:

(i) the quantity and quality of groundwater;

(ii) the depth and directional flow of groundwater;

(iii) the quality and function of natural springs.

Residential Stormwater Management

PDC 250 *Land division design should:*

(a) facilitate major storm drainage system to safely convey major stormwater flows;

(b) incorporate where practicable, provision for on-site stormwater detention, retention and use (including, where practicable, the collection and storing of water from roofs and communal car parks in appropriate devices);

(c) provide for on-site infiltration, where practicable, having regard to:

(i) availability of unsealed areas or areas which are not built-up;

(ii) the capacity of soils to absorb water;

(iii) the capacity of building footings on and adjacent to the site to withstand the likely effects of retained water; and

(iv) potential adverse impacts on the level of groundwater;

(d) allow convenient access to all components of the drainage system for maintenance purposes and not cause damage or nuisance flows on the site or onto adjoining properties.

PDC 251 *Land division design should integrate major storm drainage system with:*

(a) creeks and vegetation;

(b) sports grounds and other types of low flood sensitive land uses;

(c) detention and retention basins, where required;

(d) improvements to residential amenity; and

(e) the open space system and provides recreational opportunities.

PDC 252 *Land division design should facilitate a minor storm drainage system which:*

(a) does not overload adjoining downstream systems; and

(b) where practicable, provides for stormwater flows to be detained and retained close to its source.

Residential Water Quality Management

PDC 253 *Land division design should facilitate a storm drainage system that:*

(a) maximises the interception, retention and removal of water-borne pollutants (including sediment, litter, nutrients, microbial contaminants and other potential toxic materials) prior to their discharge to receiving water, whether surface or underground;

(b) ensures the continuation of or assisting in the establishment of healthy and diverse wetland environments; and

(c) minimises the potential for sewage overflows to enter the system.

Residential Stormwater Use

PDC 254 *Land division design should, where practicable, facilitates stormwater systems, providing the community with non-potable water to reduce mains water consumption, by collecting, applying physical treatment to, and storing and retrieving storm run-off for subsequent use.*

WGA have prepared a stormwater management plan and strategy that achieves stormwater quantity and quality standards while also ensuring that post development erosion risks would be appropriately addressed to protect and improve habitat values across the project (refer to ***Appendix 10***). This strategy applies environmental stormwater management practices in the form of Water Sensitive Urban design (WSUD) to manage stormwater quality and frequent flow runoff from the proposed urban development.

The strategy has been designed in consultation with the Department for Environment and Water (DEW) and the Environment Protection Authority (EPA) and is also based on direct engagement with the Town of Gawler representatives including consideration of draft studies provided by Council. It has also been designed in response to the 'Conservation' Principles of the Gawler Development Plan and includes:

- Constructed wetland systems accommodating extended detention storages to treat and manage quality and quantity of stormwater;
- Remediation of Spring Creek along the degraded sections to improve the ecology & biodiversity and control in stream velocities post development (including the creation of a sequence of rock riffles and pools along the base of Spring Creek to ensure long term erosion stability and robustness when the adjacent catchment is developed);

- The integration of stormwater infrastructure features into passive recreation uses for community benefit and visual interest;
- Using the treatment train approach to stormwater management through the inclusion of:
  - Trash rack within Spring Creek to provide a regional scale trap to facilitate interception of debris and coarse sediments;
  - Wetland ponds, wetland systems, biofiltration basin, rain gardens and ecological sponge systems;
  - Infiltration wells for rear of allotments (where these back onto gullies and Spring Creek);
  - Infiltration wells are designed to cater for roof runoff only and incorporate trickle flow outlets to ensure storages are available to mitigate frequent rain events;
  - Linear wetland pools and reed beds (macrophyte zones) integrated into the base of Spring creek;
  - Each stormwater management system is designed to incorporate frequent flow management into their extended detention zone;.
- Preservation of the Nationally Threatened iron-grass community and ensuring that the stormwater strategy does not encroach on this area and supports planning for regeneration of this area;
- Preservation of remnant vegetation areas and faunal group habitats and through additional planting with indigenous species of local provenance to enhance degraded areas;
- Protection of areas of high biological value, including the retention of trees and planting for appropriate regeneration, particularly as part of the waterway remediation and stormwater treatment elements; and
- Mitigation of the 1% AEP post development flow from the overall proposed catchment down to the 1% AEP pre-development flow rate, with the resulting outcomes:
  - A storage volume of 18ML;
  - No existing iron-grass communities inundated in storm events of less than 0.5 EY (equivalent to a 2 – year ARI);
  - Storage is achieved within Spring Creek without the requirement to excavate or disturb the existing profile and vegetation of the Creek (the disturbance is confined to the footprint of the new road crossing only and the culvert crossing would be designed using environmental principles and incorporate fish passage through the design of a partially submerged culvert).

6.2.11 Earthworks and Remediation

The Residential (Gawler East) Zone in the Gawler Development Plan includes a specific principle of Development Control that the filling of land is anticipated when in association with the remediation and development of the former quarry site (sand mine) and where the retaining is not directly visible from a public road.

Residential (Gawler East) Zone

PDC 25 *Filling of land exceeding 1.0 metre in height is appropriate where both of the following can be achieved:*

(a) it is associated with the remediation and development of the former quarry site;

(b) consequential retaining is not directly visible from a public road.

The abandoned sand mine includes a pit (up to about 25 m deep), with various spoil piles of overburden material (up to approximately 10m high) and several slimes pits (unconsolidated and saturated fines from sand washing activities) up to 6m deep. In order to achieve the required future landform, significant earthworks will be required at the sand mine site which would be resolved via detailed design to ensure the land is suitable to support residential, educational and commercial buildings, as well as road pavements.

It is anticipated that earthworks will be undertaken at the sand mine site in order to achieve the required landform. Any surplus material as result of staged earthworks could be placed directly into the mine site as part of the rehabilitation of the mine.

The bulk earthworks required would include:

- Backfilling the deeper sections of the former sand extraction pit with engineered fill (with fill material sourced both from within the existing mine site as well as surplus material generated from the construction of subdivision stages around the broader development);
- Excavating the natural ground at the crest of the sand pit high wall;
- Reworking areas of non-engineered fill (spoil piles); and
- Excavating slime pits and backfilling with engineered fill.

The intention is that only site materials (surficial clays, Tertiary aged sand and weathered rock) from across the proposed Development would be incorporated in the engineered fill. The slimes can potentially be dried back and blended with other materials prior to re-use.

Prior to the commencement of remediation works, a technical specification relating to fill placement and construction overview would be developed based on relevant Australian Standards, such as AS3798 "*Guidelines on earthworks for commercial and residential developments*."

In accordance with Zone PDC 25 excess cut material on site could therefore be used to successfully remediate the existing sand mine quarry in the north-western corner of the site.

7. Conclusion

The proposed Plans of Division seek to divide land creating 1,415 allotments within the 'Residential (Gawler East) Zone' and 'Open Space Zone' of both the Gawler (CT) Development Plan and The Barossa Council Development Plan.

Land division is necessary to implement envisaged future use of the land for residential, commercial and educational purposes as well as public open space.

Following an inspection of the subject site and locality, a review of the proposed plans and associated documentation accompanying the application and a detailed assessment of the proposed development against the relevant provisions of the Gawler and Barossa Development Plan, we are of the opinion that the proposed development represents appropriate and orderly development that deserves favourable consideration for approval. More specifically:

- The proposal is for the purposes of future residential, commercial an educational **land uses** as well as public open space in accordance with:
  - The 'Open Space Zone', 'Residential (Gawler East) Zone' and 'Mixed Use Centre Policy Area 3' of the Gawler (CT) Development Plan; and
  - The 'Open Space Zone' and the 'Residential (Gawler East) Zone' of The Barossa Council Development Plan;
- The proposal addresses the development outcomes sought by the '*Gawler East Structure Plan MAP Ga/1 (Overlay 1) Enlargement G'* of the Gawler (CT) Development Plan and '*Concept Plan Baro/15 Gawler East*' of The Barossa Council Development Plan;
- A **range of allotment sizes** have been provided to cater for a variety of housing needs, while also providing the opportunity for medium density and affordable housing to be established on the land within the 'Mixed Use Centre Policy Area 3' and in proximity to public open space;
- Proposed **allotments have been designed** with a suitable size, shape and configuration and with an appropriate gradient to accommodate future intended land uses and development;
- The proposed sub-division incorporates 73.57 hectares of land divested as **open space reserve** (representing 39.5% of the site) significantly exceeding the statutory requirement of 12.5% and designed:
  - With a range of open space typologies to allow future residents to enjoy formal active recreation, age group specific play spaces, informal play spaces and natural environment systems along Spring Creek and the South Para River;
  - To provide an integrated open space network that retains and enhances the key features of the site and defines its urban structure;

  - To create strong connections between open space and key destinations (i.e. schools, the village centre, open space reserves, Spring Creek etc.);
  - To recognise Spring Creek as a key open space destination;
  - To ensure open space is located within 200m of all residents and centrally within neighbourhoods - safe and easy to access;
  - With drainage requirements integrated as part of the broader open space network;
  - To ensure streets are located to capture views to open space; and
  - To enhance the quarry as a key landscape feature and distinctive backdrop to open space.
- The proposed Plans of Division retain the majority of **Regulated and Significant Trees** (296 trees or 77%) in open space reserves and only seeks removal of 47 Regulated Trees and 40 Significant Trees (87 trees in total) to accommodate the proposed subdivision and associated bulk earth works (noting that 43% of the proposed trees to be removed comprise self-seeded re-growth on uncontrolled fill from the historic quarry that operated in the north western corner of the site);
- A **Preliminary Site Investigation (PSI)** has been prepared by LBWco to identify any potentially contaminating activities (PCAs) that may impact upon the proposed future land uses on the site and based on the finding of these independent investigations:
  - The applicant would accept a suitable and appropriate condition of approval that Section 51 clearance not be provided for each application over land located in APEI 6, 7, 10, and 11 (i.e. DA490/D025/19 and DA490/D027/19) until such time as a 'Site Contamination Audit Report' (SCAR) has been provided by an accredited Site Contamination Auditor confirming that the land is suitable for its intended use; and
  - No further environmental investigations are warranted for each application over land located in APEIs 1-5, 8, 9, or 12-14 (i.e. the majority of the site) and therefore it is not proposed to appoint a Site Contamination Auditor for the balance of allotments in these areas (i.e. DA960/D025/19, DA490/D026/19 or DA490/D028/19.
- With respect to the **SEA Gas Pipeline**:
  - A Safety Management Study (SMS) workshop was carried out in 2017 to assess the relationship between the Springwood Master Plan and the SEA Gas Pipeline and the findings of the SMS were taken into consideration throughout the master planning process to assist the pipeline operator to meet its obligations under '*AS 2885.2008, Pipelines – Gas and Liquid Petroleum*';
  - The proposed subdivision layout has been designated to incorporate a minimum 45 metre buffer zone between the vent stack and the nearest residence (as a noise protection measure, and as a hazardous area exclusion zone to remove ignition sources from the area); and

  - The Emergency Vent for the SEA Gas pipeline should incorporate a buffer zone of approximately 220m to residential development and given this buffer zone would currently sit outside of the existing SEA Gas easement we understand that it is the intention of SEA Gas to therefore relocate this vent to ensure its ongoing compliance with AS2885;

- No allotments have been proposed within the 275 kV or 132 kV **transmission easement areas** and all roads and infrastructure in these areas will be designed to the minimum vertical and horizontal clearances required by ElectraNet in order to comply with the requirements set out in ElectraNet's '*Land Use Guidelines for Electricity Transmission Corridors*,' 2013.
- The proposed Plans of division have been designed to protect against **bushfire** and bushfire risk with:
  - Areas of high bushfire risk proposed to be retained in public open space reserves and not developed for residential purposes;
  - A high proportion of land divested as public open space reserve is accessible via perimeter roads which separates vegetation from future dwellings and provides vehicle access to vegetated areas for fire-fighting and other emergency vehicles; and
  - A permeable road network is proposed and provides two-way vehicular access between areas of fire risk noting that an emergency fire access is also proposed to link the south-eastern portion of the site to Balmoral Track (to enable alternative access to the east if the collector roads to the west of this precinct is not accessible);
- The proposed Plans of Division have been designed to accommodate safe and convenient **vehicle access, circulation and linkages** to the surrounding road network and has been designed:
  - With a road layout that is permeable, easy to navigate and well-connected to the surrounding environment with a new Collector Road network that will provide accessibility around and through the site for daily traffic, public transport, pedestrian and cyclists demands and that is designed in accordance with '*Gawler East Structure Plan MAP Ga/1 (Overlay 1) Enlargement G*' of the Gawler (CT) Development Plan;
  - With local streets that will comprise single carriageway roads and laneways which will provide appropriate two-way access and on-street parking (not laneways) suitable for the proposed residential density;
  - To facilitate safe access with multiple access road routes generally in the event of an emergency (although the southern portion will require an access track linkage to Balmoral Road given the lack of alternative routes to emergency access due to terrain and private property to the west);
  - With a road network that will cater for occasional service vehicles including waste collection, maintenance and delivery vehicles;

  - With traffic volumes on the internal and external roads adjacent the site that will remain within acceptable levels for operational capacity, and will be managed by pre-planned external infrastructure upgrades at a number intersections based on an agreement between the developer, Council and DPTI; and
  - With planned infrastructure upgrades at intersections and road segments that will ameliorate the impact of the development on the surrounding community and road network;

- The proposed **stormwater management strategy**:
  - Incorporates regional flood detention storage to manage the pre-and post-development flows for the proposed urban development catchment and achieves mitigation of the 1% AEP post development flow from the overall proposed catchment down to the 1% AEP pre-development flow rate;
  - Applies Water Sensitive Urban design (WSUD) techniques to manage stormwater quality and frequent flow runoff from the proposed urban development;
  - Incorporates wetland systems accommodating extended detention storages to treat and manage quality and quantity of stormwater;
  - Remediates Spring Creek along the degraded sections to improve the ecology & biodiversity and control in stream velocities post development (including the creation of a sequence of rock riffles and pools along the base of Spring Creek to ensure long term erosion stability and robustness when the adjacent catchment is developed);
  - Integrates stormwater infrastructure features into passive recreation uses for community benefit and visual interest;
  - Utilises the treatment train approach to stormwater management through the inclusion of:
    - Trash rack within Spring Creek to provide a regional scale trap to facilitate interception of debris and coarse sediments;
    - Wetland ponds, wetland systems, biofiltration basin, rain gardens and ecological sponge systems;
    - Infiltration wells for rear of allotments (where these back onto gullies and Spring Creek);
    - Infiltration wells are designed to cater for roof runoff only and incorporate trickle flow outlets to ensure storages are available to mitigate frequent rain events;
    - Linear wetland pools and reed beds (macrophyte zones) integrated into the base of Spring creek; and
    - Each stormwater management system is designed to incorporate frequent flow management into their extended detention zone.

  - » Preserves a Nationally Threatened iron-grass community and ensuring that the stormwater strategy does not encroach on this area and supports planning for regeneration of this area;
  - » Protects areas of high biological value, including the retention of trees and planting for appropriate regeneration, particularly as part of the waterway remediation and stormwater treatment elements;
- In accordance with Zone PDC 25 excess cut material can be used as engineered fill on site to successfully **remediate the existing sand mine quarry** in the north-western corner of the site; and
- The development can be efficiently and economically serviced by essential **infrastructure and services**, subject to the augmentation requirements of the various infrastructure providers.

Therefore, the proposed development closely adheres to the most relevant provisions of the Gawler and The Barossa Council Development Plan and warrants Development Plan Consent, subject to reasonable and relevant conditions.

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Appendix 1. Land Tenure Plan & Certificates of Title

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Appendix 2. Plan of Division (combined) & Staging Plan (Alexander Symonds)

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Appendix 3. Plan of Division (DA490/D026/19 & DA960/D025/19)

(Alexander Symonds)

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Appendix 4. Plan of Division (DA490/D028/19)

(Alexander Symonds)

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Appendix 5. Plan of Division (DA490/D025/19)

(Alexander Symonds)

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Appendix 6. Plan of Division (DA490/D027/19)

(Alexander Symonds)

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Appendix 7. Springwood Master Plan (Tract)

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Appendix 8. Traffic Impact Assessment (GTA)

ekistics

Appendix 9. Flora & Fauna Assessment

(EBS & KBR)

ekistics

Appendix 10. Stormwater Management Plan (WGA)

ekistics

Appendix 11. Site Services Report (WGA)

ekistics

Appendix 12. Roads & Earthworks Report (WGA)

ekistics

Appendix 13. Regulated & Significant Tree Removal

Alexander Symonds

ekistics

Appendix 14. Preliminary Site Investigation (LBWco)

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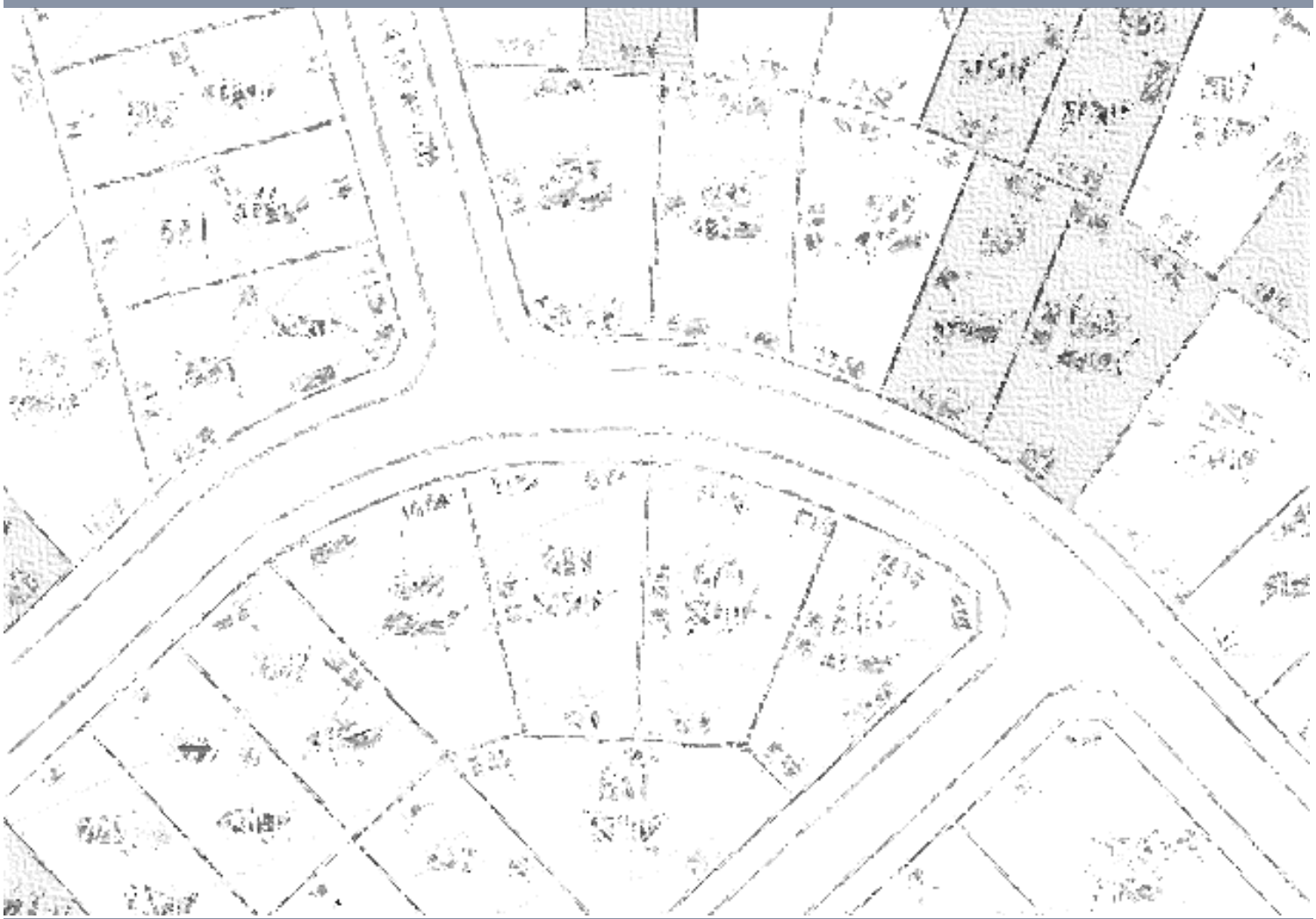
Appendix 15. Legal Opinion

(Botten Levinson Lawyers)

Springwood Land Division

Gawler East
Transport Impact Assessment



Prepared by: GTA Consultants (SA) Pty Ltd for Springwood Project Management Pty Ltd

on 13/06/19

Reference: S165350

Issue #: A

GTAconsultants

Springwood Land Division

Gawler East
Transport Impact Assessment

Client: Springwood Project Management Pty Ltd

on 13/06/19

Reference: S165350

Issue #: A

Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
A	13/06/19	Final	Paul Morris	Paul Morris	Paul Morris	

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1. INTRODUCTION

01

1.1. Background

A Development Application is currently being sought for a proposed residential subdivision development on land located at Calton Road in Gawler East. The proposed development incorporates approximately 1,400 residential allotments, a school, retail and commercial developments, and a new road network within the site.

GTA Consultants was commissioned by Springwood Development Nominees Pty Ltd to undertake a transport impact assessment of the proposed development.

1.2. Purpose of this Report

This report sets out an assessment of the anticipated transport implications of the proposed development, including consideration of the following:

1. Existing traffic and parking conditions surrounding the site
2. Parking demand likely to be generated by the proposed development
3. Suitability of the proposed parking in terms of supply (quantum) and layout
4. Traffic generation characteristics of the proposed development
5. Proposed access arrangements for the site
6. Transport impact of the development proposal on the surrounding road network.

1.3. References

In preparing this report, reference has been made to the following:

- Town of Gawler Development Plan (consolidated 20 February 2018);
- The Barossa Council Development Plan (consolidated 1 November 2018);
- Australian Standard/ New Zealand Standard, Parking Facilities, Part 1: Off-Street Car Parking AS/NZS 2890.1:2004
- Australian Standard, Parking Facilities, Part 2: Off-Street Commercial Vehicle Facilities AS 2890.2:2002
- Australian Standard / New Zealand Standard, Parking Facilities, Part 6: Off-Street Parking for People with Disabilities AS/NZS 2890.6:2009
- Plans for the proposed development prepared by Alexander Symonds
- Other documents as nominated.

2. EXISTING CONDITIONS

02

2.1. Subject Site

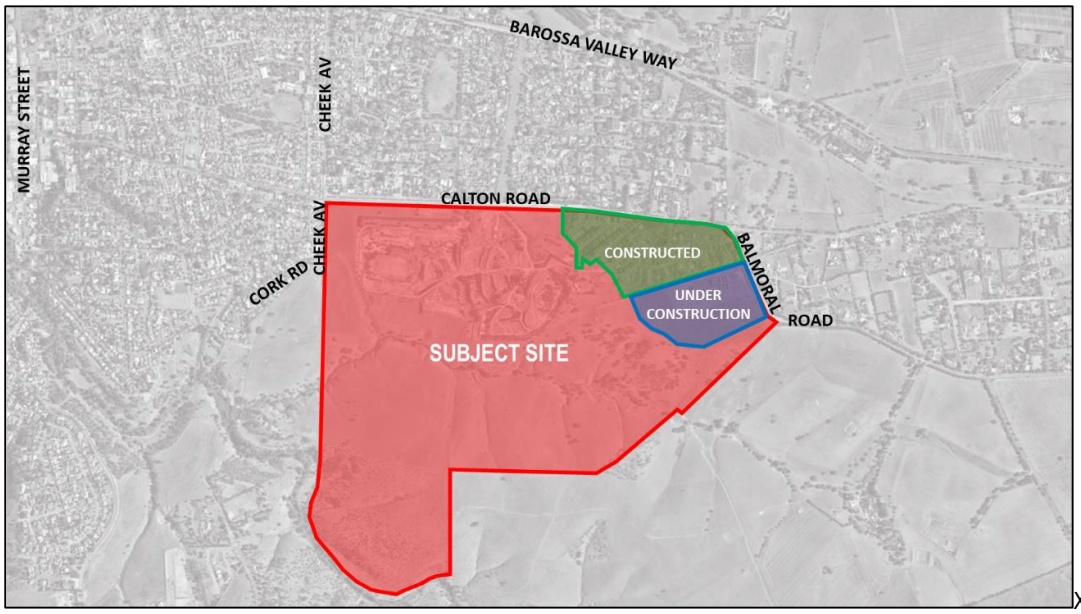
The subject site (Springwood) is located to the south of Calton Road in Gawler East. The site of approximately 186 hectares is situated between Cheek Avenue and Balmoral Road. The site has frontages of approximately 1.74km to Calton Road, 438 metres to Balmoral Road and 235 metres to Cheek Avenue.

The site is located within a residential zone and for the most part, is currently occupied by agricultural land. A small section of the site of approximately 20.2 ha located at the north eastern corner has been developed for residential use. A further 7.7ha on the eastern side has received development consent for residential use and is currently under construction.

The site is surrounded by residential land use to the west and north and agricultural land uses to the south.

The location of the subject site and the surrounding environs is shown in Figure 2.1.

Figure 2.1: Subject Site and its Environs



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(PhotoMap courtesy of NearMap Pty Ltd)

2.2. Road Network

2.2.1. Adjoining Roads

Calton Road

Calton Road is a collector road providing east-west access from the Gawler central business district to the west, and rural regions to the east. The road comprises a two-way, two-lane carriageway approximately 6.8 metres wide with a lane of traffic in either direction. The carriageway is set within a reserve at least 16 metres wide. The road is under the care and control of the Town of Gawler between the town centre and Sunnydale Avenue. East of Sunnydale Avenue, the road is under the care and control of The Barossa Council.

Traffic volumes on Calton Road are approximately 8,600 vehicles per day to the west of the site, and 3,500 vehicles per day at the east of the site.

Easton Drive

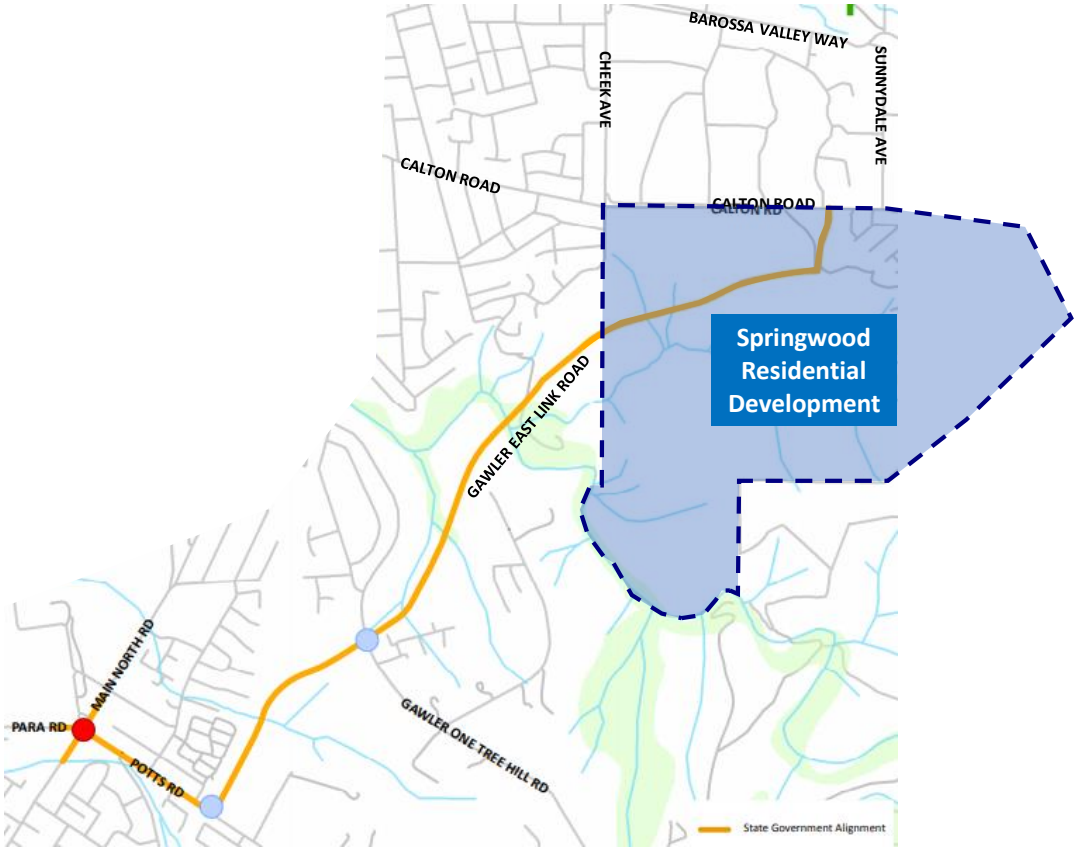
Easton Drive is a collector street comprising a single carriageway approximately 7.5 metres wide. Based on approval for 218 dwellings (not including those fronting Calton Road) in the currently approved stages in Springwood, it is predicted a traffic volume of approximately 1,800 vehicles per day when the currently approved development is complete and occupied (including Highfield stages).

Gawler East Link Road

The Springwood development located in Gawler East will provide the terminus of the Gawler East link Road as part of its road network with the GELR linking to Calton Road. The Gawler East Link Road is a new sub-arterial road that will provide a link for traffic to the east of the Gawler town centre between Calton Road in Gawler East to Main North Road in Evanston. This road will service both the existing and future communities of the Gawler East development zone and beyond, as well as reduce the impact of traffic generated from growth on the Gawler Town Centre.

The GELR will pass through the proposed Springwood town centre located 200 metres to the south of Calton Road. Further development of Springwood will see the GELR become part of the Springwood collector road network with a new four-way intersection proposed in the town centre. The intersection will be developed as part of the urban design and placemaking for the town centre and will provide key pedestrian access in the town centre. The intersection is proposed to be signalised.

Figure 2.2: Gawler East Link Road Future Alignment.



(Source: Extract from Gawler East Link Road Project Approved Alignment produced by DPTI)

Balmoral Road

Balmoral Road is a collector road connecting Calton Road to Williamstown Road and is under the care and control of the Barossa Council. Within the vicinity of the site, the road comprises a two-way, two-lane carriageway approximately 6.6 metres wide with a lane of traffic in either direction. The carriageway is set within a road reserve approximately 17 metres wide.

The traffic volume on Balmoral Road is estimated at approximately 3,500 vehicles per day.

Cheek Avenue

Cheek Avenue is a local road providing access to existing residential properties and is under the care and control of the Town of Gawler. Cheek Avenue links between Calton Road and Barossa Valley Way to the north. Within the vicinity of the site, on the south side of Calton Road, Cheek Avenue comprises a two-way, two-lane carriageway approximately 7.4 metres and is set within a reserve approximately 18 metres wide.

Traffic volumes on Cheek Avenue north of the site are approximately 2,000 vehicles per day.

2.2.2. Surrounding Intersections

The following intersections currently exist in the vicinity of the site:

- Calton Road / Cheek Avenue (unsignalised)
- Popham Avenue / Cheek Avenue (unsignalised)
- Quarton Street / Cheek Avenue (unsignalised)
- Calton Road / Melaleuca Drive (unsignalised)
- Calton Road / Stithians Drive (unsignalised)
- Calton Road / Philips Avenue (unsignalised)
- Calton Road / Sunnydale Avenue (unsignalised)
- Calton Road / Easton Drive (unsignalised)
- Calton Road / Balmoral Road (unsignalised)

2.2.3. Crash Data

Crash data for the most recent five-year period (2013-2017) was obtained from DPTI and is shown in Figure 2.3 and the crash types and severity are summarised in Table 2.1.

Figure 2.3: Crash Data (2013-2017)

Table 2.1: Summary of Road Crashes

Location	Crash Type	Severity
Calton Road / Cheek Avenue	3 x Right Angle	Property Damage Only
Calton Road / Sithians Road	2 x Rear End	Property Damage Only
Calton Road / Philips Avenue	1 x Rear End	Property Damage Only
Midblock (Sunnydale Drive to Easton Avenue)	1 x Rear End	Property Damage Only
Calton Road / Easton Drive	1 x Rear End	Property Damage Only
Calton Road / Balmoral Avenue	2 x Rear End	Property Damage Only
Balmoral Avenue, Curve to the west of site	1 x Hit Fixed Object	Property Damage Only

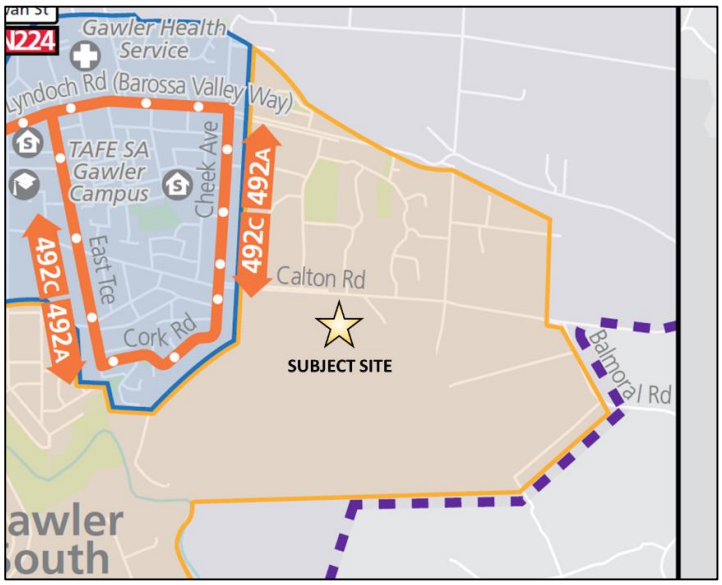
The most common type of crash occurring at intersections along Calton Road is rear end followed by right angle crashes which only occurred at the intersection of Calton Road and Cheek Avenue. All crashes resulted in property damage only to the vehicles involved.

2.3. Sustainable Transport Infrastructure

2.3.1. Public Transport

Figure 2.4 shows the subject site in relation to existing public transport routes within its vicinity.

Figure 2.4: Public Transport Map



There are currently no public transport services along Calton Road, adjacent to the site. Services may run along the Gawler East Link, however there is no publicly available information at present to indicate if this will be the case.

The closest service is the 492A and 492C – Gawler East Circuit which passes along Cheek Avenue connecting to Gawler Town Centre and Railway Station. The nearest public transport stops to the site are located on Cheek Avenue approximately 154 metres and 170 metres north and south of Calton Road respectively.

2.3.2. Pedestrian Infrastructure

Pedestrian paths are provided on the west side of Cheek Avenue but are not provided along any other roads bounding the site.

2.3.3. Cycle Infrastructure

There are no formal cycle facilities provided on or off-road within the vicinity of the site.

3. DEVELOPMENT PROPOSAL

03

3.1. Land Uses

The proposed land division will include the following:

- Approximately 1,400 residential allotments
- Town Centre comprising 7 allotments to include commercial/retail uses including shopping centre, child care, and other retail/commercial uses
- An allotment to the west for a school (approximately 1,000 children)
- Local road network providing collector, street and laneway functions, with connectivity through the western, northern and eastern portions of the site to the existing road network (and future Gawler East Link Road).

A site layout plan is shown in Figure 3.1.

Figure 3.1: Site Layout Plan

4. STREET LAYOUT

04

4.1. Site Access

Access to the development site will generally be limited to the proposed collector road and/or GELR network as follows:

1. New link at Cheek Avenue and Calton Road intersection;
2. Calton Road at the proposed town centre;
3. Collector Road (in previous approved Highfield precinct) to Balmoral Road
4. Gawler East Link Road (GELR) to west of site

However local streets access is proposed at the following locations:

5. Two local street junctions on Calton Road between Cheek Avenue and Calton Collector Road;
6. One local street access to Cheek Avenue south for residential access.

Emergency fire access has been considered as follows:

7. Emergency access (in the event of bush fire) is proposed to link the south-eastern portion of the site to Balmoral Track to enable alternative access to the east if the collector roads to the west of this precinct is not accessible.

These are shown in Figure 4.1.

Figure 4.1: External Access for Proposed Subdivision

The upgrades for the external access points for the proposed subdivision has been considered in line with the Town of Gawler Gawler East Interventions Assessment Report (Tonkin Consulting, June 2018). Details of each location is referenced in Section 6.5.

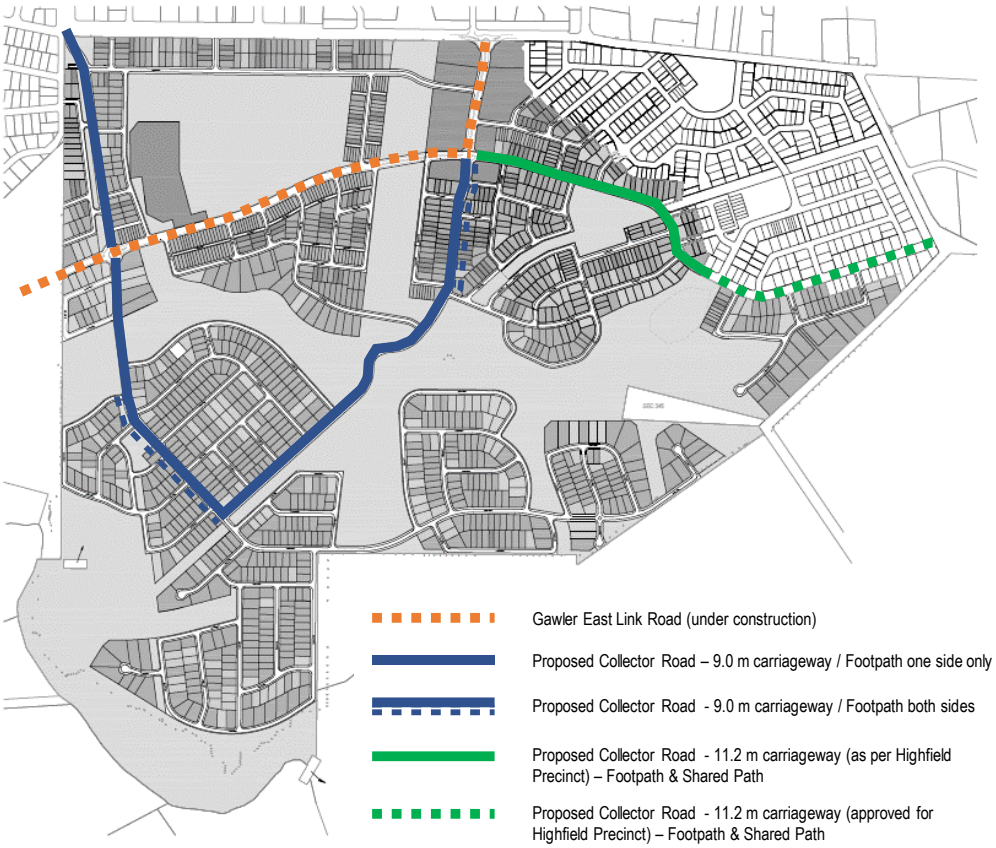
4.2. Local Collector Roads

A collector road network will be developed within the site based on integration with the Gawler East Link Road and collector roads developed for the previous development in the site (Springwood Highfield precinct).

The Gawler East Link Road is under construction between the western boundary of the site and it's link to Calton Road. The GELR will provide a travelling lane in each direction separated by a median, bicycle lanes and footpath (generally on northern side). The Calton Link Road will also provide one lane in each direction, a raised median, parking bays and bicycle lanes on each carriageway.

The proposed collector road network is shown in Figure 4.2.

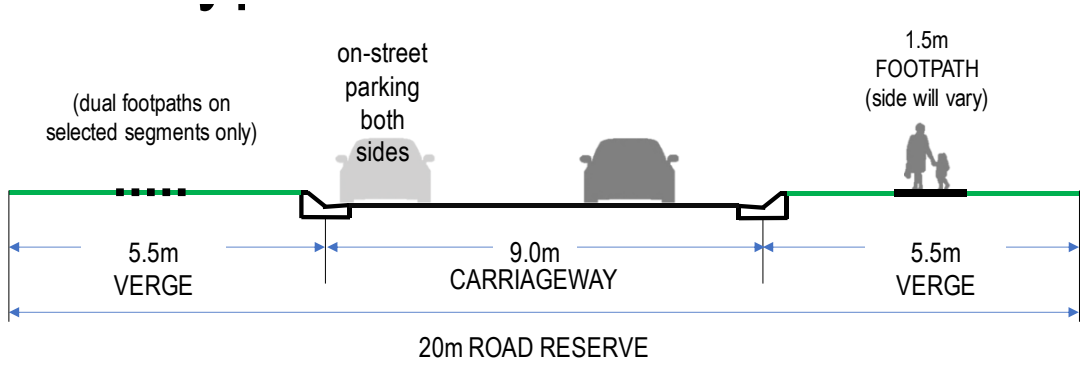
Figure 4.2: Proposed Collector Road Network



The collector roads will generally comprise a single two-way carriageway 9.0 metres wide within a 20 metre road reserve. A verge of 5. 5 metres one each side will provide for footpaths and driveways between boundary and kerb, and streetscaping. The wider verge will facilitate a higher level for sight distance for vehicles reversing from properties. The collector roads will be designed to facilitate a speed environment of 50km/h. There will generally be a footpath on one side of the collector roads given most segments will have dwellings on one side only. Some segments will have dwellings on both sides and these will have a dual footpath arrangement. The typical cross section for the collector road is shown in Figure 4.3.

Where the collector roads intersect within the site, the intersection will be in the form of a roundabout except for the commercial centre where the intersection will be signalised.

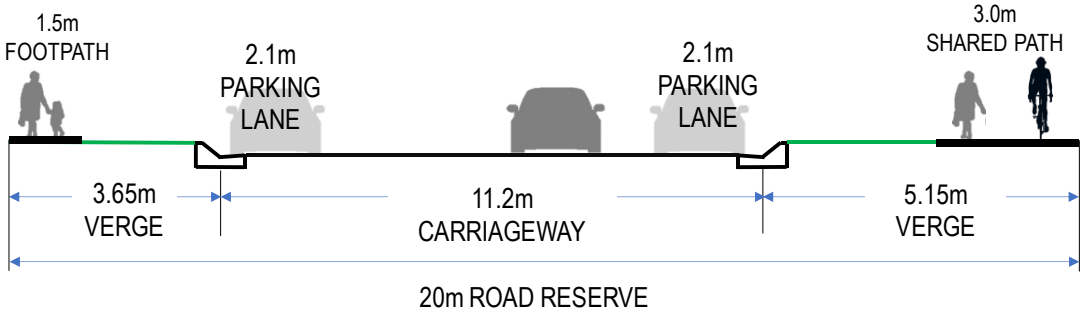
Figure 4.3: Proposed Collector Road Cross Section



It should be noted that the proposed collector road from the east linking to Balmoral Road will continue to the town centre in the same configuration as approved for the Highfield precinct. This road will comprise an 11.2 metre carriageway with two travelling lanes and a parking lane on each side within a 20 metre road reserve. This cross section was proposed given the higher function status of this collector road in the Highfield precinct linking ultimately to the GELR.

The approved cross section from the Highfield Precinct is shown in Figure 4.4.

Figure 4.4: Approved Highfield Collector Road Cross Section

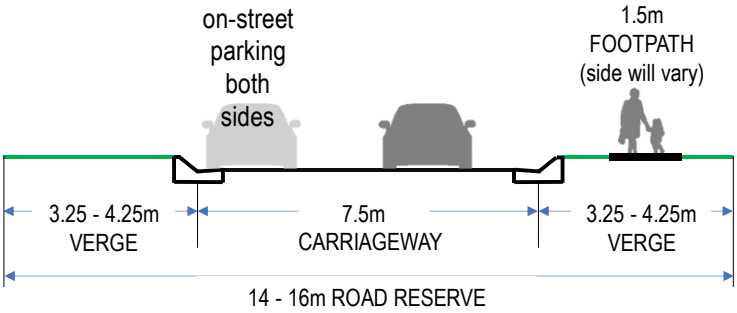


4.3. Local Streets

The proposed land division will utilise local streets with carriageway widths of 7.5 metres within 14.0 or 16.0 metre road reserves. This will be suitable to permit parking on both sides of the street while retaining a clear lane for through traffic. Verges approximately 3.25 metres wide (or 4.25 metres wide) will be provided which is sufficient for footpaths and other service infrastructure.

The proposed local street cross section is shown in Figure 4.5.

Figure 4.5: Proposed Local Street Cross Section



Austroads Guide to Road Design *"Part 3: Geometric Design"* (2016) states a typical acceleration of 1km/h for every 5 metres is possible for private vehicles from a stationary position. Therefore, a vehicle can be expected to reach 50km/h (the expected posted speed limit) from a stopped position after 250 metres.

In consideration of the above, roads that provide less than 250 metres of straight sections of road are considered too short for excessive vehicle speeds to occur and act as natural speed control devices. Generally, most streets in the proposed land division have straight sections less than 250 metres in length due to proposal to introduce re-aligned T-intersections. These streets will generally assist in creating a speed environment of less than 50km/h, and closer to 35km/h where streets are less than 150 metres long.

Nevertheless, traffic management strategies are recommended to achieve a safe, low speed environment within the local street network. The proposed strategies are discussed in the following sections.

4.3.1. Roundabouts

Roundabouts efficiently manage traffic through intersections while promoting a low speed environment along streets. The land division proposes a number of roundabouts in the site at key locations to manage traffic control and speed environment. Roundabouts are recommended at the locations shown in Figure 4.6. Construction of roundabouts at these locations will limit the sections of road to around 250 metres and promote a lower speed environment.

Figure 4.6: Proposed Location of Traffic Controls

4.3.2. Realigned T-junction

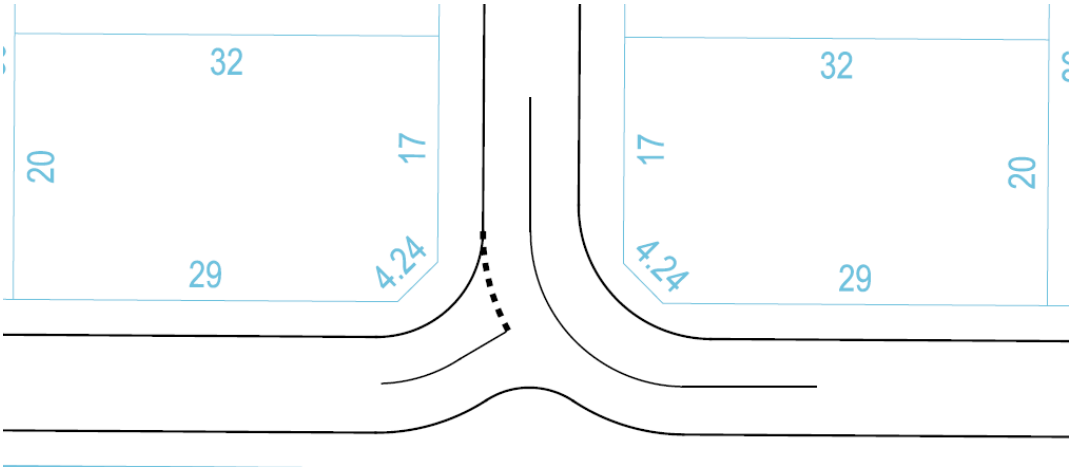
Realigned T-junctions are proposed at a number of locations throughout the development. A realigned T-junction is designed to affect a change in the vehicle travel path by creating a deflection and altering the intersection priorities. This treatment is effective at reducing vehicle speeds on approach to the intersection, improving safety while maintaining street connectivity.

Traffic management measures are required at T-junctions to ensure drivers understand the give way priority assigned. Generally, the right-angle bend in conjunction with appropriate kerb alignments will be sufficient, however a review in detailed design should consider the following methods to clarify give way priority:

- Give way signs on the minor road approach
- Pavement marking on the bend for the centreline and parking control
- Distinctive pavement on the minor road approach
- Careful consideration of radius of bends to ensure suitable turn paths are achieved for the anticipated traffic volumes and vehicle types.

An example of a realigned T-junction arrangement is shown in Figure 4.7. These can be applied in the detailed design phase of the development.

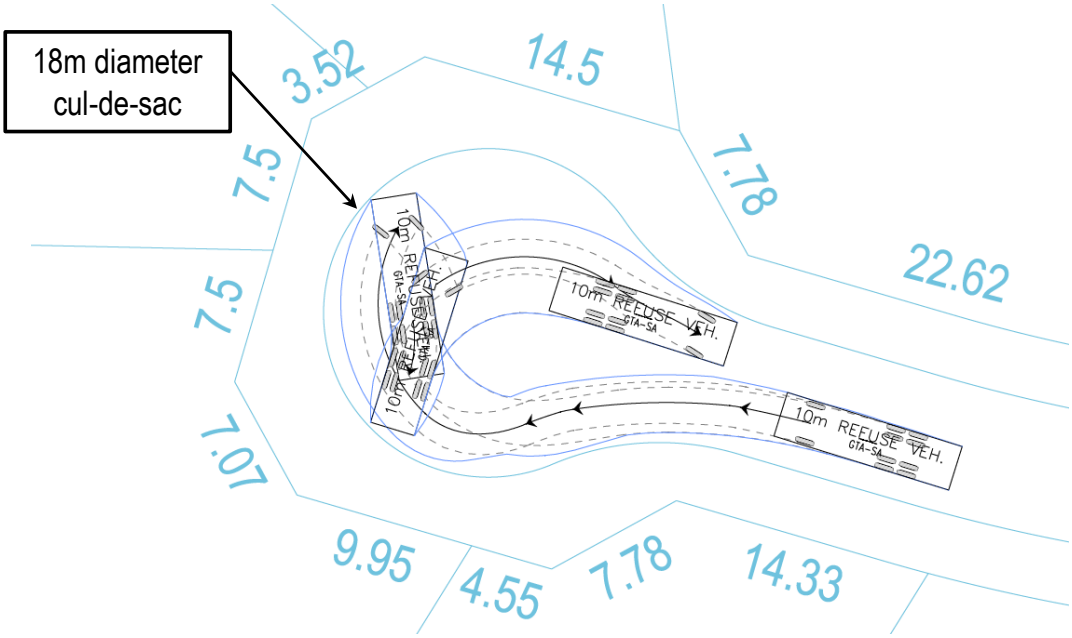
Figure 4.7: Realigned T-junction example



4.3.3. Cul-de-sacs

The development will incorporate cul-de-sacs with circular turning areas of 18 metre diameter. The dimensions shown will enable a refuse vehicle to enter in a forward direction, turn and then exit the cul-de-sac in a forward direction as shown in Figure 4.8.

Figure 4.8: Heavy vehicle turn in proposed cul-de-sac



4.3.4. Access Places and Laneways

Within the development there will be short and narrow sections of road that will be used for dwelling access, these roads are defined as Access Places. There will also be laneways in some locations which will facilitate vehicular access to properties.

Both Access Places and Laneways will be designed with a minimum carriageway of 6.0 metres with an 8.0 metre road reserve (which provides 1 metre clearance on either side) which will be suitable to assist vehicles reversing from garages facing the lane way, and also provide space for bin placement if rear collection is proposed. The additional width will also allow for placement of lighting, services and planting if desired.

8.0 metre wide laneways have been applied in a number of residential developments recently including Woodforde residential development, Dock One Port Adelaide and Lightsview.

Access places are typically short sections of road leading directly to dwellings. They range in length from up to 50 metres depending upon the number of allotments being serviced. Larger vehicles may reverse into these areas to service the properties, such as refuse collection, or alternatively the bins may be positioned to the main street for collection.

4.4. Intersection Sight Distance

GTA has undertaken a review of the horizontal alignment of the approaches to each intersection and is generally satisfied the proposed intersections within the development will be able to provide the minimum horizontal sight distance required for the low speed environment. Sight distance however is subject to detailed design, particularly with regard to property boundaries and landscaping and as such should be reviewed again at the detailed design stage. Some roads within the site will be subject to steeper gradients and vertical sight distance should therefore be assessed at the preliminary and detailed design stages to ensure adequate sight distance is maintained.

4.5. Parking

Resident parking will generally be provided off-street within each residential allotment in accordance with the Development Plan requirements (subject to development consent for individual dwellings). On-street parking for visitors will typically comprise parallel parking adjacent the kerb, and given larger allotments in this development use of driveways where available (depending on dwelling designs). The proposed verge widths along the local collector street will also enable indented parallel parking bays to be provided if required.

The proposed road widths will be satisfactory for on-street parking to be located on both sides of the road. Similar developments in metropolitan Adelaide generally provide on-street parking at a rate of one parking space per every two dwellings. The development site has the capacity to meet this requirement with appropriate design and positioning of driveway crossovers. The proposed road widths will overcome the concerns regarding on-street parking in the original Springwood stages (in north-east precinct of the development site) due to very narrow carriageway widths.

Parking for the proposed school and other commercial developments will be provided within each of the respective development sites and will be provided in accordance with the Development Plan requirements (as per individual development applications).

4.6. Street Gradients

For local streets, it is generally accepted that gradients should not exceed 10% along a street, particularly if the street forms part of a bus route. Gradients of up to 15% are satisfactory for short sections of the street when the street is for local access only.

The land division is characterised by hilly terrain with a number of valleys (water courses) running through the site. For the most part, the gradient along the streets will not exceed 10% however there are a few streets where a gradient up to 15% is likely. These are estimates and the final grades of the streets will be subject to detailed design. The proposed layout has been developed to minimise the requirement for any grades greater than 10% where possible.

4.7. Heavy Vehicles

Heavy vehicles will use the proposed road network on an occasional service for waste collection within the proposed residential area and commercial areas with deliveries to the commercial land uses being made likely using up to a 19 metre semi-trailer. The proposed road network will be capable of providing appropriate access subject to detailed design of intersections and junction to ensure safe and appropriate turning movements are available.

The short cul-de-sac streets will enable refuse trucks to turn to enter and exit in a forward direction. The cul-de-sacs are shown in Section 4.3.3.

The proposed laneways will generally not require vehicles to turn with entry/exit points at each end. There are some streets and access places which will require heavy vehicles to reverse as there is no space available for a turnaround at the end. The length of reversing is generally less than 60 metres which is an accepted length for reversing movements by occasional services vehicles (i.e. less than daily occurrence and typically weekly at maximum) in low volume residential street networks. The locations which will require reversing from streets by heavy vehicles are shown in Figure 4.9.

Figure 4.9: Streets with heavy vehicle reverse to exit or cul-de-sac arrangements

5. SUSTAINABLE TRANSPORT INFRASTRUCTURE

05

5.1. Public Transport

As discussed in Section 2.3.1, there are currently no public routes along Calton Road however there is a bus route along Cheek Avenue on the western side of the site. Opportunity for bus routes within the site will exist with the collector road network suitable for bus services if required. These routes are shown in Figure 5.1.

Figure 5.1: Road network available for bus services

5.2. Walking and Cycling Network

The internal street network will be designed as a slow speed environment which will enable vehicles and cyclists to share the carriageway.

Footpaths are proposed on both sides of the internal street network to support local walking trips. Cyclists that are not confident to share the road with vehicles will also be permitted to travel on the footpaths.

Footpaths on collector roads and local street are discussed in Section 4.2. Generally there will be one footpath on each street as a minimum, with dual footpaths on some segments of collector roads. Access places and laneways will not have formal footpaths. Footpaths on the road network in the hilly terrain in this site will generally provide the most efficient and direct walking networks for daily purposes, as opposed to recreational trails in the open space/reserve areas.

SUSTAINABLE TRANSPORT INFRASTRUCTURE

An off-street path network will be developed as part of the open space design. These recreational links have not been considered in the traffic assessment as they will not generally provide the best linkage with regards to grades and alignment compared to the on-street network.

Details of off-street path networks are shown in the landscape and urban design plans for the proposed development.

6. TRAFFIC IMPACT ASSESSMENT

06

6.1. Traffic Generation

Traffic generation estimates for the proposed development have been sourced from RMS NSW's '*Guide to Traffic Generating Developments*' (2002, henceforth referred to as the RTA Guide) which provides traffic rates for various types of dwellings including houses, townhouses and apartments. These range from 5 to 9 trips per day for each type of dwelling.

For the purposes of this assessment, and in consideration of the range of dwellings proposed (low to medium density), a trip rate in the order of 8 daily trips per dwelling is considered appropriate, and reflects traffic generation rates recorded in other similar development including Mount Barker.

The actual land uses in the town centre have not been confirmed and will be assessed individually for each site with future development applications. For the purposes of this assessment, as assumption of 8,000 square metres of retail floor space is considered appropriate given its high traffic generation rates to provide a worst case scenario for traffic in the town centre. It is known that a supermarket/shopping centre of approximately 4,600 sq.m floor space is proposed. An additional 3,400 square metres of retail floor space would suitably cover the traffic generation of other proposals in this town centre area.

The proposed school has also been assumed to cater for 1,000 students which provides a suitable basis for traffic demands in this location.

Estimates for the PM peak hour and daily traffic volumes resulting from the proposed development (based on the above) are set out in Table 6.1.

Table 6.1: Development Site Traffic Generation Estimates (Daily & Peak Periods)

Land Use	Size	Traffic Generation Rate		Vehicle Movements (approx.)	
		Peak Hour	Daily	Peak Hour	Daily
Residential dwellings	1,400 dwellings	0.85 / dwelling	8.0 dwelling	1,190	11,200
Retail & Commercial*	8,000 sq. m	12.3 / 100 sq. m	121 / 100 sq. m	490	4,840
School**	1,000 students	0.6 / student	1.4 / student	420	980
			Total	**2,100**	**17,020**

* trips have been discounted by 50% assuming half of customers will travel from outside of the development site, and 50% internally generated trips from residential traffic generation.

** trips have been discounted by 70% assuming most students will travel from outside of the development site with 30% internal trips accounting for students travelling from within the site.

Table 6.1 indicates that the proposed development site could potentially generate up to 2,100 vehicle movements during the peak hour and 17,020 vehicle trips daily.

It should be noted that the total traffic generation of the development site will be less than shown for the individual uses due to shared trips (for instance residents dropping children to school on way to work). A proportion of trips for the retail/commercial and school will also be external trips (that is customers and students travelling from other areas) which will affect the traffic volumes on the external portions of road adjacent the site. It is assumed that up to 70% of students will be from outside of the development site area. Similarly, it is assumed that 50% of trips for the retail/commercial will be from outside of the area. Hence, this proportion of trips form these uses are assigned to external road links around the site, and contribute to their overall volumes.

It is also assumed that 80% of residential trips will ultimately travel on the external road network, with 20% of trips internal to the site.

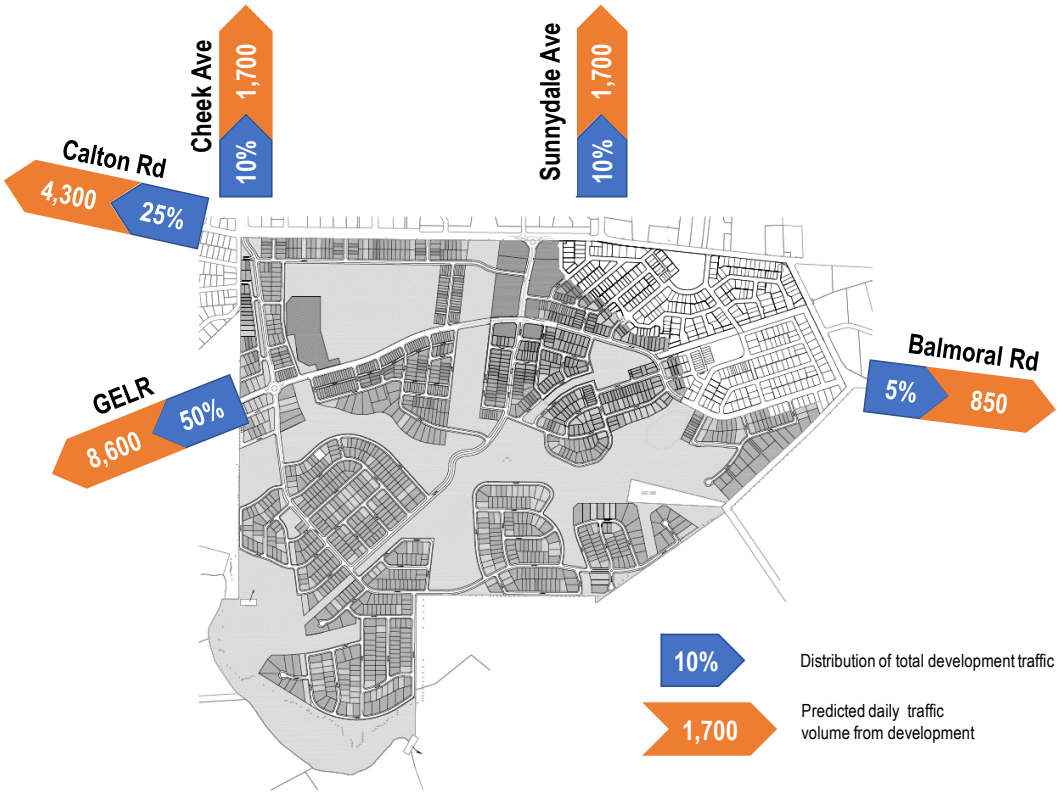
6.2. Distribution and Assignment

The directional distribution and assignment of traffic generated by the proposed development will be influenced by a number of factors, including the:

- Configuration of the arterial road network in the immediate vicinity of the site;
- Existing operation of intersections providing access between the local and arterial road network;
- Surrounding employment centres, retail centres and schools in relation to the site;
- Configuration of access points to the site.

The distribution of traffic around the site is shown in Figure 6.1.

Figure 6.1: Traffic Distribution External to the Site

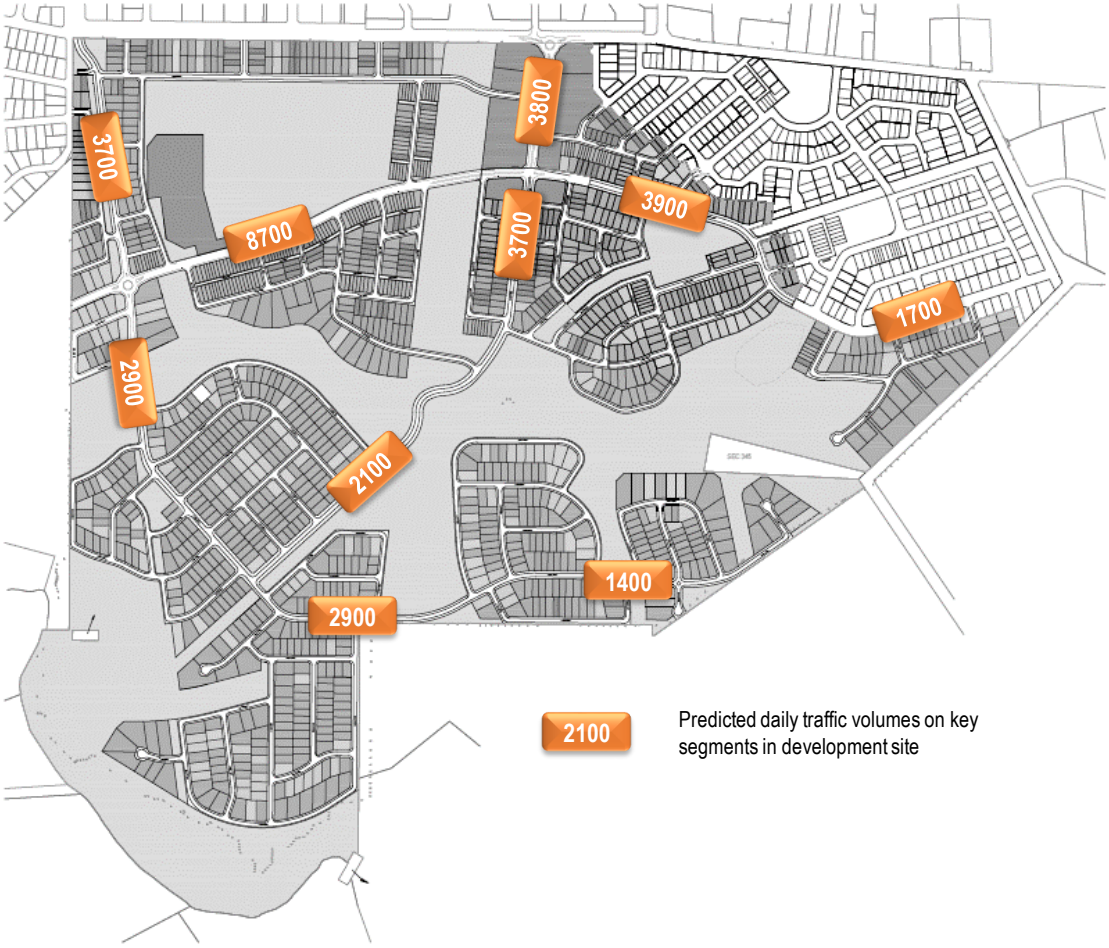


6.3. Traffic Modelling

Based on the distribution of traffic around the site to the external road network, the location of the proposed school and town centre retail/commercial areas, traffic volumes on the internal and external road network have been assigned.

The traffic volumes generated by the proposed development are shown for key road segments within the site in Figure 6.2. These traffic volumes indicate only traffic generated by the land uses within the site.

Figure 6.2: Predicted Traffic Volumes Generated by the Subdivision



The traffic volumes internal to the site indicate that much of the local collector roads (south of GELR) will generally be below 3,000 vehicles per day, with most local streets below 1,000 vehicles per day in each precinct of the site.

The creation of the internal road network and town centre/school will attract people from other areas to use the proposed land uses, as well as traffic using Cheek Avenue and GELR as a bypass of the existing Gawler town centre (Murray Street). The traffic model has included predictions for redistribution of traffic from the surrounding Gawler township which may be attracted to and through the site for the above reasons.

Redistribution of traffic assumed around the site includes:

- Traffic to and from Barossa Valley Way to GELR via Cheek Avenue and/or Sunnydale Avenue;
- Traffic on Balmoral Road to GELR, and avoiding the existing Calton Road;
- Traffic from the north and west attracted to Calton Road for the proposed town centre;

Traffic volumes have been developed on this basis as shown in Figure 6.3. These volumes indicate traffic volumes based on a completed Springwood road network with redistribution of traffic into the site from other areas.

It should be noted that these volumes do not include other potential developments in the Gawler area as their impacts are largely unknown and not part of this assessment. Impacts form these developments will require assessment for external road network upgrades beyond the imapcts of Springwood.

Figure 6.3: Predicted traffic volumes (completed development)

6.4. Traffic Impact

The proposed development will increase traffic volumes on roads surrounding the site including Calton Road, Cheek Avenue, Sunnydale Drive and Balmoral Road. However, the integration of the Gawler East Link Road to connect from the site to Main North Road in Evanston will assist to ameliorate the impact of traffic from this site. The GELR has been planned for some time and is now under construction, which gives more certainty to the traffic predictions for the proposed development.

The GELR will cater for most of the traffic generated by the proposed development and provide an alternative for traffic to exit Gawler to the south without impacting the existing Gawler town centre (Murray Street in particular).

The proposed development will also facilitate traffic management for the existing Gawler town centre by providing alternative through routes from Barossa Valley Way (to the north) via Cheek Avenue and Sunnydale Drive to avoid Murray Street. Hence, there will be redistribution of traffic from the north/east of Gawler to the Springwood site and GELR. Calton Road in particular will experience a reduction in through traffic (from Balmoral Road) with traffic entering Springwood to utilise the GELR as a more efficient bypass to Evanston.

Whilst there will be some reduction in through traffic on Calton Road, there will be new traffic generation from the site utilising Calton Road to access existing town centre facilities (retail, commercial, community, entertainment) which will offset any reductions in traffic. An increase in traffic on Calton Road is expected with an additional 2,500 vehicles per day above existing volumes. Calton Road will remain within the capacity of a two lane road.

These impacts have been considered by the Town of Gawler in the Gawler East Interventions Assessment Report (June 2018, Tonkin Consulting). This assessment resulted in a range of upgrades identified to cater for the growth from Springwood on the adjacent road network,. The external works required adjacent the site are listed in the next section. It is understood that these interventions will be undertaken based on a separate rate to be declared by Council on the Gawler East development areas.

The overall impact of the proposed development will be within the range identified in the Gawler East Interventions Assessment. Hence the impact of the development is well known and is planned to be managed effectively.

The internal road network to the site will adequately cater for the anticipated traffic volumes, with intersections proposed to be suitable for efficient and safe traffic management, including pedestrian and cyclist accessibility.

6.5. External Infrastructure

The Town of Gawler - Gawler East Interventions Assessment Report (June 2018, Tonkin Consulting) identified external infrastructure required to cater for future growth in Gawler East and surrounding areas based on the Springwood development. The external infrastructure recommended on adjacent roads is shown in Table 6.2. Further infrastructure upgrades are proposed on the surrounding road network but these are not discussed for the purposes of this assessment.

Table 6.2: Summary of External Infrastructure Adjacent the Site

	Location	Treatment
1.	Calton Road Up-Grade - Cheek to Project entrance	Upgrade to kerbed collector road
2.	Calton Road / Link Road Intersection at Hamilton Reserve (Part of DPTI delivered Gawler East Link Road project)	Roundabout
3.	Calton Road / Proposed Collector Road Intersection at Cheek Avenue	Roundabout
4.	Calton Road Upgrade – Project entrance to Balmoral Road	Widen through to junction
5.	Proposed Collector (Highfield) Road / Balmoral Road Intersection	T-junction
6.	Calton Road / Balmoral Road Junction	Junction upgrade

The location of each upgrade listed is shown in Figure 6.4.

Figure 6.4: Agreed external road upgrades for Springwood

7. CONCLUSION

07

CONCLUSION

Based on the analysis and discussions presented within this report, the following conclusions are made:

1. The proposed subdivision comprises a land division for the Springwood development with approximately 1,400 residential allotments, education site and a town centre with a mixed use of retail, commercial and community uses.
2. The proposed subdivision will include a collector and local street network which will link to the existing Calton Road and Balmoral Road, as well as integrate with the Gawler East Link Road (currently under construction).
3. The proposed collector road network will provide accessibility around and through the site for daily traffic, pedestrian and cyclists demands. The collector roads will include a footpath on one side generally (or dual footpaths in required segments) to provide a most practical and efficient pedestrian access given the hilly terrain in the site.
4. The proposed local streets will comprise single carriageway roads and laneways which will provide appropriate two way access and on-street parking (not laneways) suitable for the proposed residential density;
5. The subdivision will facilitate safe access with multiple access road routes generally in the event of an emergency, and the southern portion will include an access track linkage to Balmoral Road given lack of alternative routes to emergency access due to terrain and private property to the west.
6. The proposed road network will cater for occasional service vehicles including waste collection, maintenance and delivery vehicles as would be expected in a residential development, with cul-de-sacs at a number of locations suitable for waste collection vehicles to turn. Some smaller streets will require these vehicles to reverse to exit but these manoeuvres will be limited within generally accepted parameters;
7. The site will generate a high level of traffic on a daily basis with internal generation by the proposed uses, but also attraction from other areas to the proposed town centre and education site. The proposed road network will also facilitate a redistribution of traffic away from Murray Street in the Gawler town centre to utilise the bypass effects of the GELR;
8. The anticipated traffic volumes on the internal and external roads adjacent the site will remain within acceptable levels for operational capacity, and will be managed by pre-planned external infrastructure upgrades at a number intersections based on an agreement between the development, Council and DPTI (GELR within the site is being built by DPTI);
9. Overall, whilst the impact of the proposed development is high with regards to anticipated traffic volumes in the site and surrounding area, these will be effectively managed through infrastructure upgrades at intersections and road segments and ameliorate the impact on the surrounding community and road network.

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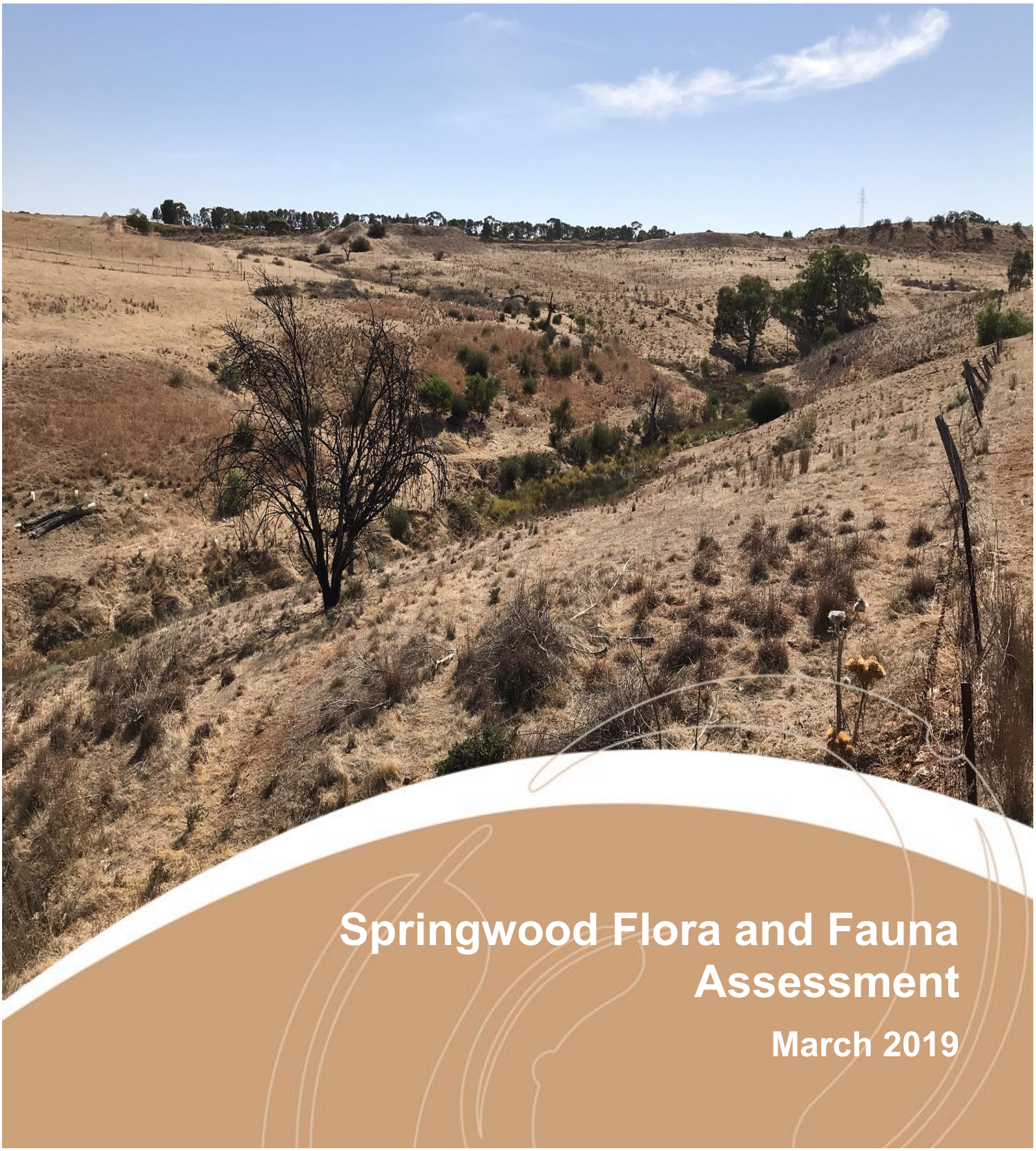

Springwood Flora and Fauna Assessment

March 2019

Springwood Flora and Fauna Assessment March 2019

13 June 2019

Version 2

Prepared by EBS Ecology for Arcadian Property

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GLOSSARY AND ABBREVIATION OF TERMS

BAM	Bushland Assessment Method
BDBSA	Biological Database of South Australia
DEW	Department for Environment and Water
DotEE	Department of the Environment and Energy
EBS	EBS Ecology
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
IBRA	Interim Biogeographical Regionalisation of Australia
LGA	Local Government Area
NPW Act	National Parks and Wildlife Act 1974
NRM Act	Natural Resources Management Act 2004
NV Act	Native Vegetation Act 1991
NVIS	Normalised Vegetation Information System
PMST	Protected Matters Search Tool
SEB	Significant Environmental Benefit
SPRAT	Species Profile and Threats Database
TEC	Threatened Ecological Community
TPZ	Tree Protection Zone

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1 INTRODUCTION

EBS Ecology (EBS) was engaged by Arcadian Property (Arcadian) to undertake a review of the land at Gawler being utilised for the Springwood Development. This land was first assessed in November 2008 and then seasonally through to 2010 by Kellogg Brown and Root (KBR) on behalf of Delfin Lend Lease which involved rigorous ecological assessments of the area utilising both flora and fauna survey methods (Appendix 3). This included the use of pitfall trapping to analyse inconspicuous species such as small reptiles and mammals. A number of ecological constraints were identified within this report and this directed the future planning of the Springwood Development with a view to avoiding key areas where possible.

The review was undertaken to update changes (if any) to species of conservation significance and if the ecological conditions present at the time of the 2010 survey were still relevant to the current Springwood Masterplan. The desktop assessment involved searching Commonwealth and State databases to identify threatened species potentially occurring or known from the proposed Springwood Development site, as well as relevant matters of national environmental significance and other matters protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *National Parks and Wildlife Act 1972* (NPW Act). A review of other available background information sources such as Naturemaps was also conducted.

The field survey, which was conducted on 18 March 2019, included a roaming fauna survey and was largely focussed on ground-truthing the ecological values as presented in KBR (2010). For all background survey methods and detailed results please refer to that report in the first instance.

1.1 Objectives

Specifically the objectives of this report are to:

- Conduct database searches to identify matters of national and state environmental significance (*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters database via the online Protected Matters Search Tool (PMST) and NatureMaps Supertable results);
- Review previous biological surveys, data and reports to highlight data gaps and key issues;
- Review existing mapping data (e.g. vegetation communities, vegetation condition and aerial photographs);
- Ground truth and confirm the outcomes and findings of the desktop study by conducting a field assessment;

1.2 Springwood development area

The Springwood Development is located on the south eastern fringe of the Town of Gawler, SA approximately 39 km north east of the Adelaide CBD (Figure 1).

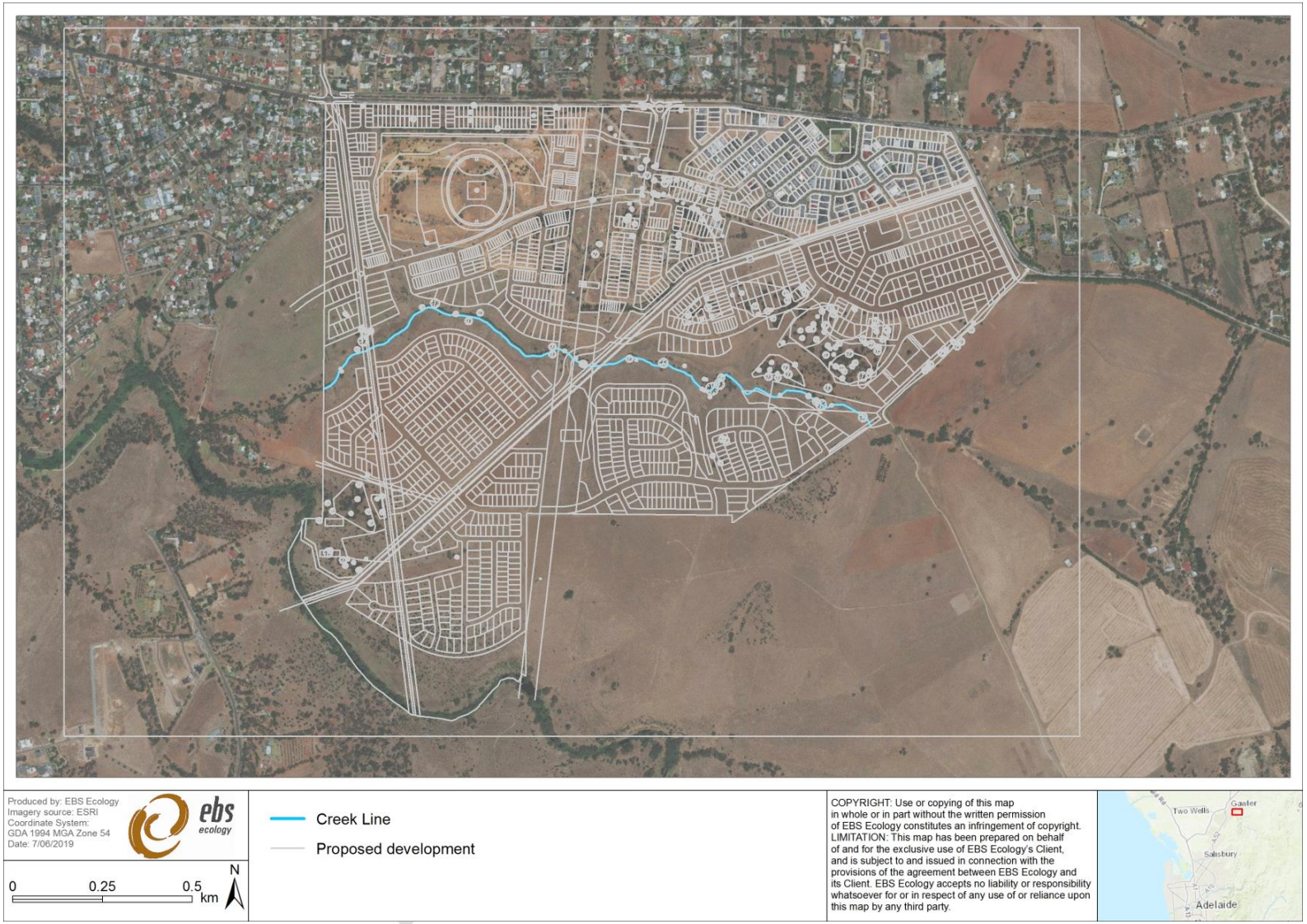


Figure 1. Location of the Springwood Development with masterplan layout.

2 COMPLIANCE AND LEGISLATIVE SUMMARY

2.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act and the *Environment Protection and Biodiversity Conservation Regulations 2000* provide a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the Act as 'matters of national environmental significance'. The nine matters of national environmental significance protected under the Act are:

1. World Heritage properties
2. National Heritage places
3. Wetlands of international importance (listed under the RAMSAR Convention)
4. Listed threatened species and ecological communities
5. Migratory species protected under international agreements
6. Commonwealth marine areas
7. The Great Barrier Reef Marine Park
8. Nuclear actions (including uranium mines
9. A water resource, in relation to coal seam gas development and large coal mining development

Any action that has, will have, or is likely to have a significant impact on matters of national environmental significance requires referral under the EPBC Act. Substantial penalties apply for undertaking an action that has, will have or is likely to have significant impact on a matter of national environmental significance without approval.

2.2 Native Vegetation Act 1991

Native vegetation within the Springwood Development area is protected under the *Native Vegetation Act 1991* (NV Act) and *Native Vegetation Regulations 2017* which has been updated since the previous survey. Any proposed clearance of native vegetation in South Australia (unless exempt under the *Native Vegetation Regulations 2017*) is to be assessed against the NV Act Principles of Clearance, and requires approval from the Native Vegetation Council (NVC). A net environmental benefit is generally conditional on an approval being granted. This project is considered to be relevant under exemption Regulation 12(35) – Residential subdivision to allow clearance of vegetation in connection with residential subdivision, associated house sites, roads and other associated infrastructure.

Applications for clearance approval and development approval are encouraged to be made at the same time. In determining the SEB, the NVC must be provided with written notification of the entire clearance footprint at the allotment scale which includes clearance for the dwelling and any associated structures; clearance within 10 metres of a building for maintenance; fences; vehicle tracks; and any additional clearance for fire safety. Individual regulations for these clearance activities will not apply in connection to new subdivisions and must be considered at this stage.

Depending on how large the allotments, consideration of all areas for the dwelling (and associated clearance) should occur, including those areas that involve no vegetation clearance situated on a different part of the block (or where the vegetation is shown to be less significant or more degraded than the vegetation proposed to be cleared).

This regulation ensures adequate planning is undertaken for residential subdivisions and the associated house site and residual clearance required. If clearance is avoided and minimised at this stage, the SEB requirement can also be minimised.

Clearance can only occur once development approval has been granted and the NVC have approved the clearance and SEB.

2.3 National Parks and Wildlife Act 1972

Native plants and animals in South Australia are protected under the *National Parks and Wildlife Act 1972* (NPW Act). It is an offence to take a native plant or protected animal without approval. Threatened plant and animal species are listed in Schedules 7 (endangered species), 8 (vulnerable species) and 9 (rare species) of the Act. Persons must not:

- Take a native plant on a reserve, wilderness protection area, wilderness protection zone, land reserved for public purposes, a forest reserve or any other Crown land;
- Take a native plant of a prescribed species on private land;
- Take a native plant on private land without the consent of the owner (such plants may also be covered by the NV Act);
- Take a protected animal or the eggs of a protected animal without approval;
- Keep protected animals unless authorised to do so; and
- Use poison to kill a protected animal without approval.

Conservation rated flora and fauna species listed on Schedules 7, 8, or 9 of the NPW Act are known to or may occur within the Springwood Development area. Persons must comply with the conditions imposed upon permits and approvals.

2.4 Natural Resources Management Act 2004

Under the *Natural Resources Management Act 2004* (NRM Act) landholders have a legal responsibility to manage declared pest plants and animals and prevent land and water degradation.

Key components under the Act include the establishment of regional Natural Resource Management (NRM) Boards and development of regional NRM Plans; the ability to control water use through prescription, allocations and restrictions; requirement to control pest plants and animals and activities that might result in land degradation.

3 BACKGROUND INFORMATION

3.1 Project background

The Springwood Development masterplan has allocated 74 hectares of open space, equating to 34% of the overall area. Primarily farmland, the Springwood Development area also includes a tributary of the south Para River, from this point onwards referred to as Springwood Creek.

3.2 Environmental setting

3.2.1 IBRA

The Interim Biogeographical Regionalisation of Australia (IBRA) identifies geographically distinct bioregions based on common climate, geology, landform, native vegetation and species information. The bioregions are further refined into subregions and environmental associations (DotEE, 2012). The Springwood Development area is located within the Flinders Lofty Block IBRA Bioregion, the Mt Lofty Ranges IBRA Subregion and the Rosedale Environmental associations.

Native vegetation remnancy figures for IBRA subregions and associations are useful for setting regional landscape targets. Approximately 15% (46,342 ha) of the Mt Lofty Ranges Subregion is mapped as remnant vegetation, of which 27% (12,706 ha) is formally conserved. Areas are formally conserved and protected within National Parks and Wildlife reserves, private Heritage Agreements under the NV Act and Indigenous Protected Areas. A full summary is provided below in Table 1.

Table 1. IBRA bioregion, subregion, and environmental association environmental landscape summary.

Flinders Lofty Block IBRA bioregion	
Temperate to arid Proterozoic ranges, alluvial fans and plains, and some outcropping volcanics, with the semi-arid to arid north supporting Native Cypress, Black Oak (Belah) and Mallee open woodlands, *Eremophila* and *Acacia* shrublands, and Bluebush/Saltbush chenopod shrublands on shallow, well-drained loams and moderately-deep, well-drained red duplex soils. The increase in rainfall to the south corresponds with an increase in low open woodlands of *Eucalyptus obliqua* and E. *baxteri* on deep lateritic soils, and E. *fasciculosa* and *E. cosmophylla* on shallower or sandy soils.	
Mount Lofty Ranges IBRA subregion	
This subregion extends from north of the Fleurieu Peninsula to the Barossa Valley, and is predominantly an undulating to low hilly upland with steeper marginal ranges and hills. The Barossa Valley is the lowest area in this subregion and represents a structural basin. The rest of the subregion consists of hilly uplands on sandstone and shale with northerly trending strike ridges and dissected lateritic tableland remnants. Low open woodland commonly dominated by *Eucalyptus obliqua* and *E. baxteri* are found in higher rainfall areas on deep, lateritic soils. Shallower or sandy soils support *E. fasciculosa, E cosmophylla* and in the northern part of the region *E. goniocalyx*. *E leucoxylon* dominates the woodlands on podzolised soils in the lower rainfall areas*, E. viminalis* ssp. *cygnetensis* dominate the wetter and cooler woodlands and *E. odorata* characterises drier sites. Eucalypts give way to drooping sheoak (*Allocasuarina verticillata*) in the most arid woodlands and in coastal situations on shallow rocky soils.	
Remnant vegetation	Approximately 15% (46,342 ha) of the subregion is mapped as remnant native vegetation, of which 27% (12,706ha) is formally conserved
Landform	Hills and valleys; alternating subparallel hilly ridges and valleys with a general N-S trend in north. In south, hilly dissected tableland.

Geology	Dissected lateralised surface in south
Soil	Hard setting loams with red clayey subsoils, Highly calcareous loamy earths, Hard setting loams with mottled yellow clayey subsoil, Coherent sandy soils, Cracking clays.
Vegetation	Eucalyptus woodlands with a shrubby understorey.
Conservation significance	129 species of threatened fauna, 270 species of threatened flora. 4 wetlands of national significance.
Rosedale IBRA environmental association	
Remnant vegetation	Approximately 5% (3,089 ha) of the association is mapped as remnant native vegetation, of which 11% (331 ha) is formally conserved
Landform	Undulating to rolling plain on shale with broad floodplains.
Geology	Shale and alluvium.
Soil	Hard pedal red duplex soils, reddish friable loams and brown self-mulching cracking clays.
Vegetation	Open parkland of SA Blue gum, Sugar Gum, River Red gum or exotic conifers.
Conservation significance	70 species of threatened fauna, 66 species of threatened flora. 0 wetlands of national significance.

3.2.2 Administrative boundaries

The Springwood Development area falls within The Gawler and the Barossa Councils Local Government Areas (LGA's). From an environmental perspective, the area is situated within the Adelaide and Mount Lofty Ranges (AMLRNRM) Board area.

4 METHODS

4.1 Desktop assessment

A PMST report was generated on 26 March 2019 to identify matters of national environmental significance under the EPBC Act relevant to the Springwood Development area (DotEE 2019). This was undertaken to identify any elements which may have changed since the KBR 2010 report. The PMST is maintained by the Department of the Environment and Energy (DotEE) and was used to identify flora and fauna species or ecological communities of national environmental significance that may occur or have suitable habitat within the Springwood Development area.

4.1.1 Database searches

Species listed under South Australia's NPW Act in the Springwood Development area were assessed using the BDBSA flora and fauna supertable overview. The dataset was obtained on 29th March 2019 and used to identify threatened species that have been recorded within the 5 km buffer of the Springwood Development area (DEW 2019) as well as having a spatial reliability of <1km and the record occurred within the past 30 years

4.1.2 Literature review

A review of the KBR flora and fauna survey report previously conducted within the Springwood Development area was undertaken to augment the desktop assessment. More specifically, to assist in the deliberation of the likelihood of occurrence of threatened species in the local area.

4.2 Field survey

The field survey was conducted on March 18 2019 by NVC accredited consultant Andrew Sinel. Areas highlighted from the review of the KBR report were targeted as well as any other areas that looked of higher potential ecological value. The quarry area was not assessed specifically however general observations were made based on previous surveys such as the presence of Peregrine Falcon.

4.3 Limitations

The content of the desktop assessment was derived from existing datasets and references from a range of sources. EBS has not attempted to verify the accuracy of any such information.

Flora and fauna records were sourced from the PMST and the Naturemaps flora and fauna supertable overviews. The flora and fauna super tables include verified flora and fauna records submitted to DEW or partner organisations. Although much of the data has been through a variety of validation processes, the lists may contain errors and should be used with caution. DEW give no warranty that the data is accurate or fit for any particular purpose of the user or any person to whom the user discloses the information.

The reliability of the data ranges from 100 m to over 100 km. Fauna species, in particular birds, also have the ability to traverse distances in excess of 20 km. It is also acknowledged that the presence of species may not be adequately represented by database records. Hence the PMST and supertable

results may not highlight all potential threatened flora and fauna species that may occur in the area, within a 5 km radius.

The findings and conclusions expressed by EBS are based solely upon information in existence at the time of the assessment. The combination of database records and background research have provided a solid foundation for determining the flora and fauna that are likely to, or are known to, occur within the Springwood Development area.

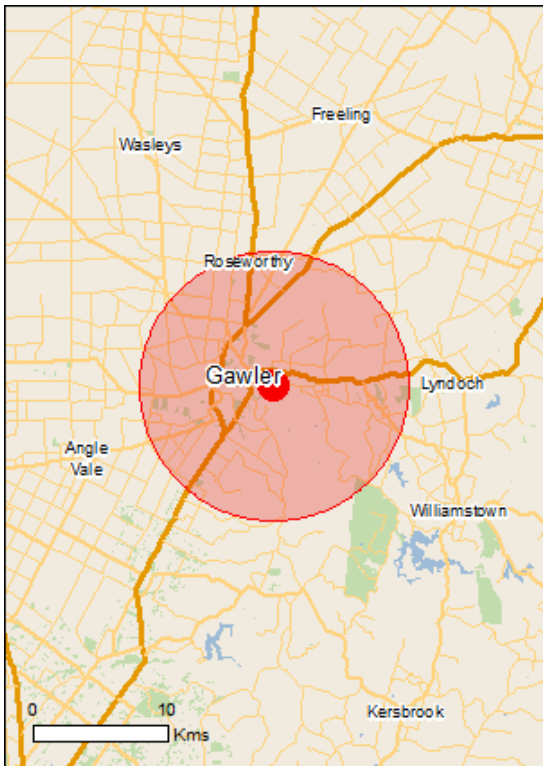
5 RESULTS

5.1 Matters of national environmental significance

Two threatened ecological communities (TECs), 28 threatened species and 13 migratory species were identified in the PMST as potentially occurring or having suitable habitat potentially occurring within 5 km of the Springwood Development area. The results of the EPBC Act PMST report are summarised in Table 2 (DotEE 2018).

The relevant matters of national environmental significance, other matters protected under the EPBC Act, and threatened species listed under the NPW Act are discussed in detail below (Table 2).

Table 2. Summary of the results of the EPBC Act Protected Matters Search Tool report.

Search area (20 km buffer)	Matters of National Environment Significance under the EPBC Act 1999	Identified within the search area
	World Heritage Properties	None
	National Heritage Properties	None
	Wetlands of International Significance	None
	Great Barrier Reef Marine Park	None
	Commonwealth Marine Areas	None
	Threatened Ecological Communities	2
	Threatened Species	28
	Migratory Species	13
	Commonwealth Lands	3
	Commonwealth Heritage Places	None
	Listed Marine Species	19
	Whales and other Cetaceans	None
	Critical Habitats	None
	Commonwealth Reserves	None
	State and Territory Reserves	3
	Regional Forest Agreements	None
	Invasive Species	45
	Nationally Important Wetlands	None

5.1.1 Threatened ecological communities

Two TECs were identified in the PMST as potentially occurring within 5 km of the Springwood Development area. A summary of these TECs and comment regarding their likelihood of occurrence in the area are provided in Table 3.

Table 3. The threatened ecological communities identified in the PMST and their likelihood of presence within the Springwood Development area.

Threatened Ecological Community	EPBC Status	Likelihood of occurrence in the Development area
Iron-grass Natural Temperate Grassland of South Australia	CE	Known
Peppermint Box (*E. odorata*) Grassy Woodland of South Australia	CE	Unlikely

A community fitting within the criteria for Iron-grass Temperate Grassland was observed by KBR (2010). The size and condition of the community meet the requirements of condition class B as described in the EPBC Policy Statement 3.7 (DEWR 2007). If development or adverse impact on this area was likely to occur, then the proposal will require referral to DoTEE. For a summary of this community please see section 7.2.1.

5.1.2 Nationally Threatened flora

Fourteen flora species listed as threatened under the EPBC Act were identified in the PMST as potentially occurring or having suitable habitat potentially occurring within 5 km of the Springwood Development area (Table 4). One of these species (*Olearia pannosa* ssp. *pannosa*) was also identified in the 5 km BDBSA search however was not recorded in the KBR surveys. This species was not observed during the 2019 site assessment. No other species from the EPBC search tool results were deemed likely to be present based on previous records and existing conditions.

5.1.3 State threatened flora

Eleven flora species listed as threatened under the NPW Act were identified in the BDBSA search as being previously recorded within 5 km of the Springwood Development area (Table 4). Nine of the NPW Act listed species were considered as likely or possibly occurring within the Springwood Development area (Table 4) based on previous surveys and available habitat. A full list of the BDBSA flora observations is provided in Appendix 1.

Table 4. Threatened flora species listed under the EPBC Act and NPW Act identified in the PMST (Source 1) and BDBSA (Source 2) database searches within 5 km of the Springwood Development area.

Scientific name	Common name	Conservation status		Source	BDBSA last record (year)	Likelihood of occurrence within Development area
		Aus	SA			
Acacia iteaphylla	Flinders Ranges Wattle		R	2	27/11/2002	Likely
Acacia trineura	Three-nerve Wattle		E	2	10/02/2012	Unlikely
Austrostipa densiflora	Fox-tail Spear-grass		R	2	11/11/2005	Possible
Austrostipa gibbosa	Swollen Spear-grass		R	2	28/10/2011	Possible
Austrostipa multispiculis	Many-flowered Spear-grass		R	2	20/11/2011	Possible

Scientific name	Common name	Conservation status		Source	BDBSA last record (year)	Likelihood of occurrence within Development area
		Aus	SA			
Bothriochloa macra	Red-leg Grass		R	2	21/09/2016	Likely
Caladenia argocalla	White beauty spider Orchid	EN		1		Unlikely
Caladenia behrii	Pink Lipped spider Orchid	EN		1		Unlikely
Caladenia rigida	White Spider-orchid	EN		1		Unlikely
Caladenia tensa	Greencomb Spider-orchid	EN		1		Unlikely
Caladenia xantholeuca	White Rabbits	EN		1		Unlikely
Cladium procerum	Leafy Twig-rush		R	2	31/01/2018	Possible
Corybas dentatus	Toothed Helmet Orchid	VU		1		Unlikely
Dianella longifolia var. grandis	Pale Flax-lily		R	2	1/07/2018	Possible
Euphrasia collina ssp. osbornii	Osbornes eyebright	EN		1		Unlikely
Maireana rohrlachii	Rohrlach's Bluebush		R	2	3/01/2013	Likely
Olearia pannosa ssp. pannosa	Silver Daisy-bush	VU	V	1,2	22/09/2015	Possible
Prasophyllum pallidum	Pale leek orchid	VU		1		Unlikely
Prasophyllum pruinosum	Plum Leek Orchid	EN		1		Unlikely
Prasophyllum validum	Sturdy leek Orchid	VU		1		Unlikely
Pterostylis psammophila	Two-bristle Greenhood	CE		1		Unlikely
Pterostylis sp. Hale	Hale Dwarf Greenhood	EN		1		Unlikely
Sclerolaena muricata var. villosa	Five-spine Bindyi		R	2	30/01/2018	Unlikely
Telymitra matthewsii	Spiral Sun Orchid	VU		1		Unlikely

Conservation status
Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. ssp.: the conservation status applies at the sub-species level. Mi: Migratory species. (W): Wetland migratory species. (M): Marine migratory species. (T): Terrestrial migratory species. Ma: Marine species.

5.1.4 Nationally threatened fauna

Fourteen fauna species listed as threatened under the EPBC Act were identified in the PMST as potentially occurring or having suitable habitat potentially occurring within 5 km of the Springwood Development area (Table 5). Flinders Range Worm Lizard (*Aprasia pseudopulchella*) was considered likely to be present within the area based on available habitat and opportunistic observations made in the KBR 2010 report. The areas mapped as suitable habitat for this species in the KBR report have been avoided by the Springwood Masterplan.

5.1.5 State threatened fauna

Fourteen fauna species listed as threatened under the NPW Act were identified in the BDBSA search as being previously recorded within 5 km of the Springwood Development area (Table 5). Several of these were previously observed within the area by KBR (2010). Four species of state conservation significance were known onsite from the KBR surveys, Common Brushtail Possum (*Trichosurus vulpecula*), White Winged Chough (*Corcorax melanorhamphos*), Elegant Parrot (*Neophema elegans*) and Peregrine Falcon (*Falco peregrinus*). These are all likely to still utilise the site for some or all of the species habitat requirements. A further six were considered likely to utilise the area at some period (Table 5). A full list of the BDBSA flora observations is provided in Appendix 2.

Table 5. Threatened fauna species listed under the EPBC Act and NPW Act identified in the PMST (Source 1) and BDBSA (Source 2) database searches within 5 km of the Springwood Development area

Scientific name	Common name	Conservation status		Source	BDBSA last record (year)	Likelihood of occurrence within Development area
		Aus	SA			
Actitis hypoleucos	Common Sandpiper	Mi.		1		Unlikely
Aprasia pseudopulchella	Flinders Ranges Worm-lizard	VU		1		Known
Apus pacificus	Fork Tailed Swift	Mi.		1		Unlikely
Botaurus poiciloptilus	Australasian Bittern	EN		1		Unlikely
Calidris acuminata	Sharp-tailed Sandpiper	Mi.		1		Unlikely
Calidris ferruginea	Curlew Sandpiper	CE, Mi		1		Unlikely
Calidris melanotos	Pectoral Sandpiper	Mi.		1		Unlikely
Cinclosoma punctatum anachoreta	Spotted Quailthrush	CE		1		Unlikely
Corcorax melanorhamphos	White-winged Chough		R	2	31/08/2016	Known
Coturnix ypsilophora	Brown Quail		V	2	16/09/2015	Likely
Emydura macquarii	Macquarie River Turtle		V	2	14/10/2017	Possible
Falco peregrinus	Peregrine Falcon		R			Known
Falcunculus frontatus frontatus	Eastern Shriketit		R	2	2/03/2013	Likely
Gallinago hardwickii	Latham's Snipe	Mi.	R	2	23/11/2008	Unlikely
Grantiella picta	Painted Honeyeater	VU		1		Unlikely
Hirundapus caudacutus	White-throated Needletail	Mi.		1		Unlikely
Hylacola pyrrhopygia parkeri	Chestnut-rumped Heathwren	EN		1		Unlikely
Isoodon obesulus obesulus	Southern Brown Bandicoot	EN		1		Unlikely
Leipoa ocellata	Malleefowl	VU		1		Unlikely
Melithreptus gularis	Black-chinned Honeyeater		R	2	24/02/2012	Possible
Motacilla cinerea	Grey Wagtail	Mi.		1		Unlikely
Motacilla flava	Yellow Wagtail	Mi.		1		Unlikely
Myiagra cyanoleuca	Satin Flycatcher	Mi.		1		Unlikely
Myiagra inquieta	Restless Flycatcher		R	2	22/09/2015	Likely
Neophema elegans	Elegant Parrot		R	2	20/09/2017	Known
Numenius madagascariensis	Eastern Curlew,	CE, MI		1		Unlikely
Pandion haliaetus	Osprey	Mi.		1		Unlikely
Parvipsitta pusilla	Little Lorikeet		E	2	25/02/2012	Possible

Scientific name	Common name	Conservation status		Source	BDBSA last record (year)	Likelihood of occurrence within Development area
		Aus	SA			
Pedionomus torquatus	Plains-wanderer	CE		1		Unlikely
Petroica phoenicea	Flame Robin		V	2	17/05/2018	Likely
Pezoporus occidentalis	Night Parrot	EN		1		Unlikely
Plegadis falcinellus	Glossy Ibis		R	2	25/11/2014	Possible
Pteropus poliocephalus	Grey-headed Flying-fox	VU		1		Unlikely
Rostratula australis	Australian Painted-snipe	EN		1		Unlikely
Stagonopleura guttata	Diamond Firetail		V	2	18/04/2018	Likely
Strepera versicolor	Grey Currawong		R	2	25/10/2017	Likely
Trichosurus vulpecula	Common Brushtail Possum		R	2	2/03/2013	Known
Tringa nebularia	Common Greenshank	Mi.		1		Unlikely
Zoothera lunulata halmaturina	Bassian Thrush	VU		1		Unlikely

Conservation status

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. ssp.: the conservation status applies at the sub-species level. Mi: Migratory species. (W): Wetland migratory species. (M): Marine migratory species. (T): Terrestrial migratory species. Ma: Marine species.

5.1.6 Nationally listed migratory / marine species

Thirteen fauna species listed as migratory under the EPBC Act were identified in the PMST as potentially occurring or having suitable habitat potentially occurring within 5 km of the Springwood Development area (Table 5). All 13 species were bird species. Latham's Snipe (*Gallinago hardwickii*) was recorded immediately south of the area by KBR (2008) and could potentially occur in the creek habitat within the Springwood Development area as a vagrant visitor. There has been no further observations of this species within the BDBSA search to 2019. Based on the lack of habitat within the Springwood Development site, a referral for this specie sis not required.

Rainbow Bee-eater (*Merops ornatus*) was previously recorded across the area and noted onsite at the time of the 2019 survey. This species (previously listed as a migratory) is now listed only as a marine species under the EPBC Act which means protection is limited to Commonwealth Marine Areas. Commonwealth Marine Areas are not present within the Springwood Development Area. A referral for this species is not required.

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5.2 Field survey

5.2.1 Flora

While seasonal conditions have been very good in the interim period since the 2010 KBR report, the past few seasons have had exceptionally dry periods and this has been coupled with a dramatic increase in the numbers of Western Grey Kangaroos (*Macropus fuliginosus*) which were described as commonly recorded though confined to few individuals throughout the site in the 2008 report. Based on the number of observations in 2019, it can be assumed that this population has expended significantly, and this would be consistent with many areas surrounding the Adelaide metropolitan and peri – urban areas. Despite this, the vegetation communities were represented in similar condition and the range of species previously present could be expected to persist since that time. The range of perennial grass tussocks present however was most likely reduced due to seasonal inputs.

5.3 Specific species and community issues

5.3.1 Eucalyptus porosa scattered trees

Scattered *Eucalyptus porosa* (Mallee Box) trees are dominant on the northern slopes of the South Para River anabranch with a few other scattered remnants in other sections of the Springwood Development area. These trees are subject to the *Native Vegetation Act 1991*. There are permitted clearance activities authorised under the *Native Vegetation Regulations 2017.* The Regulations outline the circumstances where clearing native vegetation is permitted, outside of the clearance controls in the Native Vegetation Act 1991. This development allows a clearance application to occur under the Native Vegetation Regulation exemption 12(35) – Residential subdivision.

The Regulations place a great emphasis on the proponent applying the Mitigation Hierarchy, a fundamental principle which encourages proponents to consider all possible ways to avoid and minimise clearance to reduce the level of clearance required. Reducing the level of clearance also reduces the SEB offset (where required) and associated cost to the proponent. The Native Vegetation Council (NVC) assesses whether proponents have adequately applied the Mitigation Hierarchy.

In determining the SEB, the NVC must be provided with written notification of the entire clearance footprint at the allotment scale which includes clearance for the dwelling and any associated structures; clearance within 10 metres of a building for maintenance; fences; vehicle tracks; and any additional clearance for fire safety. Individual regulations for these clearance activities will not apply in connection to new subdivisions and must be considered at this stage.

5.3.2 Iron-grass (Lomandra) Temperate Grassland

This was identified within the KBR report and was observed as still being present and in relatively good condition in terms of tussock density and size. It was not possible to make an accurate assessment as the herbaceous species diversity during the March visit due to appalling conditions from a seasonal perspective. The masterplan avoids the area mapped as the Threatened Ecological Community. See section 6.2.1 for further discussion on this area.

Figure 2. Lomandra community observed still present during 2019 site visit.

5.3.3 Flinders Worm Lizard

An opportunistic observation of this species was made within the area by KBR (2010) and has not been recorded onsite since. No new records for this species have been made within the Gawler area since that observation. While the species is likely to be in low density, they are widespread and any retention of habitat is of high conservation value. The Springwood Masterplan has avoided all areas mapped as high habitat value within the 2010 KBR report.

5.3.4 Peregrine Falcon

KBR observed Peregrine Falcon using the site as a roosting and hunting area. A pair was observed in a roost site within the high wall of the quarry precinct and hunting over the adjacent areas of the quarry and Mallee Box woodland south of the quarry fence line over 2008 to 2010. There was no evidence of past or current nesting / breeding in the quarry or elsewhere. The March visit confirmed likely ongoing use by this species which, while not observed directly, there was significant whitewash on the walls of the quarry suggesting the quarry walls were being used as roosting and resting habitat.

6 QUANTIFYING EPBC IMPACTS

6.1 What is a significant impact?

The Australian Government Department of Sustainability, Environment, Water, Population and Communities publication 'Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies: Significant Impact Guidelines 1.2' states: 'A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts.

6.2 Self-assessment

An action is likely to have a significant impact on species if there a real chance or possibility that the action will cause the following criteria to occur. A self-assessment for Iron-grass Temperate Grasslands has been conducted below.

6.2.1 Iron-grass Temperate Grassland

The Springwood Development will not impact directly on the TEC based on the Masterplan design. The close proximity of housing allotments to the mapped community will be likely to cause indirect impacts. These include potential disturbances such as illegal dumping; e.g. lawn clippings and garden waste; and increased foot traffic and bike use. A self-assessment of the *Lomandra* grassland is made based on criteria used in assessing matters of national environmental significance.

- Will the Development lead to a long term decrease in the size of the population.

There is every likelihood that this project will lead to a slow long term decrease in the population due to the impacts listed above

- Will the Development reduce the area of occupancy of the species.

The Springwood Development area will not directly reduce the area of occupancy

- Will the Development fragment an existing population.

The project will not fragment the existing population

- Will the Development adversely affect critical habitat.

The Springwood Development area is not considered to impact other areas of critical habitat.

- Will the Development disrupt breeding cycles.

No changes to the pollination or seed production potential of the community would be expected.

- Will the Development modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

It is likely that some alterations to the quality of the habitat would occur, partly due to potential weed competition but also through soil compaction and degradation of the slopes where the community is present.

- Will the Development result in the establishment of invasive species that are harmful to the species.

High potential for this impact with garden waste and increased likelihood of garden escapees

- Will the Development introduce disease that may cause the species to decline.

The proposed project is not considered likely to act as a vector for disease.

- Will the Development interfere with the recovery of the species.

The proposed project will not impact on the recovery of this community at the wider scale.

It is likely that the close proximity of the Springwood Development to a nationally listed ecological community will impact the community through a long term decrease in size and threats from invasive species. It is recommended that a referral for this area is conducted. The potential outcome of this would be mitigation measures employed such as buffer zones from the Iron-grass community and a conservation management plan to ensure the longevity and sustainability of the community.

7 MITIGATION MEASURES

7.1 Mitigation Hierarchy

Avoid outline measures taken to avoid clearance of native vegetation such as making adjustments to the location, design, size or scale of the activity in order to reduce the impact.

Areas of the highest density trees are of particularly high value with many having large hollows and provide other habitat values such as food and roosting resources. Springwood has avoided the areas of highest vegetation cover where practical and maintains over 70ha of open space.

Minimise if clearance cannot be avoided, outline measures taken to minimize the extent, duration and intensity of impacts of the clearance on biodiversity to the fullest possible extent.

Prior to development commencing, a Vegetation Management Plan (VMP) and a Construction Environmental Management Plan (CEMP) must be developed so as to guide the future development of the site. Reserves have been incorporated into the strategic design where remnant trees are present where possible in a bid to reduce SEB requirements while also improving the amenity value of the development.

Rehabilitate/restore - outline measures taken to rehabilitate ecosystems that have been degraded, and to restore ecosystems that have been degraded, or destroyed by the impact of clearance that cannot be avoided or further minimized, such as allowing for the re-establishment of the vegetation

WGA has included a preliminary stormwater treatment strategy for the site. This considers the drainage for the Springwood Development and includes elements such as Macrophyte beds, shallow wetland ponds and ecological sponges / reed beds. KBR provided input into the most suitable sites and has assisted in the initial stormwater treatment planning. The wetland systems and ponds along the eastern section of the Springwood Creek avoids the important reptile habitat areas, all of the remnant trees and will allow for development of biologically productive riparian habitats in what is currently a weed infested gully.

Offset- any adverse impact on native vegetation that cannot be avoided or further minimized should be offset by the achievement of a significant environmental benefit that outweighs that impact.

Offsets are intended to compensate for any residual adverse impacts. An offset should only be considered after all reasonable steps have been taken to avoid, minimise and rehabilitate/restore the impacts of clearance activities.

8 IMPACT SUMMARY

The following is a summary of the direct and indirect impacts associated with the Masterplan based on the KBR 2010 report and follow up site visit in March 2019 with likely mitigation or follow up requirements.

- Recommendation for a referral to the minister under the EPBC Act for potential indirect impacts to the TEC Iron-grass Temperate Grassland.
- Scattered Tree Assessment clearance application provided to the Native Vegetation Council for the removal of up to 70 individual *Eucalyptus porosa* (Mallee Box) trees with measures utilising the mitigation hierarchy undertaken.

9 DISCUSSION

This Springwood Development area has an overall low ecological value with pasture the dominant vegetation type present which commonly had high weed cover as part of the composition. Based on species observations made by KBR (2010), the survey effort was commensurate with the biological values of the site and annual and seasonal variation components were undertaken through 2008 to 2010.

Impacts on fauna will be mostly associated with rehabilitation of the quarry and the consequent impacts on avifauna. Rehabilitation and major earthworks are a necessity in order to make the quarry precinct safe. Remediation of the high wall of the quarry must be undertaken to manage some of the geotechnical risks and it is unlikely that mitigation actions can be undertaken for species utilising the quarry wall such as Rainbow Bee-eater, Peregrine Falcon, White-winged Chough and Fairy Martin and these species will be displaced from the site. Given the man-made nature of the quarry, this feature has been a temporary habitat structure and it is expected that species will adapt to changes again with each of these species having differing opportunities to re-locate in the region. This includes greater use of other habitats, both natural and man-made such as woodland, sand quarries and natural cliff and rock outcrops in the region.

Stormwater management plans utilizing sections of Springwood Creek as temporary flow management buffers is supported by EBS. Joint planning undertaken by WPG and KBR identified suitable sections devoid of native vegetation for retention and riffle banks. In an area of increasing urbanization, extremely low remnancy of native vegetation, historical records of migratory wetland birds and indirect pressures such as climate change, any efforts to increase the extent and frequency of ephemeral or semi -riparian zones is welcomed from an ecological perspective.

Culverts associated with these structures are not expected to provide significant habitat fragmentation or restriction of biodiversity corridor values provided by Springwood Creek based on the likely fauna community structure expected within an urban area.

10 REFERENCES

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Department of the Environment and Energy (DotEE) (2012) Interim Biogeographic Regionalisation for Australia v. 7 (IBRA) [ESRI shapefile]. Available at: http://intspat01.ris.environment.gov.au/fed/catalog/search/resource/details.page?uuid=%7B3C182B5A-C081-4B56-82CA-DF5AF82F86DD%7D [Accessed 29th March 2019].

Department of the Environment and Energy (DotEE) (2019) EPBC Act Protected Matters Report. http://www.environment.gov.au/erin/ert/epbc/index.html [Report created 29th March 2019]

Kellogg Brown and Root (2010) Gawler East Development Plan Amendment, Gawler East Ecological Survey.

11 APPENDICES

Appendix 1. Flora species BDBSA records within 5km radius of Springwood Development Area

Species	Common	AUS	SA	Date
Acacia acinacea	Wreath Wattle			3/01/2013
Acacia continua	Thorn Wattle			1/08/2012
Acacia cyclops	Western Coastal Wattle			17/12/2014
Acacia iteaphylla	Flinders Ranges Wattle		R	27/11/2002
Acacia ligulata	Umbrella Bush			10/12/2014
Acacia melanoxylon	Blackwood			22/09/2016
Acacia notabilis	Notable Wattle			13/10/2015
Acacia paradoxa	Kangaroo Thorn			19/10/2017
Acacia pycnantha	Golden Wattle			19/10/2017
Acacia retinodes	Wirilda			1/08/2012
Acacia salicina	Willow Wattle			25/11/2012
Acacia saligna	Golden Wreath Wattle			10/02/2012
Acacia sp.	Wattle			17/06/2001
Acacia trineura	Three-nerve Wattle		E	10/02/2012
Acacia victoriae ssp.	Elegant Wattle			18/02/2015
Acaena echinata	Sheep's Burr			25/10/2017
Aira cupaniana	Small Hair-grass			28/10/2011
Aira elegantissima	Delicate Hair-grass			28/10/2011
Aira sp.	Hair-grass			25/10/2017
Allium triquetrum	Three-cornered Garlic			29/09/2015
Allocasuarina verticillata	Drooping Sheoak			13/10/2015
Amaranthus albus	Stiff Tumbleweed			1/05/2012
Anredera cordifolia	Madeira Vine			29/09/2015
Anthosachne scabra	Native Wheat-grass			31/01/2018
Arctotheca calendula	Cape Weed			25/10/2017
Aristida behriana	Brush Wire-grass			5/12/2017
Aristida contorta	Curly Wire-grass			20/11/2011
Artemisia arborescens	Silver Wormwood			31/01/2018
Arthropodium fimbriatum	Nodding Vanilla-lily			30/11/2016
Arthropodium sp.	Vanilla-lily			18/09/2010
Arthropodium strictum	Common Vanilla-lily			23/09/2013
Arundo donax	Giant Reed			31/01/2018
Asparagus asparagoides (NC)	Bridal Creeper			23/11/1999
Asparagus asparagoides f.	Bridal Creeper			24/10/2012
Asparagus asparagoides f. asparagoides	Bridal Creeper			25/02/2015
Asphodelus fistulosus	Onion Weed			25/10/2017
Asteriscus spinosus	Golden Pallensis			3/04/2018
Atriplex prostrata	Creeping Saltbush			31/01/2018
Atriplex semibaccata	Berry Saltbush			27/11/2014

Species	Common	AUS	SA	Date
Atriplex sp.	Saltbush			1/10/2011
Atriplex suberecta	Lagoon Saltbush			25/11/2012
Austrostipa blackii	Crested Spear-grass			3/01/2013
Austrostipa curticoma	Short-crest Spear-grass			25/11/2012
Austrostipa densiflora	Fox-tail Spear-grass		R	11/11/2005
Austrostipa drummondii	Cottony Spear-grass			23/11/2012
Austrostipa elegantissima	Feather Spear-grass			25/11/2012
Austrostipa eremophila	Rusty Spear-grass			3/01/2013
Austrostipa gibbosa	Swollen Spear-grass		R	28/10/2011
Austrostipa mollis	Soft Spear-grass			1/12/2014
Austrostipa multispiculis	Many-flowered Spear-grass		R	20/11/2011
Austrostipa nodosa	Tall Spear-grass			3/01/2013
Austrostipa puberula	Fine-hairy Spear-grass			24/10/2012
Austrostipa scabra ssp. falcata	Slender Spear-grass			28/10/2011
Austrostipa sp.	Spear-grass			25/10/2017
Avena barbata	Bearded Oat			31/01/2018
Avena sp.	Oat			3/01/2013
Baumea juncea	Bare Twig-rush			31/01/2018
Bellardia latifolia	Red Bartsia			24/10/2012
Boerhavia dominii	Tar-vine			25/10/2017
Boerhavia dominii (NC)	Tar-vine			6/04/2013
Bolboschoenus caldwellii	Salt Club-rush			28/10/2011
Bothriochloa macra	Red-leg Grass		R	21/09/2016
Brachypodium distachyon	False Brome			25/10/2017
Brassica sp.				13/01/2004
Brassica tournefortii	Wild Turnip			24/10/2012
Briza maxima	Large Quaking-grass			25/10/2017
Briza minor	Lesser Quaking-grass			25/10/2017
Bromus diandrus	Great Brome			25/10/2017
Bromus diandrus (NC)	Great Brome			27/11/2002
Bromus hordeaceus ssp. hordeaceus	Soft Brome			19/10/2017
Bromus madritensis	Compact Brome			28/10/2011
Bromus rubens	Red Brome			28/10/2011
Bromus sp.	Brome			31/01/2018
Bursaria spinosa ssp.	Bursaria			15/11/2005
Bursaria spinosa ssp. spinosa	Sweet Bursaria			24/10/2012
Callitris gracilis	Southern Cypress Pine			26/11/2012
Calostemma purpureum	Pink Garland-lily			13/04/2016
Cardamine flexuosa	Wood Bitter-cress			26/08/2015
Carduus pycnocephalus	Shore Thistle			13/10/2015
Carex bichenoviana	Notched Sedge			10/12/2014
Carthamus lanatus	Saffron Thistle			8/12/2017
Casuarina glauca	Grey Buloak			29/09/2015
Casuarinaceae sp.	Sheaok Family			19/10/1999
Catapodium rigidum	Rigid Fescue			29/10/2014

Species	Common	AUS	SA	Date
Cenchrus ciliaris	Buffel Grass			1/01/2012
Cenchrus clandestinus	Kikuyu			2/10/2014
Cenchrus longisetus	Feather-top			11/06/2015
Cenchrus setaceus	Fountain Grass			31/01/2018
Centaurea calcitrapa	Star Thistle			10/12/2010
Centaurium erythraea	Common Centaury			19/12/2014
Centipeda cunninghamii	Common Sneezeweed			10/05/2017
Chasmanthe floribunda	African Corn-flag			29/09/2015
Cheilanthes austrotenuifolia	Annual Rock-fern			18/09/2010
Cheilanthes distans	Bristly Cloak-fern			10/08/1999
Cheilanthes lasiophylla	Woolly Cloak-fern			18/12/2014
Cheilanthes sp.	Rock-fern			21/09/2016
Chenopodium glaucum	Glaucous Goosefoot			31/01/2018
Chenopodium murale	Nettle-leaf Goosefoot			31/05/2017
Chloris gayana	Rhodes Grass			11/06/2015
Chloris truncata	Windmill Grass			17/12/2014
Chondrilla juncea	Skeleton Weed			6/12/2017
Chrozophora tinctoria	Dyer's Litmus Plant			8/12/2017
Cirsium vulgare	Spear Thistle			21/06/2018
Citrullus colocynthis	Colocynth			8/12/2017
Cladium procerum	Leafy Twig-rush		R	31/01/2018
Convolvulus angustissimus ssp.	Narrow-leaf Bindweed			8/12/2017
Convolvulus angustissimus ssp. angustissimus (NC)	Narrow-leaf Bindweed			10/12/2014
Convolvulus angustissimus ssp. peninsularum (NC)	Narrow-leaf Bindweed			23/11/2012
Convolvulus arvensis	Field Bindweed			10/12/2010
Convolvulus erubescens (NC)	Australian Bindweed			27/11/2002
Convolvulus erubescens complex				10/09/2013
Convolvulus remotus	Grassy Bindweed			28/10/2014
Convolvulus sp.	Bindweed			30/01/2013
Conyza bonariensis	Flax-leaf Fleabane			15/02/2018
Corybas diemenicus	Veined Helmet-orchid			22/08/2016
Crassula colligata ssp. colligata				25/11/2011
Crassula colorata var. acuminata	Dense Crassula			24/10/2012
Crassula sp.	Crassula/Stonecrop			18/09/2010
Crepis capillaris	Smooth Hawksbeard			13/10/2015
Crepis foetida ssp. foetida	Stinking Hawksbeard			4/12/2017
Cucumis myriocarpus ssp. myriocarpus	Paddy Melon			31/05/2017
Cullen australasicum	Tall Scurf-pea			19/10/2017
Cycnogeton procerum	Water-ribbons			9/11/2012
Cymbopogon ambiguus	Lemon-grass			31/01/2018
Cynara cardunculus ssp. flavescens	Artichoke Thistle			31/01/2018
Cynodon dactylon (NC)	Couch			13/01/2004
Cynodon dactylon var.	Couch			14/02/2018
Cynodon dactylon var. dactylon	Couch			25/10/2017
Cynoglossum suaveolens	Sweet Hound's-tongue			28/10/2011

Species	Common	AUS	SA	Date
Cynosurus echinatus	Rough Dog's-tail Grass			31/01/2018
Cyperus gymnocaulos	Spiny Flat-sedge			23/11/2012
Cyperus sp.	Flat-sedge			31/01/2018
Cyperus vaginatus	Stiff Flat-sedge			28/10/2011
Dactylis glomerata	Cocksfoot			5/12/2017
Danthonia sp. (NC)	Wallaby-grass			27/11/2002
Datura inoxia	Downy Thorn-apple			16/12/2014
Dianella longifolia var. grandis	Pale Flax-lily		R	1/07/2018
Dianella revoluta var.				26/11/2012
Dianella revoluta var. revoluta	Black-anther Flax-lily			26/11/2014
Dichanthium sericeum ssp.	Silky Blue-grass			23/11/2012
Dichanthium sericeum ssp. sericeum	Silky Blue-grass			3/01/2013
Dichondra repens	Kidney Weed			8/12/2017
Digitaria ammophila	Spider Grass			3/01/2013
Digitaria brownii	Cotton Panic-grass			24/10/2012
Diplotaxis tenuifolia	Lincoln Weed			6/06/2017
Disa bracteata	South African Weed Orchid			31/01/2018
Dittrichia graveolens	Stinkweed			14/02/2018
Dodonaea viscosa ssp.	Sticky Hop-bush			23/11/2012
Dodonaea viscosa ssp. spatulata	Sticky Hop-bush			31/01/2018
Drosera auriculata	Tall Sundew			10/09/2013
Drosera macrantha ssp. planchonii	Climbing Sundew			15/11/2005
Dysphania pumilio	Small Crumbweed			12/05/2017
Echium plantagineum	Salvation Jane			31/01/2018
Ehrharta calycina	Perennial Veldt Grass			22/10/2014
Ehrharta longiflora	Annual Veldt Grass			25/10/2017
Einadia nutans ssp.	Climbing Saltbush			23/10/2013
Einadia nutans ssp. nutans	Climbing Saltbush			28/10/2011
Enchylaena sp.				25/11/2012
Enchylaena tomentosa var.	Ruby Saltbush			25/08/2017
Enchylaena tomentosa var. tomentosa	Ruby Saltbush			27/11/2002
Enneapogon nigricans	Black-head Grass			5/12/2017
Enteropogon acicularis	Umbrella Grass			3/01/2013
Eragrostis barrelieri	Pitted Love-grass			23/05/2016
Eragrostis cilianensis	Stink Grass			11/06/2015
Eragrostis curvula	African Love-grass			13/05/2013
Eragrostis minor	Small Stink-grass			11/06/2015
Eragrostis trichophora	Hairyflower Lovegrass			11/06/2015
Eremophila longifolia	Weeping Emubush			24/10/2012
Erodium botrys	Long Heron's-bill			8/12/2017
Erodium crinitum	Blue Heron's-bill			16/11/2017
Erodium sp.	Heron's-bill/Crowfoot			15/11/2005
Eucalyptus camaldulensis ssp.	River Red Gum			25/10/2017
Eucalyptus camaldulensis ssp. camaldulensis	River Red Gum			31/01/2018
Eucalyptus cladocalyx (NC)	Sugar Gum			15/11/2005

Species	Common	AUS	SA	Date
Eucalyptus leucoxylon ssp.	South Australian Blue Gum			25/10/2017
Eucalyptus leucoxylon ssp. leucoxylon	South Australian Blue Gum			28/10/2011
Eucalyptus leucoxylon ssp. pruinosa	Inland South Australian Blue Gum			28/10/2011
Eucalyptus odorata	Peppermint Box			16/10/2014
Eucalyptus odorata (NC)	Peppermint Box			23/11/1999
Eucalyptus porosa	Mallee Box			3/01/2013
Eucalyptus socialis ssp. socialis	Beaked Red Mallee			12/02/2012
Eucalyptus sp.				11/07/2013
Euphorbia drummondii (NC)				13/03/2013
Euphorbia drummondii s.str.				3/04/2018
Euphorbia terracina	False Caper			29/09/2015
Foeniculum vulgare	Fennel			31/01/2018
Fraxinus angustifolia ssp. angustifolia	Desert Ash			31/01/2018
Freesia cultivar	Freesia			29/09/2015
Fumaria capreolata	White-flower Fumitory			25/10/2017
Fumaria densiflora	Dense Fumitory			17/10/2012
Gahnia lanigera	Black Grass Saw-sedge			12/02/2012
Galenia pubescens var. pubescens	Coastal Galenia			3/04/2018
Galium aparine	Cleavers			7/10/2016
Gazania linearis	Gazania			6/06/2017
Gazania sp.	Gazania			19/10/1999
Geranium retrorsum	Grassland Geranium			11/11/2005
Geranium solanderi	Austral Geranium			17/09/2012
Geranium sp.	Geranium			18/09/2010
Gladiolus undulatus	Wild Gladiolus			1/12/2014
Gleditsia triacanthos				2/10/2014
Gomphocarpus cancellatus	Broad-leaf Cotton-bush			31/01/2018
Gomphocarpus fruticosus	Narrow-leaf Cotton-bush			1/05/2012
Gonocarpus elatus	Hill Raspwort			8/06/2017
Goodenia pinnatifida	Cut-leaf Goodenia			18/11/2014
Gramineae sp.	Grass Family			22/05/2000
Hainardia cylindrica	Common Barb-grass			14/11/2016
Haloragis aspera	Rough Raspwort			10/11/2005
Heliotropium asperrimum	Rough Heliotrope			19/10/2017
Heliotropium europaeum	Common Heliotrope			15/02/2018
Heliotropium supinum	Creeping Heliotrope			31/01/2018
Helminthotheca echioides	Ox-tongue			31/01/2018
Hordeum glaucum	Blue Barley-grass			23/11/1999
Hordeum leporinum	Wall Barley-grass			2/10/2014
Hordeum sp.	Barley-grass			3/01/2013
Hordeum vulgare	Barley			19/10/1999
Hyparrhenia hirta	Tambookie Grass			29/01/2018
Hypochaeris glabra	Smooth Cat's Ear			31/01/2018
Hypochaeris radicata	Rough Cat's Ear			25/10/2017
Hypochaeris sp.	Cat's Ear			8/12/2015

Species	Common	AUS	SA	Date
Juncus kraussii	Sea Rush			28/10/2011
Juncus subsecundus	Finger Rush			28/10/2011
Juncus usitatus	Common Rush			28/10/2011
Kickxia commutata ssp. graeca				18/04/2018
Kickxia elatine ssp.	Sharp-leaf Toadflax			6/12/2017
Lachnagrostis filiformis	Common Blown-grass			28/10/2011
Lactuca saligna	Willow-leaf Lettuce			31/01/2018
Lactuca serriola f.	Prickly Lettuce			8/12/2017
Lavandula stoechas ssp. stoechas	Topped Lavender			1/12/2012
Leiocarpa tomentosa	Woolly Plover-daisy			24/10/2012
Lepidium africanum	Common Peppercress			23/10/2013
Lepidium sp.	Peppercress			24/10/2012
Lichen sp.				25/11/2012
Limonium companyonis	Sea-lavender			11/06/2015
Lobelia anceps	Angled Lobelia			31/01/2018
Lolium rigidum	Wimmera Ryegrass			3/01/2013
Lolium sp.	Ryegrass			25/10/2017
Lomandra collina	Sand Mat-rush			23/09/2013
Lomandra densiflora	Soft Tussock Mat-rush			25/10/2017
Lomandra effusa	Scented Mat-rush			3/01/2013
Lomandra multiflora ssp.	Many-flower Mat-rush			13/04/2016
Lomandra multiflora ssp. dura	Hard Mat-rush			18/12/2014
Lomandra nana	Small Mat-rush			23/11/2012
Lomandra sororia	Sword Mat-rush			28/10/2011
Lomandra sp.	Mat-rush			13/03/2013
Lycium australe	Australian Boxthorn			10/08/1999
Lycium ferocissimum	African Boxthorn			31/01/2018
Lysimachia arvensis	Pimpernel			19/12/2014
Lythrum hyssopifolia	Lesser Loosestrife			17/10/2012
Maireana brevifolia	Short-leaf Bluebush			15/02/2018
Maireana enchylaenoides	Wingless Fissure-plant			25/10/2017
Maireana rohrlachii	Rohrlach's Bluebush		R	3/01/2013
Malva parviflora	Small-flower Marshmallow			25/02/2016
Malva preissiana	Australian Hollyhock			13/10/2015
Malva preissiana (NC)	Australian Hollyhock			28/10/2011
Malva weinmanniana	Australian Hollyhock			25/10/2017
Malvaceae sp.				19/10/1999
Marrubium vulgare	Horehound			25/10/2017
Medicago minima	Little Medic			23/10/2013
Medicago polymorpha	Burr-medic			23/10/2013
Medicago scutellata	Snail Medic			15/11/2005
Medicago sp.	Medic			17/06/2001
Melaleuca brevifolia	Short-leaf Honey-myrtle			31/01/2018
Melaleuca lanceolata	Dryland Tea-tree			12/02/2012
Melaleuca sp.	Tea-tree			17/06/2001

Species	Common	AUS	SA	Date
Mentha pulegium	Pennyroyal			31/01/2018
Microtis frutetorum				15/11/2005
Moraea miniata	Two-leaf Cape Tulip			6/10/2016
Moraea setifolia	Thread Iris			7/10/2016
Moss sp.				26/11/2012
Myoporum montanum	Native Myrtle			10/08/1999
Myriophyllum sp.	Milfoil			28/10/2011
Nassella neesiana				4/10/2009
Nicotiana glauca	Tree Tobacco			31/01/2018
Not naturalised in SA sp.				23/11/1999
Oenothera stricta ssp. stricta	Common Evening Primrose			14/12/2017
Olea europaea ssp.	Olive			9/05/2017
Olea europaea ssp. europaea	Olive			3/07/2018
Olearia pannosa ssp. pannosa	Silver Daisy-bush	VU	V	22/09/2015
Onopordum acaulon	Horse Thistle			15/06/2017
Orobanche minor	Lesser Broomrape			24/09/2018
Oxalis perennans	Native Sorrel			2/11/2017
Oxalis perennans (NC)	Native Sorrel			18/06/2003
Oxalis pes-caprae	Soursob			3/07/2018
Oxalis purpurea	One-o'clock			13/10/2015
Panicum capillare var. brevifolium	Witch-grass			21/06/2017
Panicum effusum var. effusum	Hairy Panic			24/10/2012
Panicum hillmanii	Witch-grass			11/06/2015
Panicum sp.	Panic/Millet			1/12/2014
Papaver rhoeas	Field Poppy			4/12/2017
Paspalum dilatatum	Paspalum			31/01/2018
Pentameris pallida	Pussy Tail			31/01/2018
Phalaris aquatica	Phalaris			31/01/2018
Phalaris sp.	Canary Grass			3/07/2018
Phoenix canariensis	Canary Island Palm			2/04/2015
Phragmites australis	Common Reed			31/01/2018
Picnomon acarna	Soldier Thistle			11/01/2017
Pimelea micrantha	Silky Riceflower			24/10/2012
Pinus halepensis	Aleppo Pine			27/11/2002
Pinus sp.	Pine			19/10/1999
Piptatherum miliaceum	Rice Millet			6/12/2017
Pittosporum angustifolium	Native Apricot			31/01/2018
Plantago lanceolata var.	Ribwort			6/12/2017
Plantago lanceolata var. lanceolata	Ribwort			13/11/2015
Plantago sp.	Plantain			17/06/2001
Pleurosorus rutifolius	Blanket Fern			28/10/2010
Poa annua	Winter Grass			26/05/2017
Poa crassicaudex	Thick-stem Tussock-grass			24/10/2012
Poa labillardieri var. labillardieri	Common Tussock-grass			3/01/2013
Poa sp.	Meadow-grass/Tussock-grass			1/12/2014

Species	Common	AUS	SA	Date
Polygonum arenastrum	Wireweed			23/10/2013
Polygonum aviculare	Wireweed			10/02/2012
Polypogon monspeliensis	Annual Beard-grass			31/01/2018
Populus nigra	Lombardy Poplar			11/06/2015
Portulaca oleracea	Common Purslane			17/12/2014
Potamogeton pectinatus	Fennel Pondweed			28/10/2011
Prunus dulcis	Almond			13/10/2015
Prunus persica var.	Peach			3/02/2014
Prunus sp.	Plum			27/11/2002
Pseudognaphalium luteoalbum	Jersey Cudweed			23/05/2018
Ptilotus angustifolius	Narrow-leaf Yellow-tails			23/11/2012
Ptilotus seminudus	Rabbit-tails			15/11/2005
Ptilotus spathulatus	Pussy-tails			8/12/2017
Raphanus raphanistrum	Wild Radish			31/01/2018
Rapistrum rugosum ssp. rugosum	Turnip Weed			25/10/2017
Reichardia tingitana	False Sowthistle			6/12/2017
Reseda lutea	Cut-leaf Mignonette			14/04/2016
Rhagodia parabolica	Mealy Saltbush			11/12/2014
Rhamnus alaternus	Blowfly Bush			29/09/2015
Roepera glauca	Pale Twinleaf			25/11/2012
Romulea rosea var. australis	Common Onion-grass			16/08/2016
Romulea sp.	Onion-grass			18/06/2003
Rosa canina	Dog Rose			18/12/2014
Rostraria cristata	Annual Cat's-tail			25/10/2013
Rumex acetosella	Sorrel			28/10/2011
Rumex brownii	Slender Dock			28/10/2011
Rumex conglomeratus	Clustered Dock			31/01/2018
Rumex crispus	Curled Dock			3/01/2013
Rumex hypogaeus	Three-corner Jack			25/10/2017
Rumex sp.	Dock			13/04/2016
Rytidosperma auriculatum	Lobed Wallaby-grass			15/11/2005
Rytidosperma caespitosum	Common Wallaby-grass			3/01/2013
Rytidosperma duttonianum	Brown-back Wallaby-grass			28/10/2011
Rytidosperma racemosum var. racemosum	Slender Wallaby-grass			10/11/2005
Rytidosperma setaceum	Small-flower Wallaby-grass			3/01/2013
Rytidosperma sp.	Wallaby-grass			25/10/2017
Salsola australis	Buckbush			17/04/2018
Salvia verbenaca var.	Wild Sage			31/01/2018
Salvia verbenaca var. verbenaca	Wild Sage			25/10/2017
Samolus repens	Creeping Brookweed			31/01/2018
Scabiosa atropurpurea	Pincushion			15/02/2018
Scandix pecten-veneris ssp. pecten-veneris	Shepherd's Needle			15/11/2005
Schinus molle	Pepper-tree			25/10/2017
Schoenoplectus subulatus	Shore Club-rush			28/10/2011
Schoenoplectus tabernaemontani	River Club-rush			31/01/2018

Species	Common	AUS	SA	Date
Sclerolaena muricata var. villosa	Five-spine Bindyi		R	30/01/2018
Scorzonera laciniata var. calcitrapifolia	Scorzonera			4/12/2017
Senecio odoratus	Scented Groundsel			21/11/2014
Senecio phelleus	Woodland Groundsel			19/06/2018
Senecio picridioides	Purple-leaf Groundsel			11/12/2014
Senecio pterophorus	African Daisy			31/01/2018
Senecio quadridentatus	Cotton Groundsel			4/06/2014
Senecio sp.	Groundsel			11/11/2005
Senecio vulgaris	Common Groundsel			16/11/2017
Senna artemisioides ssp.	Desert Senna			9/05/2017
Senna artemisioides ssp. petiolaris				27/11/2002
Senna artemisioides ssp. X coriacea	Broad-leaf Desert Senna			24/10/2012
Setaria constricta	Knotty-butt Paspalidium			23/11/2012
Setaria jubiflora	Warrego Summer-grass			2/11/2017
Sherardia arvensis	Field Madder			28/10/2011
Sida corrugata var.	Corrugated Sida			23/06/2012
Sida corrugata var. angustifolia	Grassland Sida			13/03/2013
Sida corrugata var. corrugata	Corrugated Sida			24/10/2012
Silybum marianum	Variegated Thistle			26/10/2017
Sisymbrium erysimoides	Smooth Mustard			11/06/2015
Sisymbrium sp.	Wild Mustard			19/10/1999
Solanum elaeagnifolium	Silver-leaf Nightshade			21/06/2018
Solanum linnaeanum	Apple Of Sodom			3/07/2018
Solanum nigrum	Black Nightshade			15/02/2018
Sonchus asper	Rough Sow-thistle			31/01/2018
Sonchus oleraceus	Common Sow-thistle			31/01/2018
Stackhousia monogyna	Creamy Candles			25/10/2017
Stackhousia monogyna (NC)	Creamy Candles			10/09/2013
Symphyotrichum subulatum	Aster-weed			31/01/2018
Tamarix parviflora	Athel Pine			29/09/2015
Taraxacum sp.	Dandelion			1/06/2012
Teucrium racemosum	Grey Germander			25/11/2011
Themeda triandra	Kangaroo Grass			8/06/2017
Thyridia repens	Creeping Monkey-flower			14/02/2018
Tragopogon porrifolius	Salsify			19/10/2016
Tribulus terrestris	Caltrop			29/01/2018
Trifolium angustifolium	Narrow-leaf Clover			25/10/2017
Trifolium arvense var. arvense	Hare's-foot Clover			31/01/2018
Trifolium campestre	Hop Clover			31/01/2018
Trifolium sp.	Clover			11/07/2013
Trifolium subterraneum	Subterranean Clover			17/10/2012
Tropaeolum majus	Nasturtium			2/10/2014
Typha domingensis	Narrow-leaf Bulrush			31/01/2018
Urtica urens	Small Nettle			31/05/2017
Velleia arguta	Toothed Velleia			24/10/2012

Species	Common	AUS	SA	Date
Verbascum virgatum	Twiggy Mullein			8/12/2017
Verbena supina var. erecta	Trailing Verbena			15/01/2016
Vicia sativa ssp.	Common Vetch			10/09/2013
Vicia sativa ssp. sativa	Common Vetch			28/10/2011
Vicia sp.	Vetch			11/11/2005
Vicia tetrasperma	Slender Vetch			2/03/2012
Vittadinia blackii	Narrow-leaf New Holland Daisy			20/11/2015
Vittadinia cervicularis var. cervicularis	Waisted New Holland Daisy			25/11/2011
Vittadinia cuneata var.	Fuzzy New Holland Daisy			3/11/2017
Vittadinia cuneata var. cuneata	Fuzzy New Holland Daisy			3/01/2013
Vittadinia gracilis	Woolly New Holland Daisy			25/10/2017
Vittadinia megacephala	Giant New Holland Daisy			24/10/2012
Vulpia bromoides	Squirrel-tail Fescue			28/10/2011
Vulpia muralis	Wall Fescue			28/10/2011
Vulpia myuros f.	Fescue			15/11/1999
Vulpia myuros f. myuros	Rat's-tail Fescue			25/10/2017
Vulpia sp.	Fescue			31/01/2018
Wahlenbergia sp.	Native Bluebell			1/02/2011
Wahlenbergia stricta ssp. stricta	Tall Bluebell			28/10/2011
Walwhalleya proluta	Rigid Panic			6/12/2017
Walwhalleya proluta (NC)	Rigid Panic			27/11/2002
Watsonia meriana var. bulbillifera	Bulbil Watsonia			25/10/2017
Withania somnifera	Winter Cherry			15/02/2018
Xanthium spinosum	Bathurst Burr			9/05/2017
Xanthorrhoea quadrangulata	Rock Grass-tree			9/05/2017

Appendix 2. Fauna species BDBSA records within 5km radius of Springwood Development Area

Class	Species	Common	AUS	SA	DATE
ACTINOPTERI	*Carassius auratus*	Goldfish			25/11/2011
	Cyprinus carpio	European Carp			8/12/2015
	Galaxias maculatus	Common Galaxias			8/12/2015
	Gambusia holbrooki	Eastern Gambusia			25/11/2011
	Philypnodon grandiceps	Big-headed Gudgeon			15/11/2012
AMPHIBIA	*Crinia signifera*	Common Froglet			28/06/2018
	Limnodynastes dumerilii	Banjo Frog			10/09/2013
	Limnodynastes tasmaniensis	Spotted Marsh Frog			27/07/2017
	Litoria ewingii	Brown Tree Frog			14/09/2005
	Tadpole sp.	tadpole			6/12/2017
AVES	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater			15/06/2017
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill			18/04/2018
	Acanthiza reguloides	Buff-rumped Thornbill			14/12/2017
	Accipiter cirrocephalus cirrocephalus	Collared Sparrowhawk			14/03/2011
	Accipiter fasciatus	Brown Goshawk			29/01/2018
	Acrocephalus australis	Australian Reed Warbler			25/10/2017
	Aegotheles cristatus	Australian Owlet-nightjar			5/09/2009
	Alauda arvensis	Eurasian Skylark			10/09/2013
	Anas gracilis	Grey Teal			5/09/2012
	Anas superciliosa	Pacific Black Duck			31/01/2018
	Anthochaera carunculata	Red Wattlebird			18/04/2018
	Anthus australis	Australian Pipit			24/08/2017
	Aphelocephala leucopsis	Southern Whiteface			18/10/2010
	Aquila audax	Wedge-tailed Eagle			21/03/2018
	Ardea alba modesta	Great Egret			25/10/2012
	Ardea pacifica	White-necked Heron			20/09/2017
	Artamus cinereus	Black-faced Woodswallow			3/04/2018
	Artamus cyanopterus	Dusky Woodswallow			25/08/2011
	Cacatua galerita	Sulphur-crested Cockatoo			25/10/2017
	Cacatua sanguinea sanguinea	Little Corella			25/10/2017
	Cacatua tenuirostris	Long-billed Corella			1/08/2011
	Cacomantis flabelliformis	Fan-tailed Cuckoo			8/08/2012
	Cacomantis pallidus	Pallid Cuckoo			27/06/2018
	Caligavis chrysops	Yellow-faced Honeyeater			31/05/2018
	Carduelis carduelis	European Goldfinch			26/07/2017
	Chalcites basalis	Horsfield's Bronze Cuckoo			18/09/2015
	Chalcites lucidus	Shining Bronze Cuckoo			25/02/2012
	Chenonetta jubata	Maned Duck			6/10/2016
	Cheramoeca leucosterna	White-backed Swallow			19/06/2018
	Circus assimilis	Spotted Harrier			16/03/2017
	Climacteris picumnus	Brown Treecreeper			26/10/2017
	Colluricincla harmonica	Grey Shrikethrush			25/10/2017

Class	Species	Common	AUS	SA	DATE
	Columba livia	Feral Pigeon			25/10/2017
	Coracina novaehollandiae	Black-faced Cuckooshrike			6/06/2018
	Corcorax melanorhamphos	White-winged Chough		R	31/08/2016
	Corvus coronoides	Australian Raven			18/10/2009
	Corvus mellori	Little Raven			18/04/2018
	Coturnix pectoralis	Stubble Quail			22/05/2018
	Coturnix ypsilophora	Brown Quail		V	16/09/2015
	Dacelo novaeguineae	Laughing Kookaburra			31/01/2018
	Daphoenositta chrysoptera	Varied Sittella			28/02/2012
	Dicaeum hirundinaceum	Mistletoebird			14/05/2018
	Egretta novaehollandiae	White-faced Heron			18/04/2018
	Elanus axillaris	Black-shouldered Kite			23/05/2018
	Elseyornis melanops	Black-fronted Dotterel			25/10/2017
	Eolophus roseicapilla	Galah			25/10/2017
	Epthianura albifrons	White-fronted Chat			16/10/2017
	Falco berigora	Brown Falcon			22/05/2018
	Falco cenchroides	Nankeen Kestrel			25/10/2017
	Falco longipennis	Australian Hobby			17/12/2014
	Falcunculus frontatus frontatus	Eastern Shriketit		R	2/03/2013
	Gallinago hardwickii	Latham's Snipe		R	23/11/2008
	Gallinula tenebrosa	Dusky Moorhen			31/01/2018
	Gallirallus philippensis mellori	Buff-banded Rail			29/03/2010
	Gavicalis virescens	Singing Honeyeater			22/05/2018
	Geopelia placida	Peaceful Dove			22/05/2018
	Glossopsitta concinna	Musk Lorikeet			25/10/2017
	Grallina cyanoleuca	Magpielark			25/10/2017
	Gymnorhina tibicen	Australian Magpie			18/04/2018
	Haliastur sphenurus	Whistling Kite			25/05/2018
	Hieraaetus morphnoides	Little Eagle			14/02/2018
	Hirundo neoxena	Welcome Swallow			25/10/2017
	Lalage tricolor	White-winged Triller			8/12/2017
	Malacorhynchus membranaceus	Pink-eared Duck			18/01/2012
	Malurus cyaneus	Superb Fairywren			21/06/2018
	Malurus cyaneus leggei	Superb Fairywren (Mainland SA)			13/10/2015
	Manorina melanocephala	Noisy Miner			21/02/2013
	Megalurus cruralis	Brown Songlark			19/10/2017
	Megalurus gramineus	Little Grassbird			24/10/2012
	Megalurus mathewsi	Rufous Songlark			25/10/2017
	Melithreptus brevirostris	Brown-headed Honeyeater			31/01/2018
	Melithreptus gularis	Black-chinned Honeyeater		ssp	24/02/2012
	Melithreptus lunatus	White-naped Honeyeater			20/07/2015
	Merops ornatus	Rainbow Bee-eater			25/10/2017
	Microcarbo melanoleucos melanoleucos	Little Pied Cormorant			31/01/2018
	Milvus migrans	Black Kite			25/03/2015
	Myiagra inquieta	Restless Flycatcher		R	22/09/2015

Class	Species	Common	AUS	SA	DATE
	Neophema elegans	Elegant Parrot		R	20/09/2017
	Ninox boobook	Southern Boobook			19/06/2018
	Northiella haematogaster (NC)	Bluebonnet		ssp	16/10/2009
	Ocyphaps lophotes	Crested Pigeon			15/06/2017
	Pachycephala pectoralis	Golden Whistler			28/06/2018
	Pachycephala rufiventris	Rufous Whistler			22/05/2018
	Pachycephala rufiventris rufiventris	Rufous Whistler			27/10/2015
	Pardalotus punctatus	Spotted Pardalote			31/03/2016
	Pardalotus striatus	Striated Pardalote			22/09/2016
	Parvipsitta porphyrocephala	Purple-crowned Lorikeet			2/11/2011
	Parvipsitta pusilla	Little Lorikeet		E	25/02/2012
	Passer domesticus	House Sparrow			8/12/2017
	Pelecanus conspicillatus	Australian Pelican			4/12/2017
	Petrochelidon ariel	Fairy Martin			14/10/2017
	Petrochelidon nigricans	Tree Martin			24/08/2017
	Petroica goodenovii	Red-capped Robin			15/05/2018
	Petroica phoenicea	Flame Robin		V	17/05/2018
	Phalacrocorax carbo	Great Cormorant			1/02/2013
	Phalacrocorax sulcirostris	Little Black Cormorant			7/11/2012
	Phalacrocorax varius	Great Pied Cormorant			9/11/2012
	Phaps chalcoptera	Common Bronzewing			19/06/2018
	Phasianus colchicus	Common Pheasant			25/10/2016
	Phylidonyris novaehollandiae	New Holland Honeyeater			18/04/2018
	Phylidonyris novaehollandiae novaehollandiae	New Holland Honeyeater (mainland SA)			28/08/2015
	Platycercus elegans	Crimson Rosella			18/04/2018
	Plegadis falcinellus	Glossy Ibis		R	25/11/2014
	Podargus strigoides	Tawny Frogmouth			27/03/2018
	Porphyrio porphyrio	Purple Swamphen			10/09/2013
	Porzana fluminea	Australian Crake (Australian Spotted Crake)			18/01/2012
	Psephotus haematonotus	Red-rumped Parrot			25/10/2017
	Psephotus haematonotus haematonotus	Red-rumped Parrot (eastern SA except NE)			19/12/2014
	Ptilotula penicillata	White-plumed Honeyeater			18/04/2018
	Rhipidura albiscapa	Grey Fantail			16/08/2016
	Rhipidura leucophrys	Willie Wagtail			18/04/2018
	Smicrornis brevirostris	Weebill			25/10/2017
	Spilopelia chinensis	Spotted Dove			24/10/2012
	Stagonopleura guttata	Diamond Firetail		V	18/04/2018
	Strepera versicolor	Grey Currawong		ssp	25/10/2017
	Strepera versicolor melanoptera	Black-winged Currawong (SE, MLR, MM)			28/08/2015
	Streptopelia risoria	Barbary Dove			10/09/2011
	Sturnus vulgaris	Common Starling			31/01/2018
	Tachybaptus novaehollandiae	Australasian Grebe			11/01/2017
	Threskiornis moluccus	Australian White Ibis			11/01/2017
	Todiramphus sanctus	Sacred Kingfisher			19/10/2017

Class	Species	Common	AUS	SA	DATE
	Tribonyx ventralis	Black-tailed Nativehen			27/08/2013
	Trichoglossus haematodus	Rainbow Lorikeet			25/10/2017
	Turdus merula	Common Blackbird			2/03/2013
	Tyto delicatula delicatula	Eastern Barn Owl			1/05/2018
	Vanellus miles	Masked Lapwing			25/10/2017
	Vanellus tricolor	Banded Lapwing			17/08/2011
	Zosterops lateralis	Silvereye			18/04/2018
MAMMALIA	*Cervus dama*	Fallow Deer			3/09/2015
	Cervus elaphus	Red Deer			17/12/2013
	Felis catus	Domestic Cat (Feral Cat)			25/06/2012
	Lepus europaeus	European Brown Hare			22/05/2018
	Macropus (Osphranter) robustus	Euro			27/06/2018
	Macropus fuliginosus	Western Grey Kangaroo			16/04/2018
	Mus musculus	House Mouse			24/08/2017
	Oryctolagus cuniculus	Rabbit (European Rabbit)			8/12/2017
	Ovis aries	Sheep (Feral Sheep)			13/02/2013
	Rattus norvegicus	Brown Rat (Sewer Rat, Norway Rat)			3/05/2017
	Tachyglossus aculeatus	Short-beaked Echidna	ssp		10/09/2013
	Trichosurus vulpecula	Common Brushtail Possum		R	2/03/2013
	Vulpes vulpes	Fox (Red Fox)			14/05/2018
REPTILIA	*Chelodina longicollis*	Eastern Long-necked Turtle			30/08/2013
	Christinus marmoratus	Marbled Gecko			2/03/2013
	Cryptoblepharus pannosus	Speckled Wall Skink			15/10/2014
	Ctenotus spaldingi	Eastern Striped Skink			30/01/2018
	Delma molleri	Gulfs Delma			18/06/2015
	Emydura macquarii	Macquarie River Turtle		V	14/10/2017
	Hemiergis decresiensis	Three-toed Earless Skink			9/08/2017
	Hemiergis peronii	Four-toed Earless Skink			29/03/2010
	Lampropholis guichenoti	Garden Skink			14/10/2017
	Lerista bougainvillii	Bougainville's Skink			16/09/2015
	Menetia greyii	Dwarf Skink			15/08/2015
	Morethia obscura	Mallee Snake-eye			19/10/2009
	Parasuta flagellum	Little Whip Snake			29/03/2010
	Pogona barbata	Eastern Bearded Dragon			28/10/2016
	Pseudechis porphyriacus	Red-bellied Black Snake			14/10/2017
	Pseudonaja textilis	Eastern Brown Snake			27/11/2017
	Tiliqua rugosa	Sleepy Lizard			31/01/2018
	Tiliqua scincoides	Eastern Bluetongue			17/04/2018

Appendix 3. KBR Phase 2 ecological survey

GAWLER EAST DEVELOPMENT PLAN AMENDMENT

Gawler East Ecological Survey

Prepared for:

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20 August 2010

AEN814-G-REP-003 Rev. 1

Limitations Statement

The sole purpose of this report and the associated services performed by Kellogg Brown & Root Pty Ltd (KBR) is to provide a flora fauna survey in accordance with the scope of services set out in the contract between KBR and Delfin Lend Lease Pty Ltd ('the Client'). That scope of services was defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

KBR derived the data in this report primarily from visual inspections, examination of records in the public domain and interviews with individuals with information about the site made on the dates indicated. The passage of time, manifestation of latent conditions or impacts of future events may require further exploration at the site and subsequent data analysis, and re-evaluation of the findings, observations and conclusions expressed in this report.

In preparing this report, KBR has relied upon and presumed accurate certain information (or absence thereof) relative to the site provided by government officials and authorities, the Client and others identified herein. Except as otherwise stated in the report, KBR has not attempted to verify the accuracy or completeness of any such information.

The findings, observations and conclusions expressed by KBR in this report are not, and should not be considered, an opinion concerning seasonal and annual variation in some species. No warranty or guarantee, whether express or implied, is made with respect to the data reported or to the findings, observations and conclusions expressed in this report. Further, such data, findings, observations and conclusions are based solely upon site conditions, information, drawings supplied by the Client in existence at the time of the investigation.

This report has been prepared on behalf of and for the exclusive use of the Client, and is subject to and issued in connection with the provisions of the agreement between KBR and the Client. KBR accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

Revision History

Revision	Date	Comment	Signatures		
			Originated by	Checked by	Approved by
0	1/2/2010	For use	SJR	RJA	SJR
1	20/8/2010	For use			

CONTENTS

1 Introduction

Kellogg, Brown & Root Pty Ltd (KBR) was commissioned by Delfin Lend Lease (Delfin, the Client) to undertake an ecological assessment for a site at Gawler East, South Australia which is the subject of a Development Plan Amendment (DPA). An initial assessment report was based on on-site reconnaissance surveys and a review of 'desktop information' over July to September 2008 and November 2008 to January 2009 (KBR 2009).

Detailed assessment of vegetation, flora and fauna was undertaken in 2009, with seasonal observations made over July to December 2009 and up to May 2010. A more detailed fauna survey, including a trapping assessment of ground fauna, occurred in October 2009. This report describes the findings from all components of the field assessments during 2008 to 2010. Appendix A includes copies of species lists for the site. This extended period of survey provided for ecological investigations under both drought and more normal weather and rainfall conditions. It also allowed for comprehensive records to be compiled of annual and seasonal variation in some flora and fauna groups.

2 Legislation and policy

Commonwealth legislation relevant to the project in relation to vegetation communities and flora and fauna species and their habitat is the:

- *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act). This Act relates to the definition, protection and management of all matters of national environmental significance such as ecological communities, species and their habitat and sites. It also includes strategic assessments, threatening processes and recovery plans, including regional recovery plans. It is illegal to undertake an action that will have a significant adverse impact on a matter of national environmental significance.

The EPBC Act provides for the implementation and administration of international agreements concerning fauna to which Australia is a signatory, namely:

- CITES—Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)
- JAMBA—Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (1974)
- CAMBA—Agreement between the Government of Australia and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their Environment (1986)
- ROKAMBA—Agreement between the Government of Australia and the Government of the Republic of Korea for the Protection of Migratory Birds (2007)
- Bonn Convention—Convention on the Conservation of Migratory Species of Wild Animals, for which Australia is a range state under the Convention (1979)
- Earth Summit—Convention on Biological Diversity (Rio de Janeiro, 1992). Convention on Biological Diversity and The National Strategy for the Conservation of Australia's Biological Diversity (ANZECC, Department of the Environment, Sport and Territories 1996)
- National Strategy for the Conservation of Australian Species and Communities Threatened with Extinction (Endangered Species Advisory Committee 1992).

A proponent of any proposed development that may have an adverse impact upon Matters of National Environmental Significance (MNES) must submit a referral under the EPBC Act to the Commonwealth Minister of Environment.

State legislation includes:

- *National Parks and Wildlife Act 1972* (NP&W Act), especially Schedules 7, 8 and 9 as revised in the *National Parks and Wildlife (Miscellaneous) Amendment Act 2000* and in *2008*.
- *Natural Resources Management Act 2004 (NRM Act)*, which repeals the *Animal and Plant Control (Agricultural Protection and Other Purposes) Act 1986* and the *Soil Conservation and Land Care Act 1997* and incorporates the functional requirements of these latter Acts under the NRM Act. The NRM Act establishes provisions for the management of the State's natural resources, including the land and water resources plus pest plants and animals.
- *Native Vegetation Act 1991, Native Vegetation (Miscellaneous) Amendment Act 2002* and the Native Vegetation Regulations 2003.

In addition, the *Development Act 1993* will be relevant to the occurrence of significant trees and the *Mining Act 1971* may be relevant to actions undertaken in the former quarry.

State agreements, policies and strategies relevant to habitats, communities and species include:

- *Threatened Species Strategy for South Australia* (Department of Environment and Natural Resources 2007).
- *The State Government policy, No Species Loss A Biodiversity Strategy for South Australia 2006–2016* is the key policy for protection of biodiversity in the State and is applicable to the project.
- *Tackling Climate Change: South Australia's Greenhouse Strategy 2007-2020* also relates to the sustainable management of natural resources and includes requirements to assess the potential risks associated with climate change influences on native and invasive species.
- *The South Australian Biosecurity Strategy 2008-2013* is a risk management framework that provides a summary review of threats posed by pests in the State, plus potential implementation requirements. This Strategy is applicable to the project.
- *Informing biodiversity conservation for the Adelaide and Mount Lofty Ranges Region, South Australia. Priorities, Strategies and Targets* (Department for Environment and Heritage 2009a.). This strategic document provides a summary of nature conservation matters for the region in which the site is located.

3 Methodology

Following review of an aerial photograph of the site, a reconnaissance survey of the site was undertaken in August and September 2008 by Dr Bob Anderson and Sarah Reachill. This survey involved a general assessment of all of the site and identification of areas of potential conservation significance. Specific areas of potential interest, such as riparian, rocky and remnant woodland sites, were assessed on foot. These included sections of the South Para River and an unnamed tributary of the River to the north, plus areas of remnant *Eucalyptus porosa* (Mallee box) woodland in the east and south of the site. Site-specific and incidental observations of all species observed were recorded for the site and surrounding area. The results of the initial surveys are described in KBR (2009).

Following on from the initial assessments it was determined that much of the site is anthropogenic and provides habitat primarily for introduced plants and for a few common native flora and fauna species only. However, there are smaller areas of higher quality habitat for some native flora and fauna species. These include:

- The rocky creekline (the unnamed tributary of the South Para River referred to above) which traverses the site in an east to west direction. This section of the site, including rocky outcrops, represented potential habitat for Iron-grass grassland, which is a nationally threatened plant association, the nationally threatened Flinders Ranges worm-lizard (*Aprasia pseudopulchella*) and a number of other reptile species, possibly including the nationally endangered Pygmy bluetongue lizard (*Tiliqua adelaidensis*).
- Riparian areas of the South Para River, primarily for avifauna and aquatic species, but also for reptiles in rocky areas.
- Areas of remnant native woodland and grassland, for bats, some avifauna and possibly, a few reptile species, including species dependent on spider burrows. This could include Pygmy bluetongue lizard.

Following a project review with Delfin in 2009, KBR was informed that there would be no development along the South Para River corridor, primarily due to the very steep and rugged terrain and its riparian values. The Gawler East DPA drafted by Government indicates that the South Para River corridor will be in an Open Space Zone and will be protected from development. In addition, much of the corridor is under private ownership and access to some areas of private property is difficult to negotiate. It was agreed that most of the survey effort in 2009/10 would be directed at documenting in detail the remainder of the site.

Detailed observations were made of the site on 21 – 23 November 2008 (dawn and day surveys) and 27 – 28 December 2008 (dawn and dusk surveys) and

16 January 2009 (day survey). Vegetation and fauna surveys were undertaken on 5 September; 4 October, 16 October and 18 October; 13 November and 28 December 2009 and 29 March and 14 May 2010. These were dawn and day surveys.

A reconnaissance of the quarry precinct was undertaken over two days in July 2009 and initial observations and species lists compiled. A detailed fauna assessment of the quarry site was carried out by observation on 11 December 2009 and 29 March 2010, primarily for seasonally dependent (migratory) avifauna. A brief boundary survey of the quarry was undertaken on 28 December 2009 and 14 May 2010.

Each survey occasion reviewed the vegetation, flora and habitat areas on the site. Specific faunal groups surveyed by observation on each occasion included:

- Mammals and avifauna (terrestrial and riparian)
- reptiles
- amphibians.

Conditions at the time of each assessment varied according to season, including cool mornings and evenings and warm days during December 2008 and hot and dry for the week preceding the January 2009 survey. Mallee box was flowering in November 2008 and 2009. *Eucalyptus camaldulensis* (River red gum) was flowering in December 2008 and 2009 and January 2009. Some of the planted tree and shrub species were flowering during all site assessments. All flowering trees were key attractants for some woodland bird species.

Remnant pools of water were present in the South Para River section of the site in November and December 2008, but only a few remained in January 2009. Water was present over September to December 2009 and into May 2010, including a number of deep pools.

Water was not present in much of the unnamed tributary of the River during all of these surveys i.e. the eastern section, east of the SA Water pipeline. Water was confined to occasional shallow pools and a surface film in January 2009 and present as a low level flow and pools in the western section of the tributary for much of the winter and spring. It was present as a low flow and pools up to 20 cm deep throughout the central section of the tributary over July to December 2009. Parts of this section were dry in 2010, with some areas of stagnant water and slow trickle flows in others.

The October 2009 survey was undertaken in cool to warm weather with daytime temperatures varying between 17°C to 27°C. Night time temperatures were also cool (7°C-12°C) with the exception of one warm night (17°C). Nil rainfall was recorded for this period.

Conditions over the main period of observation from September to December 2009, the main period of assessment, are summarised below in Table 3.1 (data sourced from the Bureau of Meteorology for the Edinburgh Station).

Table 3.1 Weather averages for 2009

	September 2009	October 2009	November 2009	December 2009
Total rainfall (mm)	55.2	16.2	25.4	20.6
Average temperature (ºC)	19.8	22.6	32.0	14.2

Areas of loose rocks and rock outcrop, especially those in and surrounding the watercourses, were thoroughly investigated on multiple occasions by rock turning to ascertain the presence of ground fauna (primarily reptiles) and to assess the presence of invertebrate fauna.

Observations of all flora and fauna species were recorded as field notes. Collections of flora were made and will be lodged in the State Herbarium following curation and completion of the project.

Discussions were held with members of Birds South Australia and Birds Australia, the South Australian Museum curators and Dr Aaron Fenner in order to access information not in the public domain. Dr Fenner recently completed a PhD on Pygmy bluetongue lizards and he inspected the site to assess its suitability as habitat for this species.

3.1 PITFALL TRAPPING

Following initial review and site reconnaissance, key habitat areas for trapping were determined and a stratified assessment by pitfall traps established. Elliott trap and cage trap trapping was not undertaken due to large populations of meat ants present across the site.

Stratification targeted the two dominant habitats, namely:

- Mallee box mature open woodland
- Anthropogenic grassland with shallow rock strata and surface rock scatter suitable for reptiles.

A total of eight traplines five pitfall buckets/trapline were established (Figures 3.1 and 3.2). Pitfall lines (as straight line transects) were placed in an orientation which provided maximum sampling of the target habitat (e.g. woodlands and rocky outcrops). Five straight sided plastic buckets were buried at 5 m intervals with their opening at or slightly below ground level. Where soil conditions—usually the presence of rock at shallow depth—prevented digging the required depth for a 15 or 10 L bucket, a smaller size (5 L) was inserted. Appendix B includes photographs of each pitfall line.

A low, temporary fence (drift net) of black fly wire 20 cm high was erected along the length of the pitfall line such that it passed over the centre of each bucket. To provide captured animals with protection, cardboard cylinders, paper towel, shredded paper, rocks and/or leaf litter were placed in each bucket. To prevent dehydration, a small amount of water was added to each bucket. A metal lid with wire supports 15 cm high was installed over each bucket to provide shade and to protect captured animals from pilfering by other animals (primarily foxes, magpies and ravens).

Following the completion of trapping, pitfall traps were filled with rocks *insitu*, closed by a secure plastic lid, capped with a large rock, buried with soil and each lid further

covered with cobbles and boulders. The end points of each trap line site were marked with pink flagging tape or a 1 m high wooden stake.

Table 3.2 Fauna trapping sites data

Site	Trapping method	X[1]	Y[1]	Comment
GE1	5 pits	296315	6168130	Open Mallee box woodland on open hill crest
GE2	5 pits	296249	6168134	Open Mallee box woodland on drainage line
GE3	5 pits	296321	6168030	Open Mallee box woodland adjacent to rocky outcrop
GE4	5 pits	293362	6167980	Open Mallee box woodland on south facing slope with remnant native grassland
GE5	5 pits	296326	6167921	Open Mallee box woodland on south facing slope adjacent to deadfall with areas of remnant native grassland
GE6	5 pits	296098	6168158	Open Mallee box woodland on open bare ground
GE7	5 pits	295880	6168090	Rocky, anthropogenic grassland on drainage line
GE8	5 pits	295887	6168090	Rocky, anthropogenic grassland on crest

[1]. Datum is GDA 94.

State Government permits and approvals relevant to the fauna assessment are as follow:

- Scientific Research Permit Z25683-1
- Animal Ethics Approval 1/2009
- Animal Welfare Licence No. 167.

All approvals are current until 2011. Copies of all field fauna data will be provided to the South Australian Biological Survey database at the completion of the project.

Delfin provided the approvals from the landholders for access.

Figure 3.1
Pitfall line in Eucalyptus porosa (Mallee box) open woodland

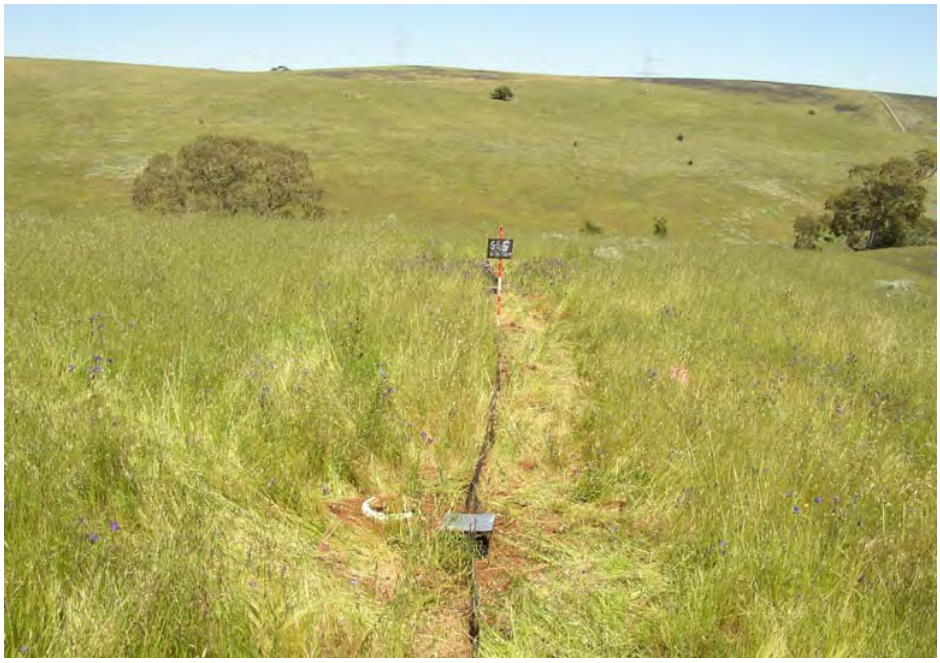

Figure 3.2
Pitfall line in anthropogenic grassland

3.2 OBSERVATION AND ACTIVE SEARCHING

Direct observations made of fauna species were recorded as field notes. This primarily included birds, larger mammals and reptiles during opportunistic and active searches.

Observations were made of actual and potential burrows, nest sites, diggings/ scratching/forage areas, paw prints and scats. Each sign was an indicator of the presence of animals and all were recorded.

Active searching generally involved rock-turning, litter raking and excavating fresh burrows. Most effort was directed at rock turning. This method was undertaken in the following fauna habitat areas;

- *Eucalyptus porosa* open woodland, especially where it occurs over rocky outcrops
- *E. camaldulensis* open woodland over tall to low sedgeland and grassland along riparian areas
- South Para River and the unnamed eastern drainage line (primarily the rock outcrops associated with these watercourses and their tributaries)
- anthropogenic grassland and cropping and pasture areas
- quarry precinct.

In addition, active searching and observation of all buildings and structures able to be inspected in the quarry precinct was undertaken to assess the presence of micro-chiropteran bats and roosting birds.

4 Results — main site

The results of the site assessments are considered in two sections in this report. The information about the largest section of the site (172.46 ha, defined as the main site), which includes all land areas excluding the quarry, and the quarry precinct (discussed in Section 5).

4.1 MAIN SITE

4.1.1 Vegetation and flora

KBR (2009) provides an introduction to the landscape setting and an initial analysis of the vegetation and flora of the site. A number of additional native and introduced (including pest) plant species were recorded during 2009 and 2010, as summarised in Appendix A. The areas of relatively intact communities which contain remnant native flora, primarily as overstorey and understorey, are depicted on Figure 7.5 at the end of the report. Note: no areas of native shrubstorey were recorded in the site; indeed, there is only one native shrub recorded in the site.

Two vegetation communities were more obvious and in much better condition in 2009/10 than 2008, presumably due to the more average rainfall conditions, especially the occurrence of rain in spring. Additional information is provided about these in this section.

The riparian grassland and sedgeland dominated by *Typha domingensis* (Narrow-leaf bulrush), *Bolboschoenus caldwellii* (Sea club-rush), *Juncus kraussii* (Sea rush) and *Cyperus gymnocaulos* (Spiny flat-sedge) associated with the western section of the unnamed creekline is relatively intact (as it is along parts of the South Para River). Despite severe grazing impacts and pest plant infestations, this community remains in good condition. Sub-surface seepage from the quarry to the north of the creekline may be responsible for much of the water present here over summer and autumn.

Two small areas of Iron-grass (*Lomandra effusa – L. multiflora* ssp. *dura*) Natural Temperate Grassland of South Australia (estimated to be about 1.4 ha), plus areas of potential habitat for this community, occur on the southern side (north facing slope) of the unnamed tributary (Refer to Figure 6.3). The community is confined to South Australia, listed as a nationally threatened community of ecological significance and is rated as being critically endangered under the EPBC Act.

This Grassland community in the site is in moderate to good condition, despite having been exposed to excessive grazing and severe trampling-compaction pressure by livestock and grazing by rabbits in the past and currently. Although the occurrence has moderate to heavy weed infestations, the native flora species diversity is considered to be reasonable with 16 species recorded. Additional native species would be likely to

occur following the cessation of livestock grazing. Other areas east of the occurrence may have supported this community in the past, although there are no plants of the Iron-grass species. These areas are considered as providing suitable, potential habitat for this Grassland.

Over 2008 to 2010, 70 indigenous flora species were recorded across the site. Additional flora species, potentially including some of State or regional conservation significance may occur in the site. However, their detection will remain problematic until the grazing pressure is reduced.

4.1.2 Introduced and pest plants

A total of 96 introduced species were recorded during the survey i.e. 58% of the total floristic diversity across the site. A range of introduced grasses, including species associated with pasture improvement, such as *Phalaris aquatica* (Phalaris) and *Dactylis glomerata* (Cocksfoot), are dominant. Various annual and perennial broadleaf species also occur, including a range of woody weeds with the species and relative abundance of each varying according to location and grazing pressure. *Cynara cardunculus* (Artichoke thistle) is a dominant broadleaf weed species of many areas in the site, such as over the area disturbed to install the SEAGas gas pipeline and adjacent to the Barossa Trunk water pipeline (SA Water). Ongoing weed control of this species will be required to prevent its spread further into the woodland areas and into the small areas of native grassland.

Lycium ferocissimum (African boxthorn) and *Olea europaea* (Olive), both declared woody weeds in the AMLR NRM Board region and South Australia, occur throughout the site, especially along creeklines and in the woodlands. The latter species is dominant and is the monotypic overstorey species in much of the open, anthropogenic grassland sections of the site. Very limited control of some trees and shrubs in small areas has been undertaken.

There is a wide range of other pest plants that will require active management, such as *Marrubium vulgare* (Horehound), *Xanthium spinosum* (Bathurst burr) and a number of other thistle species. Two species of particular concern and interest are discussed immediately below.

A relatively large infestation of *Nassella leucotricha* (White needlegrass, Texas needlegrass) was recorded over about 2 – 3 ha adjacent to the SA Water pipeline at the northern part of the site (Refer Figure 4.1). This is considered to be a significant pest species for the State, with its occurrence more typical of eastern Australia. The SA Herbarium database has two recorded collections only for the species, at Scott Creek and Clarendon Weir i.e. well distant from the current infestation. Additional small infestations are known for the Southern Lofty botanical region, but collections have not apparently been lodged with the Herbarium or have yet to be recorded on its database.

Withania somnifera (Winter cherry) was recorded in the southern half of the site. This is an unusual weed species for both the State and the site with five records of it in the SA Herbarium, including two from the Adelaide metropolitan region. The current collection is the first from the Southern Lofty botanical region outside of the metropolitan area. The species is thriving and actively colonizing an area of over 5 ha.

Figure 4.1
Example of Nassella leucotricha

4.1.3 Fauna species and habitat

No Department for Environment and Natural Resources (DENR, formerly the Department of Environment and Heritage, DEH) Biological Survey assessment sites are located at or near this location (Armstrong et al. 2003, NatureMaps 2008). DENR (BDBSA) and SA Museum databases have records of 21 bird species and five frog species for the general region of the site. There are nil records of mammals and reptiles. Including the southern section of the North Para River in the search area indicates records of 29 bird species, 20 mammal species, including five introduced species and five species considered to be extinct in the region, 36 reptile species and six frog species for the general region of the site.

However, within the wider region i.e. an area of 10 km x 10 km from the centre of site, about 290 species from all faunal groups have been recorded from all sources in the literature. This provides a far greater number of species and also introduces a degree of ambiguity, primarily because it includes a wide range of habitats, especially large areas of relatively intact native vegetation communities, species and habitats which do not occur on the site.

The regional data includes records from Birds Australia (Barrett et al. 2003, Paton et al. 2004 and Atlas records) and some of the relevant regional assessments reported in DTEI (2007). The dominant native faunal group is birds (avifauna) with 210 species, followed by reptiles (40 species), mammals (20 species) and amphibians (six species). The remainder of the species recorded are introduced.

This current assessment is primarily a survey of the terrestrial environment, with limited information being reported for the aquatic environments.

The main habitat areas for faunal groups present in the site are:

- *Eucalyptus porosa* (Mallee box) open grassy woodland, especially where it occurs over rocky outcrops
- *E. camaldulensis* (River red gum) open to very open woodland over sedgeland and grassland along riparian areas, with the better quality areas being along the South Para River
- South Para River and the unnamed eastern drainage line, including tributaries, primarily as the habitat provided by the rock outcrops and surface rock scatter associated with these watercourses
- anthropogenic cropping and pasture areas, which is dominant, occupying about 130 ha (67% of the site).

From a fauna habitat perspective, there is limited complexity remaining on most of the site, with the better quality areas, which are most prospective for fauna, associated with:

- the large, mature trees, particularly those with hollows for birds, micro-chiropteran bats and some reptiles and some of the small areas of native grassland
- riparian areas for aquatic fauna, especially amphibians and some birds, plus as a water source for fauna generally. This includes steep, sandy and rocky banks suitable for nesting by some bird species and as cover for reptiles
- rocky outcrops and surface rock scatter for reptiles.

These habitat areas are of moderate to high value.

The remaining areas are anthropogenic and would be expected to be used by common and cosmopolitan native and introduced species only, especially avifauna.

It is likely that the mining faces in the quarry and some other areas here would provide suitable habitat for some bird, reptile and rodent species. This is discussed in Section 5.

Amphibians

Four species were recorded by their advertisement calls in riparian areas of the site, with the South Para River corridor containing the largest populations. All species are common in the State and region. An additional two species could occur, but would require a much greater survey effort than was possible.

Reptiles

About 36 reptile species probably occurred in or adjacent to the site in the past. Current reptile diversity across the site is typical of what was predicted to occur in the region, with the majority of species being small lizard species. Potential habitat is present for a number of other species not recorded, such as Tawny dragon, Earless dragon, Wood gecko and several small snake species.

A total of 16 reptile species were recorded on the site through a combination of active searching and pitfall trapping. Table 3 provides a summary of the pitfall trapping results.

Table 4.1 Results of pitfall trapping (October 2009)

Pitfall no.	Habitat	Scientific name
1	Eucalyptus porosa open woodland	-
2	Eucalyptus porosa open woodland	*Menetia greyii*
		Morethia obscura
		Lerista bougainvillii
		Cryptoblepharus plagiocephalus
3	Eucalyptus porosa open woodland	*Lerista bougainvillii*
4	Eucalyptus porosa open woodland	*Lerista bougainvillii*
5	Eucalyptus porosa open woodland	-
6	Eucalyptus porosa open woodland	*Cryptoblepharus plagiocephalus*
7	Anthropogenic grassland	*Delma molleri*
		Lerista bougainvillii
8	Anthropogenic grassland	*Lerista bougainvillii*

Active searching along small rocky gullies, such as those around pitfall lines 7 and 8, yielded more reptile species than the woodland areas; *Ctenotus robustus* (Eastern striped skink), *Delma molleri, Hemiergis peronii* (Four-toed earless skink), *Lerista bougainvillii* (Bougainville's skink), *Parasuta flagellum* (Little whip snake), *Pseudonaja textilis* (Eastern brown snake) and *Pogona barbata* (juvenile) (Eastern bearded dragon) were all recorded under rocks in these areas. Each of these species was also recorded elsewhere in the site in similar habitat, such as along the slope between pitfalls 1 and 2.

The highest diversity and largest number of reptile species were observed in those sections of grassland with discontinuous scree of medium and large sized, relatively flat rocks on the surface, usually over relatively shallow bedrock. Most of these sites are located along the watercourses. Ant and termite colonies were frequently present beneath these rocks and provide a secure food source for small lizards.

Other species recorded on site by direct observation were *Christinus marmoratus* (Marbled gecko) and larger species as *Chelodina longicollis* (Long-necked tortoise) (South Para River only), *Pseudonaja textilis* (Eastern brown snake), *Tiliqua rugosa* (Sleepy lizard) and *Tiliqua scincoides scincoides* (Eastern bluetongue). *Pseudechis porphyriacus* (Red-bellied black snake) was recorded once along the South Para River. *Notechis scutatus* (Tiger snake) is known to have occurred in the site in the past (KBR 2009).

Lerista bougainvillii (Bougainville's skink), *Ctenotus* robustus (Eastern striped skink) and *Delma molleri* were the species most commonly recorded in the site by all assessment methods. *Cryptoblepharus plagiocephalus* (Wall skink) was the most common species recorded in woody debris in the understorey in woodland.

Birds

A total of 65 native bird species were recorded across all habitats in this section of the site during the survey, representing approximately 30% of the surrounding regions' avifauna diversity. The complete species list is in Appendix A.

The majority of bird species were recorded in woodland habitat at various locations throughout the site. Some of the *Eucalyptus porosa* (Mallee box) and *E. camaldulensis*

(River red gum) were flowering during the 2008 to 2010 surveys. While much of the flowering was sparse, occasional trees and small areas of woodland had an average to heavy flowering and these areas were being used by many of the bird species.

The majority of bird species recorded are considered common within the State and region and some were recorded in very small numbers or on a seasonal basis only. Based on all survey data, the dominant terrestrial species are the cosmopolitan species typically recorded in open sites with limited woodland and habitat diversity, namely *Manorina melanocephala* (Noisy miner), *Anthochaera carunculata* (Red wattlebird), *Lichenostomus penicillatus* (White-plumed honeyeater), *Gymnorhina tibicen* (Australian magpie), *Corvus coronoides* (Australian raven), *Geophaps lophotes* (Crested pigeon) and *Eolophus roseicapilla* (Galah).

Nonetheless, 17 species observed on or adjacent to the site are of National, State and/or regional conservation significance. These are summarized in Table 6.1 and discussed in more detail Section 6. In summary, *Gallinago hardwickii* (Latham's snipe), *Gallirallus philippensis* (Buff-banded rail), *Todiramphus sanctus* (Sacred kingfisher) and *Pachycephala rufiventris* (Rufous whistler) were only recorded along the South Para River corridor on one occasion for each species. *Podargus strigoides* (Tawny frogmouth) was recorded here and at Dead Man's Pass Reserve too. *Merops ornatus* (Rainbow bee-eater) was present in the main site, where it was recorded feeding on feral European honeybees. There was no evidence of past or recent nest sites. These were recorded in the quarry as discussed in Section 5. The species was also recorded adjacent to the site in Dead Man's Pass Reserve and at a number of locations along the South Para River corridor.

Acanthiza chrysorrhoa (Yellow-rumped thornbill), *Aphelocephala leucopsis* (Southern whiteface), *Petrochelidon ariel* (Fairy martin), *Ephthianura albifrons* (White-fronted chat), *Neophema elegans* (Elegant parrot), *Psephotus haematonotus* (Red-rumped parrot) and *Petronica goodenovii* (Red-capped robin) were recorded in the main site. Of these species, *Acanthiza chrysorrhoa* and *Psephotus haematonotus* are considered to be breeding residents and were recorded at a number of locations. *Podargus strigoides* (Tawny frogmouth) and *Cuculus pallidus* (Pallid cuckoo) were recorded adjacent to the site.

Mammals

Macropus fuliginosus (Western grey kangaroo) was commonly recorded, though confined to a few observed individuals, throughout most of the site, especially along the drainage lines. *Tachyglossus aculeatus* (Short-beaked echidna) was also noted once in the woodland area, but probably forages throughout the site.

Trichosurus vulpecula (Common brushtail possum) and *Pseudocheirus peregrinus* (Common ringtail possum) were recorded occasionally in the region. The former species was confined to the South Para River corridor and is listed as rare in the State.

While not formally assessed, insectivorous bats will be present throughout the site, primarily as a result of the large number of tree hollows and the water sources present. Seven species of micro-bats are commonly recorded in the region. The SA Museum (2006) and DTEI (2007) provide more information about their occurrence, with a summary of information about rare species provided below.

Saccolaimus flaviventris (Yellow-bellied sheathtail bat) is listed as rare in South Australia (a total of 20 records only of the species) and it appears to be an occasional migrant only in the State and rarely in this section of the State. There is a recent record of the species along the Gawler River.

Vespadelus vulturnus (Little forest bat), occurs in the Mt Lofty Ranges but it is at its north-western distributional limit. This species could eventually be recorded in the region. Another species, *Scotorepens balstoni* (Western broad-nosed bat), has been recorded 70 km north of Gawler and in Adelaide but these records were from 70 years ago. However, a recent record of the species in Adelaide indicates that it appears to be very rare in the region (Terry Reardon, SA Museum, pers. comm., November 2009). The vegetated corridor of the Gawler River to the west and isolated clumps and areas of woodland in the site and along the South Para River are areas of remnant overstorey vegetation with hollows in the region i.e. potential roost sites for bats.

Invertebrates

Invertebrates were common throughout the site, although the assemblage was dominated by introduced species and there was low species richness of ground invertebrates. The introduced Portuguese millipede, five species of ground spider and three species of ant were those most commonly recorded in the pitfall lines. A total of 11 ant species were recorded. Due to the large number of *Iridomyrmex* colonies, this ant species was the most commonly recorded native species. Three species of introduced land snail were present, namely the white snails, *Cernuella (Helicella) virgata*, which was the dominant species, plus *Theba pisana*, and *Cochlichella acuta*.

Feral European honeybee colonies were recorded in a number of hollows in Mallee box and River red gum trees.

Aquatic fauna

Aquatic survey sites in the region have been established as part of Waterwatch and the AMLR NRM Board and by the EPA (DTEI 2007, AMLR NRM Board 2008 and pers. comm. February 2010). Most of these assess macro-invertebrates and there are relatively few fish sampling sites. There are macro-invertebrate survey sites for the South Para River at Dead Man's Pass and the Para Woodlands Reserve. Macro-invertebrate diversity is moderate at both sites (rated as "fairly healthy").

Hammer et al. (2009) and AMLR NRM Board (2008) indicate that eight native and one introduced fish species were known to occur in the Gawler River catchment (which includes the North and South Para and Gawler Rivers) prior to 1990. Eight native fish species, of which two are additional to pre 1990 records, and four introduced species have been recorded.

Two native species have been recorded in the South Para River near to the Para Woodlands, namely Climbing galaxias and Flathead gudgeon and four native species have been recorded from the southern section of the North Para River. The pest species, Gambusia, has also been commonly recorded in all rivers in the region and at the sites referred to above.

Introduced and pest animals

Vulpes vulpes (European red fox), *Oryctolagus cuniculus* (European rabbit) and *Lepus capensis* (Brown hare) were recorded during the surveys. Adults and sub-adults and fox scats, prints and runs were evident through the woodland areas and especially along gully and riparian sites. Rabbit scats (as buck heaps) were present in parts of the site and several large active warrens were noted along the watercourses. However, there is a low incidence of the species across the whole site. Brown hare occurred as individuals throughout the site. It is expected *Felis catus* (feral cat) would also be present on site, although no evidence of the species was seen during the surveys. *Mus musculus* (House mouse) was recorded over summer and autumn 2009-10.

Introduced bird species recorded on site included *Carduelis carduelis* (European goldfinch), Alauda arvensis (Eurasian skylark), *Turdus merula* (Common/Eurasian blackbird), *Columba livia* (Rock dove), *Streptopelia chinensis* (Spotted turtle-dove, Indian dove), *Passer domesticus* (House sparrow) and *Sturnus vulgaris* (Common starling). All of these species were common and breeding in the site, with Common starling being the dominant species of all avifauna recorded. It is out-competing most native species for use of tree hollows and was recorded breeding in many of these hollows. The species occurred in flocks of several hundred individuals during summer.

Four introduced fish species have been recorded in the Gawler River catchment (AMLR NRM Board 2008).

5 Results — Quarry precinct

A disused sand quarry (Holcim quarry) is located to the north of the main site and occupies 61.71 ha. There has been minimal site clean-up and remediation of the quarry following the cessation of mining and there is an array of buildings, plant and machinery still present.

From a fauna habitat perspective, there is limited habitat remaining on this section of the site, with the better quality areas, which are most prospective for fauna, associated with the:

- Small areas of planted woodland, possibly with an occasional remnant tree, for birds and micro-chiropteran bats
- very small areas of native grassland
- riparian areas of the ponds and dams for aquatic fauna, especially amphibians and some birds, plus as a water source for fauna generally. This includes steep banks suitable for nesting by some bird species
- rocky faces and outcrops of the abandoned working faces for bird species, and possibly some reptiles.

Most of the quarry site is totally disturbed and anthropogenic, with large areas that are bare or infested with introduced species plus some small areas that have been planted with a mix of native and indigenous overstorey species as part of mine rehabilitation.

5.1 VEGETATION AND FLORA

Amenity plantings are present along the main entrance and include various eucalypt species and a range of other native species (Refer Appendix A). The former office site is present on the western side of the main entrance and adjacent to this area is a small area (0.82 ha) of planted Mallee box woodland, estimated to be about 30 – 40 years old. An occasional remnant Mallee box appears to be present here too.

Amenity and screening plantings are present around and throughout the site and include *Callitris gracilis* (Southern cypress pine) around the slime ponds and various shrubs such as *Acacia iteaphylla* (Flinders Range Wattle), *Acacia saligna* (Common wreath wattle) and *Dodonaea viscosa* (Sticky hop bush). The majority of overstorey vegetation in the main area of the quarry has been planted on areas of overburden and fill. Therefore, these areas are believed to have been planted and are not subject to the Native Vegetation Act or Native Vegetation Council clearance requirements. Nonetheless, this vegetation provides a useful habitat for some bird species from within the region and locally.

The ground flora is dominated by a wide range of introduced grass, herb and forb species, including a large number of pest plants. Small areas of terrestrial grassland species are actively colonising the site, mostly as *Chloris truncata* (Windmill grass), *Enneapogon acicularis*, *Austrodanthonia* spp. (Wallaby-grasses), especially *A. setacea* (Small-flower wallaby-grass), and *Aristida behriana* (Brush-wire Grass), with a lower incidence of *Austrostipa* spp. (Spear-grasses). A total of 35 indigenous plant species (24% of the total flora) were recorded in the quarry.

Wetlands in the quarry are associated with the slimes ponds, sumps and other low lying areas of the site. Some are bare, while others have areas of *Typha domingensis* (Narrow-leaf bulrush) as the dominant species, and others are dominated by varying sized infestations of a few weed species.

Figure 5.1
Eucalyptus porosa with White-winged choughs. This bird species is considered to be State and regionally significant.

Regrowth patches of regrowth native tussock grassland of *Austrodanthonia caespitosa* (Common wallaby-grass), several species of *Austrostipa* and *Aristida behriana* (Brush-wire grass) is present west of the main entrance and along the main driveway into the site.

Good quality remnant *Austrodanthonia caespitosa* tussock grassland was recorded as a very small area near one of the disused sand mining areas (adjacent to a power pylon within the powerline easement) and its occurrence accords with the Pre-European settlement vegetation communities for the region of Kraehenbuehl (1996) (refer to Figure 5.2).

Figure 5.2
Austrodanthonia caespitosa and Aristida behriana remnant native grassland

5.2 INTRODUCED AND PEST PLANTS

A total of 114 introduced plant species were recorded during the survey comprising approximately 76% of the total floristic diversity recorded across this portion of the proposed development area.

Artichoke thistle (*Cynara cardunculus*) is present as a colonizing species and is dominant in most of the heavily disturbed areas of the site (as it is in sections of the main site) (Figure 5.3). Weed control of this species will be required to prevent further spread. African boxthorn (*Lycium ferocissimum*) and Olive (*Olea europaea*), both declared weeds in South Australia, were recorded in varying infestations mostly as small plants. Skeleton weed (*Chondrilla juncea*), also a declared plant in South Australia, is present near the high wall adjacent to a wetland area. This species will spread easily given the lack of existing ground cover and its mode of dispersal ('daisy' seeds transported by wind) and control will be required. A number of other species, including *Tribulus terrestris* (Caltrop), *Chrysanthemoides monilifera* (Boneseed), *Xanthium spinosum* (Bathurst burr) and *Cortaderia selloana* (Pampas grass), will also require control as part of any development.

Figure 5.3
Example of Artichoke thistle infestation present in the quarry area (and elsewhere in the site)

5.3 FAUNA

Macropus robustus (Euro) is present here as a small breeding population (about six individuals recorded) and Echidna scratchings were present around some ant colonies. Micro-bats were not recorded in any of the abandoned buildings and other structures.

In total, 48 bird species were recorded within the quarry site. A number of these are breeding residents or migratory species and seven species are listed as being of conservation significance at a Commonwealth, State or regional level. The abandoned quarry provides habitat, in the form of secure rock ledges, for nest sites for species such as *Petrochelidon ariel* (Fairy martin) and *Hirundo neoxena* (Welcome swallow).

Suitable habitat is present for a number of common reptile species and the areas of ponded water +/- Typha sedgeland are suitable breeding habitat for several amphibian species. These species are similar to those described in KBR (2009) and Section 4 for the remainder of the site.

The EPBC Act listed migratory bird species, *Merops ornatus* (Rainbow bee-eater), was observed and has nested within disused compacted sand stockpiles in the site. Breeding pairs were present here in 2009, hence the site is of regional importance for this species. The species has recently been recorded as a breeding 'resident' elsewhere in the region and it was recorded as non-breeding birds at a number of sites in the quarry.

Three bird species of state significance were recorded within the quarry site. *Corcorax melanorhamphos* (White-winged chough) was present on one occasion

within the only area of Mallee box woodland with a good leaf litter layer. One old and one recent nest were present in the woodland.

Falco peregrinus (Peregrine falcon) and *Haliastur sphenurus* (Whistling kite) were also recorded on this site. A pair of Peregrine falcon was roosting at one area of the quarry 'high wall'. Whistling kite is likely to be an overfly species only. This species is known to nest along the Gawler River.

Acanthiza chrysorrhoa (Yellow-rumped thornbill) (breeding), *Petrochelidon ariel* (Fairy martin) (breeding), and *Psephotus haematonotus* (Red-rumped parrot), which are listed in the Regional Recovery Plan of Willson and Bignall (2009), were recorded here.

There is limited habitat available for most reptile species, with the most obvious difference between the main site being the lack of surface rock and sub-crop. Seven reptile species were recorded here, with *Christinus marmoratus* (Marbled gecko) being the commonly recorded species, primarily in the abandoned equipment and buildings and *Hemiergis peronii* (Four-toed earless skink) and *Lerista bougainvillii* (Bougainville's skink) were recorded under debris in the quarry. Delfin staff recorded a 'black snake' in a building in the north east of the site during 2009. It is unknown if it was a *Pseudechis porphyriacus* (Red-bellied black snake) or *Notechis scutatus* (Tiger snake) (both species have been recorded in the region in historical records).

5.4 PEST ANIMALS

Pest vertebrate animal numbers are considered to be low to moderate in the quarry. Little evidence was found to indicate high numbers of *Vulpes vulpes* (European red fox), semi-feral cat, *Lepus capensis* (Brown hare) and *Oryctolagus cuniculus* (European rabbit), although all are present and spotlight surveys were not undertaken. There is at least one breeding pair of fox present and rabbits are breeding residents here. *Columbia livia* (Rock dove, feral pigeon) is present and breeding in disused plant and equipment in the site. *Turdus merula* (Eurasian blackbird), *Streptopelia chinensis* (Spotted turtle-dove, Indian dove), *Passer domesticus* (House sparrow) and *Sturnus vulgaris* (Common starling) are breeding residents here also.

Introduced invertebrate numbers are high through the site and dominate the assemblage, especially Portuguese millipede and land snails. Four species of introduced land snail were present, namely *Cantareus (Helix) aspersa*, the white snails, *Cernuella (Helicella) virgata*, which was the dominant species and *Theba pisana*, and *Cochlichella acuta*.

6 Matters of conservation significance

All matters of conservation significance are discussed in this section according to Commonwealth and State legislation.

6.1 COMMONWEALTH

Environment Protection and Biodiversity Conservation Act 1999 (EPBC)

The following section describes EPBC Act listed species and communities identified on site and those which are likely to occur. EPBC listed species and communities which are potentially impacted as a result of development will require the project to be referred to the Commonwealth for approval.

6.1.1 EPBC Act listed Species

No flora species and habitat for these species, of national conservation significance (as described in the Protected Matters Search), were recorded in the site. *Olearia pannosa* subsp. *pannosa* (Silver daisy-bush) and *Prasophyllum pallidum* (Pale leek orchid) are listed as vulnerable under the EPBC Act and are noted as likely to occur in the area. The initial site and subsequent surveys did not indicate that the required habitat was present to support either of these species in the site.

No other flora species of national significance are predicted to occur here.

Nationally significant bird species observed on or adjacent to the site were the migratory species, *Gallinago hardwickii* (Latham's snipe) and *Merops ornatus* (Rainbow bee-eater). The former was recorded once as a single bird along the edge of sedgeland and reed beds on the South Para River, to the east of the site boundary.

Rainbow bee-eater was primarily recorded within the quarry precinct, especially in the eastern section, including the Mallee box woodland here, and in the main section of the site. It is estimated that about 20 birds were present in the quarry. This species has been recorded as a breeding migrant elsewhere in the region in the past and currently, over 2008 to 2010, for example at Clonlea Park along the North Para River, at Dead Man's Pass Reserve and along the South Para River. Over the same time period it was also recorded throughout a much wider region, including from the North Para River, Greenock Creek, Sandy Creek Conservation Park, Para Wirra Recreation Park, Tanunda Golf Course and around Buckland Park (R. Anderson, pers. obs.; R. Attwood, Birds SA, pers. comm. February 2010).

Merops ornatus is an inter-continental migrant and migrates to the southern parts of Australia from northern areas of the continent during spring and remains over summer to early autumn before returning north. At the time of survey in summer 2009, three breeding pairs and up to 14 other birds were observed using the disused quarry. The quarry precinct contains numerous potential nesting areas, which, by observation,

were predominantly unused. Compacted sand stockpiles were the only recorded breeding site. Areas of water near the quarry face provide potential food and water sources, as do the woodlands in the local and surrounding region. The woodlands provide observation, 'hawking platforms' and roosting habitat for this species. Much of the site has rocky, skeletal or heavier loam and clay soils which would preclude their use for nesting by the species.

The development of the quarry area would result in a significant impact on this population of the species and its preferred habitat.

Figure 6.1
Rainbow bee-eater nesting sites

Aprasia pseudopulchella (Flinders Ranges worm-lizard) has previously been recorded in the region and on site by observation in an earlier survey by KBR. The species was not recorded during the pitfall fauna survey or during rock turning observations over 2009 and 2010.

Aprasia pseudopulchella is currently considered to be endemic to South Australia and is classified as vulnerable under the EPBC Act. It was previously listed at a State level under the National Parks and Wildlife Act but was delisted in 2008 (DEH 2008). The delisting occurred because the Worm-lizard is now believed to be relatively common and widespread throughout the northern Adelaide Plains, northern Mount Lofty Ranges to the Flinders Ranges region of South Australia. Taxonomically, the species is barely distinguishable from another species, *Aprasia parapulchella*, which occurs in NSW and Victoria. The species is considered to be relatively common (M. Hutchinson SA Museum, pers. comm., 2009).

The distribution of the species and its apparent rarity in the past led to its classification as a species of national conservation significance (DEWHA 2008). Prior to 2000 (Robinson et al. 2000), the species was considered to be confined to the Flinders Ranges and the Northern Mount Lofty Ranges, with a few occurrences in the foothills

and western escarpment of the Mount Lofty Ranges, such as in and around the Cobbler Creek Recreation Park and the upper region of the Little Para Linear Park (City of Salisbury 2009) and one record from near Mylor in the Adelaide Hills (DEH 2008). There is one historical record of the species south of Adelaide (Noarlunga).

The species occurrence was considered to be sparse. For example, Mitchell (1992) recorded eight individuals over a 30 month survey period at Cobbler Creek.

The species is co-distributed with *Tiliqua adelaidensis* (Pygmy bluetongue lizard) and also occurs in other habitats. As a result of extensive trapping surveys as part of ecological studies of *T. adelaidensis* in the Mid North of SA, the species has been recorded relatively frequently and there are good annual records for it every year from a range of sites around Burra over 2004 to 2009. Here the species has been recorded in *Lomandra*-dominated and other grasslands and shrublands with a scatter of small surface rocks. Around Clare and Auburn the species occurs in grassy woodlands with native grassland understorey.

It will also use modified grasslands i.e. those which contain some weed species. The ecology of the species remains poorly studied and known. It occurs in open woodland, native tussock grassland, riparian habitats and rocky isolates (Cogger et al. 1993). Specifically, steep areas with surface rock, and stony soils or clay soils with stony surface appear to be its preferred habitat. The diet of most *Aprasia* species consists of the larvae and pupae of ants.

Previously it has been considered as a species which resides underground and only rarely appearing at or near the soil surface, usually in about September to October, presumably during mating season. However, recent surveys indicate that it shelters below surface rocks and can be found in these locations during autumn and winter. It is found on the surface during warm conditions in October to December and in February to April, especially a few days after rain (Anderson, pers. obs., 2008 and 2009). Juveniles are most commonly recorded during this latter time period.

The Regional Recovery Plan for Threatened Species and Ecological Communities of Adelaide and Mount Lofty Ranges 2009-2014 (Willson and Bignall 2009) states that the greatest risks to the Worm-lizard are habitat destruction or modification and predation by *Vulpes vulpes* (European red fox) and feral and uncontrolled cats (*Felis catus*). Weed invasion resulting in habitat modification is also considered a moderate risk. This species is considered a high priority conservation species for the region in Willson and Bignall (2009).

Detailed searches of the site in a range of seasons and conditions identified areas of potential fair to good quality habitat for the species, along with ample suitable food resources and it is considered highly likely that this species occurs in parts of the proposed development area. Other areas of marginal habitat are present, along with large areas of unsuitable habitat also.

Pygmy bluetongue lizard originally occurred in the region (KBR 2009), although the closest extant population is now around Auburn in the Mid North. The species was not recorded on the site. Abandoned (empty) spider burrows constructed by large lycosid and mygalomorph spiders are essential habitat for the species, since it uses these burrows as refuges. A detailed inspection of the site indicated that there are few areas of remnant grassland and very few spider burrows of sufficient size throughout

the site to support this species (A. Fenner, pers. comm.., October, 2009). Consequently, it is considered very unlikely that this species occurs in the site.

Figure 6.2
Termite colony beneath loose surface rock

EPBC Act listed communities

The Iron-grass (*Lomandra effusa – L. multiflora* ssp. *dura*) Natural Temperate Grassland of South Australia is listed as a threatened community of ecological significance and critically endangered under the EPBC Act. An area of this community (estimated to be about 1.5 ha) occur on the southern side (north facing slope) of the unnamed tributary (Refer Figure 6.3). Both species are present in the occurrence, with *L. effusa* dominant. Being on a rocky, steep slope, this section of the site is not arable and has not been subject to cultivation. The community is in moderate to good condition, despite having been exposed to livestock grazing in the past and currently, and having considerable weed infestations. The species diversity in the occurrence is considered to be reasonable with 16 native species recorded, including a number of grazing and disturbance resistant species. Additional native species would be likely to be recorded following the cessation of livestock grazing and the occurrence is amenable to rehabilitation.

Turner (2010) provides the Draft National Recovery Plan for this Grassland Community. The current example of the community is slightly south of the southern boundary on the distribution map in this reference. Nonetheless, it is clearly this community and other examples of it have been recorded around Blakeview, even further south (Anderson, pers. obs., 2005, KBR 2007).

The size and condition of the community meet the requirements of condition class B as described in the EPBC Policy Statement 3.7 (DEWR 2007). If development or

adverse impact on this area was likely to occur, then the proposal will require referral to DEWHA.

The *Eucalyptus odorata* (Peppermint box) woodland community predicted to occur in the region, and potentially the site, by the EPBC Protected Matters search databases, does not occur in the site. The few trees of this species recorded have been planted. This community is present on a small section of the Para Woodland Reserve adjacent to the site (Bentz and Milne 2007).

6.2 OTHER MATTERS OF NATIONAL CONSERVATION SIGNIFICANCE

A Regional Recovery Plan (Willson and Bignall 2009) has been prepared by DEH for a range of communities and species in the Adelaide and Mount Lofty Ranges (AMLR) region, which includes the site. The Plan complies with EPBC Act requirements for a formal Recovery Plan for adoption under the Act. The Plan divides the region into a series of sub-regions (based on landscape context) and the site is located in the Adelaide Plains sub-region. Threatened species exclude those species listed under the EPBC Act and some of the species listed in Schedules to the NPW Act. Based on analyses, each species is assigned a conservation rating for both the region and each sub-region, although these ratings are not officially recognised under legislation.

Within each sub-region, each species is further analysed and provided with a priority and threat summary. Priority includes three categories, very high, high and medium and threat summary has four categories, which are the same as for priority ranking and including low also.

Table 6.1 Bird species of conservation significance recorded on site

Family	Scientific name	Common name	Conservation status
ACANTHIZIDAE	*Acanthiza chrysorrhoa*	Yellow-rumped thornbill (B)	Regional Uncommon
	Aphelocephala leucopsis	Southern whiteface	Regional Vulnerable
ACCIPITRIDAE	*Haliastur sphenurus*	Whistling kite	Regional Uncommon
CORCORACIDAE	*Corcorax melanorhamphos*	White-winged chough (B)	State Rare, Regional Vulnerable
CUCULIDAE	*Cacomantis pallidus*	Pallid cuckoo	Regional Vulnerable
FALCONIDAE	*Falco peregrinus*	Peregrine falcon	State Rare, Regional Vulnerable
HALCYONIDAE	*Todiramphus sanctus*	Sacred kingfisher	Regional Uncommon
HIRUNDINIDAE	*Petrochelidon ariel*	Fairy martin (B)	Regional Uncommon
MELIPHAGIDAE	*Epthianura albifrons*	White-fronted chat	Regional Uncommon
MEROPIDAE	*Merops ornatus*	Rainbow bee-eater (B)	National (Migratory)
PACHYCEPHALIDAE	*Pachycephala rufiventris*	Rufous Whistler	Regional Uncommon
PETROICIDAE	*Petroica goodenovii*	Red-capped robin	Regional Vulnerable
PODARGIDAE	*Podargus strigoides*	Tawny frogmouth (B)	Regional Uncommon
PSITTACIDAE	*Neophema elegans*	Elegant parrot	State Rare
	Psephotus haematonotus	Red-rumped parrot (B)	Regional Uncommon
RALLIDAE	*Gallirallus philippensis*	Buff-banded rail	Regional Vulnerable
SCOLOPACIDAE	*Gallinago hardwickii*	Latham's snipe	National (Migratory)

B= breeding resident or migrant.

14 species with a conservation rating at the AMLR regional level were recorded on all sections of the site, including areas adjacent to it, as per Table 6.1 (Figure 7.2). All of these species are ranked as being of medium priority and most have a low, or occasionally, medium threat status.

The total includes two species with a State conservation status of Rare. Two species with national conservation status and two with State status were present as listed in Table 6.1.

Figure 6.3
Lomandra effusa – L. multiflora ssp. dura Natural Temperate Grassland community with native Austrostipa grassland in background

6.3 NATIONAL PARKS AND WILDLIFE ACT 1972 (SA)

Three bird species of State significance were recorded on site, *Falco peregrinus* (Peregrine falcon), *Corcorax melanorhamphos* (White-winged chough) and *Neophema elegans* (Elegant parrot), each of which is listed as rare. Each of these species is considered in the previous section with additional information immediately below. *Neophema elegans* is listed as rare, but is excluded from consideration in the Regional Recovery Plan.

Peregrine falcon uses the site as a roosting and hunting area, especially the pigeons that flock and breed in the site. A pair was observed in a roost site within the high wall of the quarry precinct and hunting over the adjacent areas of the quarry and Mallee box woodland south of the quarry fenceline over 2008 to 2010. There is no evidence of past or current nesting in the quarry or elsewhere. There are two breeding pairs of the species in the region, with the closest pair being in an abandoned quarry east of the site and on the South Para River, and at least an additional two pairs in the wider region. The pair in the quarry may represent a new pair of birds or may be one of the current pairs in the region that is using the quarry as a roost site out of the breeding season.

A flock of White-winged chough (about 15 birds) was recorded once within Mallee box woodland in the quarry site. The species is considered to be a breeding 'resident', although it appears to be migratory in the region i.e. it uses a large area of habitat of which the quarry is a component. This species forages in leaf litter and relies on woodland habitat, with its apparent decline in recent years linked to land clearing in South Australia (Willson and Bignall 2009).

Elegant parrot was recorded as two birds in 2008 only.

Gallirallus philippensis (Buff-banded rail), which is considered to be vulnerable in the region and was formerly of State conservation significance, was recorded once as a single adult bird in aquatic tall grassland (reed) habitat along the South Para River adjacent to the site. This species is particularly secretive and cryptic.

Trichosurus vulpecula (Common brushtail possum), listed as rare in the state, is a hollow-dependent species and is present along the woodland of the South Para River.

Pseudophryne bibronii (Bibron's toadlet) (State rare) has been recorded near Gawler recently (Ecological Associates 2005, A. Shackley, November 2008, email). The species may still be present along some of the better quality riparian sites and grassland areas which are subject to temporary inundation. The species was not observed and did not respond to aural call playback in summer and autumn. Future late summer to autumn surveys following average or above average rainfall would be required to detect the species (if present).

6.4 REGIONAL STATUS

The consideration of regional status of flora and fauna is primarily derived from Willson and Bignall (2009). There are no flora species in the site that are listed under their Regional Recovery Plan.

Lang and Kraehenbuehl (2002) in the 2008 update of Florlist provide the regional status of flora species in the State. Within the site, there are two species listed as rare and nine species listed as uncommon in the Southern Lofty botanical region.

Shackley (2009) provides lists of flora species, including threatened species, for Dead Man's Pass and the South Para River corridor, including the Para Woodland Reserve. He indicates that about 170 native species occur in both sites. It is possible that some of these species occurred in the site at some stage; however, agricultural and extractive industry use of it has resulted in the current species diversity. Nonetheless, removal of grazing impacts may well allow some additional species to be recorded in future.

Carpenter and Reid (2000) provided the original assessment of regional status for avifauna. However, the more recent regional conservation ratings for the Adelaide Mount Lofty Ranges region (AMLR) and the Adelaide Plains sub-region for all fauna species of Willson and Bignall (2009) have been applied. Sub-region ratings are described in terms of landscape species priority and further defined in terms of regional vulnerability (Very high, high, and low priority).

14 bird species rated at the AMLR regional level were recorded on or adjacent to the site. All are rated as being of moderate priority for conservation and most have a low priority for the region i.e. they are thought to be declining, but are species with risk. All have been discussed in the earlier sections of this report.

6.4.1 Potentially present species

KBR (2009) provided information about a range of species potentially present in the region. Some of these data referenced were provided by Councillor A. Shackley, Town of Gawler in a list of observations and past records for flora and fauna species in the local area (P. Gatsios, email to KBR, 19 November 2008). Additional information on this topic was provided in his Submission to the Development Policy Advisory Committee in regard to the Gawler East Plan Amendment (Shackley 2009).

Some species of national conservation significance originally occurred in or near the site, but these are now considered to be extinct, either in the State or the region. These include species such as *Bettongia lesueur* (Burrowing bettong), *Isoodon obesulus* (Southern brown bandicoot), *Leipoa ocellata* (Mallee fowl), *Pedionomus torquatus* (Plains-wanderer), *Cinclosoma punctatum* (Spotted quail-thrush), *Alcedo azurea* (Azure kingfisher) and *Xanthomyza phrygia* (Regent honeyeater). For example, the current population of the Regent honeyeater in all of eastern Australia is less than 1,500 birds (Birds Australia 2008). The species is considered to be extinct in South Australia and Western Victoria (Armstrong et al. 2003, AMLR NRM Board 2008). No additional survey for this species (or the other species referred to above) in the site or region is warranted.

Turnix varius (Painted button quail) and *Melithreptus gularis* (Black-chinned honeyeater) (listed as rare at a State level) have been recorded adjacent to the site in the past (1996 and 1981 respectively). It is unlikely that both of the species are present due to the lack of suitable habitat. Neither species was recorded in the site or adjacent region over 2008 to 2010.

Other species of particular significance include *Coturnix ypsilophora* (Brown quail), *Microeca fascinans* (Jacky winter), *Myiagra inquieta* (Restless flycatcher), *Melanodryas cucullata* (Hooded robin) and *Melithreptus albogularis* (White-throated honeyeater). Species which might still occur on or adjacent to the site for part of the year include *Falcunculus frontatus* (Crested shrike-tit), *Stagonopleura guttata* (Diamond firetail), *Climacteris picumnus* (Brown tree-creeper), *Chrysococcyx lucidus* (Shining bronze-cuckoo), *Petroica phoenicea* (Flame robin) and *Taeniopygia guttata* (Zebra finch). Some of these species are seasonal or altitudinal migrants and many occur in very small numbers in the region. No recent sightings of most of these species have been made for this part of the region, although there are recent records for some adjacent areas (R. Attwood, Birds Australia. pers. comm., December 2008). Habitat for some species, such as Diamond firetail and Brown quail, is not available in the site. It is considered that there is a very low risk of these species being present. The other species may occur here with their occurrence being confined to native woodland and grassland habitats. Providing these habitats are conserved and managed appropriately, then the species will be likely to use the site.

Wetland species, such as *Biziura lobata* (Musk duck), *Oxyura australis* (Blue-billed duck) and *Stictonetta naevosa* (Freckled duck), are considered very unlikely to use this site as primary habitat due to the lack of large areas of permanent water. However, these and other threatened aquatic species may occur in the riparian areas as occasional visitors. There are no records of these species being present in the region for many years.

Egernia cunninghami (Cunningham's skink), a species potentially present in the site and region was last recorded in the wider region east of the site in 1926 (SA Museum

collection records). A detailed assessment of the site did not record any evidence of the species. This is a similar conclusion to that recorded by Milne in Ecological Associates (2005) during an assessment of the North Para River. Potential habitat is present for a number of other reptile species not recorded during the survey, such as *Ctenophorus decresii* (Tawny dragon), *Tympanocryptis pinguicolla* (Earless dragon), Wood gecko (*Diplodactylus vittatus*) and several small snake species. None of these have an official conservation status, but their occurrence here would be of scientific interest. Two additional amphibian species may occur, including *Pseudophryne bibronii* (Bibron's toadlet), rated as rare South Australia.

Fish species such as *Pseudaphritis urvillii* (Congolli), *Mordacia mordax* (Short-headed lamprey) and *Tandanus tandanus* (Freshwater catfish) have been recorded in the catchment in the past. These species are considered to have a conservation status by Hammer et al. (2009). Drought, lack of environmental flows, including nil or reduced estuarine connections, and other management issues has resulted in major changes in the abundance of these and some other native fish species.

Figure 6.4
Peregrine falcon roosting habitat with Fairy martin nests on the roof of the rock chamber

7 Discussion and conclusions

There are three matters of national environmental significance (MNES) present on the site to which the EPBC Act is relevant:

- Two bird species and one reptile species and their habitat
- a small area of one threatened plant community and a larger area of potential habitat for the community
- avifauna species listed under a Regional Recovery Plan.

Subject to design and final use for sections of the development area, if any of the habitats and areas occupied by MNES are potentially or likely to be adversely impacted by development then a Referral to DEWHA will be required. The definition of 'adverse impact' includes all forms of impact associated with a development, including direct, indirect, potential, combined and cumulative. Delfin has indicated that it will submit a Referral to DEWHA for the project later in 2010 i.e. prior to any work commencing on the site.

Over 2009 and 2010, more detail has been provided by Delfin to KBR on the planned development and management measures proposed for the site and the conservation value of these measures are considered in the current section.

Consultation with groups in DENR will be required so as to provide for written approval from this agency. For example, this will be in relation to species of State conservation significance and in the event that any areas of native vegetation will be adversely affected.

Approval by Council will be required if any significant trees are proposed to be removed. If these are indigenous, remnant native trees then approval by the Native Vegetation Council will be required also.

The pest plants management group of the AMLR NRM Board will need to be informed of the pest plant infestations, for example, *Nassella leucotricha* (White (Texas) needlegrass), *Withania somnifera* (Winter cherry) and *Lycium ferocissimum* (African boxthorn). Other species with regional priority and high environmental threat will require control also, such as *Xanthium spinosum* (Bathurst burr), *Tribulus terrestris* (Caltrop), *Chondrilla juncea* (Skeleton weed), *Chrysanthemoides monilifera* (Boneseed) and *Cynara cardunculus* (Artichoke thistle). Management of these species will likely require the development and implementation of detailed Weeds Management Plan.

Figures 7.1, 7.2, 7.3 and 7.5 record the location of MNES and the other sites of biological significance recorded to date. Ongoing survey and monitoring of the condition of the proposed conservation management areas and measures is recommended.

7.1 POTENTIAL AND PROPOSED IMPACT AREAS AND CONSEQUENCES

This site is not homogeneous in its biological significance and much of it (67%) contains few species or habitats of biological value. This is a similar conclusion to that provided by Bentz and Milne (2007) in their assessment of the Para Woodlands Reserve adjacent to the site.

Based on species observations, the survey effort appears to be commensurate with the biological values of the site and annual and seasonal variation components have been able to be undertaken over 2008 to 2010. There are some areas of fair to good value (see Figures7. 1, 7.2, 7.3 and 7.5) and, wherever practicable, these would need to be excluded from development, or, investigated for exclusion from development. Delfin has provided commitment to these investigations as part of its early master planning for the project. Some of these areas of biological importance would require strengthening through appropriate management measures so as to retain and improve these values.

7.2 VEGETATION COMMUNITIES AND FLORA

Mallee box grassy woodland is no longer listed as a conservation priority for the State (DEH 2005). However, Armstrong et al. (2003) consider that this woodland is still of particular conservation significance in the region. By observation, any example of mature woodland remaining in peri-urban areas is unusual and hence is biologically important and all good quality examples of it on site are of at least regional value.

Planning to retain the River red gum woodland, which occurs as sparse tall woodland and isolated trees along watercourses in the site should be undertaken. An arborist's assessment may be required to assess the risk associated with these trees and to establish a retention strategy.

There are no flora species, or their habitat, in the site that are listed under the EPBC Act. No species listed under the NPW Act or the Regional Recovery Plan of Willson and Bignall (2009) were recorded.

Within the site, there are two species listed as rare in the Southern Lofty botanical region and nine species listed as uncommon (Lang and Kraehenbuehl 2002, 2008 update). *Lomandra effusa* (Iron-grass) is confined to one location in the site and is a component of the Iron-grass (*Lomandra effusa – L. multiflora* ssp. *dura*) Natural Temperate Grassland of South Australia community. The whole of this community and potential habitat for colonisation by the species adjacent to the occurrence should be planned for conservation as part of the development. Delfin has indicated that its intention is to reserve the whole of this area subject to detailed design and any approval requirements established by DEWHA and DENR..

Nine species listed as uncommon for the region are present. One species, *Calystegia sepium* (Large bindweed), was confined to the South Para River corridor. This area will not be impacted by construction.

Aristida behriana (Brush-wire grass) occurs occasionally in sections of the site with occurrences in the quarry along the main access road and with most of its distribution in the main site along the un-named watercourse. The former occurrence is likely to be removed during remediation of the quarry and the latter will be conserved.

Lomandra densiflora (Sword mat-rush) and Mallee box are primarily confined to the northern section of the main site, especially adjacent to both sides of the un-named watercourse, with occasional occurrences elsewhere in the site. Delfin has advised that major remnant occurrences of these species have been included in its master planning for conservation, conserved through excluding development in these areas of occurrence. It is expected that most of the individual trees would also be conserved, either in open space areas or in appropriately sized development sites, although this will be subject to detailed planning. The exception is some of the planted Mallee box in the quarry and these are likely to require removal as part of remediation of this precinct.

The occurrence of all of the other species is in the understorey of the south facing area of Mallee box woodland in the site (Figure 7.5). As discussed above, this area is planned to be reserved from development subject to the detailed planning process and formal approvals.

7.3 FAUNA HABITAT AND SPECIES

The largest impact on fauna will be associated with rehabilitation of the quarry and the consequent impacts on avifauna. Discussions with Delfin have indicated that rehabilitation and major earthworks are a necessity in order to make the quarry precinct safe. Therefore, Rainbow bee-eater, Peregrine falcon, White-winged chough and Fairy martin habitat will be removed by the proposed development and these species will be displaced from the site.

Each of these species will have differing opportunities to re-locate in the region, including greater use of other habitats, such as woodland, sand quarries and natural cliff and rock outcrops in the region. Some degree of management will be possible, for example, removing livestock and weeds from the Mallee box woodland and allowing a litter layer to develop could allow Choughs to eventually use the dry woodlands in the main site and it is highly likely that steep-sided compacted sand piles can be constructed elsewhere in the site to allow for the Rainbow bee-eater) to breed. Fairy martin will use a variety of steep sided structures for nest sites, including under bridges, culverts and eaves. Delfin has indicated that remediation of the high wall of the quarry must be undertaken to manage some of the geotechnical risks and it is unlikely that mitigation actions can be undertaken for the Peregrine falcon roosting within the development site.

Hollow-dependent bird and bat species and nest building bird species are present on site, although by observation, the breeding numbers of the former are very limited due to competition with introduced birds, such as Common starling and Rock dove and also feral European honeybee colonies. Since the woodlands will not be removed, both groups of bird species will be unlikely to be impacted by development. Initial and ongoing control of pest species would greatly assist in providing more habitat for hollow-dependent species.

Woodland bird species of significance were recorded in the site, but in relatively small numbers. The site does not have the biological values and habitat diversity required by many woodland bird species, or to support large populations of these species, as occur to the north, for example in Para Wirra and Sandy Creek Conservation Reserves. The occurrence of individuals of species such as Red-capped robin, Pallid cuckoo and Rufous whistler is typical of species moving from area to area to find

suitable habitat. In particular, there is no native shrubstorey present on the site and there are but a few areas of natural regeneration of the overstorey species. In most of the site, feral European olive) and African boxthorn provides the only shrubstorey. This limits the number of small bird species resident in the site. For example, *Rhipidura albiscapa* (Grey fantail), *Petroica phoenicea* (Flame robin) and thornbill species (other than Yellow-rumped thornbill) were not recorded here.

Delfin has commenced detailed master planning for the site and this includes identifying those areas that are best suited to be set aside for biological reserves and open space areas as part of managing development of the site. The basis of this will be the areas of biological value extant in the site (Table 7.1). Future planning will require development of a formal management plan that should be developed in consultation with the Town of Gawler i.e. the future custodians of the land when Delfin transfer land areas as a designated community reserve.

A revegetation plan for areas developed as conservation sites based on the use of indigenous species from the site and region to reinforce the existing values would greatly benefit a wide range of bird species. This necessarily involves collection of propagating material from the site and developing a revegetation strategy for use of tubestock and direct seeding. In addition, the most successful strategy will involve fencing, exclusion of livestock and control of weeds. This will allow native species to colonize adjacent areas.

Table 7.1 Vegetation communities and habitat areas of biological value

Community or Habitat	Area (ha)
Iron-grass Community	1.41
Potential Iron-grass Community habitat	1.37
Flinders Ranges worm-lizard (fair to good habitat)	13.48
Flinders Ranges worm-lizard (marginal habitat)	9.61
Mallee box woodland	8.56
Native vegetation as understorey	6.62
Riparian grassland and sedgeland (excluding South Para River)	1.84
Wallaby-grass grassland	0.0796
River red gum trees (excluding South Para River)	Single and scattered mature trees only

Rainbow bee-eater, Peregrine falcon, White-winged chough and Fairy martin are species primarily located in the quarry precinct that will be affected by rehabilitation works necessarily required as part of the development of the site. It is likely that similar works would have been required as part of restoration under PIRSA's requirements for the site. Nonetheless, these species will be displaced as a result of the proposal. Suitable Rainbow bee-eater nesting habitat could be established elsewhere in the site through construction of compacted silty sand banks and piles. The other three species would be displaced and would have to shift to other locations in the site or region. There are opportunities to provide for other habitats in the site as an integral part of master planning for the development for Fairy martin and White-winged chough.

Wallbridge & Gilbert (2010) has reviewed and revised the initial stormwater management strategy for the site presented as part of the DPA. A revised report considers the drainage for the development and includes management of the

watercourses. Consequently, this implicates the areas of biological significance in the site. KBR has been provided with this report and has assisted in its development. The biologically sensitive areas are now mostly avoided by the elements of the strategy. The wetland systems and ponds along the eastern section of the un-named watercourse avoids the important reptile habitat areas, all of the remnant trees and will allow for development of biologically productive riparian habitats in what is currently a weed infested gully.

7.4 PARA WOODLAND RESERVE

The Para Woodland Reserve was established in 2003. It now occupies about 400 ha, abuts the south eastern boundary of the site, and includes a relatively large frontage along the South Para River. The Reserve has a number of similarities with the Delfin site, including large areas of degraded grazing land and small areas of Mallee box woodland, as well as differences, such as the presence of *Eucalyptus odorata* (Peppermint box) woodland (Bentz and Milne 2007). The Para Woodland is jointly owned and managed by DENR and the Nature Conservation Society of South Australia. Weed species and fire management are being undertaken, complemented by revegetation works with the long term aim of re-establishing a diverse woodland ecosystem. Ongoing funding has been recently obtained to allow for future management of the Reserve in perpetuity.

Biologically it would be useful to provide a linkage between the Para Woodland to the Mallee box woodland and un-named tributary corridor on the site. In the long term, this would allow for biological connectivity from south to north and east to west. Establishing riparian vegetation in the eastern portion of the watercourse and managing the weeds and pest animals along the whole length of the corridor would be of particular value for the site.

Following cessation of livestock grazing, the site would also be able to provide ample propagating material for a range of understorey species not recorded in the Para Woodland. The combination of all of these actions could be a valuable conservation opportunity for the region.

7.5 SITE MANAGEMENT ISSUES

Management of weeds will be essential, and, in most areas of the site will involve their initial and ongoing removal as part of construction. Management within conservation and open space areas must be targeted with a long term commitment aimed at eradicating all high threat introduced species and replacing these with indigenous species.

Flora and fauna habitat management and improvement will need to be an integral part of site development. The details associated with these initiatives will developed in future but will be based on a vision and desire of protecting and managing the higher quality areas of biological significance sensitively within a planned residential development. Examples of specific programs should include:

- Weed and pest animal species control, including feral European honeybee colonies and pest fauna using tree hollows
- rehabilitation and revegetation using site and regionally specific indigenous species

- re-establishing Iron-grass Grassland in areas which are potentially suitable for this nationally threatened community
- transplanting of native understorey species which will be disturbed by development
- development and maintenance of a seed bank of native species for the site
- fencing, including virtual fencing, to exclude people from some areas
- on-site passive recreation and education areas
- development of habitat for specific fauna groups and species, including ground fauna and avifauna displaced from the quarry site during its rehabilitation
- integrating stormwater management with conservation initiatives as part of design and development
- initial and ongoing monitoring of impacts.

Cessation of livestock grazing has advantages and risks, the most important of which will be an increase in fine fuel loads in the large areas of tall grasslands of introduced species. During and as part of any long term development of the site, a fire management plan must be developed in collaboration with the CFS. Continuation of livestock grazing may be required to assist the control of fuel loads. If so, then grazing should be excluded from the areas proposed as conservation zones by temporary fencing. Active control of weeds in these zones would be a necessary, ongoing action. Cessation of grazing in the Iron-grass Grassland areas will require ongoing assessment and adaptive management in order to establish the best management regime, both in the current term and future, especially a commitment to ongoing, judicious control of pest plants in the community.

Delfin indicates that residential development is likely to commence in the north east section of the site. This area has been subject to cereal cropping for many years and is biologically insensitive for native vegetation and fauna. Therefore, there is no impediment to development here.

Any construction within the South Para River corridor will require management, especially in regard to effects on water quality and fauna. Once the impact corridor and construction methods have been agreed and a final design developed, then a baseline monitoring program will be required.

General and detailed monitoring programs should be established for the conservation areas established in the development of the site. Observations and data collection which document the management actions undertaken in relation to the response of flora and fauna should continue to be made during future surveys. Monitoring of ground fauna, primarily reptiles, should be undertaken and further representative collections made on behalf of the SA Museum of all new species found on the site.

7.6 OTHER MATTERS

The assessment has been undertaken over a range of seasonal conditions during 2008 to 2010. 2009 was a year of average rainfall, both in total and distribution. 2008 was a drought year, with little spring rainfall and 2010 was a year of below average rainfall until May, then an average to above average year thereafter (to date). In addition, livestock grazing pressure has continued to be high to extreme during all of the assessment period, especially over each summer and early autumn. Consequently, it is

considered that some additional plant and fauna species will be recorded in the site. For examples of these grazing pressures see Photos 17 and 18 in Appendix B.

For some terrestrial migratory species, such as cuckoo, all were relatively rare in south eastern Australia over 2005 to 2008. However, Pallid cuckoo was extremely widely reported in 2009 over much of this region and in southern South Australia generally. This presumably was a result of the impacts of drought in previous years.

The commencement of the planned project is unlikely to cause any significant long term effect on local bat populations or other hollow-dependent species. However, if there is the likelihood that some hollow trees will need to be removed during construction, then all trees with potential bat roosts or suitable for use by other native species should be identified and efforts made to capture and re-locate bats, and other native fauna species, from the trees before removal. Relocation and use of all such hollow trees in the conservation areas as part of habitat management is recommended.

Prior to development commencing, a Vegetation Management Plan (VMP) and a Construction Environmental Management Plan (CEMP) must be developed so as to guide the future development of the site. This would include establishing Significant Environmental Benefit requirements as off-sets for any native vegetation and areas of fauna habitat removed. Future conservation initiatives, especially habitat conservation and restoration, pest species management actions and revegetation guidelines should be included in these documents. A range of conservation and open space initiatives could be developed for the site subject to design and planning considerations. The logical timing to develop these is part of the detailed planning process. Some of these suggestions are discussed above, although more detailed planning and commitment will be required to understand and implement these opportunities properly. Approval from the Native Vegetation Council will be required for the VMP.

The development and implementation of ongoing monitoring of the proposed conservation management measures and conservation areas is recommended and may be required as part of the VMP and other conditions of approval. Ongoing liaison with State and Council authorities by Delfin will also be necessary.

Figures 7.1 to 7.5 indicate the location of MNES, other sites of biological significance and some of the key pest plant infestations recorded in the site to date.

Delfin Lend Lease

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Metres

1:8,000 @A4

SOURCE Base imagery supplied by Delfin Lend Lease Pty Ltd, 2010 (captured 2006)

GIS FILE	PROJECTION	FINAL APPROVAL	DATE
AEN814-GIS-005	MGA 94 Zone 54	B. Anderson	20Aug10

Kellogg, Brown & Root Pty Ltd
KBR
Kellogg, Brown & Root Pty Ltd ABN 91 007 660 317
186 Greenhill Rd, Parkside SA 5063

Drawn by J. Paull

TITLE

Matters of National Environmental Significance

FIGURE No.	Rev
7.1	1

Delfin Lend Lease

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Metres

1:8,000 @A4

SOURCE Base imagery supplied by Delfin Lend Lease Pty Ltd, 2010 (captured 2006)

GIS FILE	PROJECTION	FINAL APPROVAL	DATE
AEN814-GIS-006	MGA 94 Zone 54	B. Anderson	20Aug10

Kellogg, Brown & Root Pty Ltd

KBR

Kellogg, Brown & Root Pty Ltd ABN 91 007 660 317

186 Greenhill Rd, Parkside SA 5063

Drawn by J. Paull

TITLE

Regional Recovery Plan Species

FIGURE No.	Rev
7.2	1

Delfin Lend Lease

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Metres

1:8,000 @A4

SOURCE Base imagery supplied by Delfin Lend Lease Pty Ltd, 2010 (captured 2006)

GIS FILE	PROJECTION	FINAL APPROVAL	DATE
AEN814-GIS-007	MGA 94 Zone 54	B. Anderson	20Aug10

Kellogg, Brown & Root Pty Ltd

KBR

Kellogg, Brown & Root Pty Ltd ABN 91 007 660 317

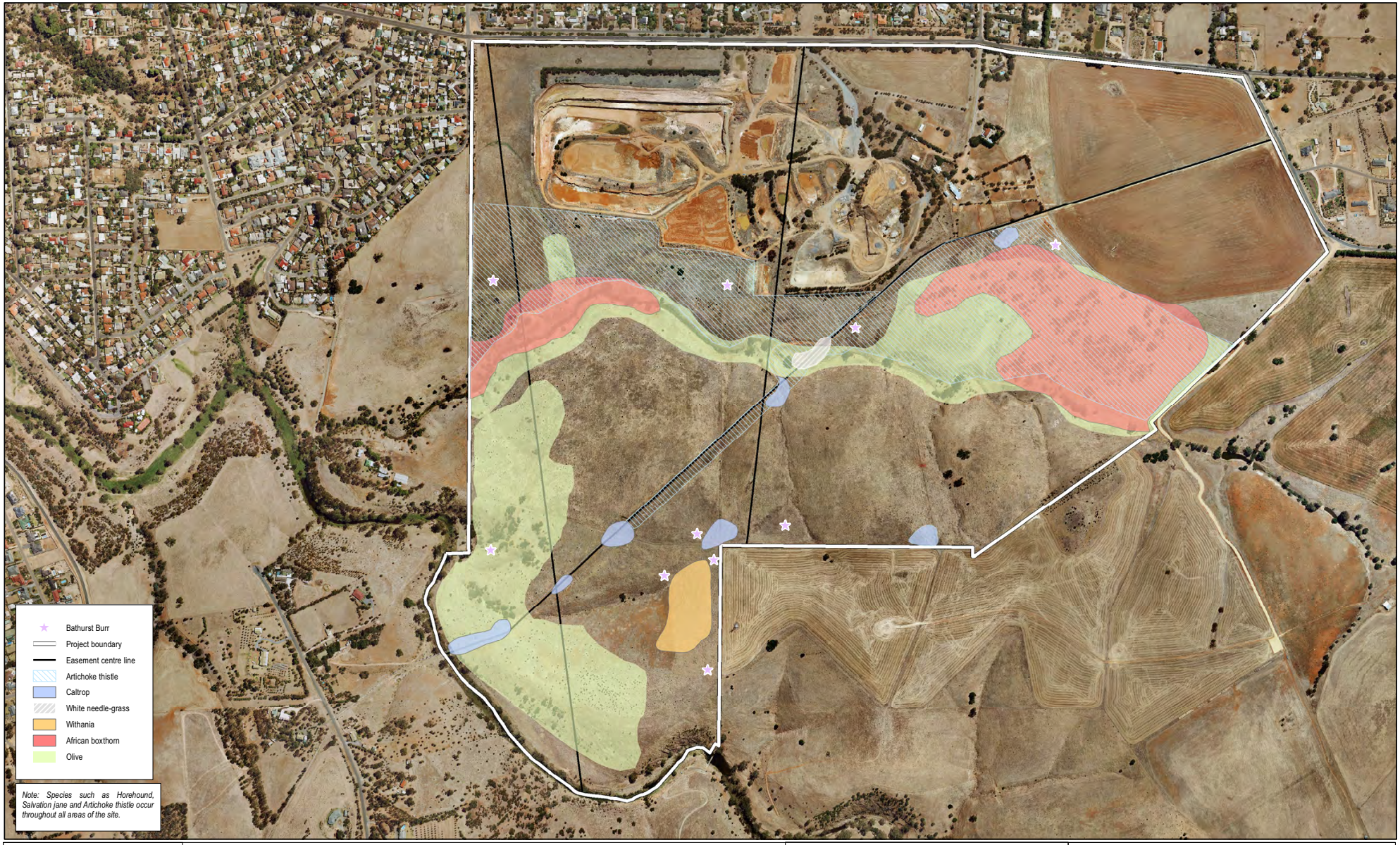
186 Greenhill Rd, Parkside SA 5063

Drawn by J. Paull

TITLE

Species of State Significance and Associated Habitat Areas

FIGURE No.	Rev
7.3	1



Delfin Lend Lease

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SOURCE Base imagery supplied by Delfin Lend Lease Pty Ltd, 2010 (captured 2006)

GIS FILE	PROJECTION	FINAL APPROVAL	DATE
AEN814-GIS-008	MGA 94 Zone 54	B. Anderson	20Aug10

Kellogg, Brown & Root Pty Ltd
KBR
Kellogg, Brown & Root Pty Ltd ABN 91 007 660 317
186 Greenhill Rd, Parkside SA 5063
Drawn by J. Paull

TITLE

Declared and High Threat Environmental Weed Species

FIGURE No.	Rev
7.4	1

Delfin Lend Lease

N

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Metres

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SOURCE Base imagery supplied by Delfin Lend Lease Pty Ltd, 2010 (captured 2006)

GIS FILE	PROJECTION	FINAL APPROVAL	DATE
AEN814-GIS-009	MGA 94 Zone 54	B. Anderson	20Aug10

Kellogg, Brown & Root Pty Ltd

KBR

Kellogg, Brown & Root Pty Ltd ABN 91 007 660 317

186 Greenhill Rd, Parkside SA 5063

Drawn by J. Paull

TITLE

Native Vegetation Areas

FIGURE No.	Rev
7.5	1

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Appendix A

SPECIES LISTS

Gawler East Ecological Survey					
Proposed development area (main site)					
2008 to 2010					
Genus	**Scientific name**	**Common name**	**EPBC Act**	**NPW Act**	**Regional rating (Southern Lofty)**
LEGUMINOSAE	*Acacia acinacea*	Gold Dust Wattle			
LEGUMINOSAE	*Acacia pycnantha*	Golden wattle			
ROSACEAE	*Acaena echinata*	Sheeps burr			
GRAMINEAE	*Aristida behriana*	Brush-wire grass			U
LILIACEAE	*Arthropodium strictum*	Chocolate lily			
CHENOPODIACEAE	*Atriplex suberecta*	Lagoon saltbush			
GRAMINEAE	*Austrodanthonia caespitosa*	Common Wallaby-grass			
GRAMINEAE	*Austrodanthonia geniculata*	Kneed Wallaby-grass			
GRAMINEAE	*Austrodanthonia pilosa*	Velvet Wallaby-grass			
GRAMINEAE	*Austrodanthonia setacea*	Small-flower Wallaby-grass			
GRAMINEAE	*Austrodanthonia sp.*	Wallaby grass			
GRAMINEAE	*Austrostipa blackii*	Crested Spear-grass			
GRAMINEAE	*Austrostipa nitida*	Balcarra Spear-grass			
GRAMINEAE	*Austrostipa scabra*	Rough Spear-grass			
GRAMINEAE	*Austrostipa eremophila*	Rusty Spear-grass			U
GRAMINEAE	*Austrostipa sp.*	Spear grass			
NYCTAGINACEAE	*Boerhavia dominii*	Tar-vine			
CYPERACEAE	*Bolboschoenus caldwellii*	Sea Club-rush			
AMARYLLIDACEAE	*Calostemma purpureum*	Garland lily			
CONVOLVULACEAE	*Calystegia sepium*	Greater bindweed/ Large bindweed			U
CENTROLEPIDACEAE	*Centrolepis sp.*				
EUPHORBIACEAE	*Chamaesyce drummondii*	Milk weed			
CHENOPODIACEAE	*Chenopodium pumilio*	Clammy Goosefoot			
GRAMINEAE	*Chloris truncata*	Windmill Grass			
CONVOLVULACEAE	*Convolvulus erubescens*	Pink bindweed			
CRASSULACEAE	*Crassula colorata*	Dense crassula			
CRASSULACEAE	*Crassula decumbens*	Spreading crassula			
CYPERACEAE	*Cyperus gymnocaulos*	Spiny Sedge			
CYPERACEAE	*Cyperus validus*				
LILIACEAE	*Dianella revoluta var. revoluta*	Black-antherFlax-lily			
DROSERACEAE	*Drosera auriculata*	Sundew			

Gawler East Ecological Survey					
Proposed development area (main site)					
2008 to 2010					
Genus	**Scientific name**	**Common name**	**EPBC Act**	**NPW Act**	**Regional rating (Southern Lofty)**
DROSERACEAE	*Drosera whittakeri*	Scented sundew			
CYPERACEAE	*Eleocharis acuta*	Common Spike-rush			
GRAMINEAE	*Enneapogon nigricans*	Black heads			
MYRTACEAE	*Eucalyptus camaldulensis var. camaldu*	River Red Gum			
MYRTACEAE	*Eucalyptus leucoxylon* (planted)	SA Blue Gum			
MYRTACEAE	*Eucalyptus porosa*	Mallee Box			U
GERANIACEAE	*Geranium retrorsum*	Grassland Geranium			
HALORAGACEAE	*Gonocarpus tetragynus*	Variable Raspwort			
GOODENIACEAE	*Goodenia pinnatifida*	Mother ducks			U
GOODENIACEAE	*Goodenia sp.*	Goodenia			
JUNCACEAE	*Juncus kraussii*	Sea Rush			
JUNCACEAE	*Juncus spp.*	Rush			
GRAMINEAE	*Lachnagrostis filiformis*	Blown-grass			
LILIACEAE	*Lomandra effusa*	Scented mat-rush			R
LILIACEAE	*Lomandra micrantha*	Small-flower Mat-rush			
LILIACEAE	*Lomandra multiflora ssp. dura*	Scented Mat-rush			
LILIACEAE	*Lomandra densiflora*	Soft Mat-rush			U
LYTHRACEAE	*Lythrum hyssopifolia*	Lesser Loosestrife			
CHENOPODIACEAE	*Maireana brevifolia*	Short-leaf Bluebush			
CHENOPODIACEAE	*Maireana enchylaenoides*	Wingless bluebush			U
BORAGINACEAE	*Myosotis australis*	Austral forget-me-not			R
HALORAGACEAE	*Myriophyllum sp.*	Milfoil			
GRAMINEAE	*Panicum effusum*	Hairy panic			
GRAMINEAE	*Phragmites australis*	Common reed			
ASPLENIACEAE	*Pleurosorus rutifolius*	Blanket fern			U
GRAMINEAE	*Poa labillardieri*	Common Tussock-grass			
PORTULACACEAE	*Portulaca oleracea*	Common Purslane			
AMARANTHACEAE	*Ptilotus spathulatus*				
CHENOPODIACEAE	*Salsola tragus*	Prickly saltwort			
CYPERACEAE	*Schoenoplectus validus*	River club-rush			
COMPOSITAE	*Senecio sp.*	Groundsel			

Gawler East Ecological Survey					
Proposed development area (main site)					
2008 to 2010					
Genus	**Scientific name**	**Common name**	**EPBC Act**	**NPW Act**	**Regional rating (Southern Lofty)**
COMPOSITAE	*Senecio odoratus*	Scented Groundsel			
MALVACEAE	*Sida corrugata*				
COMPOSITAE	*Solenogyne dominii*	Smooth solenogyne			U
STACKHOUSIACEAE	*Stackhousia monogyna*	Creamy Candles			
GRAMINEAE	*Themeda triandra*	Kangaroo grass			
TYPHACEAE	*Typha domingensis*	Narrow-leaf Bulrush			
COMPOSITAE	*Vittadinia cervicularis*				
COMPOSITAE	*Vittadinia cuneata*	Fuzzy New Holland Daisy			
CAMPANULACEAE	*Wahlenbergia stricta ssp. stricta*	Tall Bluebell			
LEGUMINOSAE	**Acacia cyclops*	Western coastal wattle			
LEGUMINOSAE	**Acacia saligna*	Golden wreath, Orange Wattle			
GRAMINEAE	**Aira caryophyllea/cupaniana*	Hair-grass			
COMPOSITAE	**Arctotheca calendula*	Cape weed			
LILIACEAE	**Asphodelus fistulosus*	Onion weed			
GRAMINEAE	**Avena fatua*	Wild oat			
GRAMINEAE	**Avena sativa*	Bearded Oat			
CALLITRICHACEAE	**Callitriche stagnalis*	Common Starwort			
CRASSULACEAE	**Crassula alata*	Three-part crassula			
CRASSULACEAE	**Crassula natans*				
GRAMINEAE	**Brachypodium distachyon*	False Brome			
GRAMINEAE	**Briza major*	Large Quaking-grass			
GRAMINEAE	**Bromus catharticus*	Prairie Grass			
GRAMINEAE	**Bromus diandrus*	Great Brome			
CHENOPODIACEAE	**Chenopodium album*	Fat Hen			
CHENOPODIACEAE	**Chenopodium murale*	Nettle-leaved goosefoot			
COMPOSITAE	**Cirsium vulgare*	SpearThistle			
COMPOSITAE	**Cynara cardunculus*	Artichoke thistle			
GRAMINEAE	**Cynosurus echinatus*	Rough Dog's-tail Grass			
GRAMINEAE	**Dactylis glomerata*	Cocksfoot			
GRAMINEAE	**Digitaria sanguinalis*	Crab Grass			

Gawler East Ecological Survey					
Proposed development area (main site)					
2008 to 2010					
Genus	**Scientific name**	**Common name**	**EPBC Act**	**NPW Act**	**Regional rating (Southern Lofty)**
GRAMINEAE	**Echinochloa crus-galli*	Barnyard Grass			
GRAMINEAE	**Eragrostis cilianensis*	Stink Grass			
GRAMINEAE	**Ehrharta longiflora*	Annual Veldt Grass			
GRAMINEAE	**Eleusine sp.*	Crowsfoot grasses			
GERANIACEAE	**Erodium cicutarium*	Cut-leaf Heron's-bill			
GERANIACEAE	**Erodium moschatum*	Musky Heron's-bill			
MYRTACEAE	**Eucalyptus albopurpurea*	Port Lincoln Mallee			
MYRTACEAE	**Eucalyptus odorata*	Peppermint Box			
FUMARIACEAE	**Fumaria capreolata*	White-flower Fumitory			
UMBELLIFERAE	**Foeniculum vulgare*	Fennel			
GRAMINEAE	**Hordeum murinum*	Barley grass			
GRAMINEAE	**Hordeum sp.*	Barley-grasses			
GUTTIFERAE	**Hypericum perforatum*	St Johns Wort			
COMPOSITAE	**Hypochaeris glabra*	Smooth Cat's Ear			
COMPOSITAE	**Hypochaeris radicata*	Rough Cat's Ear			
COMPOSITAE	**Lactuca serriola*	Prickly Lettuce			
CRUCIFERAE	**Lepidium africanum*	Common peppercress			
GRAMINEAE	**Lolium spp.*	Ryegrass			
SOLANACEAE	**Lycium ferocissimum*	African boxthorn			
MALVACEAE	**Malva parviflora*	Marshmallow			
LABIATAE	**Marrubium vulgare*	Horehound			
LEGUMINOSAE	**Medicago minima*	Woolly burr-medic			
LEGUMINOSAE	**Medicago polymorpha*	Burr-medic			
GRAMINEAE	**Nassella leucotricha*	Texas Needlegrass			
IRIDACEAE	**Morea setifolia*	Thread Iris			
SOLANACEAE	**Nicotiana glauca*	Tree Tobacco			
OLEACEAE	**Olea europaea*	European Olive			
OXALIDACEAE	**Oxalis pes-caprae*	Sour sob			
OXALIDACEAE	**Oxalis corniculata*	Creeping oxalis			
GRAMINEAE	**Pennisetum clandestinum*	Kikuyu			
GRAMINEAE	**Pennisetum villosum*	Feathertop			

Gawler East Ecological Survey					
Proposed development area (main site)					
2008 to 2010					
Genus	**Scientific name**	**Common name**	**EPBC Act**	**NPW Act**	**Regional rating (Southern Lofty)**
GRAMINEAE	**Phalaris aquatica*	Canary grass			
GRAMINEAE	**Piptatherum miliaceum*	Rice Millet			
PLANTAGINACEAE	**Plantago coronopus*	Bucks-horn Plantain			
PLANTAGINACEAE	**Plantago lanceolata*	Ribwort			
GRAMINEAE	**Poa annua*	Winter Grass			
POLYGONACEAE	**Polygonum aviculare*	Wire weed			
RESEDACEAE	**Reseda lutea*	Mignonette			
CRUCIFERAE	**Rorippa nasturtium-aquaticum*	Watercress			
IRIDACEAE	**Romulea minutiflora*	Guildford grass			
IRIDACEAE	**Romulea rosea*	Common Onion-grass			
ROSACEAE	**Rosa canina*	Dog rose			
POLYGONACEAE	**Rumex crispus*	Curled dock			
POLYGONACEAE	**Rumex obtusifolius*	Broad-leaf Dock			
LABIATAE	**Salvia verbenaca*	Wild sage			
DIPSACACEAE	**Scabiosa atropurpurea*	Scabious			
ANACARDIACEAE	**Schinus molle*	Pepper Tree			
GRAMINEAE	**Setaria verticillata*	Sticky grass			
SOLANACEAE	**Solanum linnaeanum*	Apple of Sodom			
SOLANACEAE	**Solanum nigrum*	Black Nightshade			
LEGUMINOSAE	**Trifolium sp.*	Clover			
LEGUMINOSAE	**Trifolium angustifolium*	Narrow-leaf Clover			
LEGUMINOSAE	**Trifolium campestre*	Hop Clover			
LEGUMINOSAE	**Trifolium dubium*	Suckling Clover			
LEGUMINOSAE	**Trifolium strictum*				
URTICACEAE	**Urtica urens*	Stinging nettle			
COMPOSITAE	**Sonchus oleraceus*	Common Sow-thistle			
LEGUMINOSAE	**Vicia sativa*	Common Vetch			
GRAMINEAE	**Vulpia bromoides*	Squirrel-tail Fescue			
GRAMINEAE	**Vulpia myorus*	Fescue			
SOLANACEAE	**Withania somnifera*	WinterCherry			
COMPOSITAE	**Xanthium spinosum*	Bathurst Burr			

Gawler East Ecological Survey					
Proposed development area (main site)					
2008 to 2010					
Genus	**Scientific name**	**Common name**	**EPBC Act**	**NPW Act**	**Regional rating (Southern Lofty)**
*introduced species					

AVES	FAMILY	SCIENTIFIC NAME	COMMON NAME		EPBC	NP&W Act	Adelaide Plains sub-region AM LR NRM
AVES	**ACANTHIZIDAE**	*Acanthiza chrysorrhoa*	Yellow-rumped thornbill			U	M
AVES		*Aphelocephala leucopsis*	Southern whiteface			V	M
AVES		*Smicrornis brevirostris*	Weebill				
AVES	**ACCIPITRIDAE**	*Aquila audax*	Wedge-tailed eagle				
AVES		*Circus assimilis*	Spotted harrier				
AVES		*Haliastur sphenurus*	Whistling kite			U	M
AVES	**ACROCEPHALIDAE**	*Acrocephalus australis*	Reed-warbler				
AVES	**AEGOTHELIDAE**	*Aegotheles cristatus*	Australian owlet-nightjar				
AVES	**ALAUDIDAE**	**Alauda arvensis*	Eurasian skylark				
AVES	**ANATIDAE**	*Anas gracilis*	Grey teal				
AVES		*Anas superciliosa*	Black duck				
AVES		*Chenonetta jubata*	Australian wood duck				
AVES		*Egretta novaehollandiae*	White-faced heron				
AVES	**ARTAMIDAE**	*Artamus cyanopterus*	Dusky woodswallow				
AVES		*Cracticus tibicen*	Australian magpie				
AVES	**CACATUIDAE**	*Cacatua galerita*	Sulphur-crested cockatoo				
AVES		*Eolophus (Cacatua) roseicapilla*	Galah				
AVES		*Cacatua sanguinea*	Little corella				
AVES	**CAMPEPHAGIDAE**	*Coracina novaehollandiae*	Black-faced cuckoo-shrike				
AVES	**CHARADRIIDAE**	*Vanellus miles*	Masked lapwing				
AVES	**COLUMBIDAE**	**Columba livia*	Rock dove				
AVES		**Streptopelia chinensis*	Spotted turtle-dove				
AVES	**CORCORACIDAE**	*Corcorax melanorhamphos*	White-winged chough		R	V	M
AVES	**CORVIDAE**	*Corvus coronoides*	Australian raven				
AVES		*Corvus mellori*	Little raven				
AVES	**CUCULIDAE**	*Cacomantis pallidus*	Pallid cuckoo			V	M
AVES	**FALCONIDAE**	*Falco berigora*	Brown falcon				
AVES		*Falco cenchroides*	Nankeen kestrel				
AVES		*Falco longipennis*	Australian hobby				
AVES		*Falco peregrinus*	Peregrine falcon		R	R	M
AVES	**FRINGILLIDAE**	**Carduelis carduelis*	European goldfinch				
AVES	**HALCYONIDAE**	*Todiramphus sanctus*	Sacred kingfisher				
AVES		*Dacelo novaeguineae*	Kookaburra				

AVES	FAMILY	SCIENTIFIC NAME	COMMON NAME		EPBC	NP&W	Adelaide Plains sub-region AM LR NRM
AVES	HIRUNDINIDAE	*Cheramoeca leucosterna*	White-backed swallow				
AVES		*Petrochelidon ariel*	Fairy martin			U	M
AVES		*Hirundo neoxana*	Welcome swallow				
AVES	LARIDAE	*Chroicocephalus novaehollandiae*	Silver gull				
AVES	MALURIDAE	*Malurus cyaneus*	Superb fairy-wren				
AVES	MEGALURIDAE	*Cincloramphus cruralis*	Brown songlark				
AVES		*Megalurus gramineus*	Little grassbird				
AVES		*Anthochaera carunculata*	Red wattlebird				
AVES		*Epthianura albifrons*	White-fronted chat			U	M
AVES		*Lichenostomus penicillatus*	White-plumed honeyeater				
AVES		*Manorina melanocephala*	Noisy miner				
AVES		*Phylidonyris novaehollandiae*	New-Holland honeyeater				
AVES	MEROPIDAE	*Merops ornatus*	Rainbow bee-eater	Migratory			
AVES	MONARCHIDAE	*Grallina cyanoleuca*	Magpie lark				
AVES	MOTACILLIDAE	*Anthus novaeseelandiae*	Richards pipit				
AVES	PACHYCEPHALIDAE	*Pachycephala rufiventris*	Rufous Whistler			U	M
AVES	PARDALOTIDAE	*Pardalotus punctatus*	Spotted pardalote				
AVES		*Pardalotus striatus*	Striated pardalote				
AVES	PASSERIDAE	**Passer domesticus*	House sparrow				
AVES	PETROICIDAE	*Petroica goodenovii*	Red-capped robin			V	M
AVES	PHASIANIDAE	*Coturnix pectoralis*	Stubble quail				
AVES	PHALACROCORACIDAE	*Phalacrocorax sulcirostris*	Little pied cormorant				
AVES	PODARGIDAE	*Podargus strigoides*	Tawny frogmouth			U	M
AVES	PODICIPEDIDAE	*Tachybaptus novaehollandiae*	Australian grebe				
AVES	PSITTACIDAE	*Glossopsitta concinna*	Musk lorikeet				
AVES		*Neophema elegans*	Elegant parrot		R		
AVES		*Northiella haematogaster*	Blue bonnet				
AVES		*Platycercus elegans adelaidae*	Adelaide rosella				
AVES		*Psephotus haematonotus*	Red-rumped parrot			U	M
AVES		*Trichoglossus haematodus*	Rainbow lorikeet				
AVES	RALLIDAE	*Fulica atra*	Eurasian coot				
AVES		*Gallinula tenebrosa*	Dusky moorhen				
AVES		*Gallirallus philippensis mellori*	Buff-banded rail			V	H

AVES	FAMILY	SCIENTIFIC NAME	COMMON NAME		EPBC	NP&W	Adelaide Plains sub-region AMLR NRM
AVES		*Porphyrio porphyrio*	Purple swamphen				
AVES		*Porzana fluminea*	Australian spotted crake				
AVES	**SCOLOPACIDAE**	*Gallinago hardwickii*	Latham's snipe	gratory, Aquatic			
AVES	**STRIGIDAE**	*Ninox novaeseelandie*	Southern boobook				
AVES	**STURNIDAE**	**Sturnus vulgaris*	Common starling				
AVES	**THRESKIORNITHIDAE**	*Threskiornis spinicollis*	Straw-necked ibis				
AVES	**TIMALIIDAE**	*Zosterops lateralis*	Silvereye				
MAMMALIA		*Macropus fuliginosus*	Western grey kangaroo				
MAMMALIA		*Macropus robustus*	Euro				
MAMMALIA		**Oryctolagus cuniculus*	European rabbit				
MAMMALIA		**Lepus capensis*	Brown hare				
MAMMALIA		**Mus musculus*	House mouse				
MAMMALIA		*Pseudocheirus peregrinus*	Common ringtail possum				
MAMMALIA		*Tachyglossus aculeatus*	Short-beaked echidna				
MAMMALIA		*Trichosurus vulpecula*	Common brushtail possum		R		
MAMMALIA		**Vulpes vulpes*	European red fox				
REPTILIA		*Cryptoblepharus plagiocephalus*					
REPTILIA		*Christinus marmoratus*	Marbled gecko				
REPTILIA		*Delma molleri*	Delma				
REPTILIA		*Hemiergis peronii*	Lowlands earless skink				
REPTILIA		*Lerista bougainvillii*	Bougainvilles skink				
REPTILIA		*Menetia greyii*	Common dwarf skink				
REPTILIA		*Morethia sp.*	Morethia				
REPTILIA		*Pogona barbata*	Eastern bearded dragon				
REPTILIA		*Tiliqua rugosa*	Sleepy lizard				
REPTILIA		*Tiliqua scincoides*	Common blue tongue				
REPTILIA		*Parasuta flagellum*	Little hooded snake				
REPTILIA		*Pseudonaja textilis*	Eastern brown snake				
AMPHIBIA		*Crinia signifera*	Common toadlet				
AMPHIBIA		*Limnodynastes dumerilii (SCR)*	Pobblebonk				
AMPHIBIA		*Limnodynastes tasmaniensis (SCR)*	Spotted marsh frog				

Appendix B

PHOTOGRAPHS (SPRING 2008 AND SUMMER 2008/09)

Photo B1: River red gum woodland with anthropogenic understorey (Dead Man's Pass, adjacent to the site)

Photo B2: Main watercourse on site, eastern reach, looking east.

Photo B3: Main watercourse on site, western reach with riparian grassland and sedgeland, looking west

Photo B4: Dry woodland patches dominated by mature Mallee box, central eastern section of the site

Photo B5: *Acacia acinacea*. This plant is the only large native shrub recorded in the site.

Photo B6: Iron-grass (*Lomandra effusa – L. multiflora* ssp. *dura*) Natural Temperate Grassland of South Australia.

Photo B7: Example of potential small reptile habitat along the eastern reach of the main watercourse

Photo B8: Fair to good quality reptile habitat, especially for Flinders Ranges worm-lizard

Photo B9: Example of reptile habitat.

Photo B10: *Parasuta flagellum* (sub-adult) sheltering under the rock (on the right in photo 9).

Photo B11: *Cynara cardunculus* (Artichoke thistle) infestation. Dominant weed in this site

Photo B12: Infestation of *Echium plantagineum* (Salvation jane). Typical infestation over much of the site.

Photo B13: South facing section of the site with anthropogenic vegetation

Photo B14: Severe grazing impacts. Nil native species remain here in the central section of the site.

Photo B15: *Solanum linnaeanum* (Apple of Sodom)

Photo B16: *Withania somnifera* (Winter cherry)

Photo B17: Severe livestock grazing and trampling impacts in the Iron-grass Community.

Photo B18: Severe grazing impacts indicated by the bonsai-like *Lomandra* tussocks

Pitfall line 1

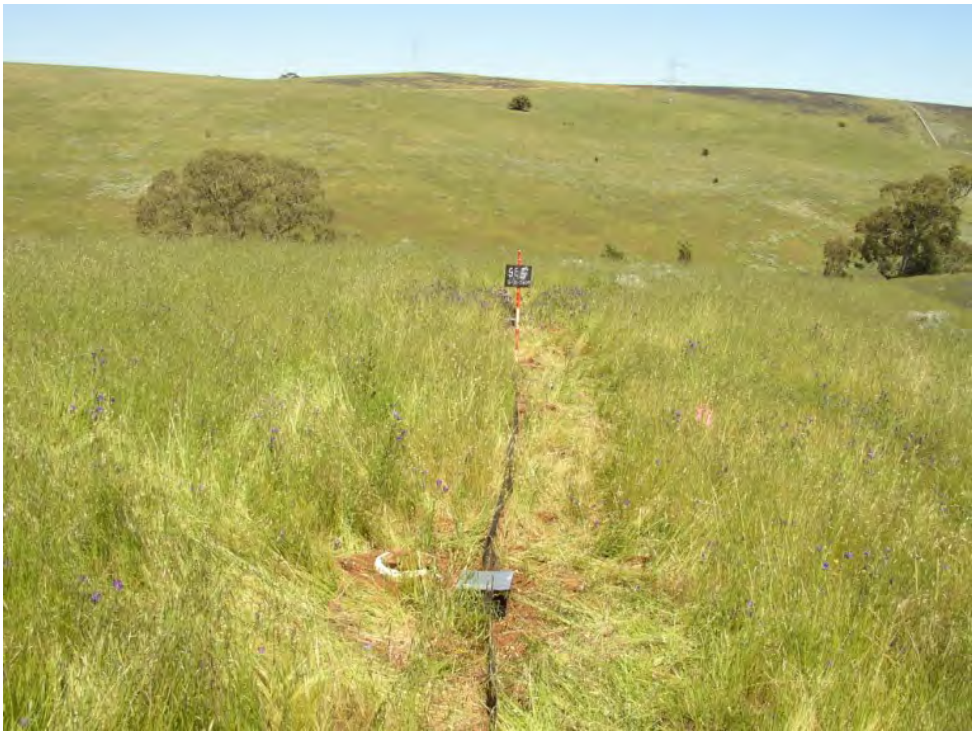
Pitfall line 2

Pitfall line 3

Pitfall line 4

Pitfall line 5

Pitfall line 6



Pitfall line 7

Pitfall line 8

EBS Ecology
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t. 08 7127 5607

WALLBRIDGE GILBERT AZTEC

Springwood Communities

Springwood Residential Development

ROADS AND EARTHWORKS REPORT

Project No. 070975
Doc No. WGA070975-RP-CV-0014
Rev. D

14 June 2019

Revision History

Rev	Date	Issue	Originator	Checker	Approver
A	07/06/2019	Draft Issue for Comment	SMc		
B	11/06/2019	Planning Approval	SMc	DB	DB
C	13/06/2019	Final Issue	SMc	DB	DB
D	14/06/2019	Minor Amendments	SMc	DB	DB

CONTENTS

Appendices

1 INTRODUCTION

1.1 BACKGROUND

Wallbridge Gilbert Aztec (WGA) has been engaged by Springwood Communities to provide a Summary Report, broadly outlining the procedures which would be adopted to rehabilitate an abandoned sand mine (quarry) adjacent to the Calton Road boundary of the Springwood Residential Development. The sand mine is known as Private Mine No 28, portion of No 208.

Further to the rehabilitation methodology, WGA has given preliminary consideration to future roads and earthworks design. A section of the most challenging area of the site has been selected, comprising 130 allotments, and a preliminary roads and earthworks model has been undertaken to demonstrate that suitable road and allotment grades can be achieved.

The proposed Springwood site is approximately 186.1 ha, located approximately 1.5 km east of the Gawler Town Centre and 37 km north of the Adelaide City Centre. The proposed development is bordered by Balmoral Road to the east, Calton Road to the north, predominantly undeveloped farming land to the west, and undeveloped, vacant land to the south. The southern boundary is adjacent the South Para River. A locality sketch of the Development site, outlined in red, is shown in Figure 1. The quarry and associated fill material are principally located in the northern portion of the proposed Development.

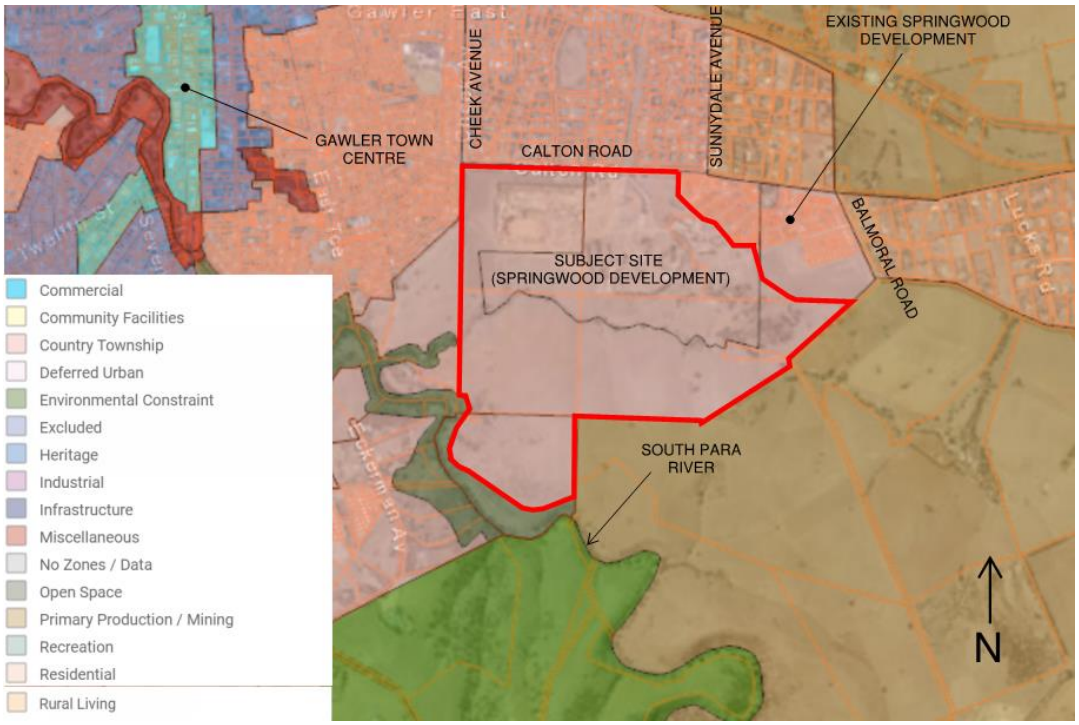


Figure 1 - Site Locality and Zoning (Location SA Map Viewer, Government SA, 2019)

1.2 PURPOSE OF THE REPORT

The purpose of this report is to:

- Provide a broad geotechnical remediation strategy for the quarry site, based on previous works undertaken by Coffey Geotechnics and WGA;
- Attain an appreciation of the level of earthworks required to be undertaken in steep locations by demonstrating:
  - Grade compliant driveway arrangements;
  - Grade compliant road long sections; and
  - Worst case allotment grading/ retaining.
- Consolidate investigations to provide supporting information and justification for development of the site.

1.3 REFERENCE DOCUMENTS

Considerable geotechnical investigations have been undertaken across the Development site, particularly within the quarry and associated spoil piles. The following references have been used as the basis for geotechnical remediation works discussed within this report:

- Coffey Geotechnics Report *'Mine Site Geotechnical Investigation – Calton Road, Gawler East,'* August 2012*;* and
- Wallbridge Gilbert Aztec Report *'Proposed Commercial Precinct, Gawler East – Supplementary Geotechnical Investigation,'* February 2019.

2 GEOTECHNICAL REMEDIATION OF THE QUARRY

2.1 SITE HISTORY AND CHARACTERISTICS

The proposed Springwood Development includes an abandoned sand mine in the north-western quadrant of the site, which was formerly operated by Readymix Holdings (now known as Holcim). The sand extracted from the pit was used as a construction material in the Adelaide metropolitan area. An ortho-photo from the 1970's has been included as Appendix A, which shows a broad outline of the sand pit workings at the time.

The abandoned sand mine includes a pit (up to about 25 m deep), with various spoil piles of overburden material (up to approximately 10m high) and several slimes pits (unconsolidated and saturated fines from sand washing activities) up to 6m deep. Figure 2 shows the locations of these particular features, forming the extent of required geotechnical remediation.

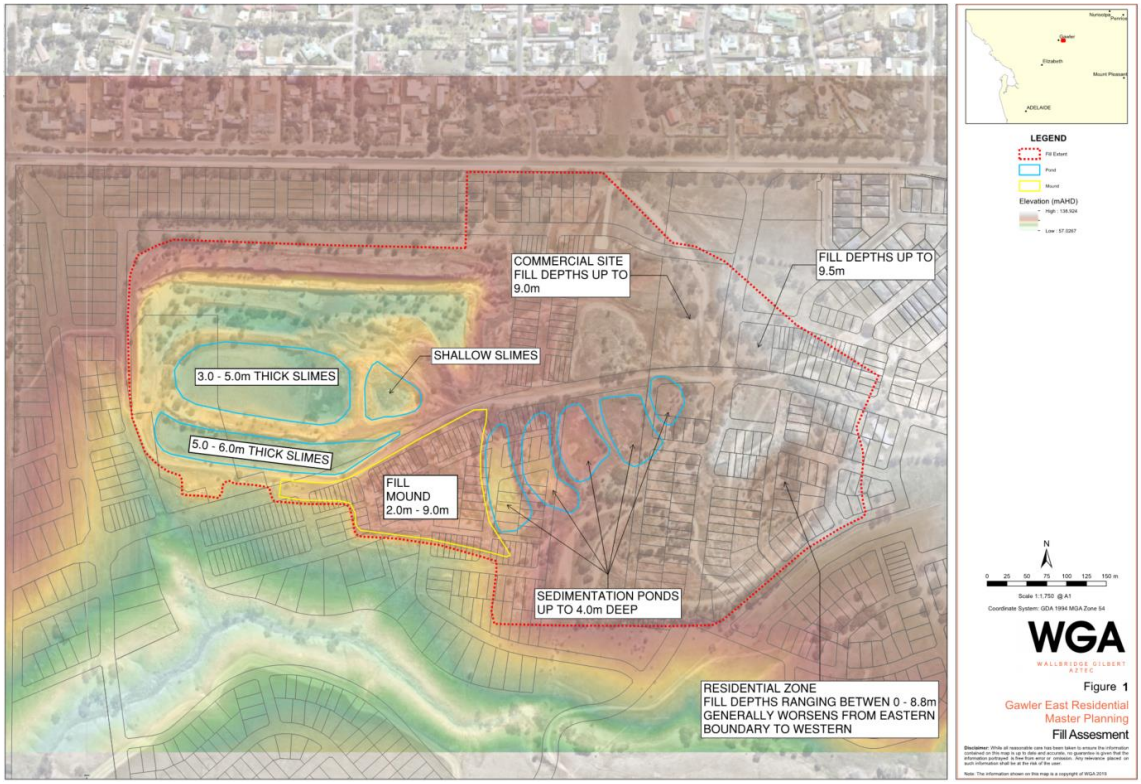


Figure 2 - Extent of Geotechnical Remediation (WGA, 2019)

The geological survey of South Australia *"1:100,000 Barossa Sheet"* indicates that the northern portion of the proposed development area around the existing sand mine is largely underlain by Tertiary aged

sand, whilst the southern portion of the site is underlain at shallow depth by weathered bedrock (Woolshed Flat Slate) with quartz seams. The regional groundwater table is well below the current base of the sand extraction pit.

The *'Mine Site Geotechnical Investigation - Calton Road, Gawler East, 2012'* consolidates geotechnical investigations conducted by Coffey Geotechnics Pty Ltd over several years and has broadly confirmed the expected regional geology and the presence of non-engineered fill in places. Plans showing the locations of the previous geotechnical investigations and typical cross-sections through the site are shown in Appendix B and Appendix C respectively.

2.2 SCOPE OF THE EARTHWORKS

The basis of the quarry remediation works is to provide the required landform for the proposed Development, taking into account the varying land usages across the site.

In order to achieve the required landform, it is anticipated that earthworks will be undertaken at the sand mine site. It is noted that the sand mine is part of the broader 181.6 ha Development, which may yield surplus material as a result of staged earthworks. This surplus material could be placed directly into the mine site as part of the rehabilitation of the mine. The bulk earthworks required include:

- Backfilling the deeper sections of the former sand extraction pit with engineered fill. The fill material will be sourced both from within the existing mine site as well as surplus material generated from the construction of subdivision stages around the broader development;
- Excavating the natural ground at the crest of the sand pit high wall;
- Reworking areas of non-engineered fill (spoil piles); and
- Excavating slime pits and backfilling.

The intention is that only site won materials (surficial clays, Tertiary aged sand and weathered rock) from across the proposed Development would be incorporated in the engineered fill. The slimes can potentially be dried back and blended with other materials prior to re-use.

Prior to the commencement of remediation works, a technical specification relating to fill placement and construction overview would be developed based on relevant Australian Standards, such as AS3798 *"Guidelines on earthworks for commercial and residential developments*."

As the sand mine has not been used for many years, there is significant scour and erosion of the pit sides and varying amounts of loose, unconsolidated spoil are present on the pit floor (including a slimes pit). Where it is proposed to place engineering fill, unsuitable materials would be stripped from the base and sides so as to expose undisturbed natural sand or bedrock. Local areas of water ponded in the base of the pit would also be removed as part of the preparation works. The sides of the pit will also need to be battered to a safe angle to allow construction machinery to operate safely.

In addition to the geotechnical testing during fill placement, environmental testing will be undertaken to assess potential contamination issues and check compliance with SA EPA regulations.

3 STEEP TERRAIN ROAD AND LOT GRADING ASSESSMENT

3.1 TARGET ASSESSMENT AREA

In order to demonstrate the viability of residential development across the site, a roads and allotment grading assessment has been undertaken in the most challenging area of the site, based on the master plan provided in Appendix D. The intention is to establish the anticipated worst-case road and allotment grading across the site.

The area chosen for this assessment is south of the central drainage channel, abutting the overall Development's southern boundary. The selection was made after preliminary assessment of multiple areas across the site. The assessment area comprises 130 allotments and the natural topography is defined by steep grades in both the north-south and east-west directions. Figure 3 shows the locality of the assessment area relative to the overall proposed Development.

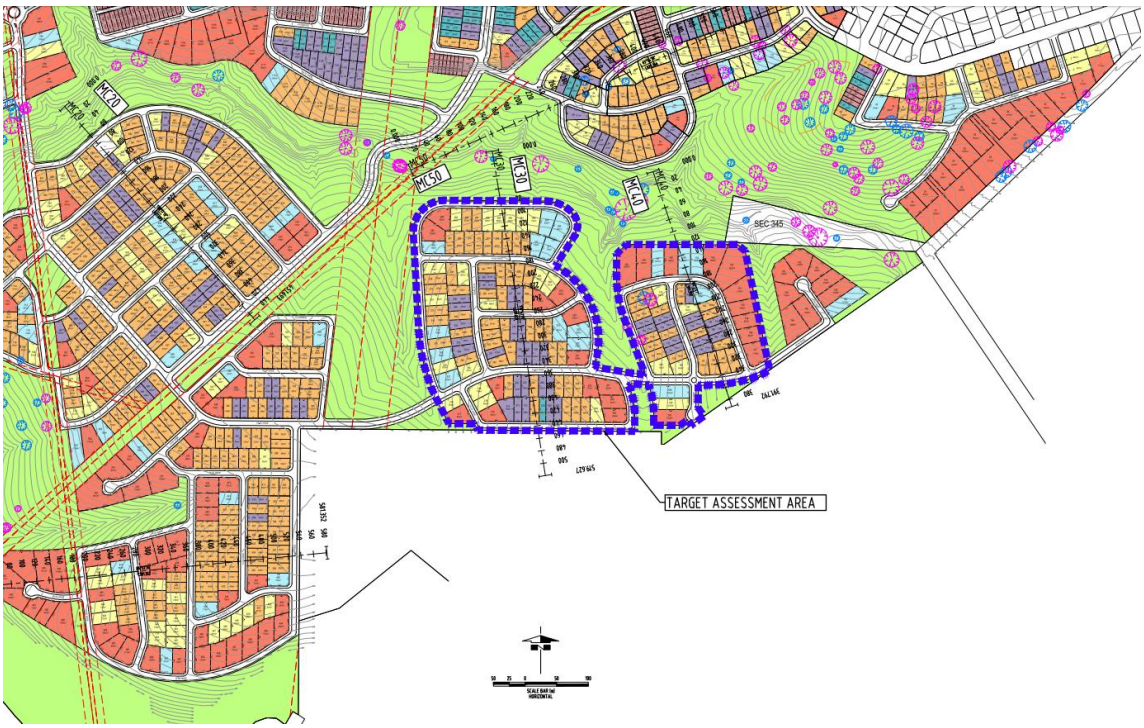


Figure 3 - Target Roads and Lot Grading Assessment Area (WGA, 2019)

The natural longitudinal grades across the area delineated in Figure 1 were found to be between 5 - 18%. There is no requirement for remediation of subsurface soils within this site, as the material is understood to be natural ground. On this basis, any surplus material generated could be used elsewhere within the Development site as fill, including within the abandoned sand mine.

3.2 ROAD GRADING

The site's natural topography tends to increase in gradient moving away from the southern boundary toward the natural watercourse. Given the relative steepness in the northern, downstream section of the assessment area, it has been proposed to cut the roads below natural level to create a more uniform grade across the site. This even distribution of road grading reduces the maximum height difference on individual allotments, and therefore reduces the maximum retaining required in future and assists in managing road gradients.

Based on Town of Gawler's *'Standards and Requirements for Land Development/ Land Division,'* July 2012, the following criteria generally applies to longitudinal road graded:

- On a steeply graded site, the maximum grade can be 10%;
- Steeper sites will require discussion with Council; and
- The minimum longitudinal grade is to be 0.67%.

To comply with Council standards, a maximum grade of 10% has been adopted where practical. In an effort to rationalise the road grading against allotment grading, short sections of 12.5% have been proposed. This complies with the requirements set out in *Guide to Road Design Part 3: Geometric Design (Austroads 2016),* and is considered appropriate given the relatively short lengths, steep natural topography and forecast traffic usage. It is also noted that WGA has been successfully involved in design of steeper longitudinal grades (up to 14%), for roads within comparable land developments throughout Mount Barker.

Intersection grading has been designed to comply with *Guide to Road Design Part 4: Intersections and Crossings: General (Austroads 2009b).* This is based on minimum Safe Intersection Sight Distance (SISD) requirements.

Longitudinal sections have been prepared for each road throughout the assessment area, and have been included in Appendix E.

As a summary of road grading through the development:

- Maximum achieved longitudinal grade = 12.5%;
- Minimum achieved longitudinal grade = 0.67%; and
- The proportion of roads graded steeper than 1 in 10 has been determined to be approximately 25% of the assessment area.

It should be noted that the proposed road grading would also result in compliant grades for gravity services.

3.3 DRIVEWAY ARRANGEMENTS

Driveways would generally be proposed on the downstream side of each allotment to maximise serviceability for gravity services including sewer and stormwater. Maximum driveway gradients have been proposed for the purpose of this assessment, as it reduces the level difference between allotments sharing a rear boundary.

Maximum driveway grades have been determined based upon Town of Gawler's *'Standards and Requirements for Land Development/ Land Division,'* July 2012 and AS2890.1-2004 Parking Facilities – Off Street Carparking. These requirements prevent scraping for a B85 design vehicle and can be summarised as follows:

- Council footpath gradient maximum 1 in 40 (2.5%);
- Driveway gradient maximum 1 in 5 (20%);
- Transitions are required where change in grade exceeds 1 in 8 (12.5%);
- Minimum transition is 2.0m;
- Maximum change in grade at a crest is 1 in 8 (12.5%); and
- Maximum change in grade at a sag is 1 in 6.7 (15%).

For garage setbacks of 6.0m, Figure 4 illustrates the maximum driveway gradients for high-side and low-side allotments, calculated to comply with Council Requirements and the relevant Australian Standard.

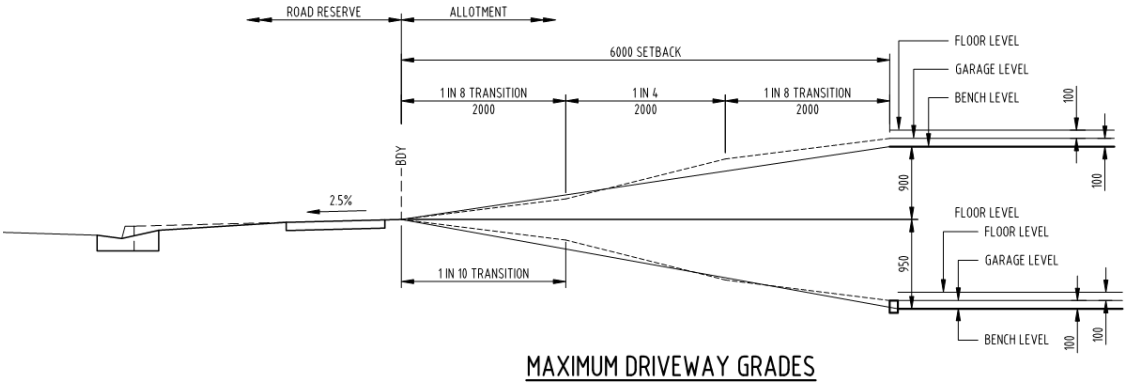


Figure 4 - Maximum Complying Driveway Grades

3.4 ALLOTMENT GRADING

Allotment grading across the site has been determined through a rationalised road grading design discussed in Section 3.2, and by utilising maximum driveway gradients across a 6.0m garage setback for individual allotments as outlined in Section 3.3. A preliminary earthworks plan and sections through the site are provided in Appendix F.

Allotments have been orientated to best suit the natural topography, so that the more prevalent level differences between allotments are found at the shared rear boundary as opposed to the shared side boundary. This maximises flexibility in design to deal with the fall across individual allotments, given the depth of lots generally exceeds their width.

Based upon the long-sections shown in Appendix F, it is evident that there are significant level differences to be dealt with. By delivering maximum driveway grades during civil construction, this difference can be minimised. The worst-case height differential between two allotments within the assessment area was determined to be 7.5 m, based on the road and driveway grading techniques discussed in this report. The sections included in Appendix F illustrate the height differentials throughout the site.

To effectively manage the height differential across adjoining allotments, WGA has proposed an approach where rear retaining walls are installed on the common boundary between allotments to reduce the total level difference. By delivering a consistent grade from the rear retaining to the garage setback, a worst-case allotment grade of 10% can be delivered. This grade can then be managed through building design of individual lots. By constructing a 2.0m high wall on the common boundary, each allotment would then have less than 3.0 m of level difference to consider through building design. Appendix F illustrates this potential solution. This methodology has been used successfully on projects in Mount Barker and on steep sides in Huntfield Heights/Hackham.

It should be noted that in many areas throughout the broader Development, there will be multiple methods available to manage allotment grade, which can be seen throughout the existing Springwood Development. This assessment seeks to demonstrate that the worst-case area can be effectively developed. Further options could include:

- retaining the entire height differential using a single rear retaining wall;
- terraced walls of varying heights;
- installation of batters within allotments;
- split-level builds; or
- a combination of the above.

In the western portion of the assessment area, a road reserve is proposed abutting the existing drainage reserve. In order to maximise pedestrian safety and linkage through the site, a 1 in 5 batter has been proposed to extend from the outer road reserve boundary, 5.0 m into the open space area. The bottom of this batter would terminate at a maximum retaining wall height of 1.0m, as shown in Appendix F. This allows pedestrian access points to be created and for fall risk to be mitigated. The batter extents shown in this report have been determined not to impact stormwater flows through the reserve area.

The eastern portion of the assessment area proposes allotments adjoining the drainage reserve. These allotments are relatively large in area, and it is likely that a combination of retaining and batters would be utilised to manage levels through the lots. This can be achieved without encroaching into the reserve to the north.

APPENDIX A

SAND MINE ORTHO-PHOTO

SHEET No. 6628-13-c

DEPARTMENT OF LANDS, SOUTH AUSTRALIA

1:2 500 SERIES, FIRST EDITION

Scale 1:2 500

50 0 100 200 300 Metres

CONTOUR INTERVAL 2 METRES

AUTHORITY .... Issued under the authority of the Minister of Lands
Prepared under the direction of the Surveyor General

PRODUCTION .... Department of Lands, Adelaide, 1973

DETAIL .... Contours and detail plotted from Aerial Photography dated December, 1971

CADASTRAL .... Cadastral Boundaries correct at April, 1973

PROJECTION .... Australian Map Grid Zone 54

ELEVATION .... Elevations in Metres

DATUM .... Mean Sea Level Port Adelaide

CONTROL .... Geodetic Control by the Department of Lands

PHOTOLITHOGRAPHY .... A. B. James, Government Printer, 1974

Prepared in co-operation with the Registrar General of Deeds Department and the Valuation Department

LOCAL GOVERNMENT AREA AND STATISTICAL DIVISION

DIVISION 1 C.T. OF GAWLER D.C. OF MUNNO PARA

DIVISION 4 D.C. OF BAROSSA

INDEX TO ADJOINING SHEETS

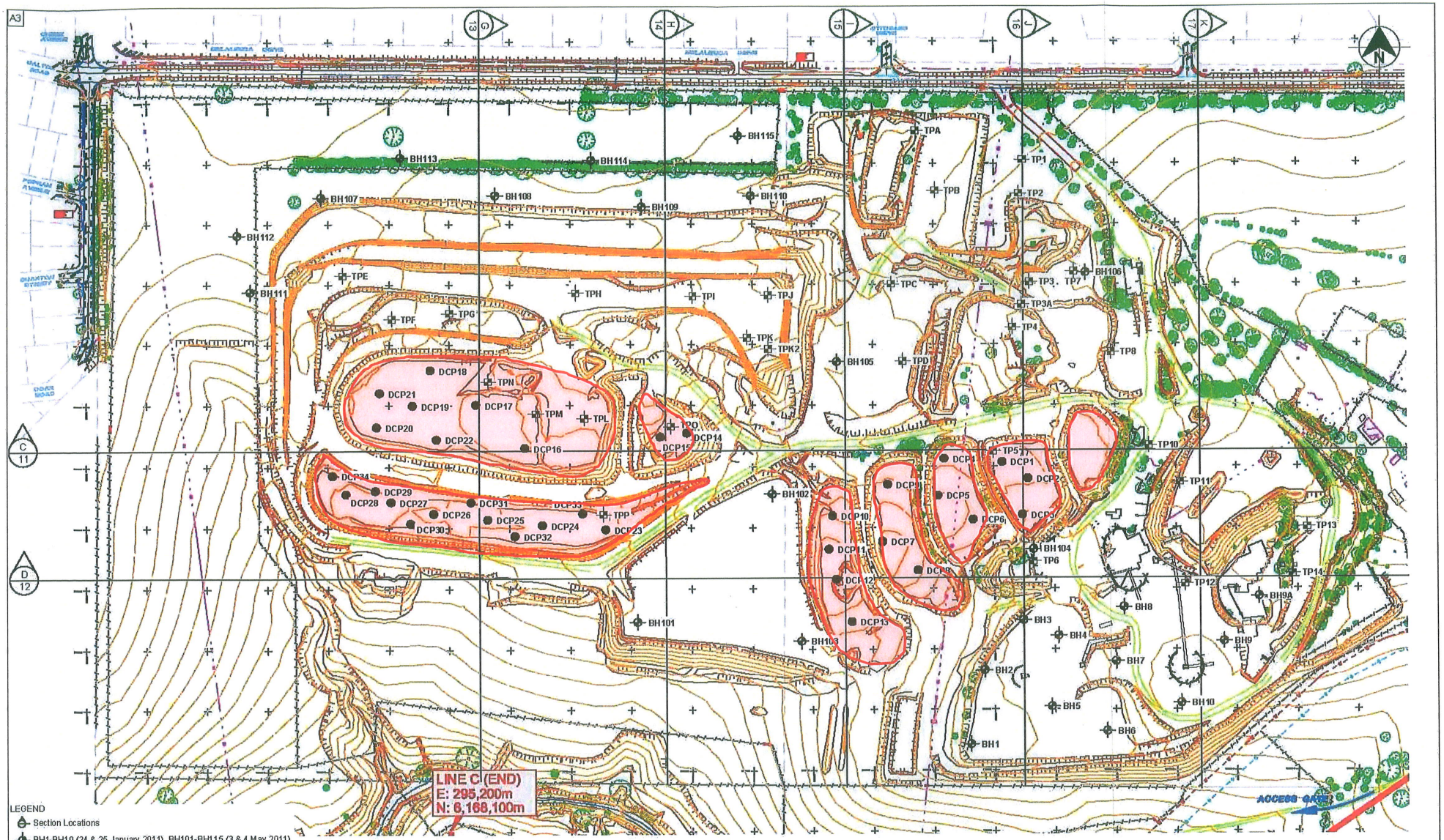
6628-8-q	6628-8-p	6628-8-n
6628-13-b	6628-13-c	6628-13-d
6628-13-g	6628-13-f	6628-13-e

SHEET No. 6628-13-c

SHEET No. 6628-13-c

APPENDIX B

PREVIOUS COFFEY INVESTIGATIONS



THIS IS ONE INTERPRETATION ONLY
OTHER INTERPRETATIONS ARE POSSIBLE.

rev	description	drawn	approved	date
A	SAMPLE LOCATION PLAN	RN		25.11.11

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SCALE 1:3000 (A3) METRES

coffey geotechnics
SPECIALISTS MANAGING THE EARTH
Level 1,33 Richmond Road,
Keswick, South Australia, 5035
Ph: (08) 8375 4400
Fax: (08) 8375 4499
www.coffey.com

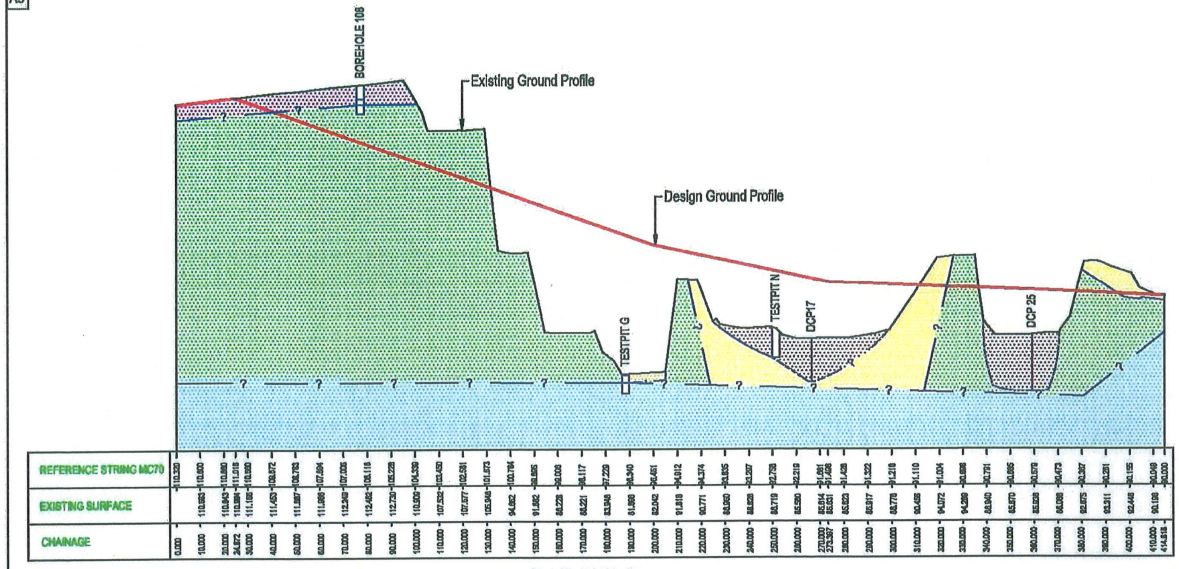
designed	—
drawn	RN
checked	
approved	
date	25.11.11
scale at A3	AS SHOWN

client: DELFIN LEND LEASE
project: MINE REDEVELOPMENT
GAWLER EAST
GEOTECHNICAL INVESTIGATION
title: INVESTIGATION LOCATION PLAN
Figure no: FIGURE 10
Job no: 06326AA
rev A

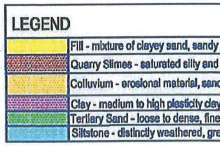
APPENDIX C

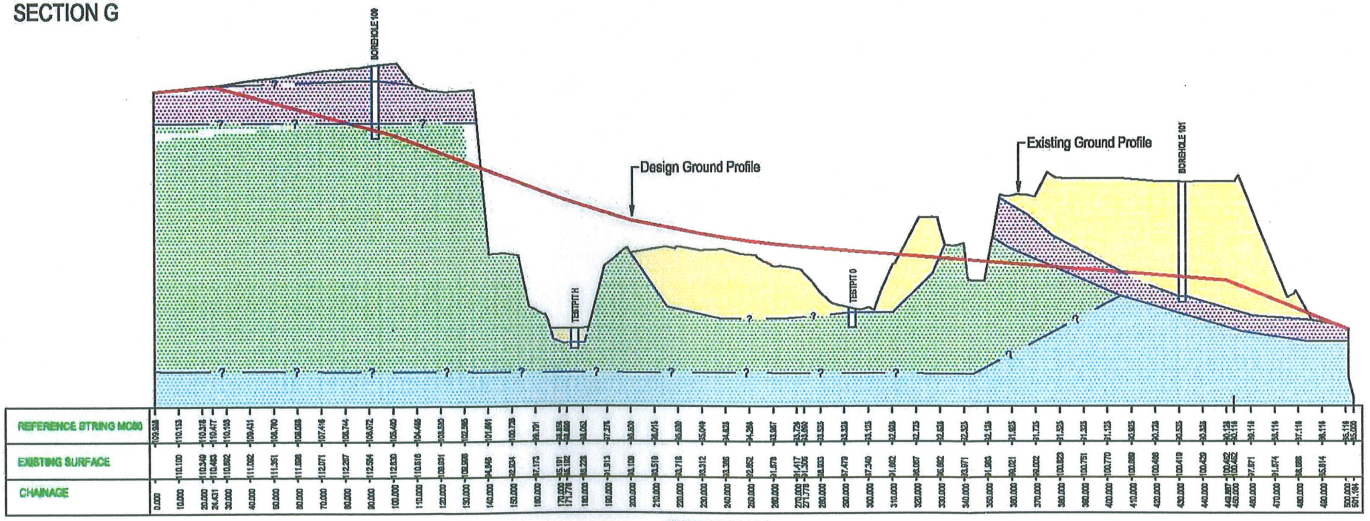
TYPICAL QUARRY CROSS-SECTION

A3



SECTION G





SECTION H

THIS IS ONE INTERPRETATION ONLY
OTHER INTERPRETATIONS ARE POSSIBLE

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A	DRAFT FOR REVIEW	WD/DL		1.12.11

SCALE: HORIZONTAL 1:2000
VERTICAL 1:500

(4 x VERTICAL EXAGGERATION)

coffey geotechnics
SPECIALISTS MANAGING THE EARTH
Level 1,33 Richmond Road,
Keswick, South Australia, 5035
Ph: (08) 8375 4400
Fax: (08) 8375 4499
www.coffey.com

designed	–
drawn	WD/DL
checked	JS
approved	JS
date	1.12.11
scale at A3	AS SHOWN

client: DELFIN LEND LEASE

project: MINE REDEVELOPMENT
GAWLER EAST
GEOTECHNICAL INVESTIGATION

title: CROSS SECTION

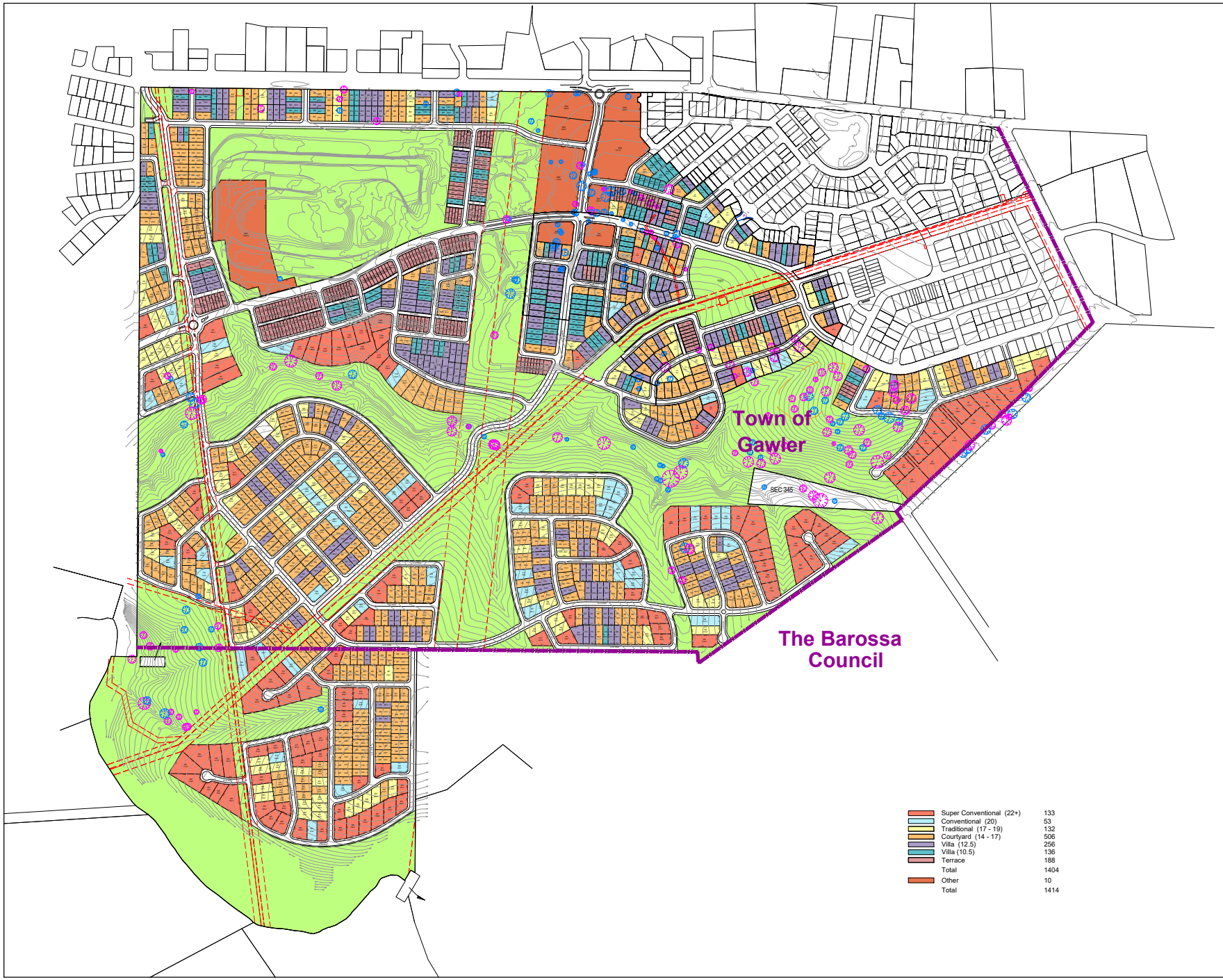
Figure no: FIGURE 12

Job no: 06326AA

rev A

APPENDIX D

DEVELOPMENT MASTER PLAN



Development No. / /
Town of Gawler

Development No. / /
The Barossa Council

Proposed Plan of Division
Allotment 2 in F7765
Allotment 1 in F13468
Allotment 9010 & 9011 in D114845
Allotment 7030 in D119118
Allotment 4 in D28814
Hundred of Barossa
in the area named
GAWLER EAST & KALBEEBA

CT 6186/896 CT 6205/146
CT 6119/249 CT 6162/334
CT 6184/173 PT CT 6212/430

0 25 50 100 150 200 250 m
1:2500

N
W E
S

	Super Conventional (22+)	133
	Conventional (20)	53
	Traditional (17 - 19)	132
	Courtyard (14 - 17)	506
	Villa (12.5)	256
	Villa (10.5)	136
	Terrace	188
	Total	1404
	Other	10
	Total	1414

No. of proposed allotments	1414
Total area	186.1ha
Reserve area	73.57ha
Length of new roads	20.15k

Contour interval 2m.
Datum AHD.

Vide Titles for disposition of easements.

Road pavements shown are indicative only.

Not to be used for detailed engineering design.

Dimensions and areas are subject to survey.

 Original Sheet Size A0

Glenn Ian Hordacre
LICENSED SURVEYOR

REF:	A010816
DWG NO:	A010816-CO OVERALL
REVISION:	B
DEL	5.06.2019

REV B

Alexander & Symonds Pty Ltd
11 King William Street Kent Town,
South Australia 5067
PO Box 1050 Kent Town, SA 5071
DX 209 ABN 93007 753 988

T (08) 8130 1666
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W www.alexander.com.au
E adelaide@alexander.com.au

+ Property + Land Development +
+ Construction + Mining +
+ Spatial Information Management +

Alexander Symonds Surveying Consultants

APPENDIX E

ROAD LONGITDUNIAL SECTIONS

DRAFT

INFORMATION ISSUE NOT FOR CONSTRUCTION

SCALE BAR (m) HORIZONTAL

When sheet printed full size, the scale bar is 100mm.

REV.	DATE	DESCRIPTION	DRAFT	ENG.	CHKD
A	11.06.19	FOR PLANNING APPROVAL	SRC	SM	DB

WGA
WALLBRIDGE GILBERT AZTEC

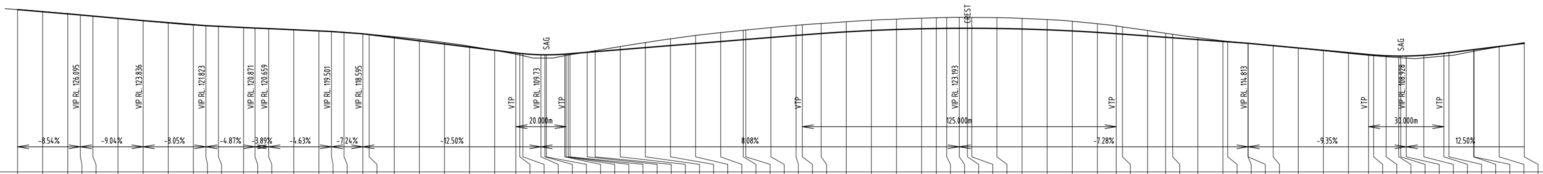
60 Wyatt Street, Adelaide
South Australia 5000
Telephone 08 8223 7433
Email adelaide@wga.com.au

SPRINGWOOD
SCAP PLANNING

LAYOUT PLAN

A1

DOCUMENT NUMBER
Project Number: WGA070975-SK- CC-SP04 A
Sheet No.
Rev.
Design
Drawn



RL.63.600

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80.000	121.580	121.555
90.000	121.093	121.064
94.558	120.871	120.871
100.000	120.659	120.659
110.000	120.196	120.249
120.000	119.732	119.778
125.000	119.501	119.501
130.000	119.139	119.182
137.500	118.595	118.595
140.000	118.283	118.385
150.000	117.033	117.447
160.000	115.783	116.400
170.000	114.533	115.122
180.000	113.283	113.679
190.000	112.033	112.021
198.421	110.980	110.456
200.000	110.796	110.153
201.240	110.669	109.885
208.421	110.245	108.916
210.000	110.223	108.922
210.567	110.221	108.924
217.918	110.499	109.889
218.421	110.538	109.986
219.262	110.606	110.123
220.000	110.666	110.242
226.825	111.218	111.342
230.000	111.474	111.878
240.000	112.282	113.507
250.000	113.091	115.101
260.000	113.899	116.581
270.000	114.707	117.950
280.000	115.515	119.081
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410.000	120.179	124.261
420.000	119.727	123.586
430.000	119.152	122.596
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450.000	117.730	119.910
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460.000	117.002	118.391
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550.824	109.730	109.047
552.987	109.747	108.916
560.000	110.037	109.010
567.987	110.803	109.746
570.000	111.055	109.927
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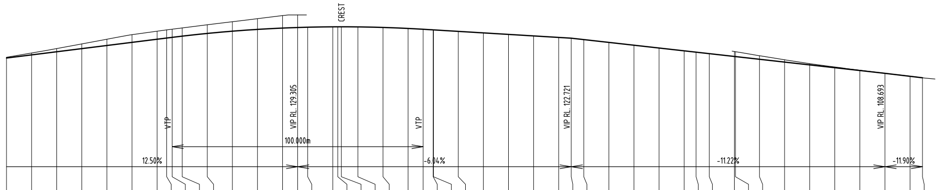
600.000	114.805	115.105

LONGITUDINAL SECTION MC00



RL.61.400

CHAINAGE	DESIGN	EXISTING
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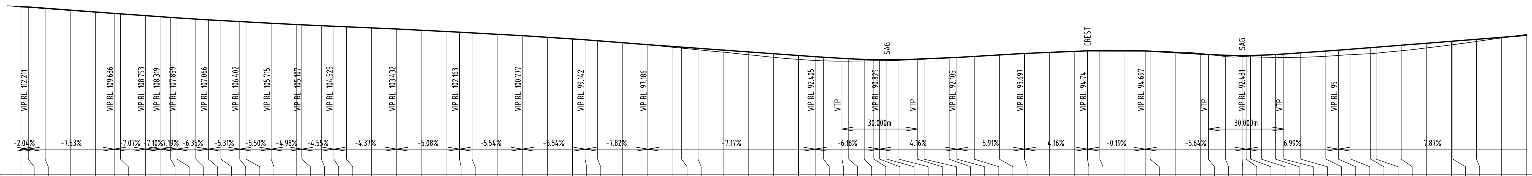
620.000	117.305	118.578
630.000	118.555	120.430
640.000	119.805	122.305
650.000	121.055	124.125
660.000	122.305	125.509
663.821	122.782	126.034
666.000	123.055	126.307
670.000	123.540	126.810
680.000	124.623	128.076
690.000	125.521	129.292
700.000	126.233	130.511
710.000	126.760	131.744
716.000	126.987	132.000
720.000	127.102	
730.000	127.258	
731.991	127.267	
733.422	127.269	
740.000	127.228	
750.000	127.014	
760.000	126.614	
766.000	126.285	
770.000	126.043	
770.140	126.035	
780.000	125.439	
790.000	124.835	
800.000	124.231	
810.000	123.627	
820.000	123.023	
825.000	122.721	
830.000	122.160	
840.000	121.038	
850.000	119.915	
860.000	118.793	
870.000	117.671	
874.740	117.139	
880.000	116.548	
890.000	115.426	117.396
890.448	115.376	117.323
900.000	114.304	115.702
910.000	113.182	114.098
920.000	112.059	112.554
930.000	110.937	111.228
940.000	109.815	109.936
950.000	108.693	108.693
960.000	107.503	107.537
964.946	106.914	106.914

LONGITUDINAL SECTION MC00



RL.45.600

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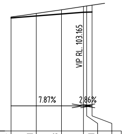
20.000	110.954	110.811
30.000	110.201	110.129
37.500	109.636	109.636
40.000	109.459	109.473
50.000	108.753	108.753
56.105	108.319	108.319
60.000	108.039	108.032
62.500	107.859	107.859
70.000	107.383	107.373
75.000	107.066	107.066
80.000	106.800	106.796
87.500	106.402	106.402
90.000	106.264	106.257
100.000	105.715	105.715
110.000	105.217	105.227
112.210	105.107	105.107
120.000	104.753	104.736
125.000	104.525	104.525
130.000	104.307	104.328
140.000	103.869	103.898
150.000	103.432	103.432
160.000	102.925	102.913
170.000	102.417	102.417
175.000	102.163	102.163
180.000	101.886	101.870
190.000	101.332	101.326
200.000	100.777	100.777
210.000	100.123	100.146
220.000	99.469	99.506
225.000	99.142	99.142
230.000	98.750	98.806
240.000	97.968	98.012
250.000	97.186	97.186
260.000	96.468	96.142
263.445	96.221	95.809
270.000	95.751	95.140
280.000	95.033	94.219
290.000	94.316	93.183
300.000	93.599	92.159
310.000	92.881	91.322
316.639	92.405	90.895
320.000	92.198	90.748
327.308	91.748	90.615
330.000	91.595	90.627
336.169	91.338	90.712
340.000	91.244	90.812
342.308	91.212	90.825
345.208	91.197	90.843
350.000	91.237	90.961
357.308	91.449	91.279
360.000	91.561	91.414
370.000	91.977	91.928
373.070	92.105	92.105
380.000	92.515	92.548
390.000	93.106	93.157
400.000	93.697	93.697
410.000	94.113	94.181
420.000	94.529	94.621
425.076	94.740	94.740
430.000	94.731	94.850
440.000	94.712	94.841
448.062	94.697	94.697
450.000	94.588	94.663
460.000	94.024	94.278
470.000	93.460	93.672
473.247	93.277	93.322
480.000	92.992	92.468
486.643	92.899	92.472
488.247	92.904	92.431
490.000	92.923	92.375
494.328	93.023	92.236
500.000	93.274	92.098
503.247	93.479	92.089
510.000	93.951	92.175
520.000	94.650	92.570
525.000	95.000	92.890
530.000	95.394	93.198
537.844	96.011	93.613
540.000	96.181	93.787
550.000	96.968	94.758
560.000	97.755	95.893
570.000	98.542	97.121
570.592	98.589	97.199
580.000	99.329	98.478
590.000	100.117	99.874
600.000	100.904	101.286

LONGITUDINAL SECTION MC10



RL.55.900

CHAINAGE	DESIGN	EXISTING
600.000	100.904	101.286
610.000	101.691	102.692
620.000	102.478	104.144
628.726	103.165	105.473
630.000	103.201	105.667
632.122		105.990

LONGITUDINAL SECTION MC10

20 10 0 20 40
SCALE BAR (m)
HORIZONTAL

DRAFT

When sheet printed full size, the scale bar is 100mm.
0 50 100mm

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A	11.06.19	FOR PLANNING APPROVAL	SRC	SM	DB

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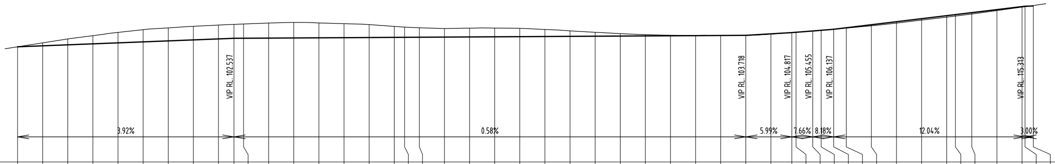
SPRINGWOOD
SCAP PLANNING

ROAD LONGITUDINAL SECTIONS

A1
DOCUMENT NUMBER
Project Number Sheet No. Rev.
Design Drawn
WGA070975-SK- CC-SP05 A

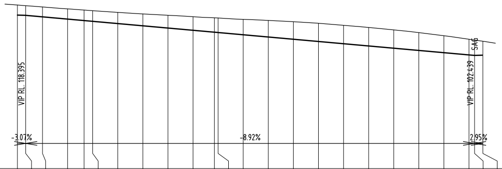
LONGITUDINAL SECTION MC30



RL.53.300

CHAINAGE	DESIGN	EXISTING
0.000	99.161	99.161
10.000	99.552	100.723
20.000	99.944	102.284
30.000	100.336	103.591
40.000	100.728	104.886
50.000	101.120	105.977
60.000	101.512	106.678
70.000	101.903	107.310
80.000	102.295	107.811
86.174	102.537	108.087
90.000	102.559	108.236
100.000	102.617	108.613
110.000	102.675	108.852
120.000	102.733	108.650
130.000	102.791	108.363
140.000	102.849	108.005
150.000	102.907	107.273
154.118	102.931	106.997
160.000	102.965	106.732
170.000	103.023	106.435
180.000	103.081	106.571
190.000	103.138	106.606
200.000	103.196	106.499
210.000	103.254	106.046
220.000	103.312	105.499
230.000	103.370	104.930
240.000	103.428	104.398
250.000	103.486	103.979
260.000	103.544	103.762
270.000	103.602	103.722
280.000	103.660	103.648
290.000	103.718	103.711
300.000	104.317	104.204
308.333	104.817	104.817
310.000	104.944	104.949
316.667	105.455	105.455
320.000	105.728	105.712
325.000	106.137	106.137
330.000	106.739	106.601
340.000	107.943	107.519
350.000	109.148	108.588
360.000	110.352	109.795
370.000	111.557	110.964
373.477	111.976	111.395
380.000	112.761	112.213
390.000	113.966	113.589
400.000	115.170	114.961
401.187	115.313	115.116
404.486		115.588

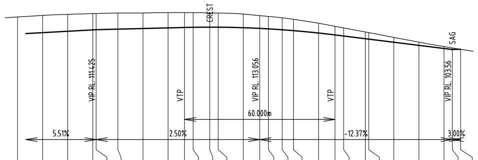
LONGITUDINAL SECTION MC40



RL.57.400

CHAINAGE	DESIGN	EXISTING
0.000	118.496	122.505
3.297	118.395	122.234
10.000	117.797	121.735
20.000	116.905	120.969
26.562	116.320	120.498
30.000	116.014	120.247
40.000	115.122	119.573
50.000	114.230	118.955
60.000	113.339	118.423
70.000	112.447	117.851
78.523	111.687	117.418
80.000	111.555	117.341
90.000	110.663	116.795
100.000	109.772	116.369
110.000	108.880	115.856
120.000	107.988	115.244
130.000	107.096	114.425
140.000	106.205	113.568
150.000	105.313	112.600
160.000	104.421	111.520
170.000	103.530	110.281
180.000	102.638	108.877
182.226	102.439	108.554
185.537		108.087

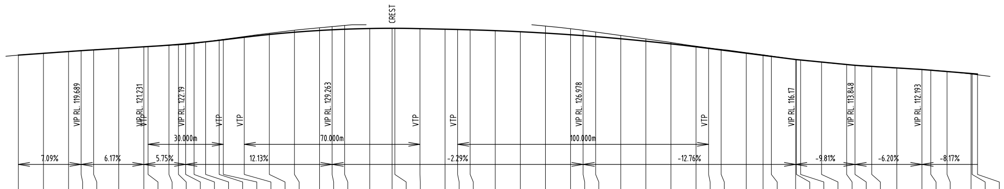
LONGITUDINAL SECTION MC50



RL.57.800

CHAINAGE	DESIGN	EXISTING
0.000		116.475
10.000	110.252	117.083
20.000	110.802	117.505
30.000	111.353	117.834
31.313	111.425	117.858
40.000	111.643	118.044
50.000	111.893	118.053
60.000	112.143	118.204
66.541	112.306	118.211
70.000	112.378	118.202
76.627	112.432	118.092
80.000	112.418	118.027
90.000	112.211	117.614
96.541	111.941	116.999
100.000	111.755	116.684
105.508	111.399	116.139
110.000	111.052	115.538
120.000	110.101	113.998
126.541	109.345	112.774
130.000	108.917	112.110
138.623	107.850	110.525
140.000	107.680	110.271
150.000	106.442	108.359
160.000	105.205	106.475
170.000	103.968	104.739
173.301	103.560	104.186
176.613		103.648

LONGITUDINAL SECTION MC60



RL.64.400

CHAINAGE	DESIGN	EXISTING
0.000	117.918	117.918
10.000	118.626	118.647
20.000	119.335	119.346
25.000	119.689	119.689
30.000	119.998	120.027
40.000	120.614	120.617
50.000	121.231	121.231
51.667	121.327	121.337
60.000	121.880	121.789
63.787	122.180	121.987
66.667	122.429	122.190
70.000	122.739	122.543
74.626	123.208	123.174
80.000	123.810	123.957
81.667	124.009	124.184
90.000	125.019	125.304
100.000	126.129	126.608
110.000	127.033	127.817
120.000	127.731	128.797
125.000	128.002	129.263
130.000	128.223	129.730
140.000	128.509	
148.898	128.590	
150.000	128.589	
160.000	128.463	
170.000	128.235	
175.000	128.121	
180.000	127.993	
190.000	127.660	
200.000	127.222	
210.000	126.679	129.477
220.000	126.031	128.422
225.000	125.668	127.800
230.000	125.279	127.111
240.000	124.421	125.731
250.000	123.459	124.356
260.000	122.392	122.947
270.000	121.221	121.470
275.000	120.596	120.803
280.000	119.957	120.187
290.000	118.681	118.895
296.704	117.825	118.015
300.000	117.404	117.541
309.672	116.170	116.162
310.000	116.138	116.122
311.658	115.975	115.932
320.000	115.156	115.120
330.000	114.175	114.148
333.333	113.848	113.848
340.000	113.434	113.383
350.000	112.814	112.751
360.000	112.193	112.189
363.539	111.904	111.942
370.000	111.376	111.428
379.563	110.594	110.389
380.000	110.559	110.335
382.144	110.384	110.078

LONGITUDINAL SECTION MC70

RL.55.700

CHAINAGE	DESIGN	EXISTING
0.000	111.372	110.196
3.300	111.274	110.317
7.538	111.123	110.492
10.000	111.035	110.485
15.420	110.842	110.197
20.000	110.679	109.875
30.000	110.322	109.308
36.000	110.108	108.997
40.000	109.954	108.778
50.000	109.471	108.220
60.000	108.848	107.720
66.000	108.406	107.452
70.000	108.083	107.272
80.000	107.178	106.802
90.000	106.133	106.263
96.000	105.438	105.945
100.000	104.958	105.771
102.938	104.606	105.644
110.000	103.758	105.303
120.000	102.558	104.800
130.000	101.633	104.377
135.000	101.376	104.139
137.009	101.311	104.048
140.000	101.256	103.940
141.863	101.247	103.946
150.000	101.428	104.626
150.965	101.471	104.757
160.000	101.875	105.764
166.497	102.165	106.425
170.000	102.322	106.749
180.000	102.768	107.429
190.000	103.215	107.954
200.000	103.661	108.400
210.000	104.108	108.784
220.000	104.555	109.119
230.000	105.001	109.348
235.613	105.252	109.497
240.000	105.448	109.548
250.000	105.895	109.677
256.197	106.171	109.636
260.000	106.359	109.606
261.233	106.427	109.597
270.000	107.023	109.604
271.197	107.119	109.604
280.000	107.934	109.887
286.197	108.622	110.123
290.000	109.074	110.338
300.000	110.261	111.136
310.000	111.449	112.304
313.434	111.856	112.782
320.000	112.636	113.729
330.000	113.824	115.154
340.000	115.011	116.645
350.000	116.198	118.207
360.000	117.386	119.828
370.000	118.573	121.572
380.000	119.761	123.306
390.000	120.948	124.897
400.000	122.135	126.766
410.000	123.323	128.732
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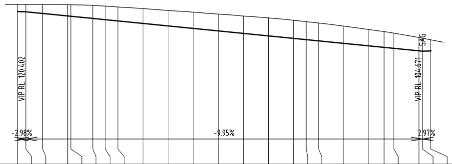
440.000	126.885	
443.223	127.268	

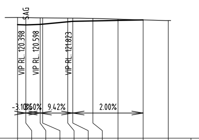
LONGITUDINAL SECTION MC80



RL.59.600

CHAINAGE	DESIGN	EXISTING
0.000	120.500	123.347
3.300	120.402	123.335
10.000	119.735	123.312
20.000	118.740	123.233
21.245	118.616	123.217
30.000	117.745	122.967
34.925	117.255	122.674
40.000	116.750	122.327
50.000	115.755	121.693
60.000	114.759	120.914
70.000	113.764	120.261
80.000	112.769	119.483
90.000	111.774	118.704
100.000	110.779	117.956
110.000	109.784	117.008
115.056	109.280	116.463
120.000	108.788	115.928
130.000	107.793	114.694
140.000	106.798	113.321
146.099	106.191	112.492
150.000	105.803	111.878
160.000	104.808	110.115
161.375	104.671	109.858
164.694	104.770	109.211

LONGITUDINAL SECTION MC90



RL.75.300

CHAINAGE	DESIGN	EXISTING
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3.300	120.398	123.289
9.000	120.598	123.201
10.000	120.692	123.191
20.000	121.634	123.105
22.000	121.823	123.091
30.000	121.983	122.975
40.000	122.183	122.690
50.000	122.383	122.383
60.000		122.120
69.050		

20 10 0 20 40
SCALE BAR (m)
HORIZONTAL

DRAFT

When sheet printed full size, the scale bar is 100mm.
0 50 100mm

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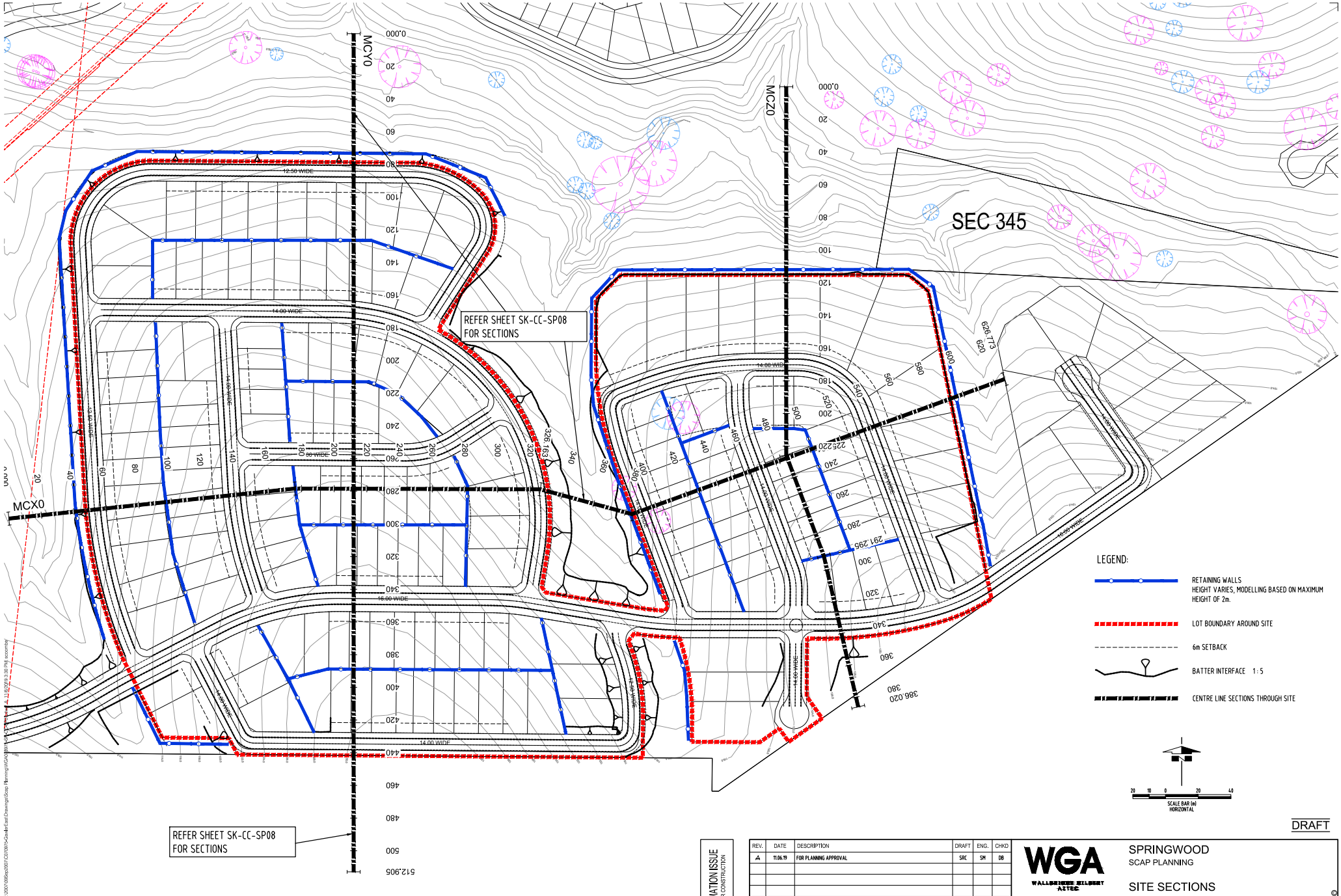
SPRINGWOOD
SCAP PLANNING

ROAD LONGITUDINAL SECTIONS

A1 DOCUMENT NUMBER
Project Number Sheet No. Rev.
Design Drawn
WGA070975-SK- CC-SP06 A

APPENDIX F

PRELIMINARY EARTHWORKS PLAN AND SECTIONS



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INFORMATION ISSUE
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REV.	DATE	DESCRIPTION	DRAFT	ENG.	CHKD
A	11.06.19	FOR PLANNING APPROVAL	SRC	SM	DB

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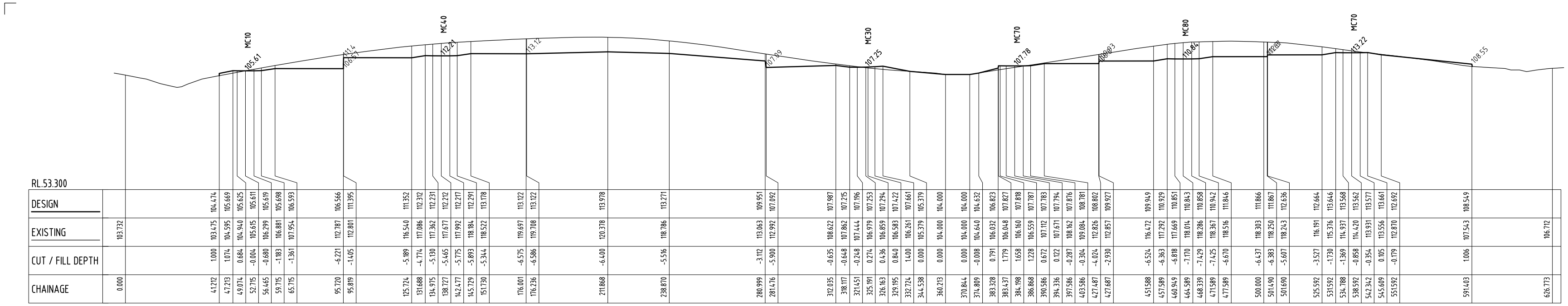
SPRINGWOOD
SCAP PLANNING

SITE SECTIONS

A1

DOCUMENT NUMBER
Project Number: WGA070975-SK-CC-SP07
Sheet No.: A
Rev.:

Design
Drawn



LONGITUDINAL SECTION MCX0

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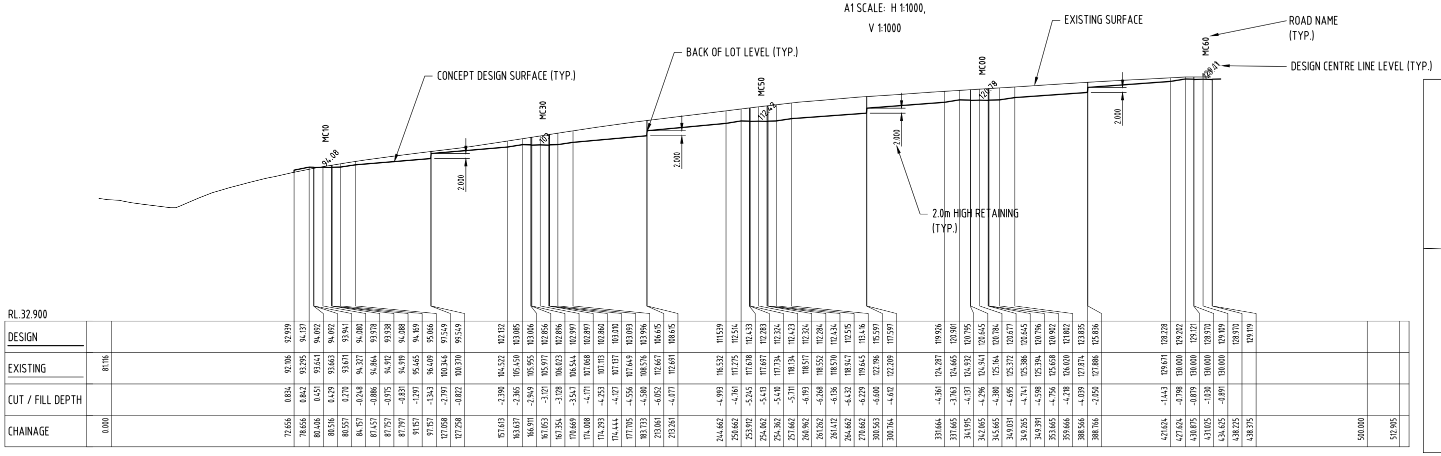

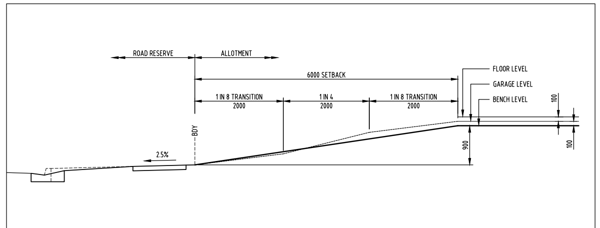

MAXIMUM DRIVEWAY GRADES

LONGITUDINAL SECTION MCY0

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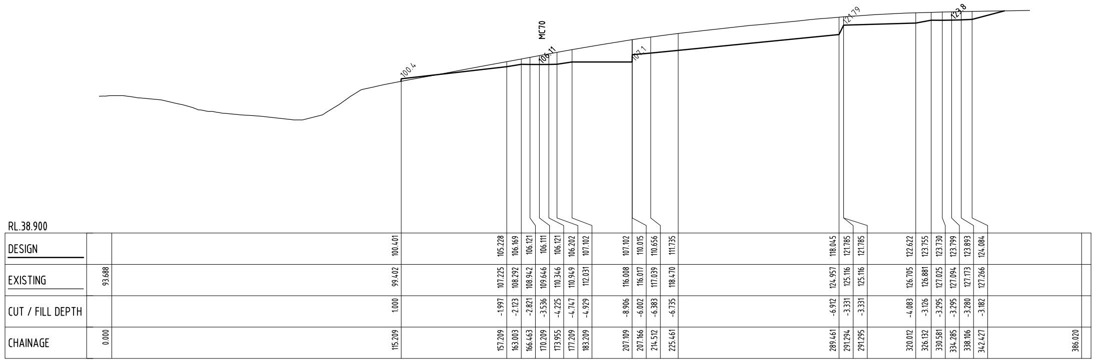
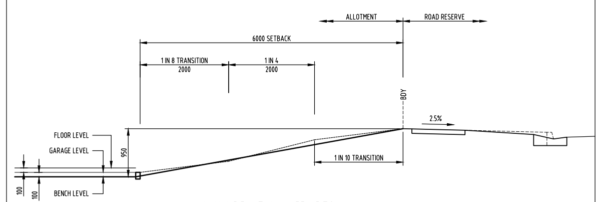
V 1:1000





MAXIMUM DRIVEWAY GRADES

DRAFT

LONGITUDINAL SECTION MCZ0

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V 1:1000

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SCALE BAR (m)
HORIZONTAL

INFORMATION ISSUE
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SPRINGWOOD
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SITE LONGITUDINAL SECTIONS

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Preliminary Site Investigation

Springwood Development Stages 3 and 4 Gawler East, South Australia

Report for Arcadian Property

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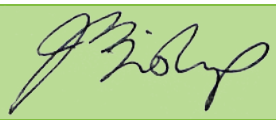
Approved for issue	

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List of Acronyms

ALS	Australian Laboratory Services
APEI	Area of Potential Environmental Interest
ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended 2013)
AST	Above-Ground Storage tank
BTEXN	Benzene, toluene, ethylbenzene, xylenes, naphthalene
COC	Chain of Custody
COI	Chemical of Interest
CSM	Conceptual Site Model
CT	Certificate of Title
DEW	Department for Environment and Water
DSI	Detailed Site Investigation
EPA	Environment Protection Authority, Government of South Australia
EP Act	*Environment Protection Act 1993*, Government of South Australia
LBWco	LBW co Pty Ltd
mAHD	metres Australian Height Datum
mBGL	metres below ground level
OCP	Organochlorine pesticides
PAH	Polycyclic aromatic hydrocarbons
PCA	Potentially contaminating activity
PSI	Preliminary Site Investigation
QA/QC	Quality assurance / quality control
SA	South Australia
TRH	Total recoverable hydrocarbons
UST	Underground Storage Tank

Executive Summary

LBW co Pty Ltd (LBWco) was commissioned by Arcadian Property (Arcadian) to undertake a preliminary site investigation (PSI) of the land comprising Stages 3 and 4 of the Springwood community development in Gawler East, South Australia (the site). The site comprises approximately 139 hectares of currently vacant land.

It is understood that Arcadian plans to develop the site for a mixture of residential, commercial, school, child care, and aged care facilities. A PSI was therefore required to identify any potentially contaminating activities (PCAs) that may impact upon the proposed land uses.

The PSI included two primary components:

- A desktop review of available site history information for the site and adjacent properties, to identify current or historical land uses which might be considered PCAs
- An intrusive soil investigation to assess for the presence of chemicals of interest (COIs) in soil that may indicate the historical presence of PCAs.

The objectives of the PSI were to:

- Identify current or historical PCAs at the site
- Provide a desktop assessment of risk with respect to the likelihood that any PCAs identified could have caused site contamination, with respect to potential future land uses
- Identify areas of the site requiring further investigation in order to assess whether potential contamination could pose an unacceptable risk to future site users.

Based on desktop review of current and historic site information, a site inspection, and intrusive soil assessment, LBWco prepared a summary CSM for PCAs and other activities that were undertaken or inferred to have occurred at and near the subject site. The conclusions of the assessment were as follows:

- Prescribed PCAs identified to have historically occurred on-site included the following:
  - Liquid organic chemical storage in above-ground storage tanks (ASTs) in APEIs 6 and 7
  - Concrete batching in APEI 11
- Prescribed off-site PCAs with the potential to result in site contamination included liquid organic chemical storage in underground storage tanks (USTs) on the farmhouse immediately east of APEIs 10 and 11.
- Non-prescribed PCAs identified for the site included the storage of small volumes of chemicals within and adjacent to the APEI 6 workshop sheds.
- No on- or off-site PCAs were identified that may materially affect APEIs 1-5, 8, 9, or 12-14.
- A localised area of identified soil contamination, adjacent to the historical location of fuel and waste oil storage tanks in APEI 6, may pose a moderate risk to future receptors. Other PCAs identified are considered likely to pose a low potential concern to future site receptors.

LBWco recommends that:

- A site contamination audit be undertaken for the two areas identified in plans provided in Appendix M, in order to confirm their suitability for the proposed land uses.

- As part of the site contamination audit, LBWco recommends that assessment of soil and/or groundwater be undertaken in APEIs 6, 7, 10 and 11 to confirm the nature and extent of site contamination (if any) that may be associated with the identified PCAs.

- Soil impacts associated with historical fuel and waste oil ASTs were historically reported in APEI 6. Should investigations to support the site contamination audit confirm the presence of these impacts, remediation of shallow soil in this area will likely be required.

- A site contamination audit is unwarranted for areas associated with APEIs 1-5, 8, 9 and 12-14, and no further environmental investigation is recommended to determine the suitability of these areas for the proposed land uses.

1 Introduction

LBW co Pty Ltd (LBWco) was commissioned by Arcadian Property (Arcadian) to undertake a preliminary site investigation (PSI) of the land comprising Stages 3 and 4 of the Springwood community development in Gawler East, South Australia (the site). The site comprises approximately 139 hectares of currently vacant land.

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- Identify current or historical PCAs at the site
- Provide a desktop assessment of risk with respect to the likelihood that any PCAs identified could have caused site contamination, with respect to potential future land uses
- Identify areas of the site requiring further investigation in order to assess whether potential contamination could pose an unacceptable risk to future site users.

This investigation was undertaken in general accordance with LBWco's proposal dated 21 January 2019 (LBWco Ref: P191767), as agreed with Arcadian.

2 Regulatory Framework

In South Australia, the assessment, management and remediation of site contamination is regulated by the *Environment Protection Act 1993* (EP Act). The EP Act defines site contamination in section 5B as follows:

(1) For the purposes of this Act, site contamination exists at a site if—

(a) chemical substances are present on or below the surface of the site in concentrations above the background concentrations (if any); and

(b) the chemical substances have, at least in part, come to be present there as a result of an activity at the site or elsewhere; and

(c) the presence of the chemical substances in those concentrations has resulted in—

(i) actual or potential harm to the health or safety of human beings that is not trivial, taking into account current or proposed land uses; or

(ii) actual or potential harm to water that is not trivial; or

(iii) other actual or potential environmental harm that is not trivial, taking into account current or proposed land uses.

(2) For the purposes of this Act, environmental harm is caused by the presence of chemical substances—

(a) whether the harm is a direct or indirect result of the presence of the chemical substances; and

(b) whether the harm results from the presence of the chemical substances alone or the combined effects of the presence of the chemical substances and other factors.

(3) For the purposes of this Act, site contamination does not exist at a site if circumstances of a kind prescribed by regulation apply to the site.

The first stage in determining whether site contamination exists is to assess whether chemical substances have been added to the site through an activity and whether these substances are above background concentrations. The second stage is to assess whether the chemical substances have resulted in actual or potential harm to the health or safety of human beings or the environment (including water) that is not trivial.

If site contamination is determined to be present at a site, the EP Act provides mechanisms to assign responsibility for the contamination and appropriate assessment and/or remediation of the contamination.

The professional assessment of site contamination and consequential risk to human health and the environment is guided by National Environment Protection Council 1999, *National Environment Protection (Assessment of Site Contamination) Measure* (the ASC NEPM, as amended 2013), Australian Standards and numerous other guidelines and technical publications prepared by the EPA and other scientific organisations.

3 Site Information

3.1 Site Details and Identification

Site identification details are provided in Table 1. A summary of the certificate of title (CT) ownership history for the site is provided in Appendix B.

Table 1 Site Identification Details

Site Addresses	Lot 9010, Deposited Plan 114845 Lot 9011, Deposited Plan 114845 Lot 4, Deposited Plan 28814 Lot 2, Filed Plan 7765 Lot 1, Filed Plan 13468 Sec 345, Hundred of Barossa
Certificate of Title References	CT 6205/146 CT 6186/896 CT 6162/334 CT 6118/249 CT 6184/173 CT 6163/873
Total Site Area	139 hectares
Land Owner	Five Ames Farming Pty Ltd. Five Ames Farming Pty Ltd. L. Bruggermann, Heather Ames, Brenton Ames, Kareena Priestly Robert Lionel Ames Robert Lionel Ames Town of Gawler
Local Government Authority	The Town of Gawler
Council Zoning	Residential (majority of site) Open space (south-west boundary adjacent to Little Para River)
Current Land Use	Vacant
Proposed Land Use	Residential, commercial, educational, and elderly care

3.2 Areas of Potential Environmental Interest

For the purpose of site assessment and reporting, LBWco divided the site into 14 areas of potential environmental interest (APEIs), based on current and historical activities conducted. These APEIs are presented on Figure 1.

3.3 Topography

The natural topography of the site comprises undulating hills, increasing in steepness towards the South Para River to the south-west of the site. Significant variations in topography exist between various areas of the site, with site elevation estimated to vary between approximately 60 m and 145 m Australian Height Datum (AHD). Maximum elevation occurs on the south-central portion of the site, with minimum elevation reported immediately adjacent to the South Para River, on the south-west site boundary.

The topography of the central and north-west portions of the site has been significantly altered by historical quarrying activities, with topography reduced to between approximately 100 mAHD and 120 mAHD. A man-made area of depression corresponding to a historical quarry

(approximately 90 mAHD) is located on the north-west portion of the site. An elevated plateau (APEI 12) of approximately 140 mAHD elevation is present in the east-central portion of the site. It is unclear whether this plateau area has been built up by historical activities, if quarrying has reduced the elevation of surrounding areas, or if some combination of the two has occurred.

Where not influenced by historical quarrying activities, areas of the site slope steeply towards a number of valleys. Those on the majority of the site discharge to a tributary of the South Para River that runs east-west roughly through the central portion of the site. Valleys on the south-west corner of the site discharge directly to the South Para River, which runs immediately to the south-west.

On the north and north-central portions of the site, where topography has been influenced by historical quarrying activities, surface water is likely to flow towards localised areas of depression, particularly the former quarry and sedimentation ponds (refer to section 5.2).

3.4 Geology

Geological data pertaining to the site was obtained from the Department for Environment and Water (DEW) via Lotsearch (refer to Appendix C). Records indicate that shallow site geology is generally characterised as the Woodstone Flat Shale, comprising shale, dolomitic siltstone, and dolomite. The far-north portion of the site, including the former quarry, is instead characterised as undifferentiated tertiary rocks. The site is located approximately 1 – 2 km east of the Para Fault.

Historical soil assessments at the site (refer to Section 5.6) generally identified silty or gravelly sand to a depth of several metres, overlying clay or sandy clay to depths of between 17 and 26 mBGL. The silty clay was underlain by shale, with a lens of clay within the shale of between 1 to 3 m in thickness, to the maximum depth assessed of 50 mBGL.

The Atlas of Australian Acid Sulphate Soils classifies the site as Class C, with an "extremely low probability" of acid sulphate soil occurrence. DEW records classify the site as having "negligible" acid sulphate soil potential.

3.5 Hydrogeology

As reported in historical investigations (refer to Section 5.6.8), groundwater was historically identified beneath the northern portion of the site at an elevation of approximately 73 mAHD to 77 mAHD, or approximately 40 m below ground level (mBGL) across the majority of this area. Groundwater salinity was brackish (3,800 mg/L to 4,300 mg/L).

On 4 February 2019, a search of the South Australian Government *WaterConnect* database was undertaken via Lotsearch. This search identified 42 on-site historical bores, as well as 185 off-site bores located within a 2 km radius of the site.

The majority of on-site bores are listed as being for exploration or construction materials and were drilled to a depth of 25 mBGL or less. Based on this information, these bore records are considered unlikely to represent monitoring wells. Four on-site bores completed as monitoring wells were identified in the records; these include the following:

- One industrial well, installed to a depth of 183 mBGL in 1988, immediately east of the former quarry
- One industrial well, installed to a depth of 183 mBGL in 1990, near the north central site boundary with Calton Road.
- One well of unidentified use, installed to a depth of 84 mBGL in 1964, immediately south of the quarry processing area (APEI 5)
- One environmental monitoring well located on the east-central portion of the site (GW02, refer to Section 5.6.8)

With the exception of the environmental monitoring well, none of the on-site wells identified by the database search were identified during the site reconnaissance (refer to Section 6.2). Its is considered likely that these wells have been decommissioned or destroyed.

Two irrigation bores were listed as being located approximately 460 m hydraulically down-gradient of the site. The database search did not identify other off-site domestic, irrigation, or stock bores considered to be hydraulically down-gradient of the site. It is noted that wells beyond the South Para River are not considered to be hydraulically connected to shallow groundwater beneath the site.

Salinity in monitoring wells on or near (100 m or less) of the site ranged from 3,800 mg/L to 4,300 mg/L, and is considered brackish.

3.6 Sensitive Receiving Environments

The South Para River is considered a sensitive receiving environment and is located immediately south-west of the site. A tributary running through the site discharges directly to the South Para River and is therefore also considered to be a sensitive receiving environment.

3.7 Adjacent Land Uses

Based upon the site inspection and review of current aerial photography, land surrounding the site comprised residential properties to the north, north-west, and east; and low-intensity cropping and grazing to the south, south-west, and south-east. A high-pressure gas line is present east of the site, running west through APEI 14. A blowdown station associated with this line is located approximately 200 m east of the site.

4 Site History Review Methodology

4.1 Site History Guidance

The site history investigation works were undertaken with reference to the guidance provided in the following documents:

- Edwards J. W., Van Alphen M and Langley A., Identification and Assessment of Contaminated Land: Improving Site History Appraisal. Contaminated Sites Monograph Series No 3, SA Health Commission, Adelaide (1994)
- National Environmental Protection Council 1999, National Environment Protection (Assessment of Site Contamination) Measure (ASC NEPM) as amended 2013.

Assessment of PCAs was made with reference to Section 50 and Schedule 3 Part 1 of the *Environment Protection Regulations 2009*.

4.2 Site History Review Methodology

The history of activities undertaken on and adjacent to the site was researched using the following sources of information:

- Aerial photographic records provided by DEW via Lotsearch Pty Ltd (Lotsearch), Mapland, and Nearmap
- Certificate of Title information obtained from Land Services SA
- Published geology and topography maps of the region via Lotsearch
- Water Connect database of groundwater records, maintained by DEW, via Lotsearch
- Environment Protection Authority (EPA) Public Register search under Section 7, *Land and Business (Sales & Conveyancing) Act 1994*
- Interrogation of the Public Register Directory Site Contamination Index for the local area via Lotsearch
- Dangerous Substances Register – Safework SA
- Available historical environmental reports for the site and adjacent properties
- Observations and information gathered during site inspections and questionnaires with key site representatives.

5 Historical Information Review

5.1 Certificates of Title

On 8 February 2019, LBWco conducted a search on the South Australian Integrated Land Information System for the current and historical certificates of title (CTs) for the site to inform the historical ownership information. Current and historical information is presented as a title tree and title table in Appendix B.

The site currently comprises portions or the entirety of each of the following certificates of title:

- Volume 5697 Folio 87
- Volume 6118 Folio 249
- Volume 6162 Folio 334
- Volume 6184 Folio 173
- Volume 6186 Folio 896
- Volume 6205 Folio 146

Available records date back to 1925 and indicate that land was transferred to Readymix Group Limited in 1979 (6114/249 and 6184/173) and 1990 (6205/146). Other owners listed were not associated with likely on-site PCAs.

5.2 Aerial Photographs

Selected aerial photographs of the site and surrounding area were obtained from the following sources:

- DEW via Lotsearch: 1949, 1954, 1968, 1979, 1989, 1999, and 2005
- Directly from DEW: 1979, 1989, and 2005
- Nearmap images: 2010, 2014, 2016, and 2018.

Copies of images obtained via Lotsearch are provided in Appendix C and copies of images obtained from other sources are provided in Appendix D. A summary of the features and apparent land use(s) observed in the historical aerial photography is provided in Table 2.

Table 2 Aerial Photography Review

Year	Key features observed
1949	On-site: • All areas of the site were cleared but undeveloped, potentially used as grazing land. • A tributary of the Little Para River ran east-west through the site, near the boundaries of APEIs 13 and 14. • A linear feature corresponding to the current gas pipeline right of way ran north-east to south-west through APEI 14. Off-site: • Surrounding land was undeveloped and potentially used as grazing land. • A farmhouse was located approximately 100 m north-east of APEIs 10/11. • A farmhouse was located approximately 250 m south-west of APEI 14. • Calton Road was present immediately north of the site. • The Little Para River was located immediately south-west of the site.
1954	On-site: • No significant changes from the 1945 aerial photograph. Off-site: • No significant changes from the 1945 aerial photograph.
1968	The aerial photograph for this date was of low quality, precluding detailed analysis. On-site: • APEIs 4 and 5 appeared to have been used for quarrying. Off-site: • A pit immediately east of APEI 4 and similar in size appeared to have been used for quarrying. • Residential development was present west of the north portion of APEI 13.
1979	On-site: • The southern portion of APEI 1 had been used for quarrying. A small area of ponding was present in the central portion of this area. • The excavated areas in APEIs 4 and 5 were filled with sediment/water. • Two rectangular buildings, inferred to be the workshop storage sheds, were present in the central portion of APEI 6. A small vegetated area was located immediately north of the sheds. • A tall structure, inferred to be the washing plant, was present in the central portion of APEI 7. • Large stockpiles, inferred from appearance to likely be washed sand product, were present throughout APEIs 7, 9, 11, and 12. • Several small stockpiles were present on the west portion of APEI 9. • APEIs 10, 11, and 12 had been excavated lower than the surrounding portions of the site, possibly through quarrying. • The portions of APEI 13 north and west of the quarry appeared to be used for low-intensity cropping. • The north-west portion of APEI 14 appeared to be used for low-intensity cropping. • High-voltage power lines ran north-south through the central portion of the site. Off-site: • A small rectangular building, was present immediately north-east of APEI 10. Based on its position relative to other infrastructure, this was inferred to have likely been a weighbridge or blending plant. • Three nearby grey stockpile appeared to comprise non-native material. These were inferred to likely comprise dolomite product from an off-site source that was processed on the site.
1989	On-site: • The site did not appear to be in active use.

Year	Key features observed
	• APEI 3 had been cleared and cut several metres below the surrounding area. • The sediment pond in APEI 3 had been filled to close to the level of surrounding land. • The south-west sediment pond in APEI 5 had been partly filled. All ponds in APEI 5 were partly to fully-vegetated. • Washing plant infrastructure was no longer present in APEI 7. • Most stockpiles were no longer present on the site. • No cropping was visible on APEI 14. Off-site: • The sediment pond east of APEI 3 had been filled to the level of surrounding land and was partly vegetated. • The unidentified structure north-east of APEI 10 was no longer present.
1999	On-site: • The site appeared to have returned to active use. • The quarry in AEPI 1 had been expanded substantially to the north and the south. The original quarry area had been divided into two areas, through the infilling of a narrow wall in its eastern portion. The two quarry areas formed by this division, as well as the new area to the south, were filled with sediment/water. • APEI 2 had been cleared and appears to be covered in sediment. • Several stockpiles were present on the north portion of APEI 3. • The surface of APEI 3 had been scraped, and/or material had been stockpiled on its surface. • Sediment/water had been added to the surface of the ponds in APEI 5. Two small rectangular structures were present in the second and fourth ponds, and were inferred to be pump pontoons for recirculating water to the process areas. • The northern-most rectangular building in APEI 6 had been replaced by a large square building, inferred to be the primary workshop shed. • Washing plant infrastructure was present in APEI 7. • Blending plant infrastructure was present in APEI 8. • Stockpiles of grey product were present in APEIs 9 and 12, with a conveyor belt leading from the washing plant in APEI 7 to the centre of APEI 12. These stockpiles appeared to comprise non-native material and are inferred to likely be dolomite product from an off-site source that was processed on the site. • Inferred concrete batching infrastructure and concrete bins for storing product were present in APEI 11. Off-site: • A weighbridge was present approximately 90 m north of APEI 6. • Residential development was present north-east of the site, north of Calton Road. • Agricultural land east of APEIs 11/12 and south/south-east of the off-site farmhouse had been subdivided into small cropping areas.
2005	On-site: • The sediment ponds in APEIs 1 and 5 appeared to be mostly dry on the surface. • Extensive soil stockpiling was present on the west portion of APEI 2 and the majority of APEI 3. • The ground surface in APEI 11 appeared white in the vicinity of the concrete batching infrastructure and product storage bins. • No cropping was visible on APEI 13. Off-site: • The blowdown station is present adjacent to the gas line, 200 m east of the site.
2010	On-site: • The central portion of the APEI quarry area appeared to have been partially backfilled, and all areas of the quarry were partially vegetated. • No stockpiles were present on APEI 2 or 3.

Year	Key features observed
	• The sediment ponds in APEI 5 appeared vegetated. Off-site: • No significant changes since the 2005 aerial photograph. .
2014	On-site: • Extensive small stockpiles were present in the north and west portions of APEI 9, and the central portion of APEI 11. • A smaller area of stockpiling was present in the south portion of APEI 7. • A series of small, linear features (potentially stockpiles) were present on the south portion of APEI 11. • The conveyor belt leading to APEI 12 was no longer present. Off-site: • The weighbridge north of the site was no longer present. • Residential development was present east of the site, in the Springwood Stage 1 development area.
2016	On-site: • The linear features on the south portion of APEI 11 were no longer present. • The majority of stockpiles in APEI 12 were no longer present. • Renewed cropping on the north and west portions of APEI 13, and the north-west portion of APEI 14. Off-site: • Increased residential development east of the site, in the Springwood Stage 1 development area.
2018	On-site: • The APEI 7 washing plant infrastructure was no longer present. • Increased density of stockpiling throughout APEIs 6 through 12. Off-site: • Increased residential development east of the site, in the Springwood Stage 1 development area.

5.3 Sands and McDougall Directory Search

LBWco conducted a search of the Sands and McDougall Directory of South Australia (accessed via the State Library of South Australia website) for businesses listed historically at and near the site (within 500m).

The search did not identify any businesses associated with PCAs in the vicinity of the site. The search results are presented in Appendix E.

5.4 Dangerous Substances Register

LBWco submitted a request for a search of the site on SafeWork SA's Dangerous Substances Register. The search did not identify any records pertaining to the site. The search results are presented in Appendix F.

5.5 EPA Public Register Searches

5.5.1 Site Contamination Index

The EPA maintains a searchable database on its website of key notifications made to the EPA regarding site contamination. The database is called the Site Contamination Index (http://www.epa.sa.gov.au/data_and_publications/site_contamination_index/). On 4 February

2019, a search of the database for the suburb of Gawler East and surrounding suburbs was undertaken by LBWco via Lotsearch. The search results are displayed in Appendix H.

The search returned no records relating to the subject site but identified an audit notification and two associated audit reports for the land immediately east of the site (Springwood Development areas 1 and 2). These audit reports contained included multiple historical assessments of the site and surrounding properties as appendices. Information obtained from LBW's review of these reports is provided in Section 5.6.

5.5.2 Section 7

A Section 7 Search under the *Land and Business (Sales and Conveyancing) Act 1994* was conducted by the EPA for the site. A copy of the search results is provided in Appendix G. The search results indicated the following, as of 28 March 2019:

- Records pertaining to the commencement of a site contamination audit were held for all CTs comprising the site. It is inferred by LBWco that these records pertained to the site contamination audits completed for Stages 1 and 2 of the Springwood development (refer to Section 5.5.1), and that initial audit notification for these assessments may have broadly included the greater Springwood development area. It is noted that the EPA does not hold any audit reports pertaining to the site itself (refer to Section 5.5.1).

- Audit reports and historical environmental investigations were held by the EPA for CTs 6205/146 and 6162/334. These CTs extend beyond the site boundary and are included in the Springwood Stage 1 and 2 development areas. The audit and investigation reports held are inferred to be those associated with development Stages 1 and 2, as discussed in Section 5.5.1.

- Records of activities of environmental significance were held by the EPA for CTs 6186/896 and 6205/146. These CTs include the historical quarrying operation, and it is inferred that these activities comprised the "activities of environmental significance".

- There were no mortgages, charges or prescribed encumbrances affecting the site under the relevant sections of the *Environment Protection Act 1993*

- In relation to the subject site, the EPA Register did not hold any information relating to:

  - Material or serious environmental harm cause or threatened in the course of an activity

  - Site contamination notified to the EPA under section 83A of the Environment Protection Act 1993

- The EPA had no details of records, held by the former South Australian Waste Management Commission under the replaced Waste Management Act 1987, of waste (within the meaning of the Act) having been deposited on the land between 1 January 1983 and 30 April 1995.

5.6 Historical Site Contamination Assessments

5.6.1 Phase 1 Environmental Site Assessment, Gawler Readymix and Ames Land (Resource & Environmental Management Pty Ltd, 2006)

Resource & Environmental Management Pty Ltd (REM) undertook a PSI of the site in July 2006. This PSI also included assessment of land to the east of the site which currently comprises Stages 1 and 2 of the Springwood development. The results of this assessment were summarised in *Phase 1 Environmental Site Assessment, Gawler Readymix and Ames Land*, dated August 2006 (the 2006 PSI).

At the time of the 2006 PSI, the north portion of the site was owned and operated by CSR Readymix Holdings Pty Ltd (Readymix) as a concrete batching operation. Active operations at

the time of the 2006 PSI included a washing plant (APEI 7), blending plant (APEI 8), and concrete batching plant (APEI 11). The quarry area was disused at the time of the assessment.

The southern portion of the site, as well as off-site land to the east that was assessed in the 2006 PSI, comprised primarily undeveloped agricultural land owned by the Ames family, referred to by REM as the "Ames Land". An off-site portion of the Ames Land, immediately east of site APEI 10, was developed with two residences and an underground fuel storage tank.

The assessment comprised a desktop assessment of historical data, site walkover, and interview with a Readymix site employee and the owner of the Ames Land. No intrusive investigations were completed as part of the 2006 PSI.

The 2006 PSI identified a 1999 environmental audit of the quarry undertaken by Readymix, and provided a summary of information in the audit document. The original audit document was not appended to the 2006 PSI, and has not been reviewed by LBWco. The following information of note was reported in the 1999 audit report (as summarised in the 2006 PSI):

- Two above-ground storage tanks (ASTs) were present north of the storage shed (APEI 6). The first AST contained diesel, while the contents of the second AST were not identified.
- Diesel and bulk oil, lubricants, greases, and sulphuric acid were stored without appropriate bunding at and outside the workshop area storage sheds (APEI 6).
- Bulk storage of flocculant, manufactured by Allied Colloids, occurred in the vicinity of the washing plant (APEI 7). The composition of this flocculant was not specified. However, LBWco has identified that Allied Colloids (now BASF SE) currently produce flocculating gels based primarily on polyacrylamide. It is therefore inferred that historical flocculant used may have also been based on polyacrylamide.
- Six storage tanks were present in the vicinity of the concrete plant (APEI 11). Neither the volume of these tanks, the nature of contents stored within, nor whether the tanks were above- or below-ground, is specified in the 2006 PSI. It is inferred by LBWco that these tanks may have been used for storage of water used in the batching process.
- Waste oil was disposed of to an unbunded AST, which was taken off-site for disposal. The volume and location of this AST were not specified in the 2006 PSI.
- Empty drums were identified "scattered on unsealed ground around the workshop" (APEI 6).
- Lead acid batteries were stored on unsealed ground against the southern wall of the workshop (APEI 6).
- Two septic systems were present on the site. The location of these septic systems is not specified.
- The following information of note was identified by REM during their site walkover and interviews:
- The quarry pit (APEI 1) was historically used for the excavation of sand. Excavated sand was processed on-site at the washing plant (APEI 8) with fines (silt and clay) separated from the sand and deposited into a series of sedimentation ponds (APEIs 4 and 5) and drying pond (APEI 2). This material was periodically excavated from the ponds and stockpiled on-site (at unspecified locations) or sold as a product.
- Flocculant was added to the fines extracted during the washing process in APEI 7, to assist in the settling of this material.
- Sediment ponds were also used for retention of stormwater. Water within the ponds was recycled for use in the washing process.
- Oversized material was screened from the sand in the washing plant (APEI 7) and stockpiled on-site (at unspecified locations).

- At the time of the 2006 PSI, the quarry and sediment ponds were no longer in use.
- A workshop area, consisting of one large and one small shed, was present on the north-east portion of the Readymix area (APEI 7). Chemicals were stored in both sheds in 200 L drums and containers up to 20 L in volume. Stored chemicals included fuel, oil, lubricants, acid, and cleaners. Chemical storage was not subject to secondary containment and was located directly on concrete flooring within these buildings.
- An above-ground waste oil tank of approximately 1,500 L volume was present adjacent to the north-east corner of the larger shed. This AST was not in use at the time of the 2006 PSI; however, Readymix personnel indicated that used oils had been historically pumped from the shed to this AST.
- An above-ground diesel storage tank of approximately 5,000 L volume, fuel distribution bowser, and associated distribution lines between these features was present approximately 20 m east of the workshop sheds. The tank was located within an earthen bund approximately 0.5 m high.
- A second AST, no longer in use, had been discarded approximately 50 m north of the operational diesel AST. The discarded AST was noted to be in poor condition. Readymix personnel indicated that this tank had been decommissioned in 2000 and was formerly located next to the operational AST.
- Readymix personnel indicated that lead acid batteries were periodically stored in and around the workshop sheds.
- The washing plant (APEI 7) was no longer in use at the time of the 2006 PSI. It was observed to comprise hoppers, feeders, conveyor, and pumps. No evidence of chemical spills or releases were noted by REM.
- The blending plant (APEI 8) was no longer in use at the time of the 2006 PSI, and only conveyors from this plant remained on the site. No evidence of chemical spills or releases were noted by REM.
- The concrete plant (APEI 11) comprised three aggregate bins, a hopper and supporting infrastructure, and three concrete wash bays. Readymix personnel indicated that tanks and conveyors had also been historically present. No evidence of chemical spills or releases were noted by REM.
- A weighbridge was present at the main entrance to the Readymix area (north of APEI 10). An office was formerly present in this area, having been removed in 2005. A septic system associated with the office building was also formerly present, having been removed in 2000.
- Materials such as dolomite were periodically imported from an off-site Readymix quarry in Montacute for processing on-site.
- The Ames family indicated that undeveloped land on the site (APEIs 13 and 14) and to the east had been used primarily for low-density grazing or cropping. No sheep dips or chemical storage had been present in these areas.
- Two petrol USTs and one diesel UST, of unknown volume were present on an off-site portion of the Ames Land, immediately east of APEI 10. These USTs had been disused since the mid 1980s.

5.6.2 Phase 2 Environmental Site Assessment, Ames Land, Gawler East (REM, 2007)

REM undertook a DSI of APEI 14 and property to the east (collectively referred to by REM as the Ames Land) in October 2006. The results of this assessment were summarised in *Phase 2 Environmental Site Assessment, Ames Land, Gawler East*, dated July 2007 (the 2007 Ames DSI).

The assessment comprised a testpit soil investigation at eight locations on the site and drilling and test pit soil investigations at multiple locations on the Ames Land east of the site. The following information of note was identified by the assessment:

- No evidence of chemicals of interest, including pesticides or elevated heavy metals, was identified in site soils (APEI 14).
- The off-site USTs (east of APEI 10) were identified to comprise three 5,000 L volume tanks used to store kerosene, leaded petrol, and diesel. No evidence of soil impacts was identified in soil adjacent to these USTs.
- REM attempted to install one off-site monitoring well in the area of the USTs. Groundwater was not encountered to the maximum depth drilled (22 mBGL), and the well was therefore not completed.

5.6.3 Phase 2 Environmental Site Assessment, Readymix Land, Gawler East (REM, 2007)

REM undertook a DSI of the northern portions of the site (APEIs 1 to 13, collectively referred to by REM as the Readymix Land) in October 2006. The results of this assessment were summarised in *Phase 2 Environmental Site Assessment, Readymix Land, Gawler East*, dated July 2007 (the 2007 Readymix DSI).

The assessment comprised soil sampling at ten bores, 52 testpits, and eight surface sampling locations. The following information of note was identified by the assessment:

- Visual and olfactory evidence of hydrocarbon impacts was noted at five soil bores in the vicinity of the workshop ASTs (APEI 6). Concentrations of hydrocarbons in soil at these locations exceeded current human health and ecological guidelines for residential properties, to a maximum depth of 1.8 mBGL. Concentrations of hydrocarbons in soil below this depth were below adopted guidelines.
- Soil samples were collected from several other APEIs, and analysed for the following COIs:
  - In the quarry pit (APEI 1): five samples for metals, two samples for TRH, BTEX, and PAH, and one sample for a broad suite of COIs
  - Throughout the southern sediment ponds (APEI 5): six samples for metals, four samples for pH, two samples for TRH and BTEX, and one sample for a broad suite of COIs
  - In the vicinity of the former workshop storage sheds (APEI 6): ten samples for TRH and BTEX, five samples for PAH and metals, three samples for organochlorine pesticides (OCP), and one sample for a broad suite of COIs
  - In the vicinity of the former washing and blending plants (APEIs 7 and 8, respectively): 28 samples for metals, 14 samples for TRH and BTEX, eight samples for pH, four samples for PAH, and one sample for a broad suite of COIs
  - Throughout and immediately east of APEI 10: ten samples for metals and pH, three samples for TRH and BTEX, one sample for polychlorinated biphenyls, and one sample for a broad suite of COIs
  - In the vicinity of the former concrete batching plant (APEI 11): 19 samples for metals, 13 samples for pH, three samples for TRH and BTEX, and one sample for a broad suite of COIs
  - Throughout APEI 13: 12 samples for metals, nine samples for pH, three samples for OCP and organophosphorous pesticides, two samples for TRH and BTEX, and one sample for a broad suite of COIs
- Soil samples were also collected from an off-site location immediately north-east of APEI 10, in the vicinity of the former weighbridge and septic tank. These included six samples for TRH and BTEX, and three samples for PAH, metals, and nutrients

- No evidence of elevated COIs of interest was identified in the soil samples assessed.

Appendix H presents Figures 3 to 8 from the 2007 DSI report, which present the historical soil sampling locations.

5.6.4 Gawler East – Stage 1, Phase 2 Soil Investigation, Investigation Report (Tierra Environment, 2011)

Tierra Environment (Tierra) undertook a DSI of the property immediately east of the north-east portion of the site (APEIs 6, 10, and 11) in January 2011. The results of this assessment were summarised in *Gawler East – Stage 1, Phase 2 Soil Investigation, Investigation Report*, dated February 2011 (the 2011 DSI).

The assessment comprised soil sampling at 18 bores and 28 testpits. Results did not suggest the presence of any sources of contamination on this property which might impact the site.

5.6.5 Site Contamination Audit Report, Stage 1 Gawler East Development, Calton Rd, Gawler East SA (Environmental Auditors Pty Ltd, 2011)

Environmental Auditors Pty Ltd (EA) completed a Site Contamination Audit Report (SCAR) for the Stage 1 Springwood development, located immediately east of the north portion of the site, in March 2011. The SCAR included a review of the 2006 PSI, the 2007 Ames DSI, the 2007 Readymix DSI, and the 2011 DSI, and provided an opinion on the suitability of the Stage 1 development area for residential use. The conclusions of the SCAR were summarised in *Site Contamination Audit Report, Stage 1 Gawler East Development, Calton Rd, Gawler East SA, date*d March 2011 (the 2011 SCAR).

The 2011 SCAR concluded that there was no contamination in the Stage 1 area, and that this area was suitable for residential development. The 2011 SCAR also concluded that the data presented in the reviewed historical reports was reliable.

5.6.6 Gawler East Stage 2, UST Removal, Validation Report (Tierra, 2012)

Tierra supervised removal of the off-site USTs (east of APEI 10) and conducted validation sampling of the tank pits in November 2011. The results of this assessment were summarised in *Gawler East Stage 2, UST Removal, Validation Report*, dated March 2012 (the 2012 UST validation report).

The assessment comprised a visual assessment of the UST pits for evidence of releases, and collection and analysis of 36 soil samples of residual soils within the pits and excavated material. Results did not suggest that a release from the USTs had occurred.

5.6.7 Gawler East Development – Stage 2, Phase 2 Soil Investigation Report (Tierra, 2012)

Tierra undertook a DSI of the property immediately east of the central and southern portions of the site (APEIs 6 to 12) in January 2011. The results of this assessment were summarised in *Gawler East Development – Stage 2, Phase 2 Soil Investigation Report*, dated June 2012 (the 2012 DSI).

- The assessment comprised soil sampling at the following locations:
  - Three test pits in the north-east sedimentation pond (immediately east of APEI 5)
  - Ten test pits in the vicinity of the former weighbridge area, (immediately north-east of APEI 10)
  - 59 additional test pits and 31 boreholes on other areas of the Stage 2 development, east of the site.
- The following information of note was identified by the assessment:

- Results did not suggest the presence of any sources of contamination on this property that might impact the site.

- No evidence of COIs was identified in the samples collected from the north-east sedimentation pond (immediately east of the on-site pond in APEI 4)

- Elevated manganese and vanadium concentrations were reported in several soil samples collected from the area, including from a stockpile immediately north-east of APEI 14 that is inferred to have originated from the site. These concentrations were present in samples collected from across the property and were not associated with any identified PCAs. Tierra concluded that these concentrations were indicative of naturally elevated metals in soil, rather than indicative of anthropogenic activities.

- Minor hydrocarbon, arsenic, and zinc impacts to soil were reported at several locations on the property. However, based on their localised scale and distance from the site, they are not considered to pose a risk of migration to the site.

5.6.8 Gawler East Development – Stage 2, Groundwater Investigation Report (Tierra, 2012)

Tierra undertook an investigation of groundwater on the south-east portion of the site (APEIs 10 and 11) in January 2012, for the purposes of assessing potential impacts to groundwater originating from off-site USTs in the stage 2 Development area. The results of this assessment were summarised in *Gawler East Development – Stage 2, Groundwater Investigation Report,* dated June 2012 (the 2012 GW report).

The assessment comprised the installation and sampling of two groundwater wells. One well was located in the central portion of the concrete batching area (APEI 11) with the second located east of this, along the site boundary in APEI 10. Samples were submitted for analysis of a broad range of COIs, including metals, cyanide, nutrients, organochlorine pesticides (OCPs), phenols, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), total recoverable hydrocarbons (TRH), and volatile organic compounds (VOCs).

The following information of note was identified by the assessment:

- Groundwater was identified at depths of approximately 40 m below APEI 14, and approximately 70 m below the agricultural areas of the site (APEIs 15 and 16).

- Trace concentrations (0.08 mg/L) of TRH in the F2 range (C10-C14) and chloroform (0.003 mg/L) were present in groundwater along the east site boundary. Resampling of this was subsequently undertaken, with trace chloroform again reported, but no TRH. Tierra inferred that the chloroform reported may have resulted from mains water used during well drilling.

- Elevated concentrations of boron, nickel, and selenium were present in one or both of the monitoring wells. These concentrations were inferred by Tierra to likely represent naturally elevated background levels in groundwater, and were not considered indicative of anthropogenic impacts.

5.6.9 Gawler East Stage 2, Waste Stockpile, Waste Drum and Old Building, Soil Removal and Validation Report (Tierra, 2013)

Tierra undertook an excavation and validation testing of three areas east of the site in September 2012. These areas were associated with off-site PCAs that had been historically identified in the 2012 DSI, comprising the location of a former stockpile that had contained miscellaneous waste, an empty metal drum, and a former fuel AST. The results of this assessment were summarised in *Gawler East Stage 2, Waste Stockpile, Waste Drum and Old Building, Soil Removal and Validation Report,* dated January 2013 (the 2013 validation report).

Based on the distance from the site of the PCAs assessed, none are considered to have had the potential to cause site contamination.

Excavated soil from beneath the off-site waste stockpile was temporarily stored atop polyethylene sheeting at two locations on-site: adjacent to the former oil storage shed (APEI 7) and immediately south of the concrete batching area (APEI 11). Validation sampling was conducted on these temporary stockpiles in September 2012.

Validation sampling included the collection and analysis of three samples from the stockpile in APEI 7 for TRH and BTEXN, and six samples from the stockpile in APEI 11, one for a broad suite of potential contaminants included in the SA EPA Waste Screen and five for zinc, TRH, and BTEXN.

The following information of note was identified by the assessment:

- No TRH was present in the samples collected from the APEI 7 stockpile.
- Elevated zinc was present in four of six samples collected form the APEI 11 stockpile. LBWco notes that the reported concentrations were above the range of background zinc concentrations for the site (refer to Section 8.3).
- No organic COIs were present in the sample collected from the APEI 11 stockpile.

Although evidence of zinc contamination was identified in the stockpile temporarily located on APEI 11, the 2013 validation report indicates that this material was stored on polyethylene and subsequently removed for off-site disposal. As such, the likelihood of site contamination arising from the temporary storage of this material on-site was considered by LBWco to be negligible. The historical presence of this stockpile was not considered to constitute a PCA for the site.

5.6.10 Site Contamination Audit Report, Stage 2 Gawler East Development, Calton Rd, Gawler East, South Australia (EA, 2013)

EA completed a SCAR for the Stage 2 Springwood development, located immediately east of the central and southern portions of the site, in June 2013. The SCAR included a review of the following documents:

- 2006 PSI
- 2007 Ames DSI
- 2007 Readymix DSI
- 2012 UST validation report
- 2012 DSI
- 2012 GW report
- 2013 validation report.

The SCAR provided an opinion on the suitability of the Stage 2 development area for residential use. The conclusions of the SCAR were summarised in *Site Contamination Audit Report, Stage 2 Gawler East Development, Calton Rd, Gawler East, South Australia, date*d June 2013 (the 2013 SCAR).

The 2013 SCAR investigation area included the north-east most former sedimentation pond, as well as the areas immediately east of APEIs 10 and 11. The 2013 SCAR did not identify historical activities in these areas, including sediment deposition and stockpiling, as PCAs.

The 2013 SCAR concluded that there was no contamination in the Stage 2 area. The 2013 SCAR further concluded that this area was suitable for residential development, and that the data presented in the reviewed historical reports was reliable.

5.6.11 Validation of Historical Data

To assess the reliability of the historical data reviewed in the reports summarised above, LBWco performed quality control (QC) checks on 5% of historical data pertaining to on-site sampling locations. Tabulated data was compared to laboratory certificates of analyses to confirm the absence of transcription errors. No errors were identified, and the data was therefore considered reliable.

LBWco also assessed QC data presented in historical reports to assess the precision of primary data, using the criteria outlined in Section 8.6. The majority of historical QC data indicated acceptable precision, providing further confidence in the reliability of historical results.

5.7 Consideration of Residual Flocculant

The 2006 PSI identified the storage and use of flocculant, inferred by LBWco to most likely be polyacrylamide-based, in association with the washing plant (APEI 7). Residual flocculant may therefore have been present in the sediment deposited in ponds and drying areas throughout APEIs 1, 2, 4, and 5.

The National Health and Medical Research Council of Australia (NHMRC) has approved the use of polyacrylamide as a treatment chemical for drinking water, and does not identify any significant health or ecological risks associated with this use, nor provide a maximum recommended concentration (NHMRC *Drinking Water Treatment Chemicals – FACT SHEETS, Polyacrylamide*, 2005).

Available literature (*Water Soluble Polymers and Industrial Sand Mining*, Wisconsin Industrial Sand Association, 2013) indicated that the typical range of polymer concentrations added to sand washing processes ranged from 6 to 15 ppm. Concentrations of the associated acrylamide monomer were typically in the range of approximately 0.001 ppm

There are no Australian screening guidelines for either polyacrylamide or its associated monomer acrylamide in soil; however, the US EPA has set a generic screening level for acrylamide of 0.24 mg/kg, or 240 parts per million. This guideline is orders of magnitude greater than the level of flocculant typically used in sand washing activities, even if all acrylamide present in the wash slurry were to transfer to sediment. Literature values for the half-life of acrylamide in an aquatic system are on the order of days to months, further suggesting that residual concentrations would be negligible.

Based on these factors, potential residual flocculant in sediment is not considered to pose a potential risk for site contamination, and sediment storage is therefore not considered to be a PCA for the site. It is further noted that the 2013 SCAR did not identify deposition of sediment in the off-site sediment pond (immediately east of APEI 4) to be a PCA.

5.8 Site History Overview

Table 3 Summary of Site Activities

APEI	Historical activities	Date	COIs
1 – Quarry	• Quarrying of sand • Deposition of sediments into former quarry pits	• Pre-1979 to pre-2005 Pre-1999 to pre-2005	• None
2 – Drying pad	• Drying of sediments • Stockpiling of mulch and tree litter	• Pre-1999 to pre-2005 2019 to current	• None
3 – North stockpile area	• Stockpiling of soil	• Pre-1999 to pre-2010	• None

APEI	Historical activities	Date	COIs
4 – Northern sediment pond	• Quarrying of sand • Deposition of sediments	• Pre-1968 to pre-2005 Pre-1979 to pre-2005	• None
5 – Southern sediment ponds	• Quarrying of sand • Deposition of sediments	• Pre-1968 to pre-1979 Pre-1979 to pre-2005	• None
6 – Workshop sheds and fuel storage area	• Storage of fuel in two diesel ASTs and distribution from associated bowser • Storage of waste oil adjacent to workshop sheds • Storage of chemicals (fuels, oils, lubricants) in workshop sheds • Storage of lead acid batteries within and adjacent to workshop sheds	• Pre-1979 to 2015 (all)	• Petroleum hydrocarbons, monocyclic aromatic hydrocarbons (MAHs), polycyclic aromatic hydrocarbons (PAHs), lead, pH
7 – Washing plant	• Processing of quarried sand to remove fine sediments via mechanical separation/ washing • Storage of flocculant	• Pre-1979 to pre-2007 (all)	• Petroleum hydrocarbons, sulphate, pH
8 – Blending plant	• Mechanical blending of different grades of sand	• Pre-1999 to pre-2007	• None
9 – South stockpile area	• Stockpiling of soils	• Pre-2014 – current	• None
10 – North-east stockpile area	• Stockpiling of soil • Off-site fuel and kerosene storage within three USTs, approximately 110 m hydraulically up-gradient of the site	• Pre-1999 to current • Pre-1990s to 2012	• Petroleum hydrocarbons, MAHs, PAHs, lead
11 – Concrete batching plant	• Cement production	• Pre-1999 to 2015	• pH, metals, MAH
12 – South-east stockpile area	• Stockpiling of soils	• Pre-1999 to current	• None
13 – North agricultural area	• Low-intensity cropping and grazing	• Pre-1945 to 2018	• None
14 – South agricultural area	• Low-intensity cropping and grazing	• Pre-1945 to 2018	• None
Off-site properties	• Low-intensity cropping and grazing • Residential development	• Pre-1945 to current • Pre-1968 to present	• None

Bold text denotes a potentially contaminating activity.

6 Site Reconnaissance and Interviews

6.1 Interviews

In March 2019, LBWco personnel interviewed Mr Anthony Andolfatto and Mr Jack Johnson, Arcadian representatives knowledgeable with respect to recent site developments. Information of note obtained from these interviews is summarised below:

- Arcadian has excavated large volumes of native soil from the Springwood Stage 1 and 2 development areas and stockpiled this material throughout the site. This material included native sandy-clay from the majority of the development areas, and white material (inferred by LBWco to be calcrete) from the north-east portion of the development. These materials accounted for the differing colours of stockpiled material (brown and white) observed on the site.

- Excavations were for the purpose of land division construction activities and site preparation and involved the removal of existing site soils that were approved for residential use via the previous SCARs.

- Prior to Arcadian assuming control of the site, similar stockpiling activities were undertaken by Lendlease, the previous site developer.

- A fuel distribution bowser was historically present near the workshop shed in APEI 6. This bowser was disposed of off-site by Arcadia. The fuel tank associated with this bowser was not present on the site at the time Arcadia assumed control of the site.

6.2 Site Reconnaissance

LBWco personnel undertook a reconnaissance of the site on 4 March 2019. Selected photographs from the reconnaissance are presented in Appendix I and information of note is summarised below:

- At the time of the site reconnaissance, historical infrastructure associated with the workshop (APEI 6), washing plant (APEI 7), blending plant (APEI 8), and concrete plant (APEI 9) was no longer present on site. Evidence of this historical infrastructure was limited to large concrete blocks inferred to have likely formed the base of these structures.

- Large volumes of stockpiled soil were observed throughout APEIs 5 through 12. The bulk of these stockpiles appeared fresh (no evidence of vegetation growth on the stockpiles) and were visually consistent with natural material being excavated on the Stage 1 and Stage 2 development areas. Stockpiles across the site were generally uniform in nature, consisting of brown clayey sand, white calcrete, or a mixture of the two materials.

- Older stockpiles (based on the presence of vegetation growth) were observed in the east portion of APEI 1, and behind newer material in APEI 12. The material in APEI 12 was generally similar to the stockpiled soil elsewhere on site; however, weathering precluded visually confirming this soil as the same material. The material in APEI 1 appeared visually distinct and is inferred to be deposited sediments from the washing process.

- Several stockpiles of construction and demolition waste were observed in the south-east portion of APEI 5, immediately opposite the former washing plant, east of the former blending plant in APEI 8, and south of the former concrete batching plant in APEI 11. Concrete blocks were also identified stockpiled immediately east of APEI 10 and are inferred to have likely originated from the batching plant in APEI 11. No suspected asbestos-containing materials were identified in the waste stockpiles.

- Drainage hoses were observed leading from the north, more recently excavated, portion of the quarry (APEI 1) to the two older areas to the south. It was inferred that these hoses historically allowed for drainage of seepage water within the active (north) portion of the quarry to those areas used for sediment deposition (referrer to section 5.2).

- Stockpiles of mulch were observed on APEI 2. This material appeared recent and is inferred to have originated from the Stage 1 and 2 development areas.
- An abandoned 1,000 L liquid storage container was observed in APEI 4, overlooking the edge of the quarry. This container was empty, and there was no evidence of staining or releases in the nearby soil. Based on its location and the absence of nearby historical infrastructure, it is inferred that the empty container was likely discarded in this area, rather than being historically used here. This container was not considered to be a PCA.
- Drainage hoses were observed leading out of the sediment pit to the south portion of APEI 5, near the former washing plant (APEI 7). It was inferred that these hoses historically allowed for either deposition of sediment slurry from the washing plant, or transport of recaptured water for use in the washing process.
- The remains of a former metal drum were identified immediately north of the north-east sediment pit in APEI 5. There was no evidence of staining or chemicals in the drum or on the nearby ground surface. This scrap metal is not considered to be a PCA for the site.
- A groundwater monitoring well was observed immediately east of APEI 10. This well was inferred to be GW01, from the 2012 GW investigation (refer to Section 5.6.8). GW02, historically installed in the central portion of APEI 11, could not be located.
- The remains of a small campfire were identified in the north-west portion of APEI 14. This fire did not appear to have been used for waste burning and is not considered to be a PCA.
- No fuel or chemical storage was identified during the site reconnaissance.
- No evidence of spills, stained soils, or distressed vegetation was observed on any portion of the site.
- No PCAs were observed on adjacent properties near the site.

7 Intrusive Investigation Methodology

7.1 Guidance Documents

The intrusive soil investigation was undertaken with reference to the guidance provided in the following documents:

- ASC NEPM (as amended, 2013)
- Environment Protection Authority 2018*, Guidelines for the Assessment and Remediation of Site Contamination*
- Standards Australia AS 4482.1-2005 *Guide to the investigation and sampling of sites with potentially contaminated soil Part 1: Non-volatile and semi-volatile compounds*
- Standards Australia AS 4482.2-1999 *Guide to the investigation of potentially contaminated soil – Part 2: Volatile substances*.

7.2 Investigations Rationale

Intrusive soil investigations were not conducted where likely PCAs were identified by the desktop assessment. Rather, the intrusive investigation focussed on confirming the absence of COIs in areas where historical activities were not considered to be PCAs.

7.3 Fieldwork Methodology

Intrusive soil investigations included the following:

- Drilling six boreholes in APEIs 1, 4, and 5
- Test pitting at 26 locations in APEIs 1, 2, 3, 5, and 12
- Surface sampling at 22 locations in APEIs 2, 3, 5, 9, and 12
- Stockpile sampling at 32 locations in APEIs 5 and 9 through 12, as well as immediately east of APEIs 10 and 11.

Stockpile sampling was conducted on a subset of selected stockpiles considered representative of the materials present throughout the site. In the vicinity of APEIs 10 and 11, stockpiling activities were continuous across the site boundary and the property to the east. As such representative stockpile samples were collected both on- and off-site in this area, for the purpose of characterising the broader site stockpiles.

The soil assessment fieldwork methodology, including field quality assurance/quality control (QA/QC) measures implemented during the investigation, is summarised in Table 4 below.

Table 4 Soil Investigation Methodology

Activity	Details
Soil sampling - boreholes	On 19 March 2019, six soil bores (SB01-SB06) were advanced by an environmental driller using push tube methodology, under supervision by an LBWco environmental consultant. Boreholes were advanced to approximately 0.5 into natural soil, or to the depth of refusal (1.7 – 4.8 mBGL). Soil was recovered from push tubes and discharged into clean core trays for logging and sampling.
Soil sampling – test pits	On 20 through 22 March 2019, 26 test pits (TP01-TP26) were excavated using a 3.5 tonne excavator under supervision by an LBWco environmental consultant. Test pits were advanced to 2 mBGL.

Activity	Details
	Soil was recovered directly from the excavator bucket for logging and sampling.
Soil sampling – surface samples	On 19 through 22 March 2019, 22 surface samples (TP27-TP31 and TP40-TP56) were collected by an LBWco environmental consultant using a hand auger. Surface samples were collected to a depth of 0.3 mBGL.
Soil sampling – stockpile samples	On 19 through 21 March 2019, 32 stockpile samples (TP31-TP54 and SP01-SP08) were collected by an LBWco environmental consultant using a hand auger. Samples were collected to a depth of 0.3 m from the surface of the stockpile. It should be noted that several sampling locations (e.g. TP031) included both stockpile sampling and surface sampling of the underlying ground surface.
Sample Recovery	Soil samples were recovered from depth intervals considered appropriate by LBWco's field representatives. Bore/test pit logs are presented in Appendix J.
Sample handling	Soil samples were handled exclusively by an LBWco consultant, and samples were stored in glass jars supplied by the primary contract laboratory. Disposable nitrile gloves were worn by the field representative during sampling.
Decontamination of sampling equipment	Sampling equipment and core trays (where used) were cleaned between sampling locations by scrubbing with phosphate-free detergent solution, followed by a potable water rinse.
Quality control duplicate and blank sampling	Six intra-laboratory and six inter-laboratory duplicate samples were collected and analysed for identical COIs to associated primary samples, to assess data precision. One rinsate blank was collected during each day of intrusive investigations (four total) to assess the effectiveness of decontamination procedures. Rinsate blanks were collected by rinsing deionised water on the primary sampling equipment utilised during the day's sampling (push tube, excavator bucket, or hand auger). Rinsate blanks were analysed for the primary COIs assessed in primary samples on each day. One trip blank was submitted alongside each shipment of primary samples (two total) to assess for potential contamination during transport. Trip blanks were analysed for volatile hydrocarbons. Quality control duplicate and blank samples results are provided in the chemical summary tables in Appendix K
Soil logging	Soils encountered at each sampling location were logged in general accordance with Standards Australia (2017) Geotechnical Site Investigations AS1726. Soil logs are provided in Appendix J. Photographs of each soil core were taken prior to collection of samples.
Sample preservation	Soil samples were stored under chilled conditions in a portable cooler immediately following sampling and during delivery to the laboratory. Sample transport was performed in accordance with LBWco's chain of custody (COC) procedures.
Laboratory Analysis	Selected primary samples were submitted for chemical analysis of potential contaminants of concern, including: • Heavy metals • Total recoverable hydrocarbons (TRH) • Benzene, toluene, ethylbenzene, xylenes (BTEX) • Sulphate • pH • A broad suite of COIs included within the SA EPA Waste Classification Screen • Physico-chemical parameters (pH clay content, cation exchange capacity) Primary analytical testing was undertaken by ALS, with Eurofins completing inter-laboratory duplicate testing. These laboratories are accredited by the National Association of Testing Authorities (NATA) for the analyses performed.

8 Results

The following section summarises the field observations and results of the laboratory soil testing. Soil sampling locations are presented on Figures 4-9 in Appendix A. Tabulated results of chemical testing are presented in Appendix K. Laboratory chain of custody documentation is presented in Appendix L.

8.1 Field Observations

Fill material (defined as materials not consistent with natural soils and therefore likely imported to the site) was not encountered at the locations assessed.

Reworked natural material, typically comprising clayey sand or sandy clay inferred to originate from an on-site source, was observed at surface throughout APEIs 1 through 12. The depth of this material was highly variable within each APEI, as indicated in Table 5.

Table 5 Depth of Reworked Natural Material

APEI	Depth Range Observed
1	0.9 to 4.6 mBGL
2	>2 mBGL
3	0.8 to >2 mBGL
4	0.4 to >3.5 mBGL
5	0.5 to >2.5 mBGL

Test pitting or drilling below ground level was not undertaken at APEIs 6-14

Underlying undisturbed natural material was variable between APEIs, likely as a result of the significant elevation differences between areas of the site. Undisturbed natural material consisted of clay, clayey sand, sandy cobbles, and/or weathered schist.

Detailed descriptions of the soils encountered are provided in soil bore logs in Appendix J. Soil bore locations are shown on Figures 4-9 in Appendix A.

8.2 Chemical Testing Results

Soil chemical data summary tables are presented in Appendix K. Laboratory certificates and chain of custody documentation are presented in Appendix L.

8.3 Metals

8.3.1 Background

Concentrations of metals in soil throughout APEIs 13 and 14, as well as off-site agricultural properties to the east, were historically assessed in 2007 and 2011 (refer to Section 5.6). No historical activities of significance were identified for these areas and reported metals concentrations are therefore considered to be indicative of naturally-occurring background concentrations in the region of the site.

Background concentrations in soil at these locations are summarised in Table 6 below.

8.3.2 Site Concentrations

Reported concentrations of metals in site soils are compared to historical background values in Table 6 below.

Table 6 Concentrations of Metals at Site Compared to Historical Background Levels

Metal	Site Concentrations (mg/kg)			Background Concentrations (mg/kg)		
	Minimum	Maximum	Mean*	Minimum	Maximum	Mean*
Arsenic	<5	12	3.8	1	21	3.5
Barium	<10	210	78	18	160	54
Beryllium	<1	1	0.57	<2	<2	1
Cadmium	<1	<1	0.5	0.1	<0.5	0.2
Chromium	4	58	26	3	59	20
Cobalt	<2	15	4.8	2.5	26	6.7
Copper	<5	33	10	3	25	9.9
Lead	<5	14	5.7	3	26	7.7
Manganese	10	240	98	32	590	266
Mercury	<0.1	<0.1	0.05	0.06	<0.1	0.06
Nickel	<2	26	8.7	3	20	8.1
Zinc	<5	130	17	3	88	17

***Where concentrations were less than the laboratory LOR, a value of 50% of the LOR was adopted for purposes of calculating mean concentrations.**

The results indicate that concentrations of metals in soils are not elevated in the APEIs assessed, relative to background levels in the region. The results do not indicate the presence of PCAs associated with metals in the APEIs assessed.

8.4 Organic Compounds

Organic compounds including total recoverable hydrocarbons, mono- and polycyclic aromatic hydrocarbons, phenols, organochlorine pesticides, and polychlorinated biphenyls were assessed in samples collected from the APEIs assessed (1-5, 9-12). Soil concentrations for all organic compounds assessed were below the laboratory limit of reporting (LOR) for the samples assessed.

The results do not indicate the presence of PCAs associated with organic compounds, including potential polyacrylamide breakdown products, in the APEIs assessed.

8.5 Sulphate

8.5.1 Background

Concentrations of sulphate in soil were assessed in ten samples collected from APEIs 2 and 12. The desktop assessment did not identify historical storage of sediment in these APEIs, which might contain residual sulphate flocculant. No possible anthropogenic sources of sulphate were identified in these APEIs, and as such reported sulphate concentrations in these areas were considered to represent background concentrations typical for natural soils at the site.

Background concentrations in soil at these locations ranged from 60 mg/kg to 650 mg/kg, with a mean concentration of 229 mg/kg.

8.5.2 Sediment Ponds

Concentrations of sulphate in soil were assessed in samples collected from APEIs 2, 4, and 5, to confirm that sulphate flocculant use was not a PCA for these areas. Concentrations of sulphate in soil ranged from <50 mg/kg to 700 mg/kg, with a mean average concentration of 120 mg/kg.

The results indicate that concentrations of sulphate in soils are not elevated in these APEIs relative to background levels elsewhere at the site. There is no evidence to suggest that residual sulphate-base flocculant may be a PCA for these APEIs.

8.6 Data Validation

An evaluation of quality control (QC) information for the soil assessment work and a statement of the data representativeness are provided below.

As part of the evaluation of laboratory chemical data, duplicate pair results were compared by determining the relative percentage difference (RPD) between the results. The RPD was calculated using the formula:

$$RPD\ (\%) = \quad 100(x_1 - x_2) \ / \ [(x_1 + x_2)/2]$$

where x_1, x_2 = duplicate results.

Based on guidance provided in AS4482.1-2005, a soil RPD within the range of -30% to 30% is considered to show acceptable agreement. Data is considered to have poor agreement where an RPD is outside this range. Generally higher RPD values occur for organic compounds than for metals and where low concentrations of an analyte are recorded.

Where reported concentrations for one or more samples within a duplicate pair were less than five times the laboratory LOR, no RPD was calculated. Instead, the duplicate pair was considered to demonstrate acceptable precision if the difference between samples was less than or equal to twice the LOR.

The results of internal laboratory quality control procedures are provided within the laboratory certificates (Appendix L). The acceptance criterion for internal laboratory replicates is set at an RPD of -50% to 50%. Laboratory recoveries should be in the range 70% to 130%.

Table 7 indicates conformance to specific QA/QC requirements for soil data. Duplicate sample and equipment blank results are presented in Appendix K.

Table 7 QC Data Validation

QA/QC Requirement	Compliant	Comment	Acceptable
Chain of custody documentation completed	Yes	All samples were transported under strict LBWco chain of custody procedures and signed chain of custody documentation.	Yes
Samples delivered to laboratory within sample holding times and with correct preservative	Yes	All samples were delivered to the laboratories within the sample holding times and in laboratory-supplied containers.	Yes
All analyses NATA accredited	Yes	Eurofins and ALS were NATA accredited for the analyses performed.	Yes
Required number of sample duplicates analysed	Yes	For the 133 samples analysed, six sets of inter- and intra-laboratory duplicates were assessed. This complies with the minimum duplicate ratio of 1 set of intra- and inter- laboratory duplicates for 20 primary samples recommended in AS 4482.1 2005.	Yes
Soil QA/QC samples reported RPDs within limits recommended by the ASC NEPM	Majority	Of 191 duplicate pairs analysed, 181reported an RPD of equal to or less than 30, or otherwise demonstrated acceptable precision. Exceedances are likely indicative of minor heterogeneity in the reworked soils present on site.	Yes

QA/QC Requirement	Compliant	Comment	Acceptable
Equipment Rinsate Blank frequency of at least 1 per day	Yes	Four rinsate blanks were collected and analysed.	Yes
Equipment Rinsate Blank below laboratory detection limits	Yes	Concentrations of COIs assessed were below the laboratory's LOR.	Yes
Transport trip blank frequency of at least 1 per batch	Yes	Two blank sample accompanied the samples to the laboratory.	Yes
Transport Trip Blank below laboratory detection limits	Yes	Concentrations of COIs assessed were below the laboratory's LOR.	Yes
Acceptable laboratory QC results	Yes	The internal laboratory duplicates, matrix spikes, and method blanks were within limits. The laboratory considered the results as acceptable.	Yes

Quality control data collected during this investigation indicated that the QC results were within acceptable limits. Accordingly, LBWco considered that the data quality was adequate for the purpose of this investigation.

9 Summary of Findings

9.1 APEI 1

This APEI was historically used for mining of sand over two periods between the early 1970s and mid 2000s. Between the late 1990s and mid-200s, older portions of the quarry pit were used as sedimentation ponds for fine soil particles removed during processing of the quarried sand. One portion of the APEI was also used for stockpiling of soil, which is inferred to have originated from elsewhere on the site. No activities have recently been conducted in this APEI.

These activities are not considered by LBWco to constitute PCAs, nor are they defined as PCAs in Schedule 3 of the EP Act. Neither historical (six locations) nor recent (ten locations) soil sampling indicated the presence of COIs that would suggest the presence of PCAs.

9.2 APEI 2

This APEI was historically used for drying fine soil particles generated by processing of quarried sand in the 1990s/2000s. More recently, this APEI has been used for the storage of mulch and tree litter.

These activities are not considered by LBWco to constitute PCAs, nor are they defined as PCAs in Schedule 3 of the EP Act. Recent soil sampling (seven locations) did not indicate the presence of COIs that would suggest the presence of PCAs.

9.3 APEI 3

This APEI was historically used for stockpiling of soil in the 1990s/2000s. Assessment of this area suggests this soil was likely natural material excavated from other areas on-site, and is unlikely to have been associated with import of off-site fill. No activities have recently been conducted in this APEI.

This activity is not considered by LBWco to constitute a PCA, nor is it defined as a PCA in Schedule 3 of the EP Act. Recent soil sampling (five locations) did not indicate the presence of COIs that would suggest the presence of PCAs.

9.4 APEI 4

This APEI may have been historically used for mining sand in the 1960s or earlier. Between the 1970s and mid-2000s, excavated areas were used as sedimentation ponds for fine soil particles removed during processing of the quarried sand from APEI 1. No activities have recently been conducted in this APEI.

These activities are not considered by LBWco to constitute PCAs, nor are they defined as PCAs in Schedule 3 of the EP Act. Recent soil sampling (three locations) did not indicate the presence of COIs that would suggest the presence of PCAs.

9.5 APEI 5

This APEI may have been historically used for mining sand in the 1960s or earlier. Between the 1970s and mid-2000s, excavated areas were used as sedimentation ponds for fine soil particles removed during processing of the quarried sand from APEI 1. The south-east portion of this APEI, beyond the extent of the sediment ponds and opposite the former washing plant, has recently been used for stockpiling of soil from the Springwood Stage 1 and 2 developments east of the site.

These activities are not considered by LBWco to constitute PCAs, nor are they defined as PCAs in Schedule 3 of the EP Act. Neither historical (six locations) nor recent (12 locations) soil sampling indicated the presence of COIs that would suggest the presence of PCAs.

9.6 APEI 6

This APEI was historically used for the storage of fuels and chemicals associated with historical sand quarrying and processing activities from the 1970s to the 2010s. This included storage of diesel fuel in two ASTs and used oil in a third AST.

These activities are defined as PCAs in Schedule 3 of the EP Act. **Historical sampling identified the presence of hydrocarbon contamination of soil** in four of nine locations assessed in the vicinity of the former diesel AST and associated distribution bowser. This contamination extended to approximately 1.8 mBGL. Historical sampling did not identify soil impacts in the vicinity of the former workshop sheds.

9.7 APEI 7

This APEI was historically used for the processing of quarried sand via mechanical separation of fines and sorting of sand/gravel products, from the 1970s to mid-2000s. Flocculant was historically stored to assist in the separation and/or settling process.

Chemical storage (flocculant) is defined as a PCA in Schedule 3 of the EP Act. Historical sampling (nine locations) did not identify evidence of soil contamination.

9.8 APEI 8

This APEI was historically used for the mechanical blending of different grades of sands and gravels to achieve specific end-products, from the 1990s to mid-2000s. More recently, this APEI has been used for stockpiling of soil from the Springwood Stage 1 and 2 developments east of the site.

These activities are not considered by LBWco to constitute PCAs, nor are they defined as PCAs in Schedule 3 of the EP Act. Historical sampling (seven locations) did not indicate the presence of COIs that would suggest the presence of PCAs.

9.9 APEI 9

This APEI has been used from the early 2010s to present for the stockpiling of soil. Recent stockpiles are material from the Springwood Stage 1 and 2 developments east of the site, while historical stockpiles are considered likely to have also originated from this source.

This activity is not considered by LBWco to constitute a PCA, nor is it defined as a PCA in Schedule 3 of the EP Act. Recent soil sampling (19 locations) did not indicate the presence of COIs that would suggest the presence of PCAs.

9.10 APEI 10

This APEI was used from the early 1990s to present for the stockpiling of soil. Recent stockpiles are material from the Springwood Stage 1 and 2 developments east of the site, while historical stockpiles are considered likely to have originated from nearby locations on-site.

Three fuel USTs were historically present on the off-site property to the north-east. **These USTs are inferred to be up-hydraulic gradient of this APEI, and as such may represent a PCA for this portion of the site**.

Historical sampling of groundwater at two locations in this APEI and APEI 11, down-hydraulic gradient of the USTs, did not identify evidence of groundwater contamination. The potential source area was also included within the boundaries of the Springwood Stage 2 Site Contamination Audit. Based on the historical groundwater sampling results, this Audit did not consider the potential source area to be an unacceptable risk for residential development in the area of the former USTs, or down-gradient.

9.11 APEI 11

This APEI was historically used for concrete batching from the 1990s to 2015. **This activity is defined as a PCA** in Schedule 3 of the EP Act. Historical sampling (13 locations) did not identify evidence of soil contamination.

Three fuel USTs were historically present on the off-site property to the north-east. **These USTs are inferred to be up-hydraulic gradient of this APEI, and as such may represent a PCA for this portion of the site**.

Historical sampling of groundwater at two locations in this APEI and APEI 10, down-hydraulic gradient of the USTs, did not identify evidence of groundwater contamination. The potential source area was also included within the boundaries of the Springwood Stage 2 Site Contamination Audit. Based on the historical groundwater sampling results, this Audit did not consider the potential source area to be an unacceptable risk for residential development in the area of the former USTs, or down-gradient.

9.12 APEI 12

This APEI was used from the early 1990s to present for the stockpiling of soil. Recent stockpiles are material from the Springwood Stage 1 and 2 developments east of the site, while historical stockpiles are considered likely to have originated from nearby locations on-site.

This activity is not considered by LBWco to constitute a PCA, nor is it defined as a PCA in Schedule 3 of the EP Act. Recent soil sampling (five locations) did not indicate the presence of COIs that would suggest the presence of PCAs.

9.13 APEI 13

This APEI was used from at least the 1940s to 2018 for low-intensity cropping and grazing. This activity is not considered by LBWco to constitute a PCA, nor is it defined as a PCA in Schedule 3 of the EP Act. Historical soil sampling (eight locations) did not indicate the presence of COIs that would suggest the presence of PCAs.

9.14 APEI 14

This APEI was used from at least the 1940s to 2018 for low-intensity cropping and grazing. This activity is not considered by LBWco to constitute a PCA, nor is it defined as a PCA in Schedule 3 of the EP Act. Historical soil sampling (ten locations) did not indicate the presence of COIs that would suggest the presence of PCAs.

9.15 Summary of PCAs

Prescribed PCAs are defined in Section 50 and further in Schedule 3 Part 1 of the *Environment Protection Regulations 2009*. The following prescribed PCAs were identified at the site or nearby surrounding area.

Table 8 Prescribed PCAs

APEI	Activity	Definition/Description	Comment
	On-site		
6	Liquid organic chemical storage	Storage of 500 L of more of a liquid organic chemical substance	Storage of diesel fuel in two historical ASTs and waste oil in one AST. Historical testing identified soil impacts to a maximum of 1.8 mBGL

APEI	Activity	Definition/Description	Comment
6	Liquid organic chemical storage	Storage of 500 L of more of a liquid organic chemical substance	Storage of fuels, oils, lubricants, and lead acid batteries within and adjacent to workshop sheds without secondary containment. Historical testing did not identify soil impacts.
7	Liquid organic chemical storage	Storage of 500 L of more of a liquid organic chemical substance	The historical volumes of flocculant stored is unknown, but may have exceeded 500 L. Historical testing did not identify soil impacts.
11	Concrete batching works	Operation of works for production of concrete or concrete products manufactured by inclusion of cement, sand, rock, aggregate or similar materials	Visual observations suggest surficial soil in this area may be impacted with cement. However, historical testing did not identify soil impacts.
	Nearby off-site		
10 and 11	Liquid organic chemical storage	Storage of more than 500 L of liquid organic chemical substances in underground or aboveground tanks or vessels	Storage of diesel and leaded petrol in three USTs on the property immediately east of APEI 10.

Other activities that are not prescribed PCAs also have the potential to cause site contamination. Relevant non-prescribed PCAs identified during the PSI are described in Table 7.

Table 9 Non-prescribed PCAs

Activity	Description/Observations	Comment
On-site		
Liquid organic chemical storage	Storage of small volumes (<500 litres) of liquid organic chemical substances and lead acid batteries	Small volumes of chemicals and lead acid batteries historically occurred in the workshop sheds with no secondary containment. Historical testing did not identify soil impacts.
Nearby off-site		
None	-	-

PCAs were not identified in APEIs 1-5, 8, 9, or 12-14.

9.16 Preliminary Conceptual Site Model

Based upon the PSI desktop assessment and intrusive sampling results, a preliminary conceptual site model (CSM) has been formulated for the identified PCAs to consider potential contaminated media onsite and possible exposure pathways and risks to receptors. Relevant receptors include future site occupants and the environment for a range of future land uses. Refer to Table 10.

Table 10 Preliminary CSM – Qualitative Assessment of Site Contamination Risk from PCAs

APEI	Potentially contaminating activity	Contaminants of potential concern	Likely location	Relevant Onsite Media			Potential Onsite Receptors			Potential risk and/or liability for future land use
				Soil	Soil Vapour	Groundwater	Humans	Ecosystems	Built Environment	
On-site										
6	Historical storage of diesel fuel in two ASTs and waste oil in one AST.	Petroleum hydrocarbons, MAH, PAH, solvents, metals,	In the vicinity of the former ASTs, in the central portion of APEI 6.	Y	Y	U	Y	Y	Y	**Moderate** Hydrocarbon impacts to soil have been historically identified, extending to a depth of 1.8 mBGL. Impacts were not identified in soil below this depth, and groundwater impacts are therefore unlikely. The areal extent of soil impacts appears localised to the vicinity of the former ASTs and is likely 40 m^2 or less. There is a potential risk to future site users via dermal contact, incidental ingestion, and dust inhalation of the impacted soil.
6	Historical storage of fuels, oils, lubricants, and lead acid batteries in and adjacent to the former workshop sheds.	Petroleum hydrocarbons, MAH, PAH, solvents, metals, pH	Localised impacts in the vicinity of the former workshop sheds, on the central portion of APEI 6.	U	U	U	U	U	U	**Low** Limited historical soil sampling has not identified evidence of chemical releases in this area. If contamination is present in shallow soils, there may be a risk to future site users via direct contact, incidental ingestion, and dust inhalation of contaminated soils.
7	Historical storage of an unknown volume of flocculant associated with washing plant	Metals, pH, sulphate, petroleum hydrocarbons	Adjacent to former washing plant infrastructure, on the east portion of APEI 7.	U	N	U	U	U	U	**Low** Limited historical soil sampling has not identified evidence of chemical releases in this area. If contamination is present in shallow soils, there may be a risk to future site users via direct contact, incidental ingestion, and dust inhalation of contaminated soils. If contamination is present in groundwater, there are considered to be no realistic human health or ecological exposure pathways, given the depth to groundwater in this area.

APEI	Potentially contaminating activity	Contaminants of potential concern	Likely location	Relevant Onsite Media			Potential Onsite Receptors			Potential risk and/or liability for future land use
				Soil	Soil Vapour	Groundwater	Humans	Ecosystems	Built Environment	
11	Historical concrete batching activities	pH, metals	Adjacent to the former batching plant infrastructure and product storage bins.	Y	N	U	Y	Y	U	**Low** Limited historical soil sampling has not identified evidence of chemical releases in this area. However, 2019 site reconnaissance identified discoloured surface soils.
Off-site										
10 and 11	Historical fuel USTs	Petroleum hydrocarbons, MAH, PAH, metals,	Farm house property immediately east of APEIs 10 and 11	N	N	U	N	N	N	**Low** Limited historical groundwater sampling has not identified groundwater impacts on the site, down-hydraulic gradient of the off-site PCA. The potential source area was included within the boundaries of the Springwood Stage 2 Site Contamination Audit. This Audit did not consider the potential source area to be an unacceptable risk for residential development. There are considered to be no realistic human health or ecological exposure pathways, given the depth to groundwater in this area. Extraction of groundwater is highly unlikely to occur for future uses, and vapour migration of COIs from groundwater depth to surface is not considered realistic.

Y – Impacts to media/receptors known or likely
U – Impacts to media/receptors unlikely but cannot be definitively precluded
N – PCA not anticipated to affect media/receptor

10 Conclusions and Recommendations

Based on desktop review of current and historic site information, a site inspection, and intrusive soil assessment, LBWco prepared a summary CSM for PCAs and other activities that were undertaken or inferred to have occurred at and near the subject site. The conclusions of the assessment were as follows:

- Prescribed PCAs identified to have historically occurred on-site included the following:
  - Liquid organic chemical storage in APEIs 6 and 7
  - Concrete batching in APEI 11
- Prescribed off-site PCAs with the potential to result in site contamination included liquid organic chemical storage on the farmhouse immediately east of APEIs 10 and 11.
- Non-prescribed PCAs identified for the site included the storage of small volumes of chemicals within and adjacent to the APEI 6 workshop sheds.
- No on- or off-site PCAs were identified that may materially affect APEIs 1-5, 8, 9, or 12-14.
- A localised area of identified soil contamination, adjacent to the historical location of fuel and waste oil storage tanks in APEI 6, may pose a moderate risk to future receptors. Other PCAs identified are considered likely to pose a low potential concern to future site receptors.

LBWco recommends the following:

- Appendix M presents development plans for the site that indicate where proposed sensitive land uses (residential, childcare, and/or aged care) overlap with APEIs at which PCAs were identified or inferred. Two such areas were identified, located to the east and west of a planned roadway running north-south through the site. LBWco recommends that a site contamination audit be undertaken for these two areas, in order to confirm their suitability for the proposed land uses.
- As part of the site contamination audit, LBWco recommends that assessment of soil and/or groundwater be undertaken in APEIs 6, 7, 10 and 11 to confirm the nature and extent of site contamination (if any) that may be associated with the identified PCAs.
- Soil impacts associated with historical fuel and waste oil ASTs were historically reported in APEI 6. Should investigations to support the site contamination audit confirm the presence of these impacts, remediation of shallow soil in this area will likely be required.
- Sensitive land uses proposed for development outside the areas identified in Appendix M do not coincide with identified PCAs, being associated with APEIs 1-5, 8, 9 and 12-14. LBWco does not consider a site contamination audit warranted for these areas, and no further environmental investigation is recommended to determine the suitability of these areas for the proposed land uses.

The information provided in this report is subject to the limitations expressed in Section 11. The reader should make themselves aware of the limitations and how they relate to the conclusions provided.

11 Limitations

Scope of Services

This environmental site assessment report ("the report") has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between Arcadian Property (Arcadian) and LBW co (LBWco) ("scope of services"). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

Reliance on Data

In preparing the report, LBWco has relied upon data, surveys, analyses, designs, plans and other information provided by Arcadian and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise stated in the report, LBWco has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. LBWco will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to LBWco.

Environmental Conclusions

In accordance with the scope of services, LBWco has relied upon the data and has conducted environmental field monitoring and/or testing in the preparation of the report. The nature and extent of monitoring and/or testing conducted is described in the report.

On all sites, varying degrees of non-uniformity of the vertical and horizontal soil or groundwater conditions are encountered. Hence no monitoring, common testing or sampling technique can eliminate the possibility that monitoring or testing results/samples are not totally representative of soil and/or groundwater conditions encountered. The conclusions are based upon the data and the environmental field monitoring and/or testing and are therefore merely indicative of the environmental condition of the site at the time of preparing the report, including the presence or otherwise of contaminants or emissions.

Also, it should be recognised that site conditions, including the extent and concentration of contaminants, can change with time.

Within the limitations imposed by the scope of services, the monitoring, testing, sampling and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

Report for Benefit of Arcadian

The report has been prepared for the benefit of Arcadian and no other party. LBWco assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of LBWco or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

Other Limitations

LBWco will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

Appendix A

Figures

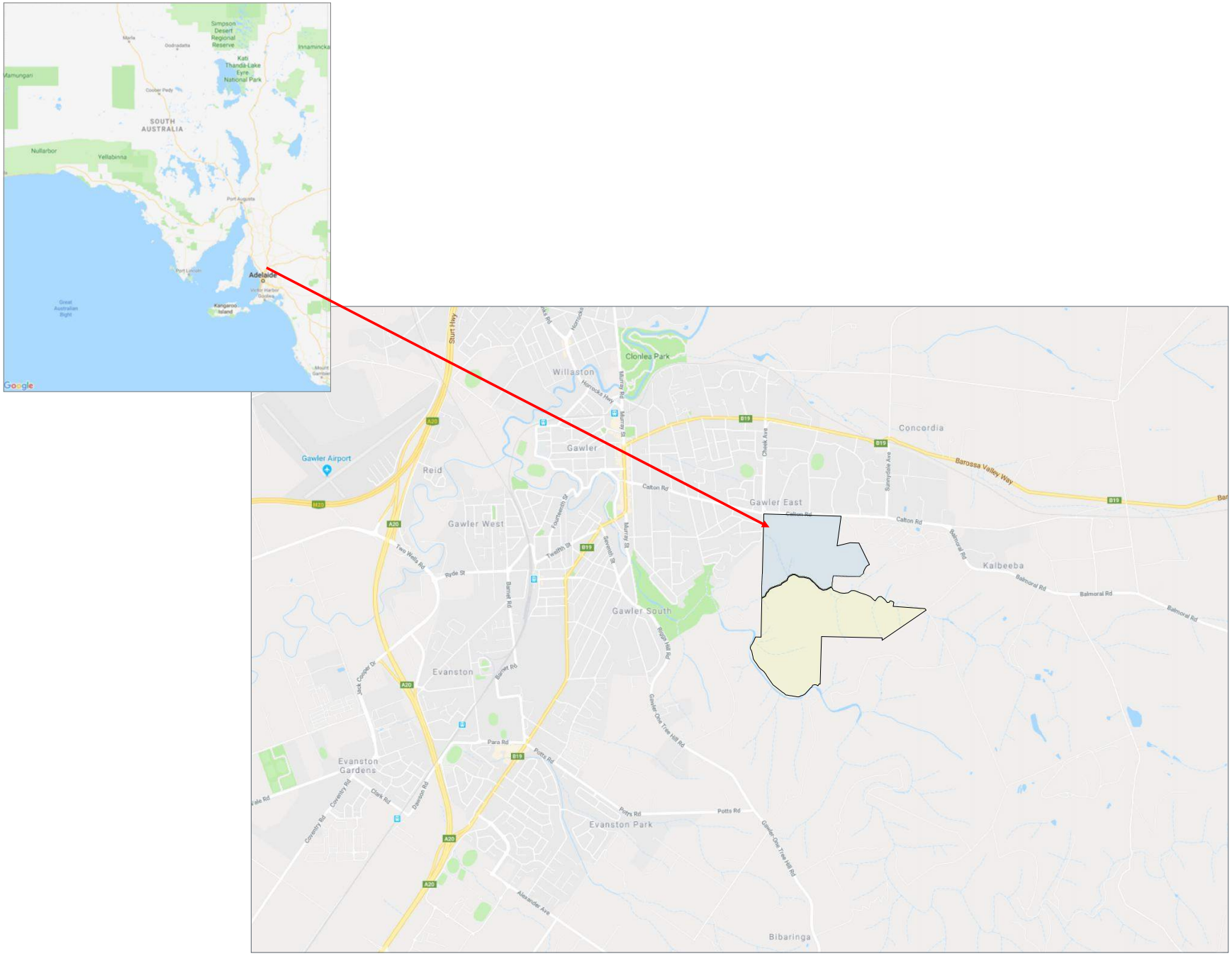

FIGURE 1

Site Location Map

Springwood Stage 3 and 4
Gawler East
Preliminary Site Investigation

For

Arcadian Property

LEGEND

- Stage 3 Boundary
- Stage 4 Boundary

SCALE

0 0.5 1 km

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LBW co Details			
Job No.	191076		
Drawn	TH	Rev.	0
Checked	MP	Date	28.03.2019

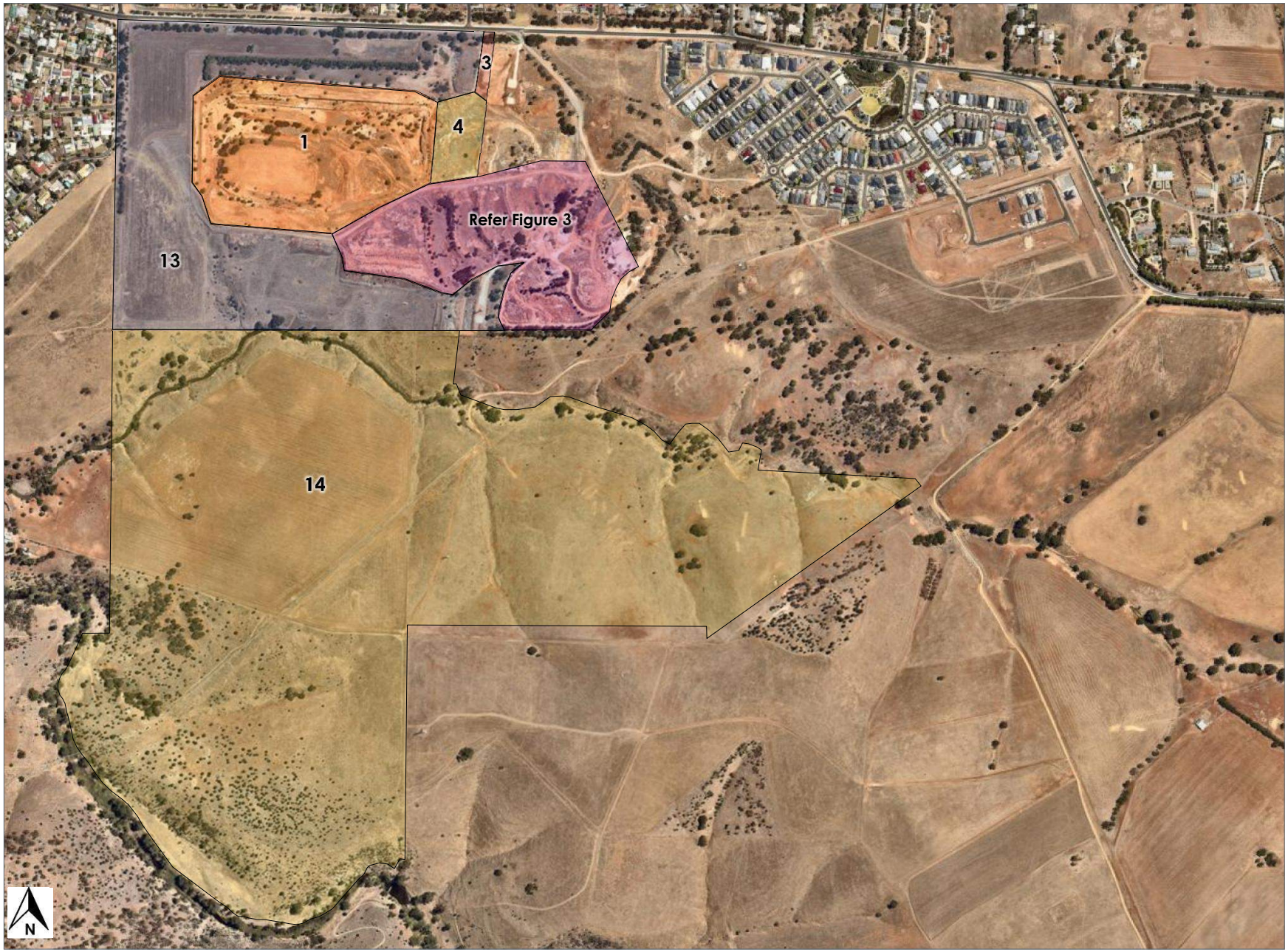

FIGURE 2

Areas of Potential Environmental Interest (APEI)

Springwood Stage 3 and 4
Gawler East
Preliminary Site Investigation

For

Arcadian Property

LEGEND

APEI Boundary

SCALE

0 100 200 m

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FIGURE 3

Sample Location Plan & APEIs

Springwood Stage 3 and 4
Gawler East
Preliminary Site Investigation

For

Arcadian Property

LEGEND

- Drilling Location (to natural)
- Test pit location (to 2 mBGL)
- Stockpile and surface sampling location
- Surface sample location
- Stockpile sampling location

SCALE

0 50 100 m

N

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Figure 4

APEI 1

Springwood Stage 3 and 4
Gawler East
Preliminary Site Investigation

For

Arcadian Property

- Drilling Location (to natural)
- Test pit location (to 2 mBGL)
- Stockpile and surface sampling location
- Surface sample location
- Stockpile sampling location

SCALE

0 20 40 m

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Job No.	191076		
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Checked	MP	**Date**	27.03.2019

Figure 5

APEI 3

Springwood Stage 3 and 4
Gawler East
Preliminary Site Investigation

For

Arcadian Property

- Drilling Location (to natural)
- Test pit location (to 2 mBGL)
- Stockpile and surface sampling location
- Surface sample location
- Stockpile sampling location

SCALE

0 10 20 m

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Job No.	191076		
Drawn	TH	**Rev.**	0
Checked	MP	**Date**	27.03.2019

Figure 6

APEI 4

Springwood Stage 3 and 4
Gawler East
Preliminary Site Investigation

For

Arcadian Property

- Drilling Location (to natural)
- Test pit location (to 2 mBGL)
- Stockpile and surface sampling location
- Surface sample location
- Stockpile sampling location

SCALE

0 20 40 m

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LBW co Details			
Job No.	191076		
Drawn	TH	**Rev.**	0
Checked	MP	**Date**	27.03.2019

Figure 7

APEIs 2, 5

Springwood Stage 3 and 4
Gawler East
Preliminary Site Investigation

For

Arcadian Property

- Drilling Location (to natural)
- Test pit location (to 2 mBGL)
- Stockpile and surface sampling location
- Surface sample location
- Stockpile sampling location

SCALE

0 20 40 m

lbw co
DELIVERING ENVIRONMENTAL SOLUTIONS

LBW co Details			
Job No.	191076		
Drawn	TH	**Rev.**	0
Checked	MP	**Date**	27.03.2019

Figure 8

APEIs 7, 8, 9, 12

Springwood Stage 3 and 4
Gawler East
Preliminary Site Investigation

For

Arcadian Property

- Drilling Location (to natural)
- Test pit location (to 2 mBGL)
- Stockpile and surface sampling location
- Surface sample location
- Stockpile sampling location

SCALE

0 10 20 m

DELIVERING ENVIRONMENTAL SOLUTIONS

LBW co Details			
Job No.	191076		
Drawn	TH	**Rev.**	0
Checked	MP	**Date**	27.03.2019

Figure 9

APEI 10, 11, 12

Springwood Stage 3 and 4
Gawler East
Preliminary Site Investigation

For

Arcadian Property

- Drilling Location (to natural)
- Test pit location (to 2 mBGL)
- Stockpile and surface sampling location
- Surface sample location
- Stockpile sampling location

SCALE

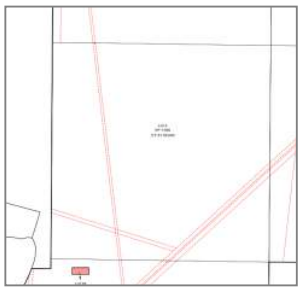
0 20 40 m

lbw co
DELIVERING ENVIRONMENTAL SOLUTIONS

LBW co Details			
Job No.	191076		
Drawn	TH	**Rev.**	0
Checked	MP	**Date**	27.03.2019

Appendix B

Certificate of Title Summary



Land Ownership History

Arcadian Springwood ESA

191076

CT Volume 6118 Folio 249

CT 6118/249

Allotment 2 Filed Plan 7765 in the area named Gawler East Hundred of Barossa

16.03.2016 New Title to Robert Lionel Ames

Current CT

CT 6110/238

Allotment 2 Filed Plan 7765 in the area named Gawler East Hundred of Barossa

02.05.2013 New Title to Robert Lionel Ames

Cancelled to CT 6118/249

CT 5912/654

Allotment 2 Filed Plan 7765 in the area named Gawler East Hundred of Barossa

03.03.2004 New Title to Robert Lionel Ames

Cancelled to CT 6110/238

CT 5893/963

Allotment 2 Filed Plan 7765 in the area named Gawler East Hundred of Barossa

30.04.2003 New title to Mahala Margaret Ames

Cancelled to CT 5912/654

CT 5893/962

Portion of Allotment 2 Filed Plan 7765 in the area named Gawler East and Portion of Allotment 1 Filed Plan 13468 in the area named Kalbeeba Hundreds of Barossa and Munno Para

30.04.2003 New title to South East Australia Gas Pty Ltd

Cancelled to CT 5912/654

CT 5214/198

Allotment 2 Filed Plan 7765 in the area named Gawler East Hundred of Barossa

12.09.1994 New title to Mahala Margaret Ames

Cancelled to CT 5893/962 and 5893/963

CT 5214/199

Allotment 1 Filed Plan 13468 in the area named Kalbeeba Hundreds of Barossa and Munno Para

12.09.1994 New title to Mahala Margaret Ames

Cancelled to CT 5893/962

CT 4152/306

Allotment 2 Filed Plan 7765 in the area named Gawler East Hundred of Barossa

05.12.1979 New title to Opticians (S.A.) Proprietary Limited

Cancelled to CT 5214/198

CT 4187/126

Allotment 1 Filed Plan 13468 in the area named Kalbeeba Hundreds of Barossa and Munno Para

25.01.1982 New title to Opticians (S.A.) Proprietary Limited

Cancelled to CT 5214/199

CT 2321/81

Section 3082 Filed Plan 7765 in the Hundred of Barossa County of Adelaide

30.04.1954 New title to Francis Augustine Taylor

27.07.1979 **Transfer to Readymix Group Limited**

Cancelled to CT 4152/306

CT 3713/123

Section 480, Portion of Section 479 Filed Plan 13468 in the Hundred of Barossa County of Adelaide

28.07.1970 New title to Eldred Henry Verco Riggs

Cancelled to CT 4187/126

Continued over page

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CT 1998/149

Section 3082 in the Hundred of Barossa County of Adelaide

21.10.1948 New title to Francis Augustine Taylor

Cancelled to CT 2321/81

CT 2371/1

Section 480 Portion of Section 479 Hundred of Barossa County of Adelaide

07.02.1955 New title to Eldred Henry Verco Riggs

Cancelled to CT 3713/123

CT 1799/155

Section 3082 and 3083 Hundred of Barossa County of Adelaide

27.07.1942 New title to Francis Augustine Taylor

Cancelled to CT 1998/149

CT 1945/7

Section 480 and Portion of Section 479 Hundred of Barossa County of Adelaide

08.07.1947 New title to Albert Henry Riggs

Cancelled to CT 2371/1

CT 1591/63

Section 3082 and 3083 Hundred of Barossa County of Adelaide

26.05.1931 New title to Francis Augustine Taylor

Cancelled to CT 1799/155

CT 793/124

Section 480 and Portion 479 Hundred of Barossa County of Adelaide

29.10.1908 New title to Henry John Riggs

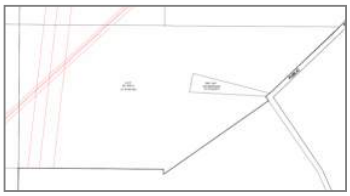
Cancelled to CT 1945/7

CT 1366/46

Sections 3082 and 3083 in the Hundred of Barossa County of Adelaide

20.03.1925 New title to Francis Augustine Taylor

Cancelled to CT 1591/63



Land Ownership History

Arcadian Springwood ESA

191076

CT Volume 6162 Folio 334

DELIVERING ENVIRONMENTAL SOLUTIONS

CT 6162/334

Allotment 4 Deposited Plan 28814 in the area named Gawler East Hundred of Barossa

02.09.2015 New Title to Leanne H Bruggemann (1/24), Heather D Ames (21/24), Brenton Ames (21/24) & Kareena Priestley (1/24)

Current CT

CT 6118/243

Allotment 4 Deposited Plan 28814 in the area named Gawler East Hundred of Barossa

09.09.2013 New Title to Leanne H Bruggemann (1/24), Heather D Ames (21/24), Brenton Ames (21/24) & Kareena Priestley (1/24)

Cancelled to CT 6162/334

CT 5921/798

Allotment 4 Deposited Plan 28814 in the area named Gawler East Hundred of Barossa

10.08.2004 New Title to Leanne H Bruggemann (1/24), Heather D Ames (21/24), Brenton Ames (21/24) & Kareena Priestley (1/24)

Cancelled to CT 6118/243

CT 5903/358

Allotment 4 Deposited Plan 28814 in the area named Gawler East Hundred of Barossa

30.09.2003 New Title to Leanne H Bruggemann (1/24), Heather D Ames (21/24), Brenton Ames (21/24) & Kareena Priestley (1/24)

Cancelled to CT 5921/798

CT 5254/893

Allotment 4 Deposited Plan 28814 in the area named Gawler East Hundred of Barossa

15.03.1995 New Title to Leanne H Bruggemann (1/24), Heather D Ames (21/24), Brenton Ames (21/24) & Kareena Priestley (1/24)

Cancelled to CT 5903/358

CT 4362/512

Allotment 4 Deposited Plan 28814 in the area named Gawler East Hundred of Barossa

11.07.1990 New Title to Heather Dawn Ames

Cancelled to CT 5254/893

CT 4349/560

Sections 482, 483, 3081 & 3084 Hundred of Barossa County of Adelaide

08.12.1989 New Title to James Guley & Thelma Doreen Guley

Cancelled to CT 4362/512

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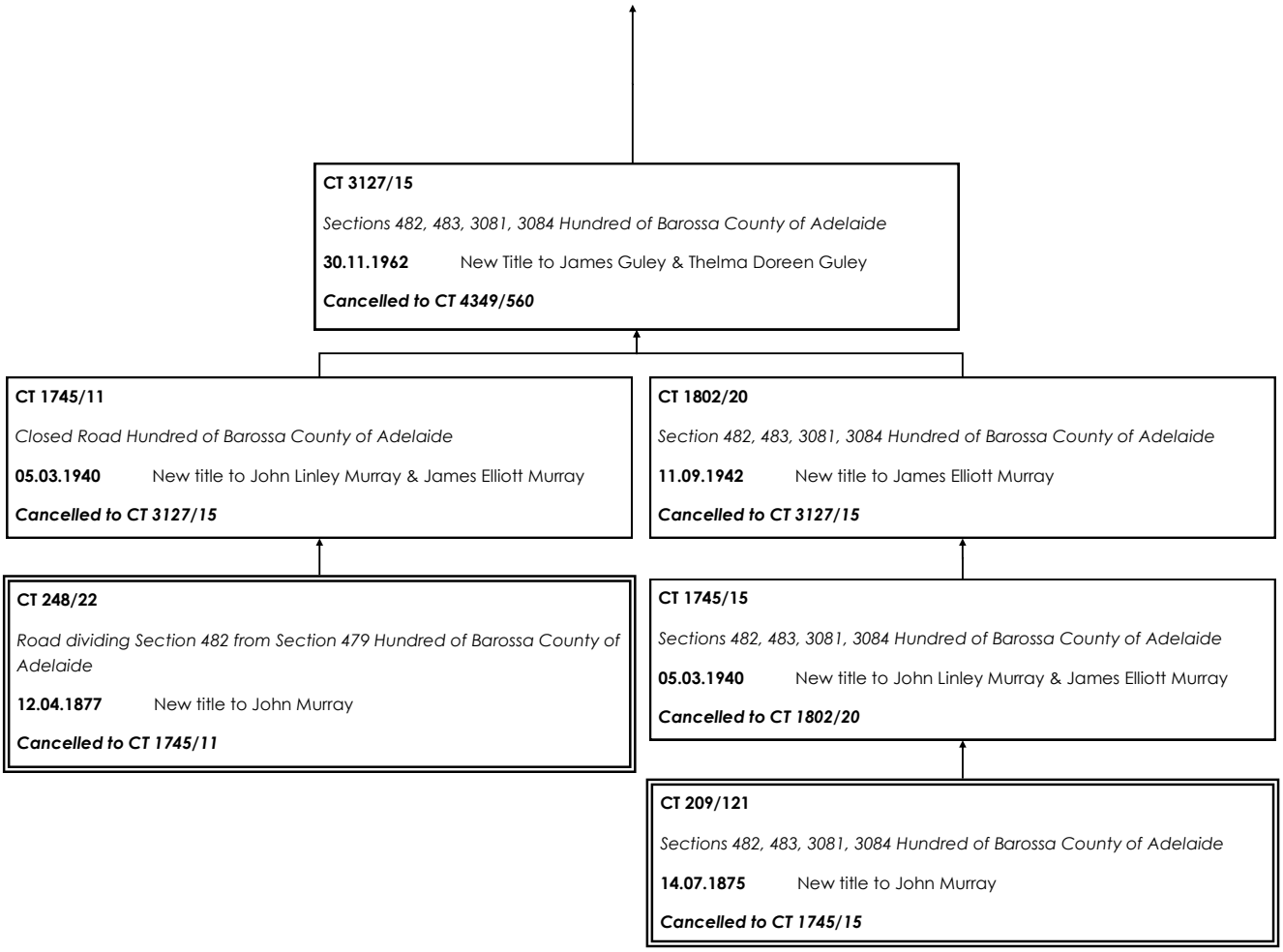
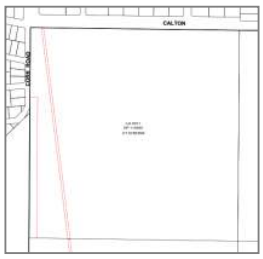




Land Ownership History

Arcadian Springwood ESA

191076

CT Volume 6186 Folio 896

CT 6186/896

Allotment 9011 Deposited Plan 114845 in the area named Gawler East, Hundred of Barossa

10.02.2017 New Title to Five Ames Farming Pty. Ltd.

Current CT

CT 5868/500

Allotment 1 Filed Plan 7765 in the area named Gawler East, Hundred of Barossa

12.03.2002 New Title to Five Ames Farming Pty. Ltd.

Cancelled to CT 6186/896

CT 5496/928

Allotment 1 Filed Plan 7765 in the area named Gawler East Hundred of Barossa

29.01.1998 New Title to CSR Ltd.

Cancelled to CT 5868/500

CT 4152/307

Allotment 1 Filed Plan 7765 in the area named Gawler East Hundred of Barossa

05.12.1979 New Title to Patricia Hellen Jewis

Cancelled to CT 5496/928

CT 2321/81

Section 3082 Filed Plan 7765 in the Hundred of Barossa County of Adelaide

30.04.1954 New Title to Francis Augustine Taylor
27.07.1979 **New Title to Readymix Group Limited**

Cancelled to CT 4152/307

CT 1998/149

Section 3082 in the Hundred of Barossa County of Adelaide

21.10.1948 New Title to Francis Augustine Taylor

Cancelled to CT 2321/81

CT 1799/155

Section 3082 & 3083 Hundred of Barossa County of Adelaide

21.10.1948 New Title to Francis Augustine Taylor

Cancelled to CT 1998/149

CT 1591/63

Section 3082 & 3083 Hundred of Barossa County of Adelaide

26.05.1931 New Title to Francis Augustine Taylor

Cancelled to CT 1799/155

CT 1366/46

Section 3082 & 3083 Hundred of Barossa County of Adelaide

20.03.1925 New Title to Francis Augustine Taylor

Cancelled to CT 1591/63

Land Ownership History

Arcadian Springwood ESA

191076

CT Volume 6212 Folio 430

CT 6212/430

Allotment 7030 Deposited Plan 119118
Area named Gawler East Hundred of Barossa

22.08.2018 New Title to Springwood Development Nominees Pty. Ltd.

Current CT

CT 6212/266

Allotment 7025 Deposited Plan 119115
Area named Gawler East Hundred of Barossa

20.08.2018 New Title to Springwood Development Nominees Pty. Ltd.

Cancelled to CT 6212/430

CT 6212/264

Allotment 7025 Deposited Plan 119115
Area named Gawler East Hundred of Barossa

20.08.2018 New Title to Springwood Development Nominees Pty. Ltd.

Cancelled to CT 6212/266

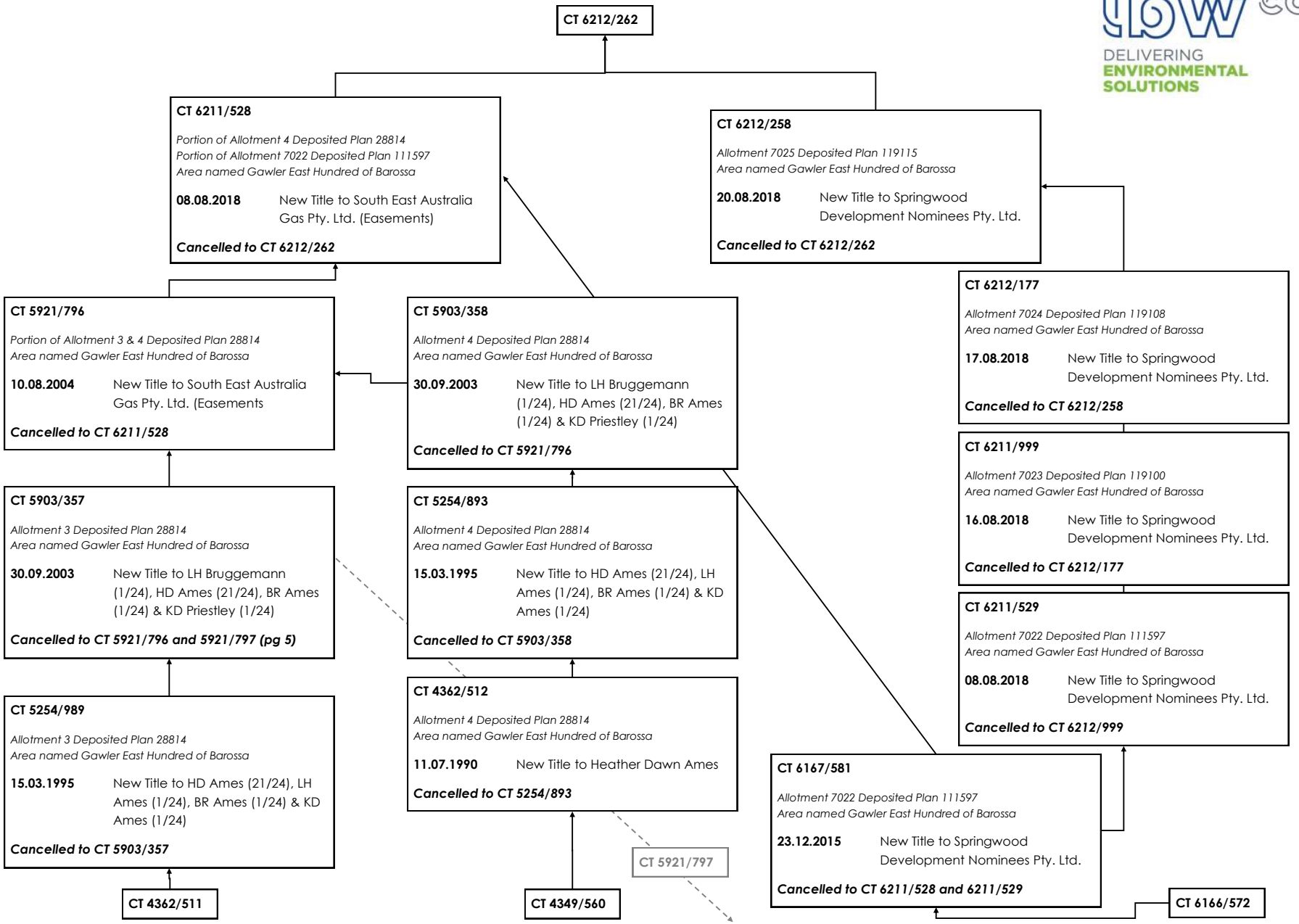
CT 6212/262

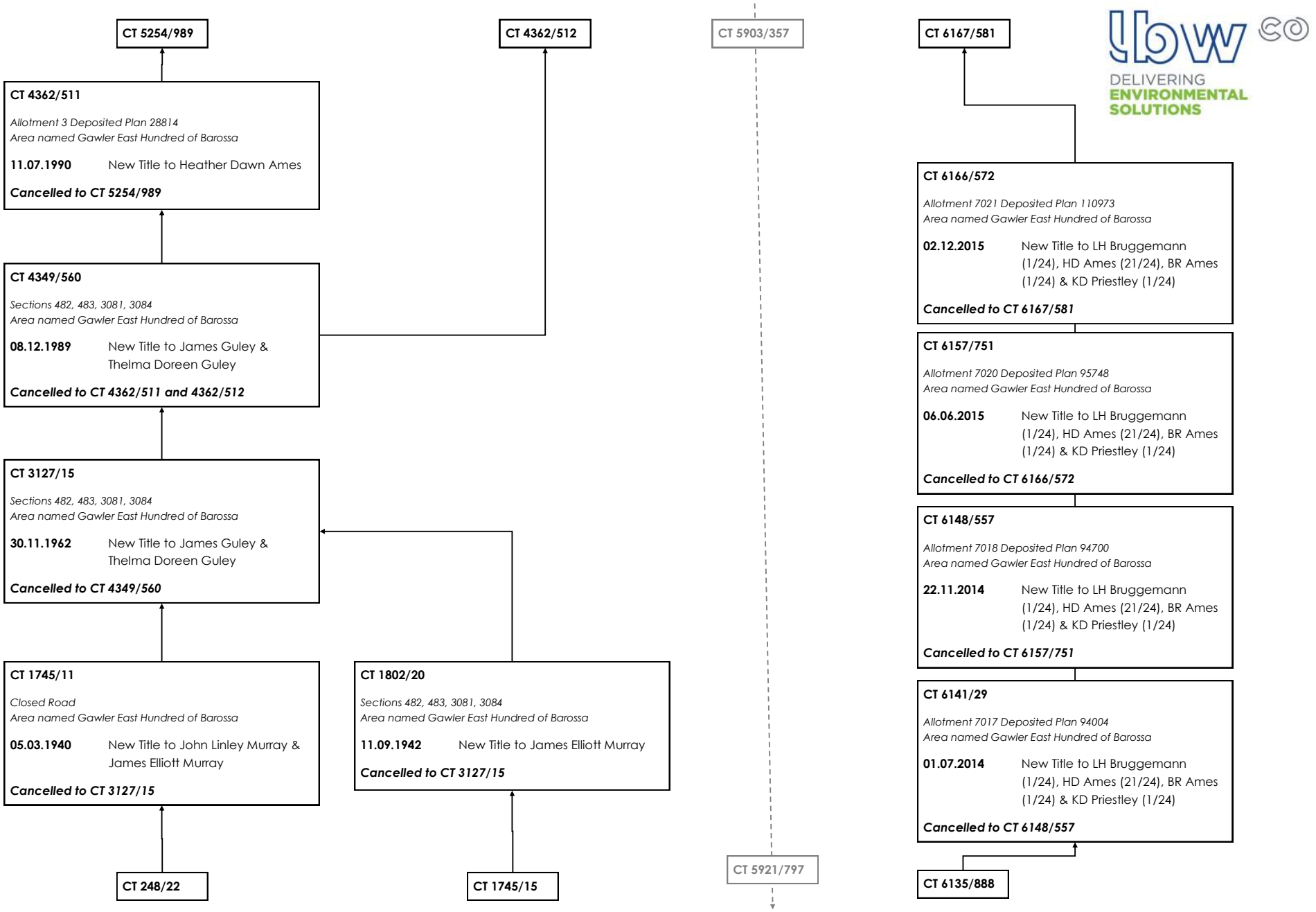
Allotment 7025 Deposited Plan 119115
Area named Gawler East Hundred of Barossa

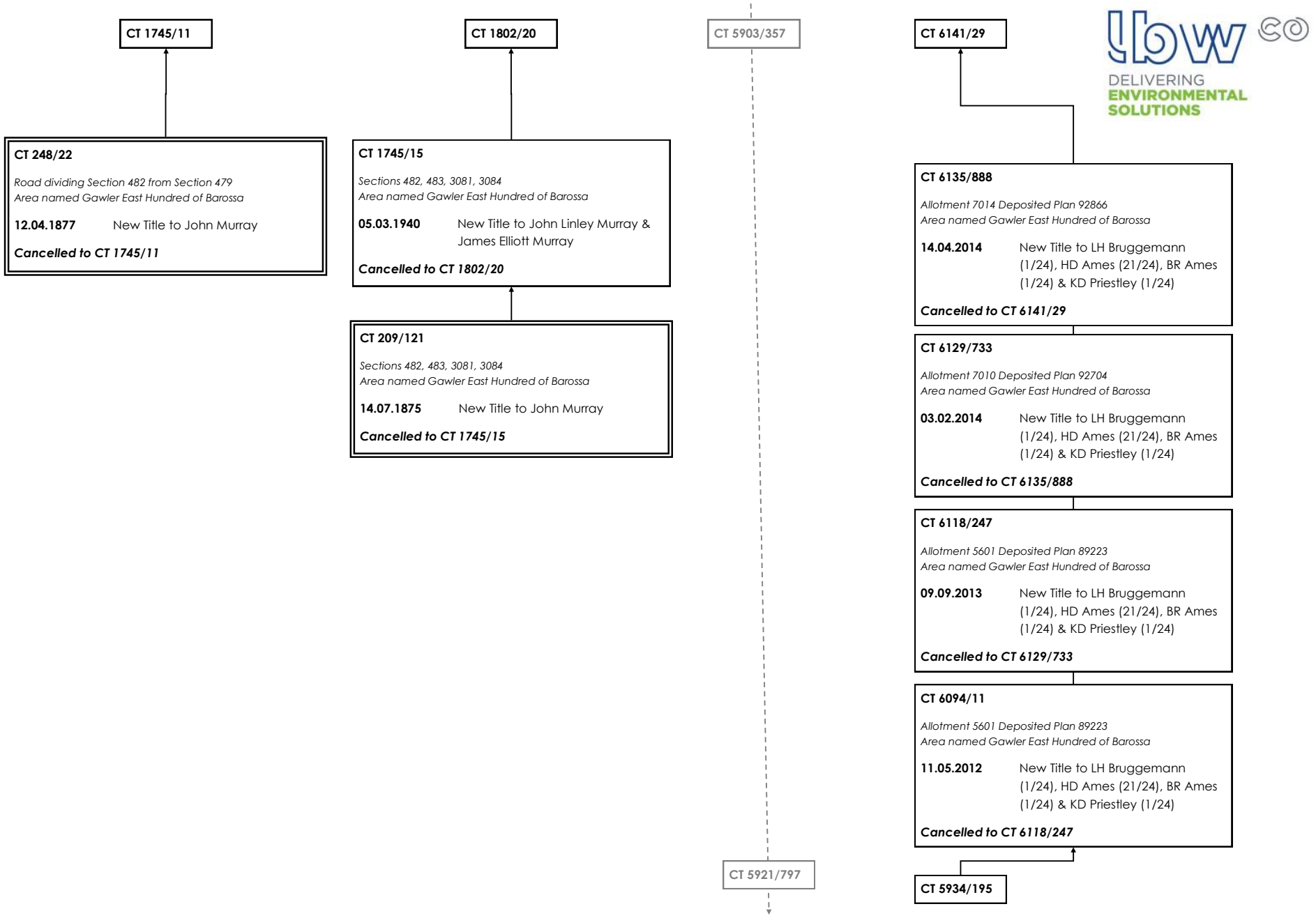
20.08.2018 New Title to Springwood Development Nominees Pty. Ltd.

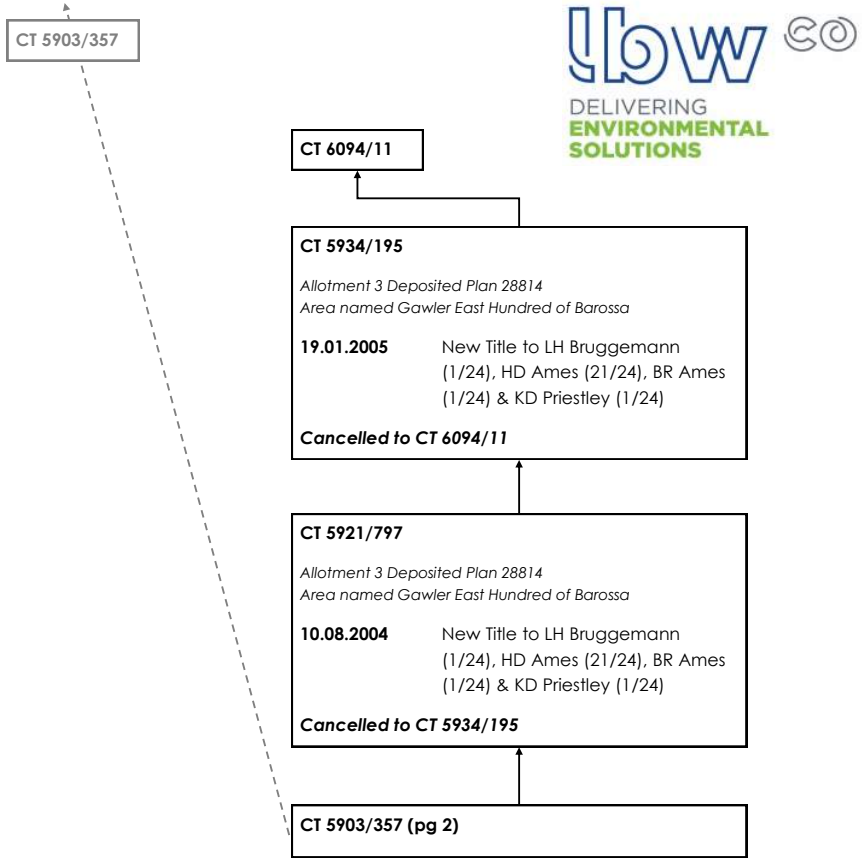
Cancelled to CT 6212/264

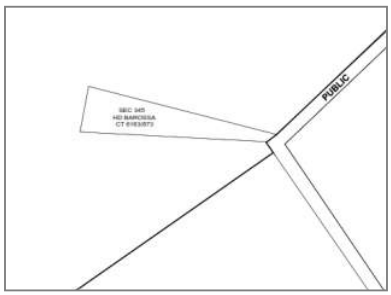
CT 6211/528 **CT 6212/258**


CT 6212/262
CT 6211/528
Portion of Allotment 4 Deposited Plan 28814
Portion of Allotment 7022 Deposited Plan 111597
Area named Gawler East Hundred of Barossa
08.08.2018 New Title to South East Australia Gas Pty. Ltd. (Easements)
Cancelled to CT 6212/262
CT 6212/258
Allotment 7025 Deposited Plan 119115
Area named Gawler East Hundred of Barossa
20.08.2018 New Title to Springwood Development Nominees Pty. Ltd.
Cancelled to CT 6212/262
CT 5921/796
Portion of Allotment 3 & 4 Deposited Plan 28814
Area named Gawler East Hundred of Barossa
10.08.2004 New Title to South East Australia Gas Pty. Ltd. (Easements
Cancelled to CT 6211/528
CT 5903/358
Allotment 4 Deposited Plan 28814
Area named Gawler East Hundred of Barossa
30.09.2003 New Title to LH Bruggemann (1/24), HD Ames (21/24), BR Ames (1/24) & KD Priestley (1/24)
Cancelled to CT 5921/796
CT 6212/177
Allotment 7024 Deposited Plan 119108
Area named Gawler East Hundred of Barossa
17.08.2018 New Title to Springwood Development Nominees Pty. Ltd.
Cancelled to CT 6212/258
CT 6211/999
Allotment 7023 Deposited Plan 119100
Area named Gawler East Hundred of Barossa
16.08.2018 New Title to Springwood Development Nominees Pty. Ltd.
Cancelled to CT 6212/177
CT 6211/529
Allotment 7022 Deposited Plan 111597
Area named Gawler East Hundred of Barossa
08.08.2018 New Title to Springwood Development Nominees Pty. Ltd.
Cancelled to CT 6212/999
CT 5903/357
Allotment 3 Deposited Plan 28814
Area named Gawler East Hundred of Barossa
30.09.2003 New Title to LH Bruggemann (1/24), HD Ames (21/24), BR Ames (1/24) & KD Priestley (1/24)
Cancelled to CT 5921/796 and 5921/797 (pg 5)
CT 5254/893
Allotment 4 Deposited Plan 28814
Area named Gawler East Hundred of Barossa
15.03.1995 New Title to HD Ames (21/24), LH Ames (1/24), BR Ames (1/24) & KD Ames (1/24)
Cancelled to CT 5903/358
CT 6167/581
Allotment 7022 Deposited Plan 111597
Area named Gawler East Hundred of Barossa
23.12.2015 New Title to Springwood Development Nominees Pty. Ltd.
Cancelled to CT 6211/528 and 6211/529
CT 5254/989
Allotment 3 Deposited Plan 28814
Area named Gawler East Hundred of Barossa
15.03.1995 New Title to HD Ames (21/24), LH Ames (1/24), BR Ames (1/24) & KD Ames (1/24)
Cancelled to CT 5903/357
CT 4362/512
Allotment 4 Deposited Plan 28814
Area named Gawler East Hundred of Barossa
11.07.1990 New Title to Heather Dawn Ames
Cancelled to CT 5254/893
CT 5921/797
CT 4362/511
CT 4349/560
CT 6166/572


CT 5254/989
CT 4362/512
CT 5903/357
CT 6167/581
CT 4362/511
Allotment 3 Deposited Plan 28814
Area named Gawler East Hundred of Barossa
11.07.1990 New Title to Heather Dawn Ames
Cancelled to CT 5254/989
CT 4349/560
Sections 482, 483, 3081, 3084
Area named Gawler East Hundred of Barossa
08.12.1989 New Title to James Guley & Thelma Doreen Guley
Cancelled to CT 4362/511 and 4362/512
CT 3127/15
Sections 482, 483, 3081, 3084
Area named Gawler East Hundred of Barossa
30.11.1962 New Title to James Guley & Thelma Doreen Guley
Cancelled to CT 4349/560
CT 1745/11
Closed Road
Area named Gawler East Hundred of Barossa
05.03.1940 New Title to John Linley Murray & James Elliott Murray
Cancelled to CT 3127/15
CT 1802/20
Sections 482, 483, 3081, 3084
Area named Gawler East Hundred of Barossa
11.09.1942 New Title to James Elliott Murray
Cancelled to CT 3127/15
CT 248/22
CT 1745/15
CT 5921/797
DELIVERING ENVIRONMENTAL SOLUTIONS
CT 6166/572
Allotment 7021 Deposited Plan 110973
Area named Gawler East Hundred of Barossa
02.12.2015 New Title to LH Bruggemann (1/24), HD Ames (21/24), BR Ames (1/24) & KD Priestley (1/24)
Cancelled to CT 6167/581
CT 6157/751
Allotment 7020 Deposited Plan 95748
Area named Gawler East Hundred of Barossa
06.06.2015 New Title to LH Bruggemann (1/24), HD Ames (21/24), BR Ames (1/24) & KD Priestley (1/24)
Cancelled to CT 6166/572
CT 6148/557
Allotment 7018 Deposited Plan 94700
Area named Gawler East Hundred of Barossa
22.11.2014 New Title to LH Bruggemann (1/24), HD Ames (21/24), BR Ames (1/24) & KD Priestley (1/24)
Cancelled to CT 6157/751
CT 6141/29
Allotment 7017 Deposited Plan 94004
Area named Gawler East Hundred of Barossa
01.07.2014 New Title to LH Bruggemann (1/24), HD Ames (21/24), BR Ames (1/24) & KD Priestley (1/24)
Cancelled to CT 6148/557
CT 6135/888


CT 1745/11
CT 1802/20
CT 5903/357
CT 6141/29
CT 248/22
Road dividing Section 482 from Section 479
Area named Gawler East Hundred of Barossa
12.04.1877 New Title to John Murray
Cancelled to CT 1745/11
CT 1745/15
Sections 482, 483, 3081, 3084
Area named Gawler East Hundred of Barossa
05.03.1940 New Title to John Linley Murray & James Elliott Murray
Cancelled to CT 1802/20
CT 209/121
Sections 482, 483, 3081, 3084
Area named Gawler East Hundred of Barossa
14.07.1875 New Title to John Murray
Cancelled to CT 1745/15
CT 6135/888
Allotment 7014 Deposited Plan 92866
Area named Gawler East Hundred of Barossa
14.04.2014 New Title to LH Bruggemann (1/24), HD Ames (21/24), BR Ames (1/24) & KD Priestley (1/24)
Cancelled to CT 6141/29
CT 6129/733
Allotment 7010 Deposited Plan 92704
Area named Gawler East Hundred of Barossa
03.02.2014 New Title to LH Bruggemann (1/24), HD Ames (21/24), BR Ames (1/24) & KD Priestley (1/24)
Cancelled to CT 6135/888
CT 6118/247
Allotment 5601 Deposited Plan 89223
Area named Gawler East Hundred of Barossa
09.09.2013 New Title to LH Bruggemann (1/24), HD Ames (21/24), BR Ames (1/24) & KD Priestley (1/24)
Cancelled to CT 6129/733
CT 6094/11
Allotment 5601 Deposited Plan 89223
Area named Gawler East Hundred of Barossa
11.05.2012 New Title to LH Bruggemann (1/24), HD Ames (21/24), BR Ames (1/24) & KD Priestley (1/24)
Cancelled to CT 6118/247
CT 5921/797
CT 5934/195
DELIVERING
ENVIRONMENTAL
SOLUTIONS


CT 5903/357
CT 6094/11
CT 5934/195
Allotment 3 Deposited Plan 28814
Area named Gawler East Hundred of Barossa
19.01.2005
New Title to LH Bruggemann (1/24), HD Ames (21/24), BR Ames (1/24) & KD Priestley (1/24)
Cancelled to CT 6094/11
CT 5921/797
Allotment 3 Deposited Plan 28814
Area named Gawler East Hundred of Barossa
10.08.2004
New Title to LH Bruggemann (1/24), HD Ames (21/24), BR Ames (1/24) & KD Priestley (1/24)
Cancelled to CT 5934/195
CT 5903/357 (pg 2)



Land Ownership History

Arcadian Springwood ESA

191076

CT Volume 6163 Folio 873

CT 6163/873

Section 345 Hundred of Barossa in the area named Gawler East

12.10.2015 New Title to Town of Gawler for a water reserve

Current CT

CT 5843/42

Section 345 Hundred of Barossa in the area named Gawler East

15.03.2001 New title to the Barossa Council for a water reserve

Cancelled to CT 6163/873

CT 250/121

Section 482, Hundred of Barossa County of Adelaide

16.05.1876 Land Grant to District Council of Barossa West for a water reserve

Cancelled to CT 5843/42

Land Ownership History

Arcadian Springwood ESA

191076

CT Volume 6205 Folio 146

DELIVERING ENVIRONMENTAL SOLUTIONS

CT 6205/146

Allotment 9010 Deposited Plan 114845 in the area named Gawler East Hundred of Barossa

26.03.2018 New Title to Five Ames Farming Pty. Ltd.

Current CT

CT 6186/895

Allotment 9010 Deposited Plan 114845 in the area named Gawler East Hundred of Barossa

10.02.2017 New Title to Five Ames Farming Pty. Ltd.

Cancelled to CT 6205/146

CT 6167/586

Allotment 9009 Deposited Plan 111597 in the area named Gawler East Hundred of Barossa

23.12.2015 New Title to Five Ames Farming Pty. Ltd.

Cancelled to CT 6186/895

CT 6162/440

Allotment 2 Deposited Plan 28814 in the area named Gawler East Hundred of Barossa

02.09.2015 New Title to Lend Lease Communities (Gawler) Pty. Ltd.

Cancelled to CT 6167/586

CT 5954/198

Allotment 2 Deposited Plan 28814 in the area named Gawler East Hundred of Adelaide

28.11.2005 New Title to Lend Lease Communities (Gawler) Pty. Ltd.

Cancelled to CT 6162/440

CT 5905/963

Allotment 2 Deposited Plan 28814 in the area named Gawler East Hundred of Adelaide

06.11.2003 **New Title to Readymix Holdings Pty. Ltd.**

Cancelled to CT 5954/198

CT 5866/534

Allotment 2 Deposited Plan 28814 in the area named Gawler East Hundred of Barossa

13.02.2002 **New Title to CSR Ltd.**

Cancelled to CT 5905/963

Continued on next page

Continued

CT 5400/345

Allotment 2 Deposited Plan 28814 in the area named Gawler East Hundred of Barossa

26.02.1997 **New Title to CSR Readymix Pty. Ltd.**

Cancelled to CT 5866/534

CT 4362/510

Allotment 2 Deposited Plan 28814 in the area named Gawler East Hundred of Barossa

11.07.1990 New Title to Heather Dawn Ames

29.06.1990 **Transfer to CSR Readymix Pty. Ltd.**

Cancelled to CT 5400/345

CT 4349/560

Sections 482, 483, 3081, 3084 Hundred of Barossa County of Adelaide

08.12.1989 New Title to James Guley & Thelma Doreen Guley

Cancelled to CT 4349/560

CT 3127/15

Sections 482, 483, 3081, 3084 Hundred of Barossa County of Adelaide

30.11.1962 New Title to James Guley & Thelma Doreen Guley

Cancelled to CT 4349/560

CT 1745/11

Closed Road Hundred of Barossa County of Adelaide

05.03.1940 New title to John Linley Murray & James Elliott Murray

Cancelled to CT 3127/15

CT 1802/20

Section 482, 483, 3081, 3084 Hundred of Barossa County of Adelaide

11.09.1942 New title to James Elliott Murray

Cancelled to CT 3127/15

CT 248/22

Road dividing Section 482 from Section 479 Hundred of Barossa County of Adelaide

12.04.1877 New title to John Murray

Cancelled to CT 1745/11

CT 1745/15

Sections 482, 483, 3081, 3084 Hundred of Barossa County of Adelaide

05.03.1940 New title to John Linley Murray & James Elliott Murray

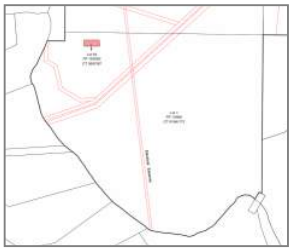
Cancelled to CT 1802/20

CT 209/121

Sections 482, 483, 3081, 3084 Hundred of Barossa County of Adelaide

14.07.1875 New title to John Murray

Cancelled to CT 1745/15



Land Ownership History

Arcadian Springwood ESA

191076

CT Volume 6184 Folio 173

DELIVERING ENVIRONMENTAL SOLUTIONS

CT 6184/173

Allotment 1 Filed Plan 13468 in the area named Kalbeeba Hundreds of Barossa and Munno Para

30.11.2016 New Title to Robert Lionel Ames

Current CT

CT 6118/242

Allotment 1 Filed Plan 13468 in the area named Kalbeeba Hundreds of Barossa and Munno Para

09.09.2013 New Title to Robert Lionel Ames

Cancelled to CT 6184/173

CT 5912/655

Allotment 1 Filed Plan 13468 in the area named Kalbeeba Hundreds of Barossa and Munno Para

03.03.2004 New Title to Robert Lionel Ames

Cancelled to CT 6118/242

CT 5893/962

Portion of Allotment 2 Filed Plan 7765 in the area named Gawler East and Portion of Allotment 1 Filed Plan 13486 in the area named Kalbeeba Hundreds of Barossa and Munno Para

30.04.2003 New title to South East Australia Gas Pty. Ltd.

Cancelled to CT 5912/655

CT 5893/964

Allotment 1 Filed Plan 13468 in the area named Kalbeeba Hundreds of Barossa and Munno Para

30.04.2003 New title to Mahala Margaret Ames

Cancelled to CT 5912/655

CT 5214/198

Allotment 2 Filed Plan 7765 in the area named Gawler East Hundred of Barossa

12.09.1994 New title to Mahala Margaret Ames

Cancelled to CT 5893/962

CT 5214/199

Allotment 1 Filed Plan 13468 in the area named Kalbeeba Hundreds of Barossa and Munno Para

12.09.1994 New title to Mahala Margaret Ames

Cancelled to CT 5893/964

CT 4152/306

Allotment 2 Filed Plan 7765 in the area named Gawler East Hundred of Barossa

05.12.1979 New title to Opticians (S.A.) Proprietary Limited

Cancelled to CT 5214/198

CT 4187/126

Allotment 1 Filed Plan 13468 in the area named Kalbeeba Hundreds of Barossa and Munno Para

25.01.1982 New title to Opticians (S.A.) Proprietary Limited

Cancelled to CT 5214/199

CT 2321/81

Section 3082 Filed Plan 7765 in the area named Gawler East Hundred of Barossa

30.04.1954 New title to Francis Augustine Taylor

27.07.1979 **Transfer to Readymix Group Limited**

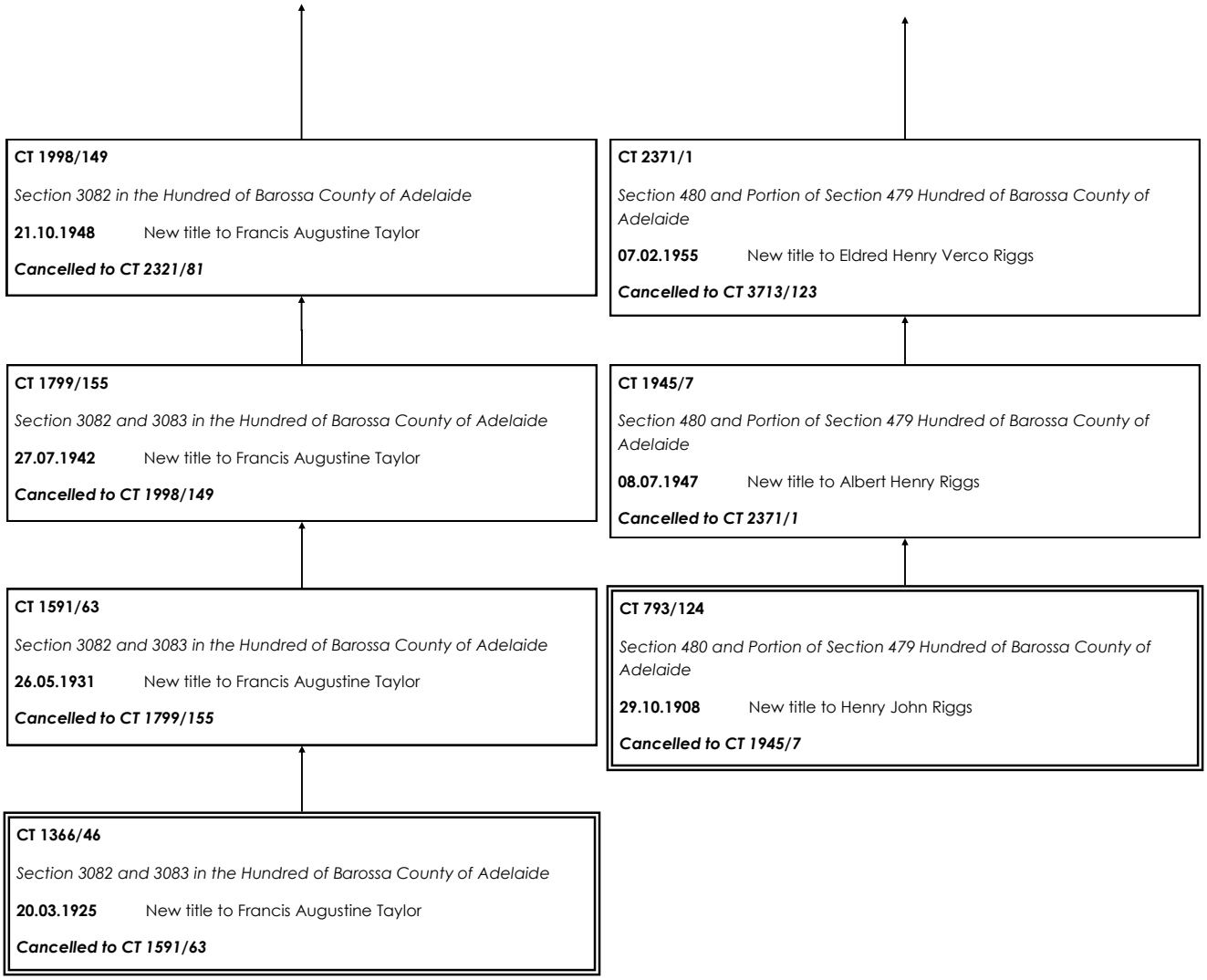
Cancelled to CT 4152/306

CT 3713/123

Section 480, Portion of Section 479 Filed Plan 13468 in the Hundred of Barossa County of Adelaide

28.07.1970 New title to Eldred Henry Verco Riggs

Cancelled to CT 4187/126


CT 1998/149
Section 3082 in the Hundred of Barossa County of Adelaide
21.10.1948 New title to Francis Augustine Taylor
Cancelled to CT 2321/81
CT 2371/1
Section 480 and Portion of Section 479 Hundred of Barossa County of Adelaide
07.02.1955 New title to Eldred Henry Verco Riggs
Cancelled to CT 3713/123
CT 1799/155
Section 3082 and 3083 in the Hundred of Barossa County of Adelaide
27.07.1942 New title to Francis Augustine Taylor
Cancelled to CT 1998/149
CT 1945/7
Section 480 and Portion of Section 479 Hundred of Barossa County of Adelaide
08.07.1947 New title to Albert Henry Riggs
Cancelled to CT 2371/1
CT 1591/63
Section 3082 and 3083 in the Hundred of Barossa County of Adelaide
26.05.1931 New title to Francis Augustine Taylor
Cancelled to CT 1799/155
CT 793/124
Section 480 and Portion of Section 479 Hundred of Barossa County of Adelaide
29.10.1908 New title to Henry John Riggs
Cancelled to CT 1945/7
CT 1366/46
Section 3082 and 3083 in the Hundred of Barossa County of Adelaide
20.03.1925 New title to Francis Augustine Taylor
Cancelled to CT 1591/63

Appendix C

Lotsearch Report

LOTSEARCH

LOTSEARCH ENVIRO PROFESSIONAL

Address: Stages 3 and 4, Springwood Development, Gawler East, SA 5118

Date: 04 Feb 2019 17:23:09

Reference: LS005006 EP

Table of Contents

Location Confidences

Where Lotsearch has had to georeference features from supplied addresses, a location confidence has been assigned to the data record. This indicates a confidence to the positional accuracy of the feature. Where applicable, a confidence is given under the field heading “LocConf” or “Location Confidence”.

Location Confidence	Description
Premise Match	Georeferenced to the site location / premise or part of site
Area Match	Georeferenced with the confidence of the general/approximate area
Road Match	Georeferenced to the road or rail
Road Intersection	Georeferenced to the road intersection
Buffered Point	Feature is a buffered point
Network of Features	Georeferenced to a network of features

Dataset Listing

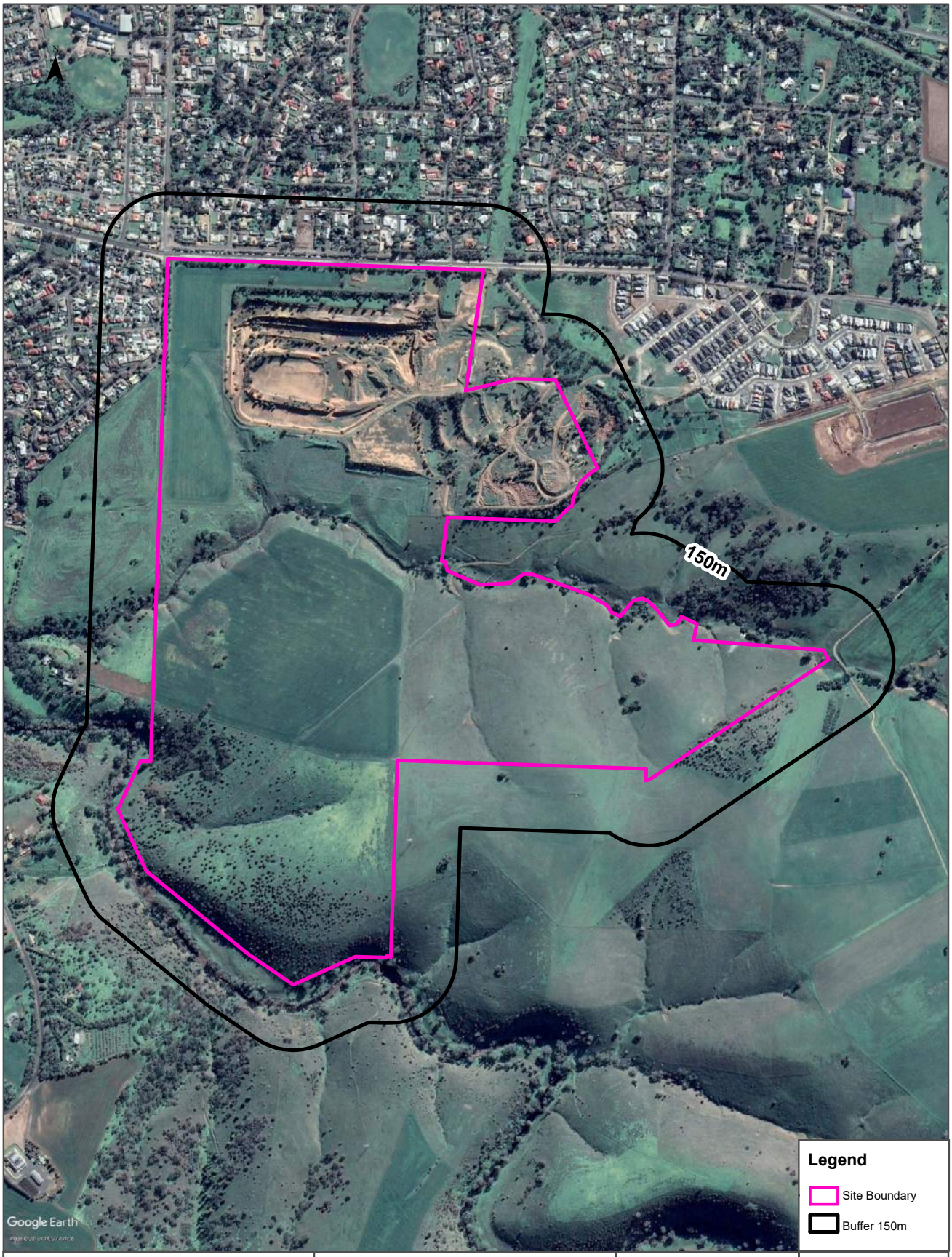
Datasets contained within this report, detailing their source and data currency:

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
EPA Site Contamination Index	EPA South Australia	10/01/2019	10/01/2019	Monthly	1000	3	3	3
EPA Environmental Protection Orders	EPA South Australia	06/02/2019	06/02/2019	Monthly	1000	0	0	0
EPA Environmental Authorisations	EPA South Australia	06/02/2019	06/02/2019	Monthly	1000	0	0	3
EPA Assessment Areas	EPA South Australia	10/01/2019	10/01/2019	Quarterly	1000	0	0	0
National Waste Management Facilities Database	Geoscience Australia	05/02/2019	07/03/2017	Quarterly	1000	0	0	0
EPA Collection Depots	EPA South Australia	05/02/2019	04/02/2019	Quarterly	1000	0	0	0
Mines and Mineral Deposits	Department for Energy and Mining	04/12/2018	04/12/2018	Quarterly	1000	1	1	2
Groundwater Aquifers	Department for Environment and Water	09/04/2018	01/01/2008	As required	1000	1	1	1
Drillholes	Department for Environment and Water	04/12/2018	21/11/2018	Quarterly	2000	41	67	224
Surface Geology 1:100,000	Department for Energy and Mining	12/07/2018	01/07/2018	As required	1000	3	3	6
Geological Linear Structures 1:100,000	Department for Energy and Mining	12/07/2018	01/07/2018	As required	1000	0	0	0
Atlas of Australian Soils	CSIRO	19/05/2017	17/02/2011	As required	1000	2	2	2
Soil Types	Department for Environment and Water	12/07/2018	01/07/2009	As required	1000	3	4	5
Atlas of Australian Acid Sulfate Soils	CSIRO	19/01/2017	21/02/2013	As required	1000	1	1	1
Acid Sulfate Soil Potential	Department for Environment and Water	09/04/2018	03/06/2016	As required	1000	2	2	2
Soil Salinity - Watertable Induced	Department for Environment and Water	12/07/2018	01/07/2009	As required	1000	2	2	2
Soil Salinity - Non-watertable	Department for Environment and Water	12/07/2018	01/07/2009	As required	1000	2	2	2
Soil Salinity - Non-watertable (magnesia patches)	Department for Environment and Water	12/07/2018	01/07/2009	As required	1000	2	2	2
Land Development Zones	Department of Planning, Transport and Infrastructure	04/12/2018	04/12/2018	Quarterly	1000	3	9	15
Land Use Generalised 2017	Department of Planning, Transport and Infrastructure	08/01/2018	10/10/2017	Annually	1000	2	9	15
Commonwealth Heritage List	Australian Government Department of the Environment and Energy - Heritage Branch	16/01/2019	31/07/2018	Unknown	1000	0	0	0
National Heritage List	Australian Government Department of the Environment and Energy - Heritage Branch	16/01/2019	28/09/2018	Unknown	1000	0	0	0
State Heritage Areas	Department for Environment and Water	12/07/2018	10/11/2004	As required	1000	0	0	0
SA Heritage Places	Department for Environment and Water	04/12/2018	23/10/2018	Quarterly	1000	0	0	24
Aboriginal Land	Department for Energy and Mining	09/04/2018	08/04/2018	As required	1000	0	0	0
Bushfire Protection Areas	Department of Planning, Transport and Infrastructure	04/09/2018	20/02/2018	As required	1000	4	4	4
Bushfires and Prescribed Burns History	Department for Environment and Water	04/09/2018	26/05/2018	As required	1000	0	1	2
Groundwater Dependent Ecosystems Atlas	Bureau of Meteorology	14/08/2017	15/05/2017	Unknown	1000	2	4	9

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Ramsar Wetland Areas	Department for Environment and Water	30/01/2017	30/01/2013	As required	1000	0	0	0

Aerial Imagery 2018

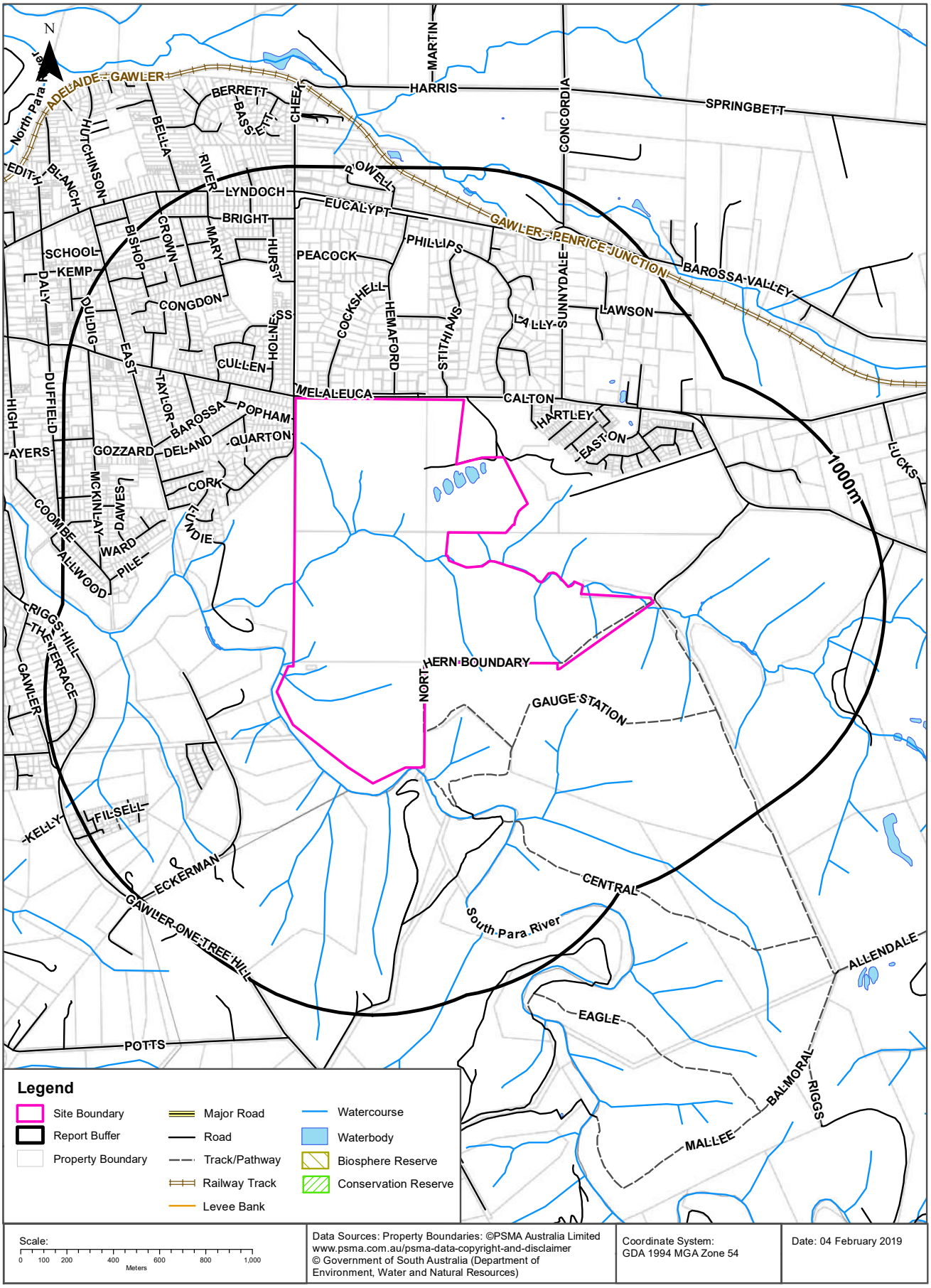
Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Scale: 0 150 300 600 Meters	Data Source Aerial Imagery: © 2018 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.	Coordinate System: GDA 1994 MGA Zone 54	Date: 05 February 2019

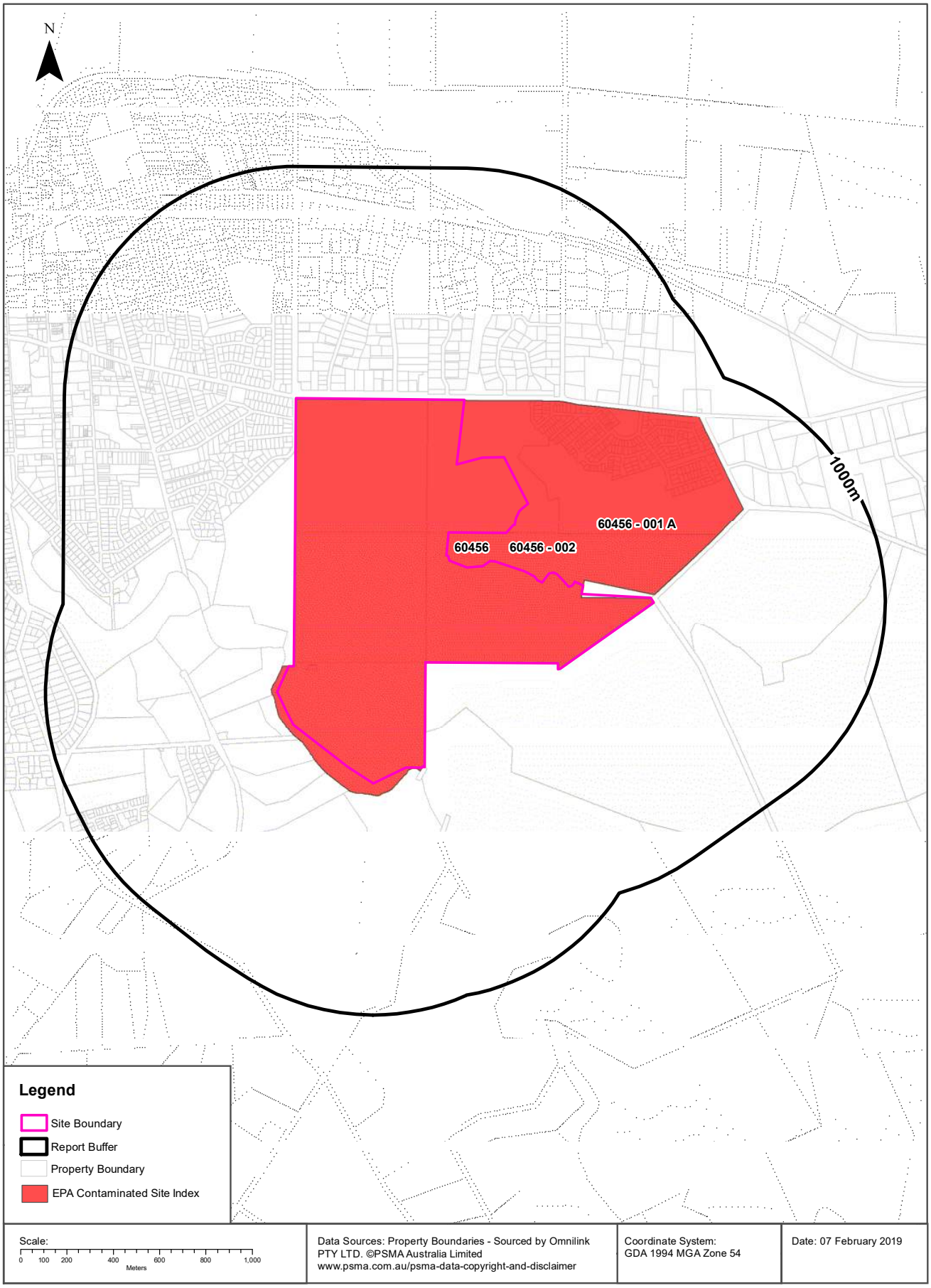
Topographic Features

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



EPA Site Contamination Index

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



EPA Contaminated Land

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

EPA Site Contamination Index

Sites on the EPA Contamination Index within the dataset buffer:

Notification No	Type	Address	Activity	Status	Location Confidence	Distance	Direction
60456	Audit Notification	1-4 Calton Road GAWLER EAST SA 5118	Listed Substances (storage)	Previous EPA List	Premise Match	0m	Onsite
60456 - 001 A	Audit Report	1-4 Calton Road GAWLER EAST SA 5118	Listed Substances (storage)	Previous EPA List	Premise Match	0m	Onsite
60456 - 002	Audit Report	1-4 Calton Road GAWLER EAST SA 5118	Listed Substances (storage)	Current EPA List	Premise Match	0m	Onsite

Site Contamination Index Data Source: EPA South Australia

EPA Public Register

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

EPA Environment Protection and Clean Up Orders

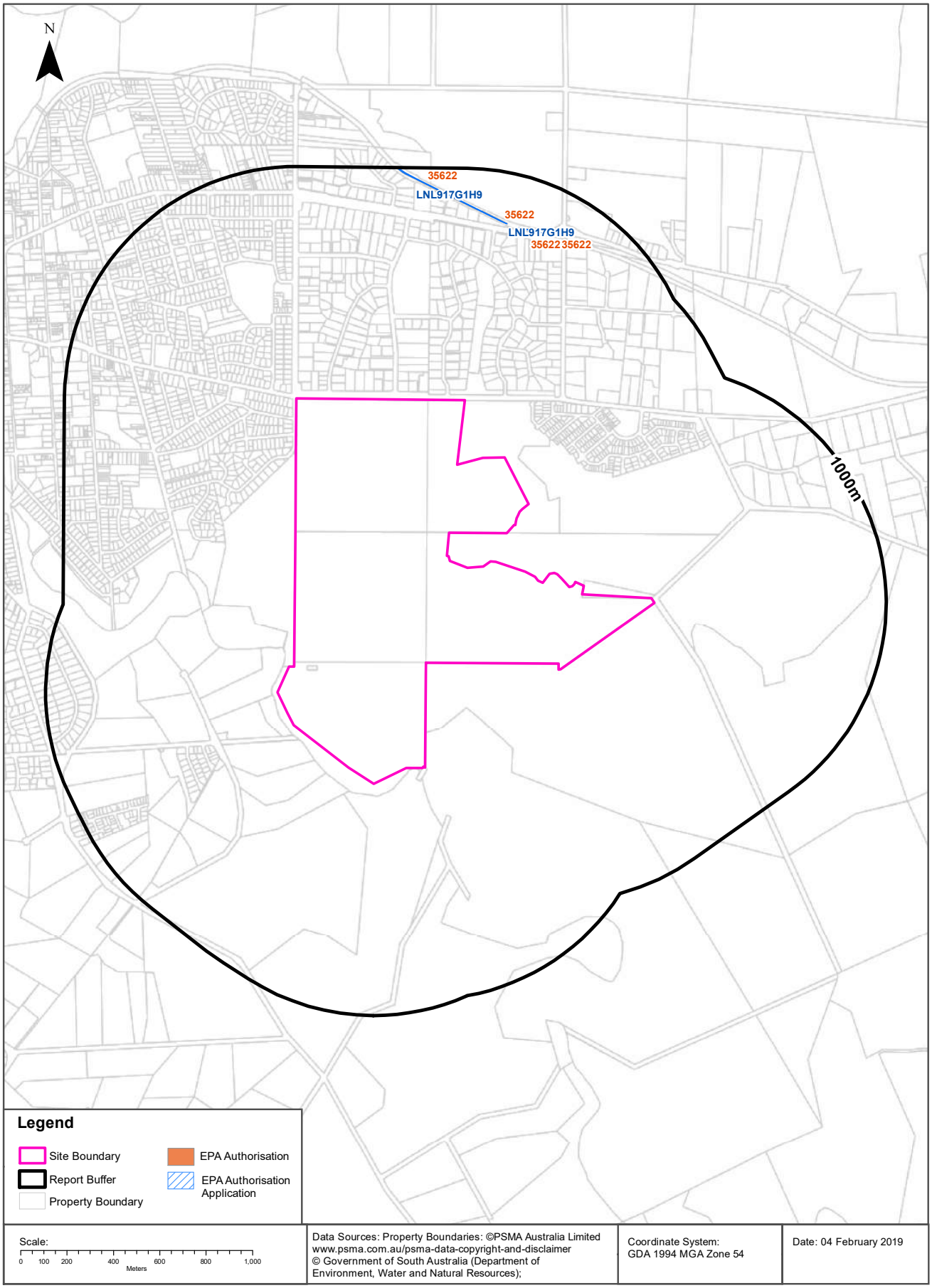
EPA Environment Protection and Clean Up Orders, within the dataset buffer:

Record No.	Record Type	Record Status	Entity	Site Address	Activity	EPA Register Status	Location Confidence	Distance	Direction
N/A	No records in buffer								

Authorisations Data Source: EPA South Australia

EPA Authorisations and Applications

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



EPA Public Register

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

EPA Authorisations and Applications

EPA Authorisations and Authorisation Applications within the dataset buffer:

Record No.	Record Type	Record Status	Entity	Site Address	Activity	EPA Register Status	Location Confidence	Distance	Direction
LNL917G1H9	LICENCE APPLICATION	Authorisation Updated	BOWMANS RAIL PTY LTD	Various Locations across Inner and Outer Harbour of the Port of Adelaide	Railway operations	Current EPA Register	Network of Features	778m	South West
35622	LICENCE	Issued	LAING O'ROURKE AUSTRALIA CONSTRUCTION PTY LTD	Various Locations Along The Adelaide Metropolitan Rail Network, SA	Railway operations	Current EPA Register	Network of Features	778m	South West
35622	LICENCE	Issued	LAING O'ROURKE AUSTRALIA CONSTRUCTION PTY LTD	Various Locations Throughout South Australia, SA	Waste transport business (category B)	Current EPA Register	Network of Features	778m	South West

Authorisations Data Source: EPA South Australia

EPA Assessment Areas

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

EPA Assessment Areas

EPA Assessment Areas within the dataset buffer:

Map Id	Supplied Ref	Area Name	Map Link	Status	Location Confidence	Distance	Direction
N/A	No records in buffer						

Assessment Areas Data Source: EPA South Australia

Waste Management Facilities

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

National Waste Management Site Database

Sites on the National Waste Management Site Database within the dataset buffer:

Site Id	Owner	Name	Address	Suburb	Class	Revised Date	Location Confidence	Distance	Direction
N/A	No records in buffer								

Waste Management Facilities Data Source: Australian Government Geoscience Australia

EPA Approved Container Collection Depots

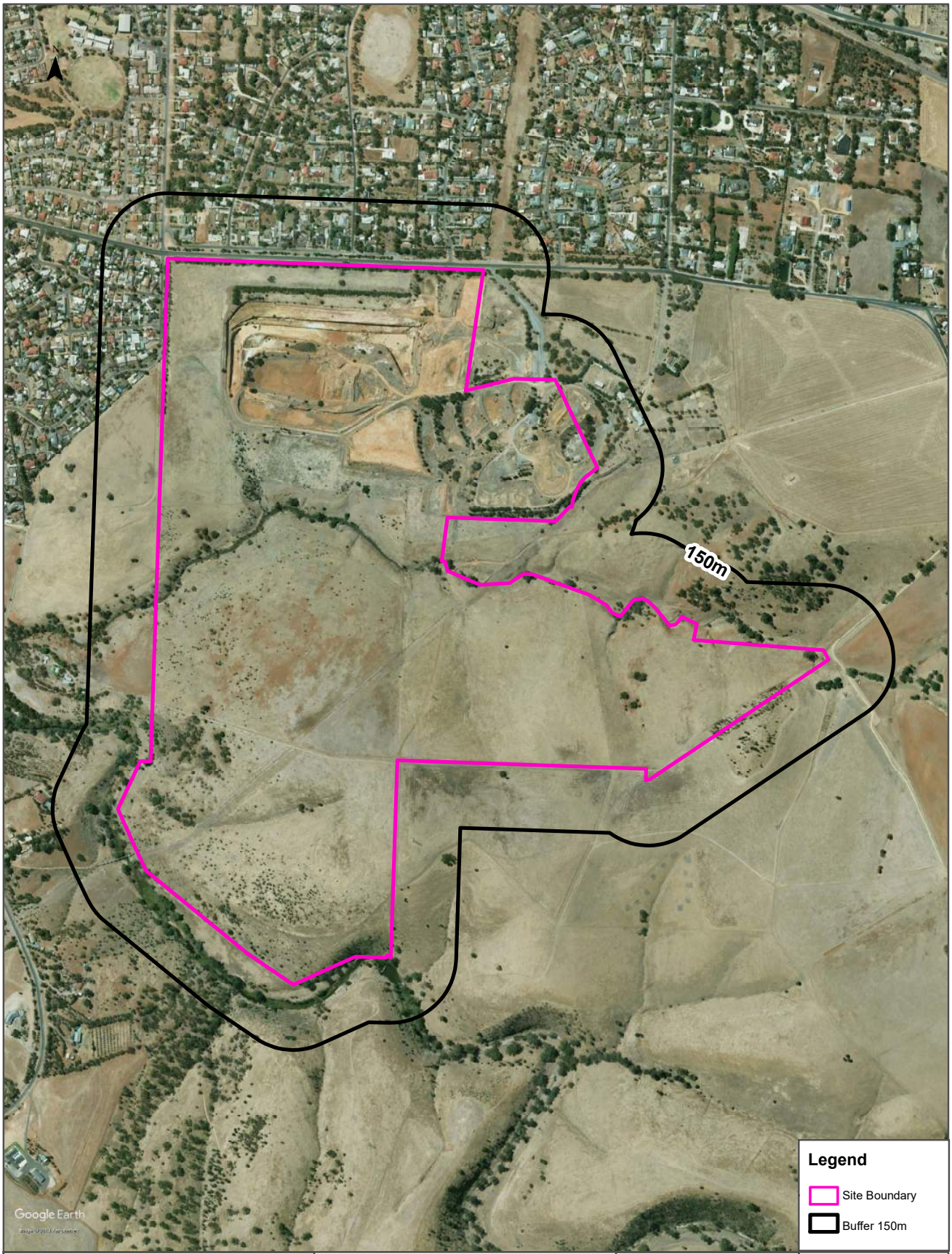
EPA approved container collection depots within the dataset buffer:

MapId	Name	Address	Suburb	Loc Conf	Distance	Direction
N/A	No records in buffer					

Collection Depot Data Source: EPA South Australia

Aerial Imagery 2010

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Scale:	Data Source Aerial Imagery: © 2018 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.	Coordinate System: GDA 1994 MGA Zone 54	Date: 05 February 2019

0 150 300 600
Meters

Aerial Imagery 2005

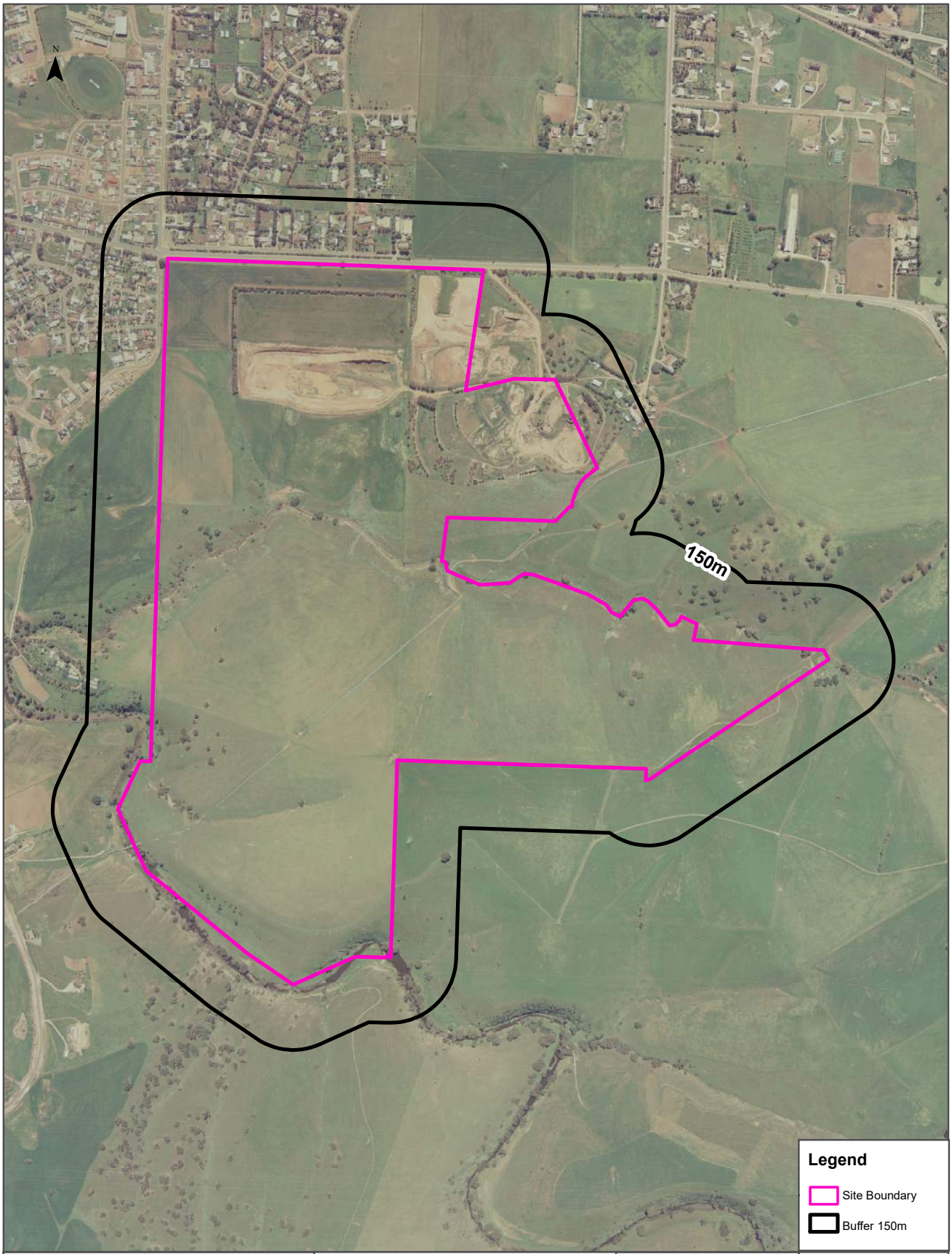
Stages 3 and 4, Springwood Development, Gawler East, SA 5118

Aerial Imagery 1999

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

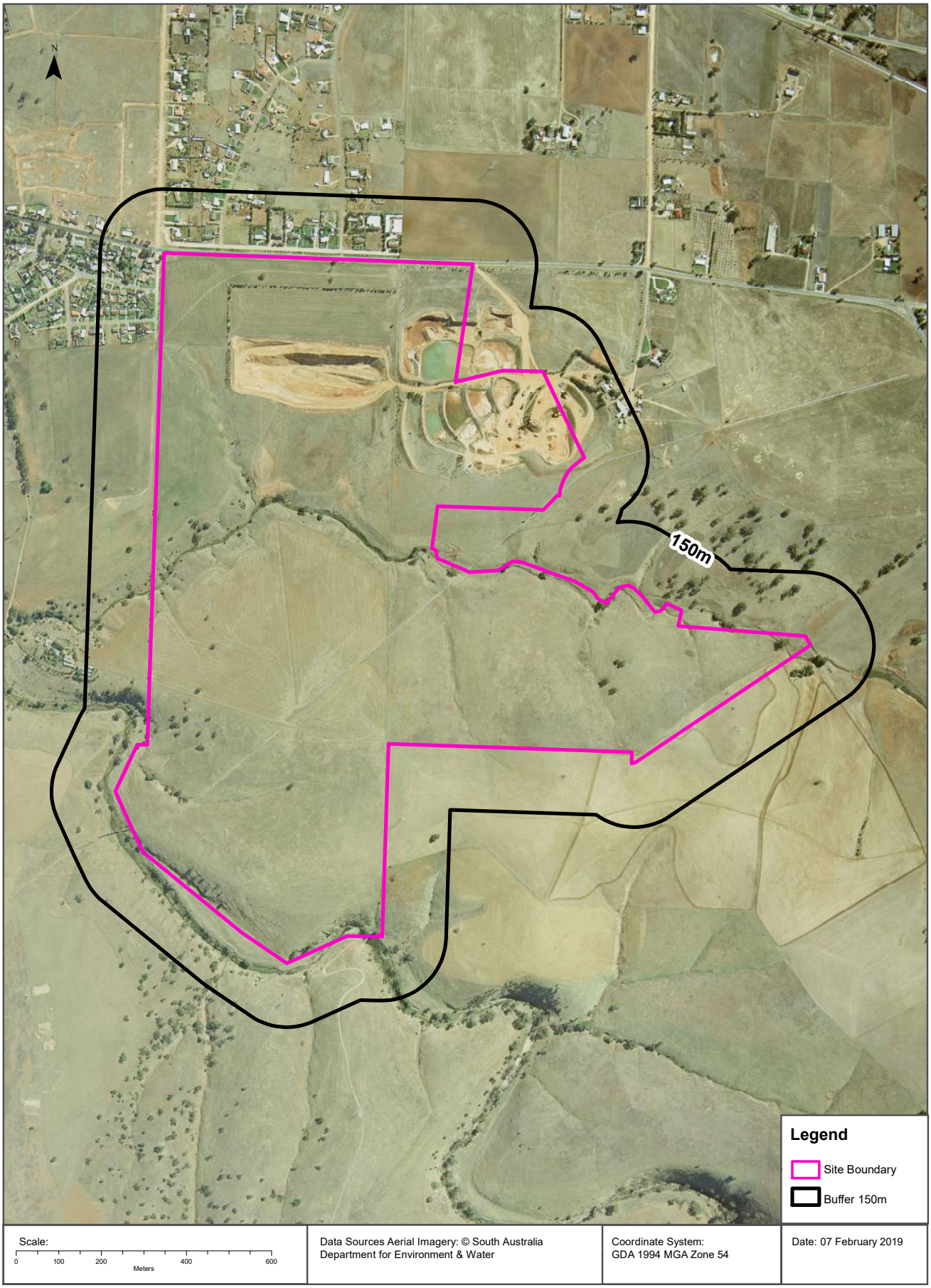
Aerial Imagery 1989

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



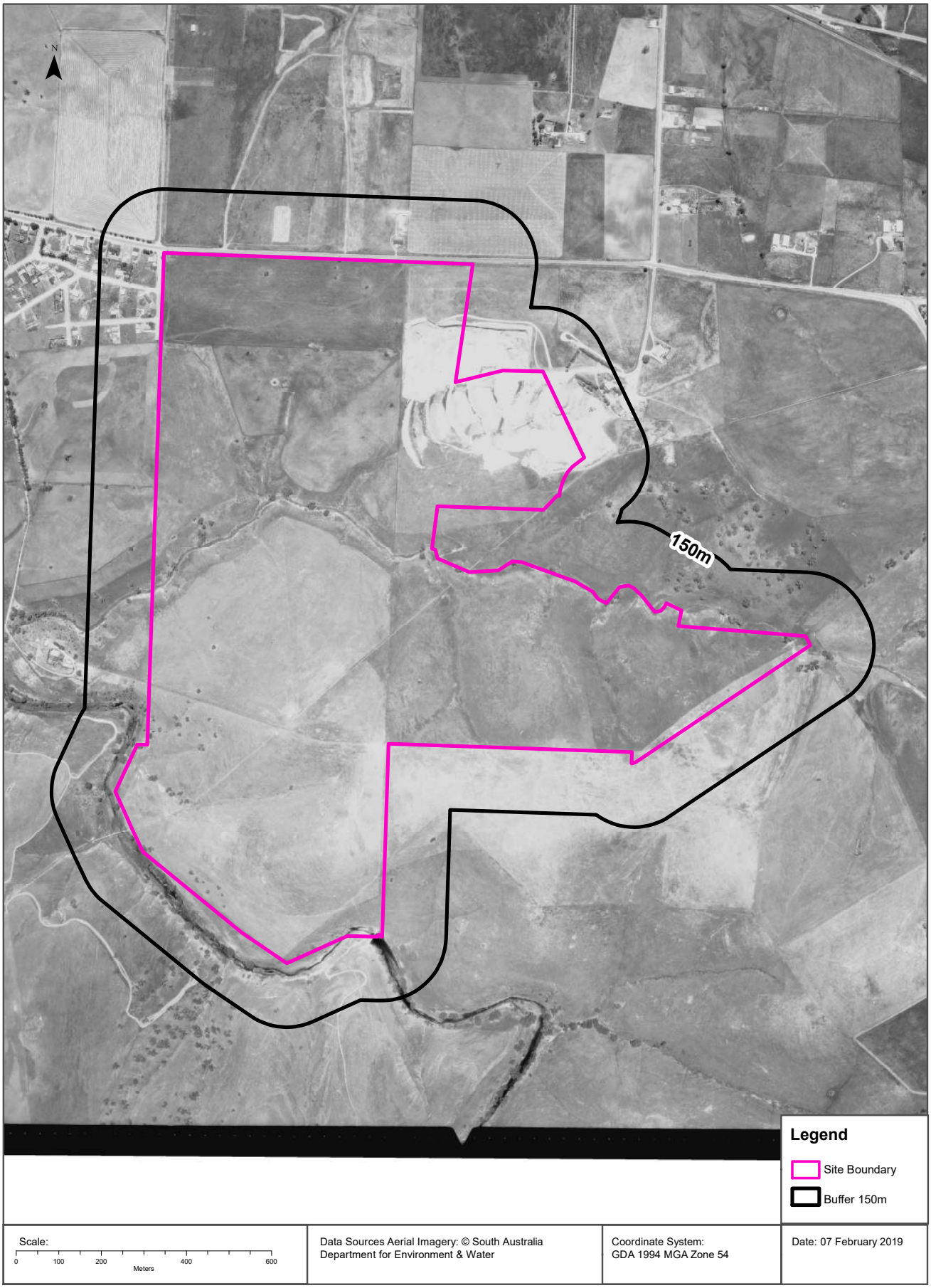
Aerial Imagery 1979

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



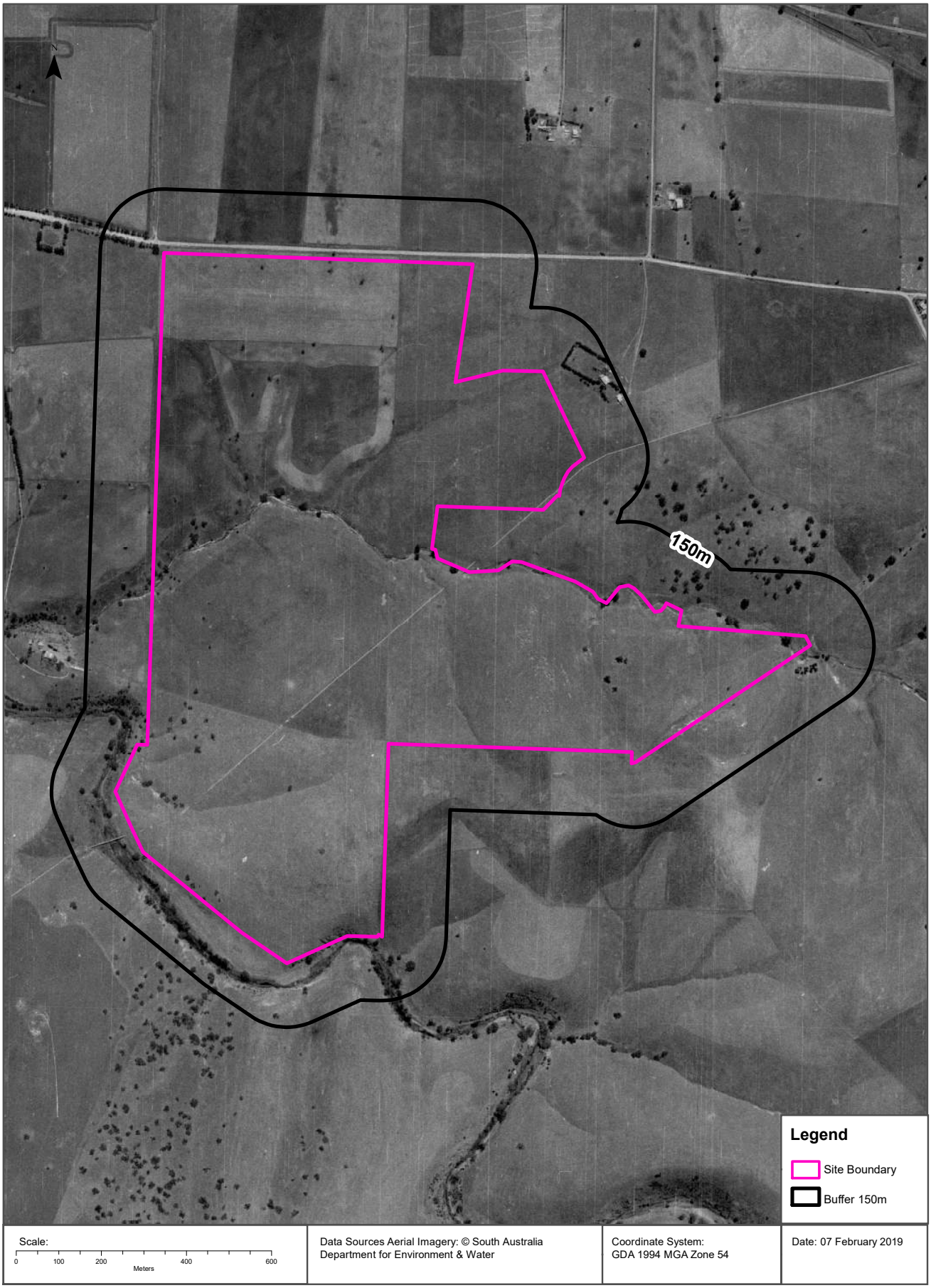
Aerial Imagery 1968

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Aerial Imagery 1954

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

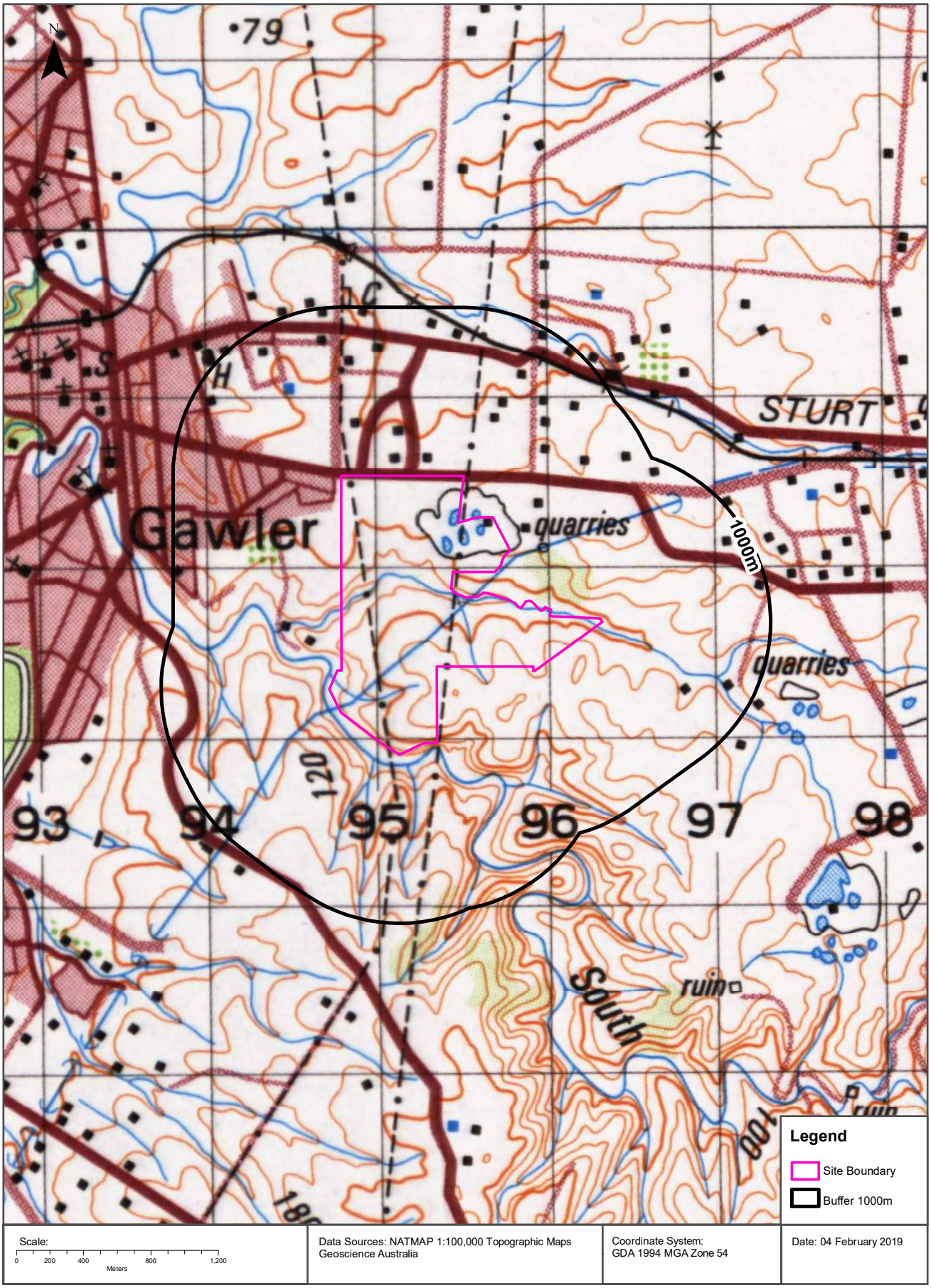


Aerial Imagery 1949

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

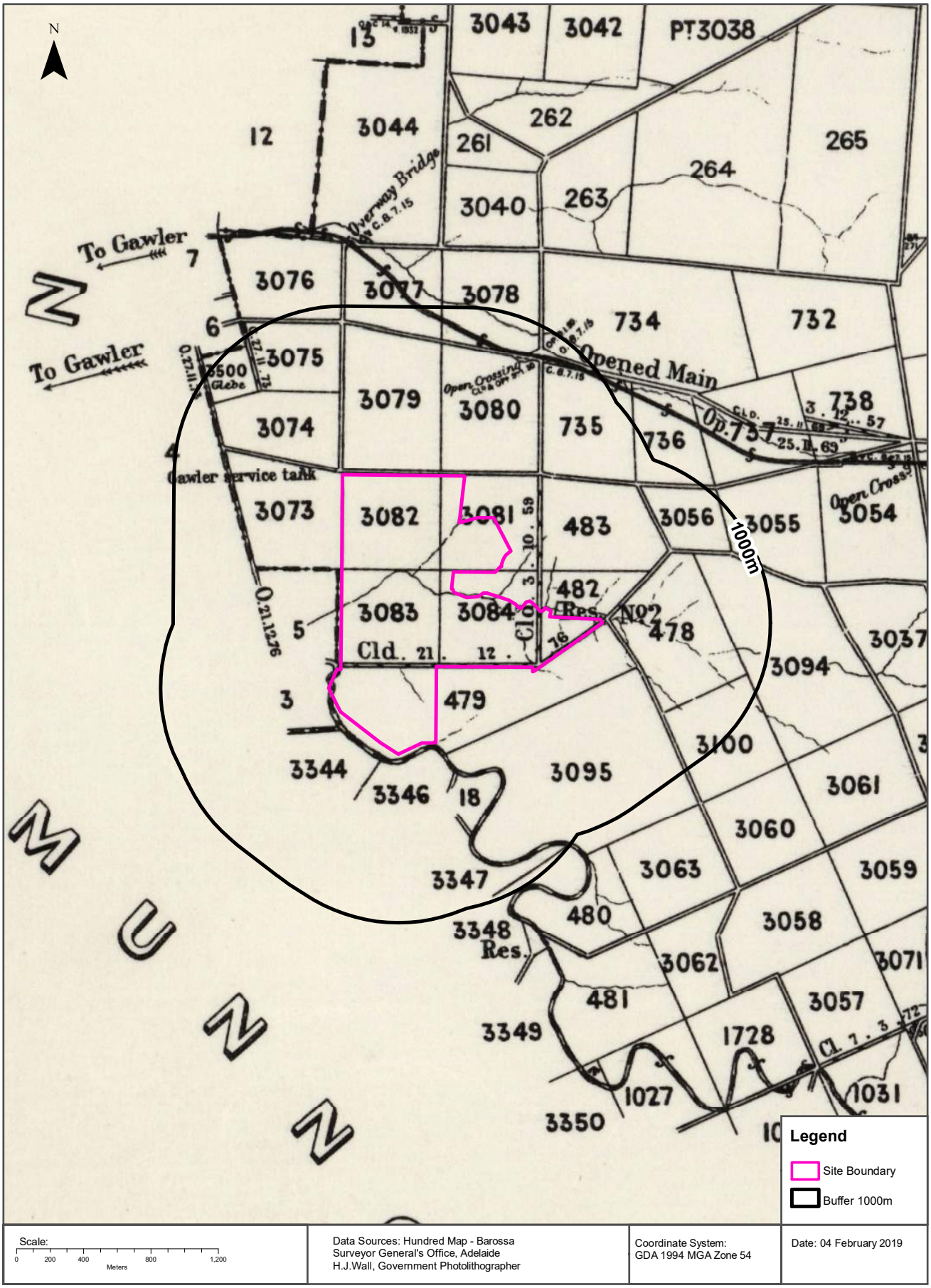
Historical Map 1982

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



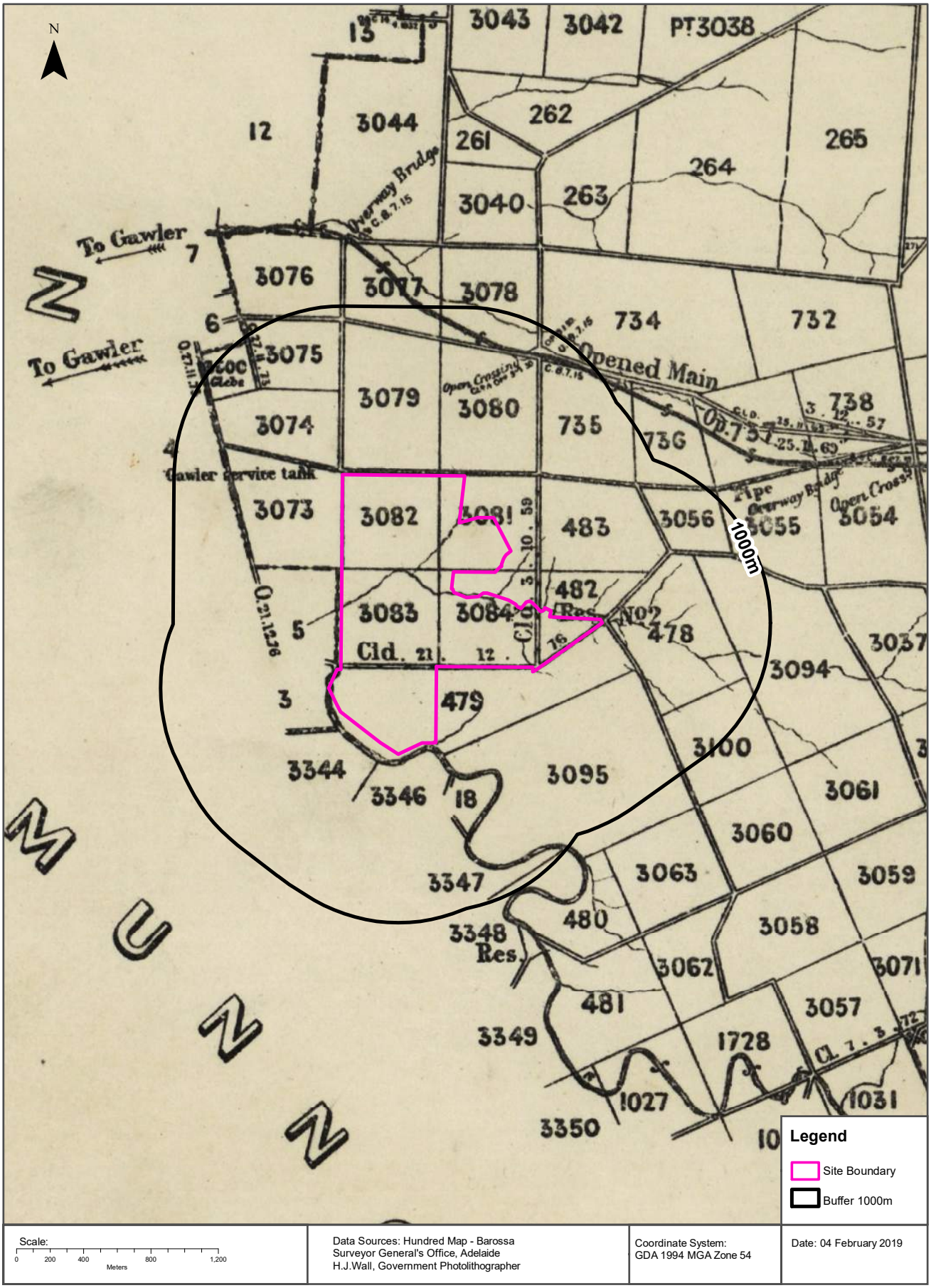
Historical Map 1961

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



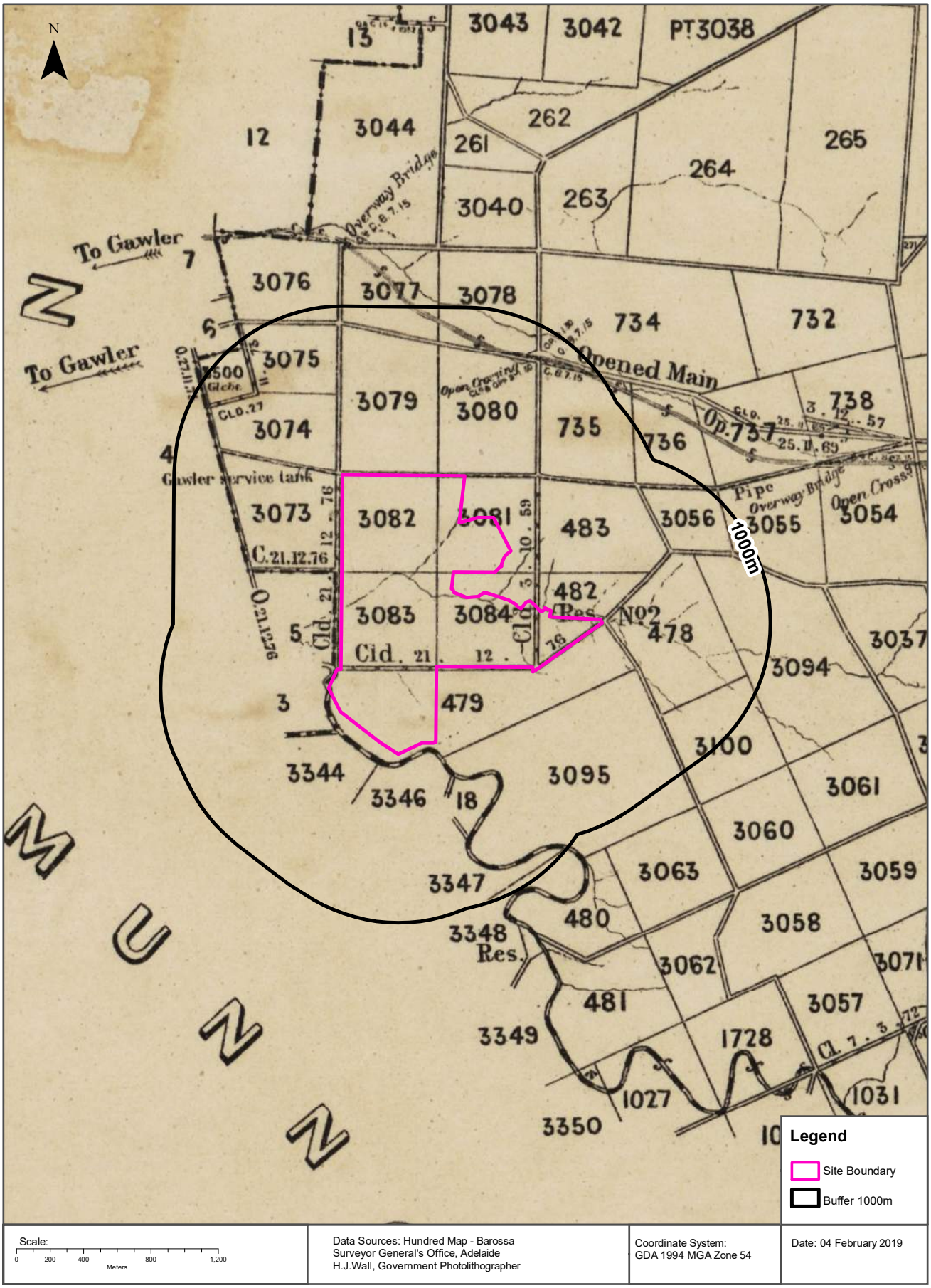
Historical Map 1956

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



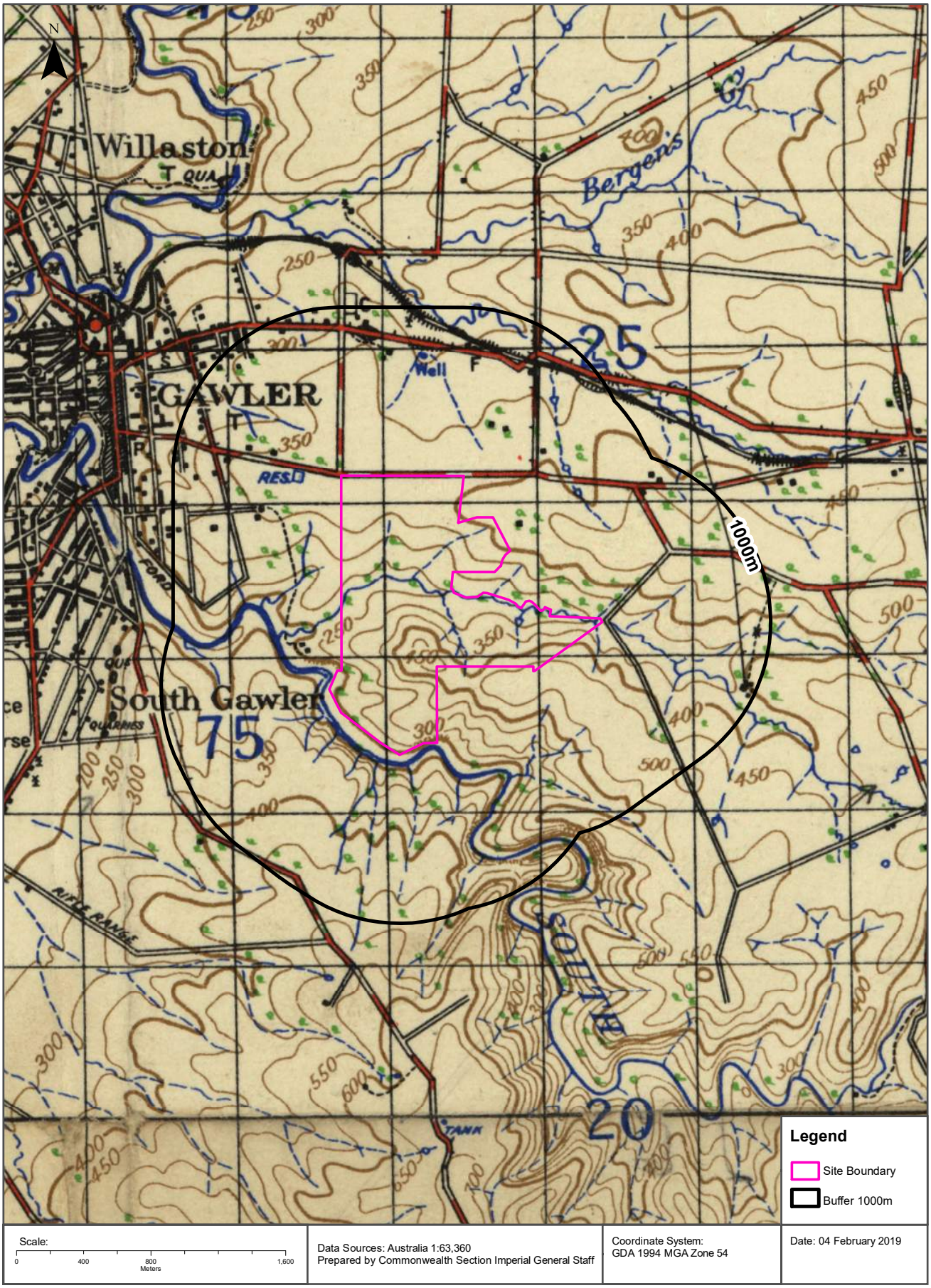
Historical Map 1948

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



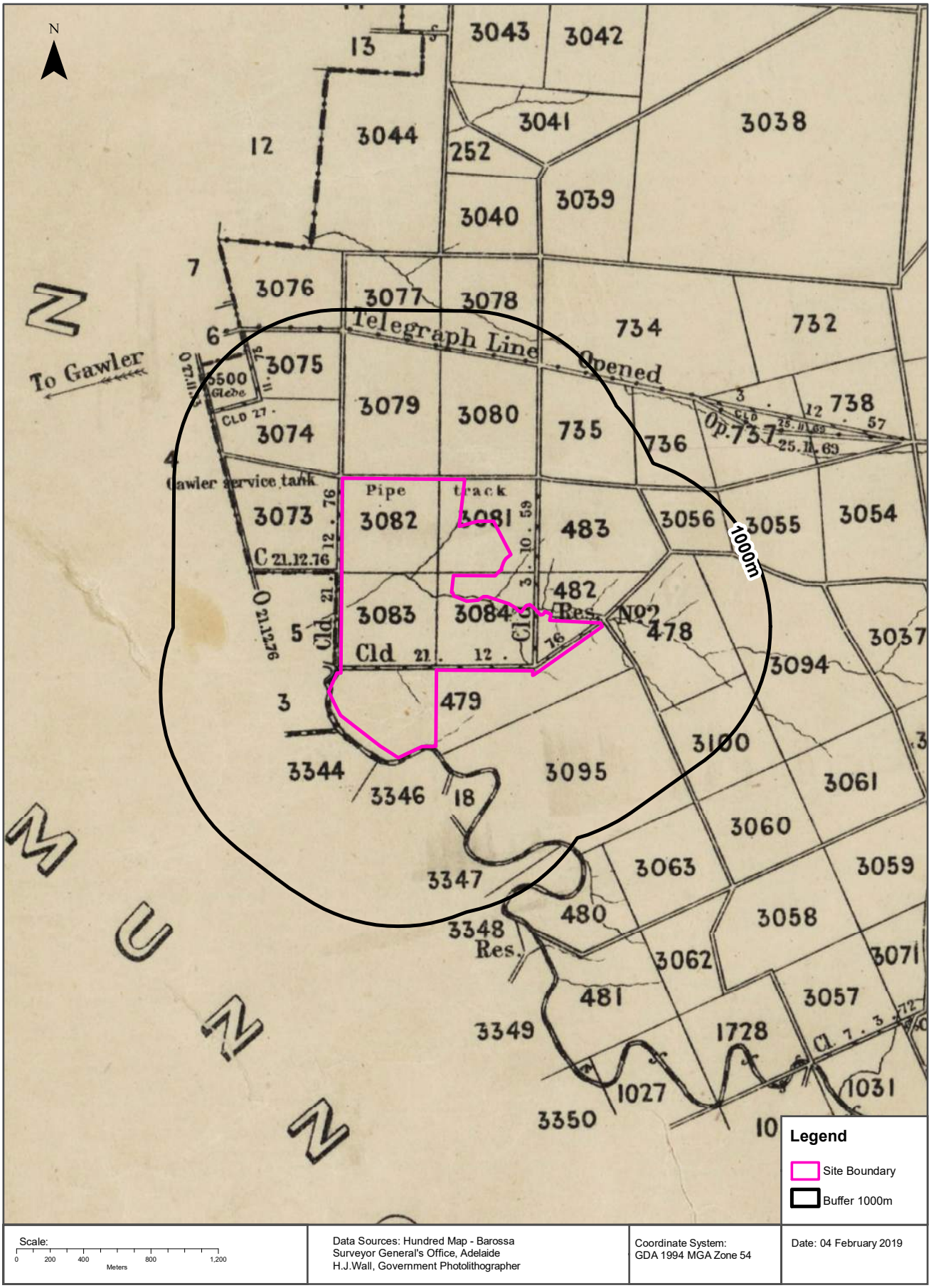
Historical Map c.1935

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



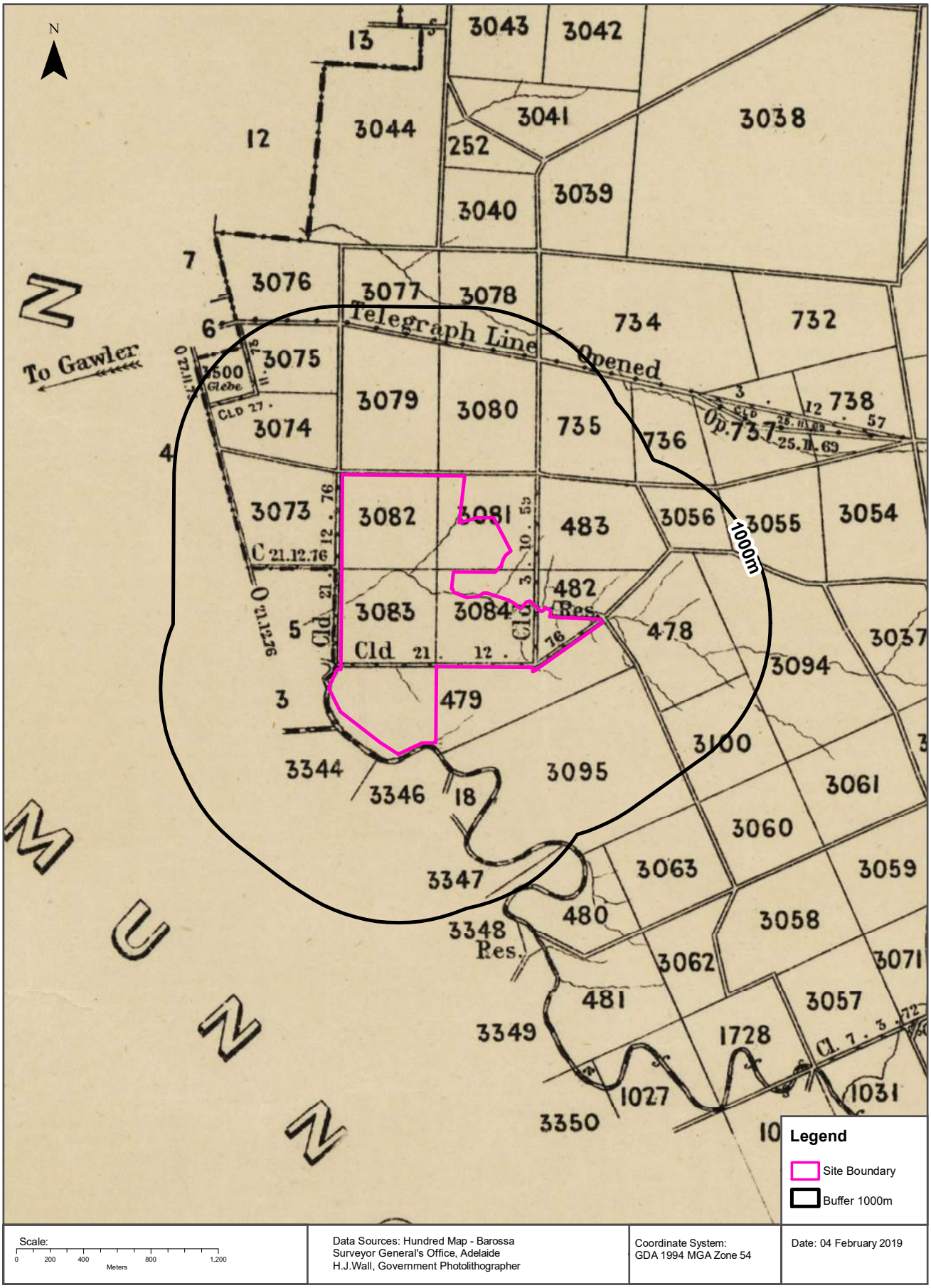
Historical Map 1910

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



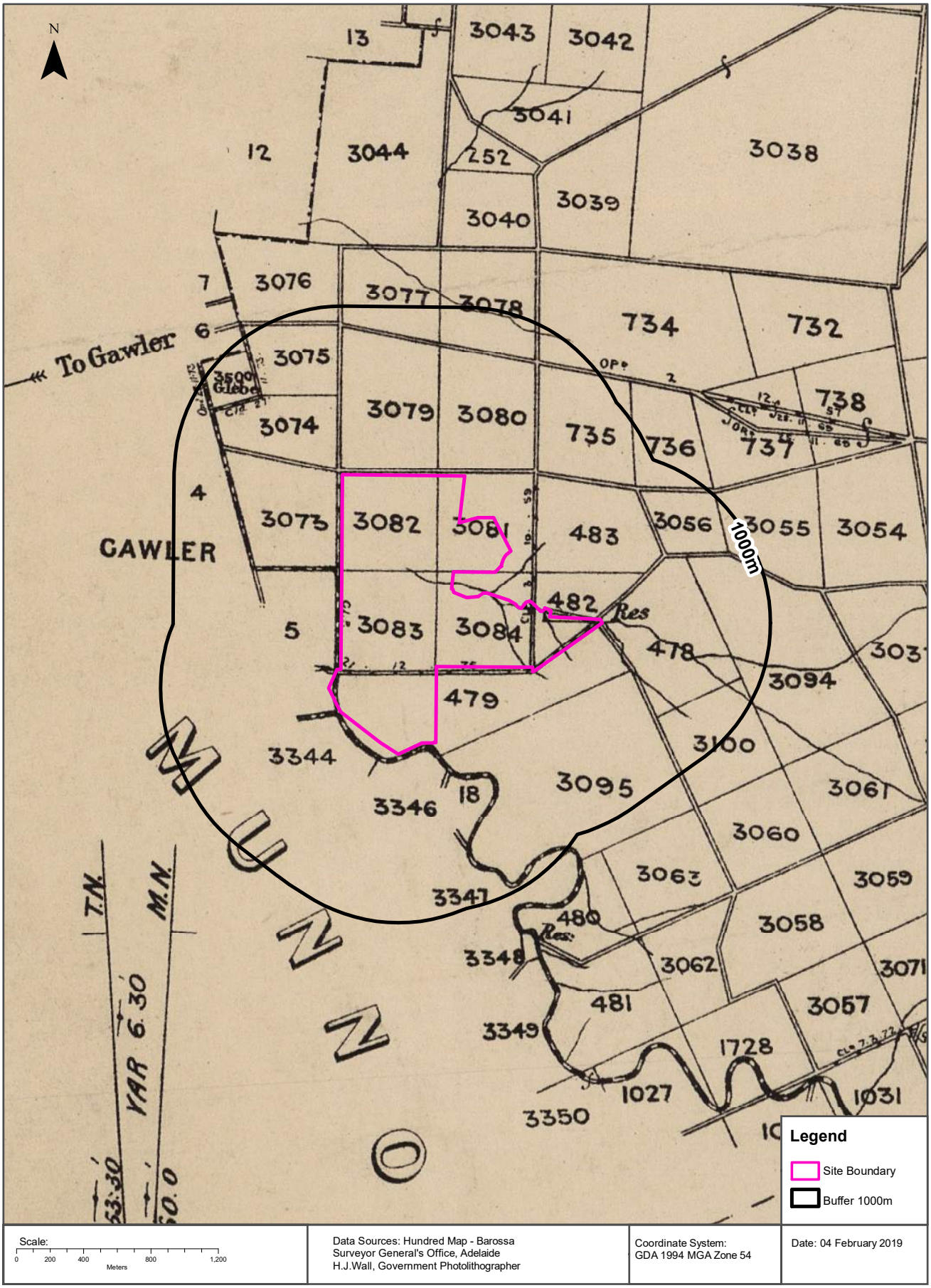
Historical Map 1901

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



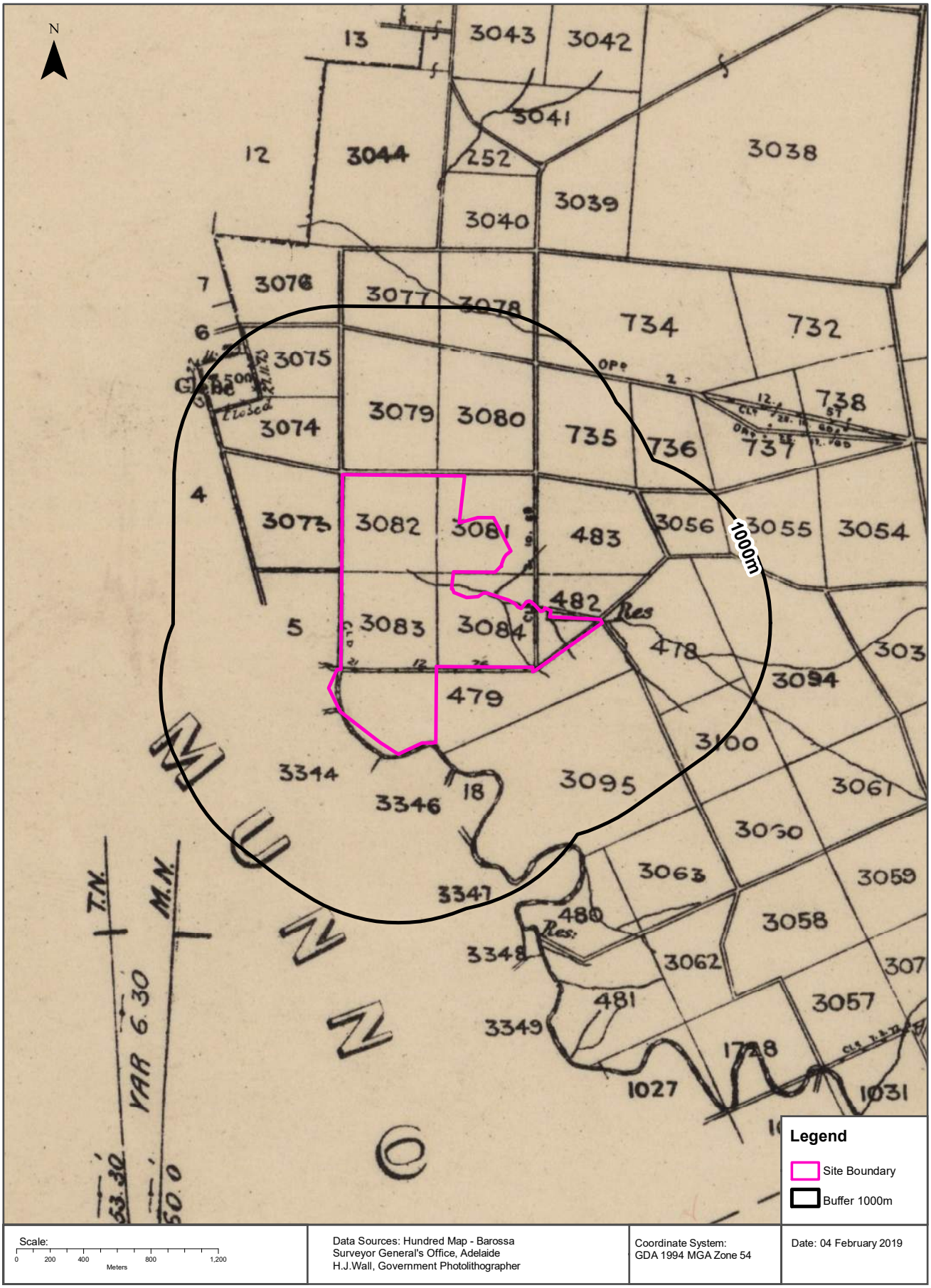
Historical Map 1887

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



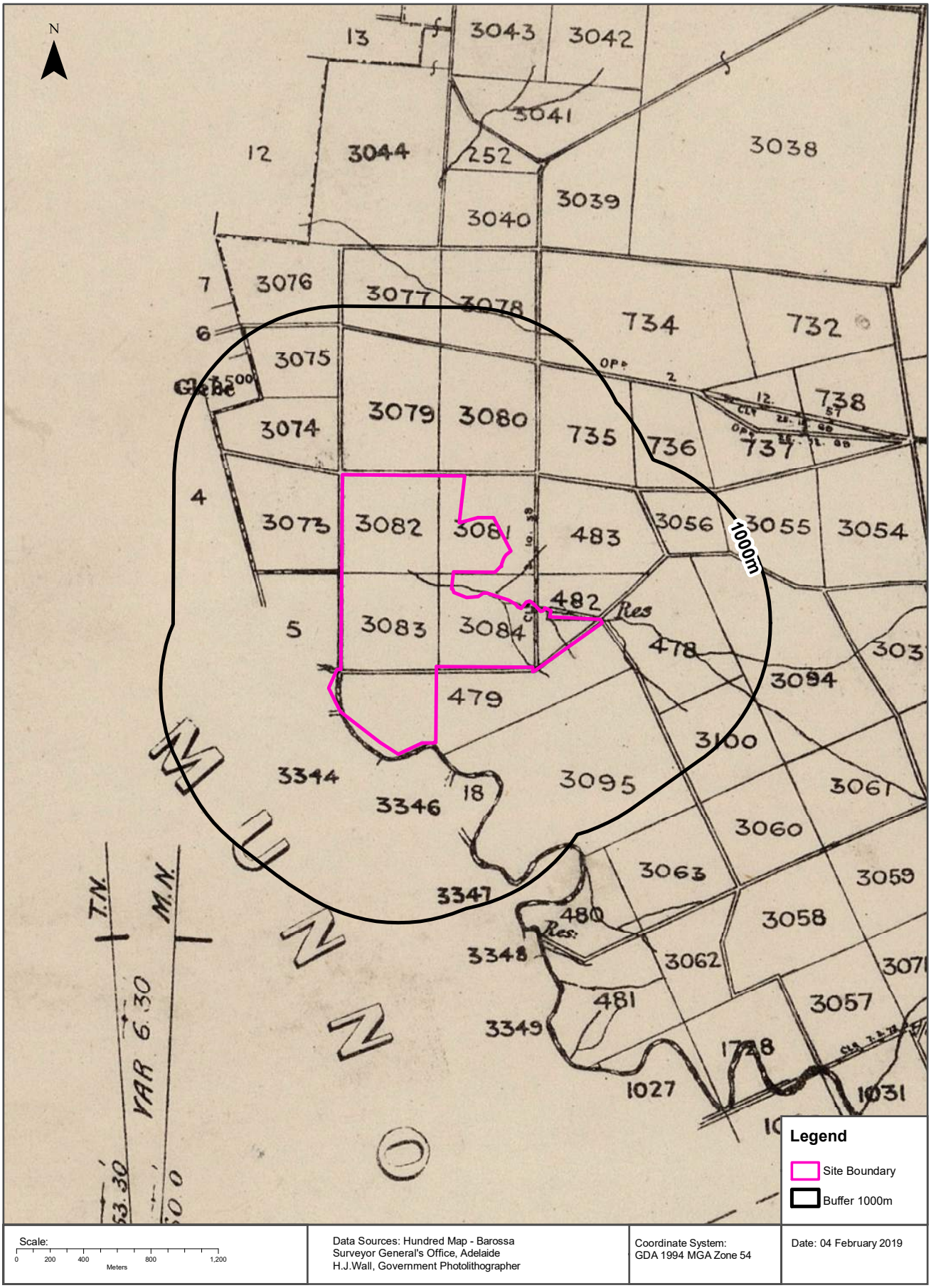
Historical Map 1881

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



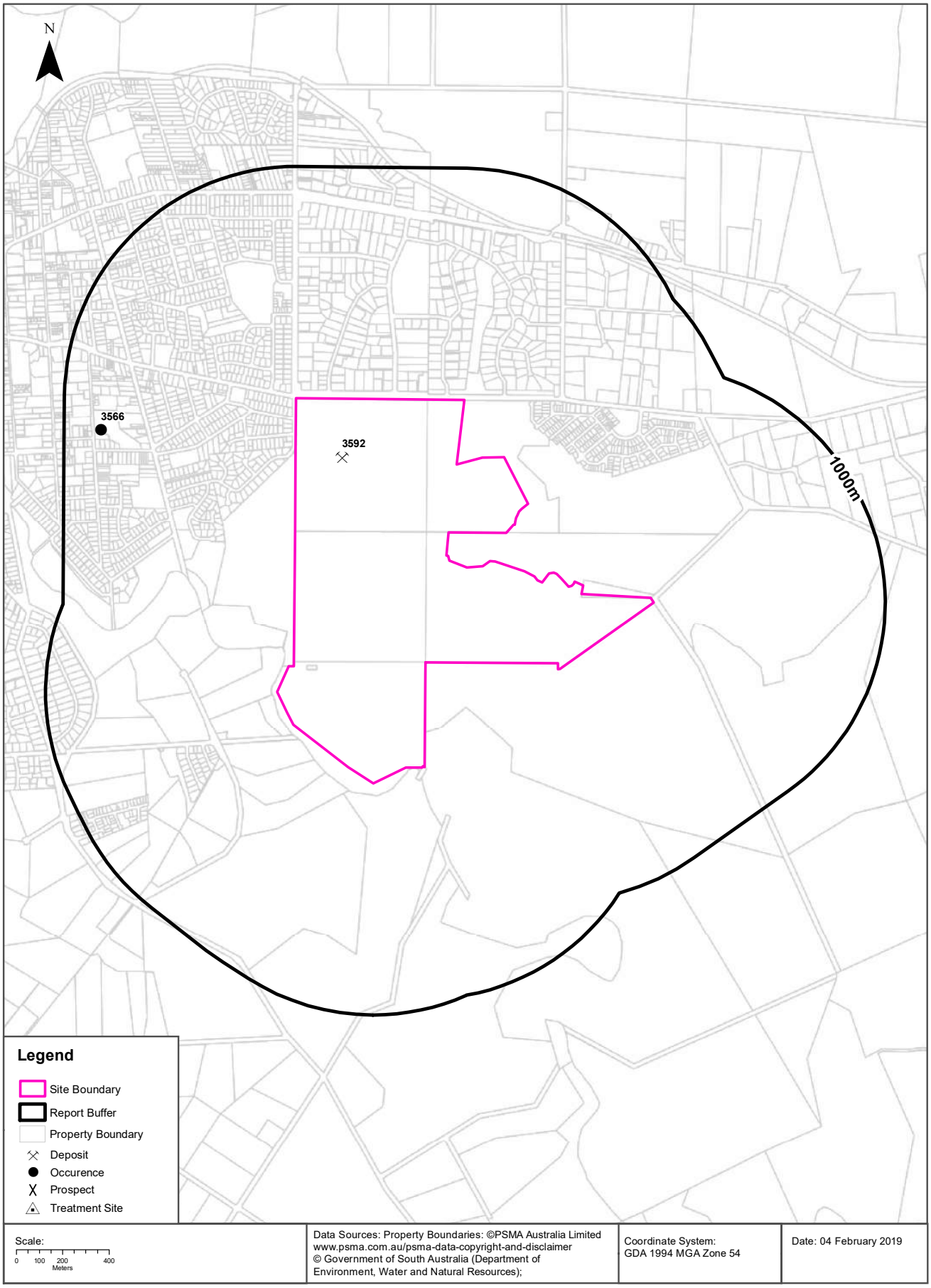
Historical Map 1875

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Mines and Mineral Deposits

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Mining

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

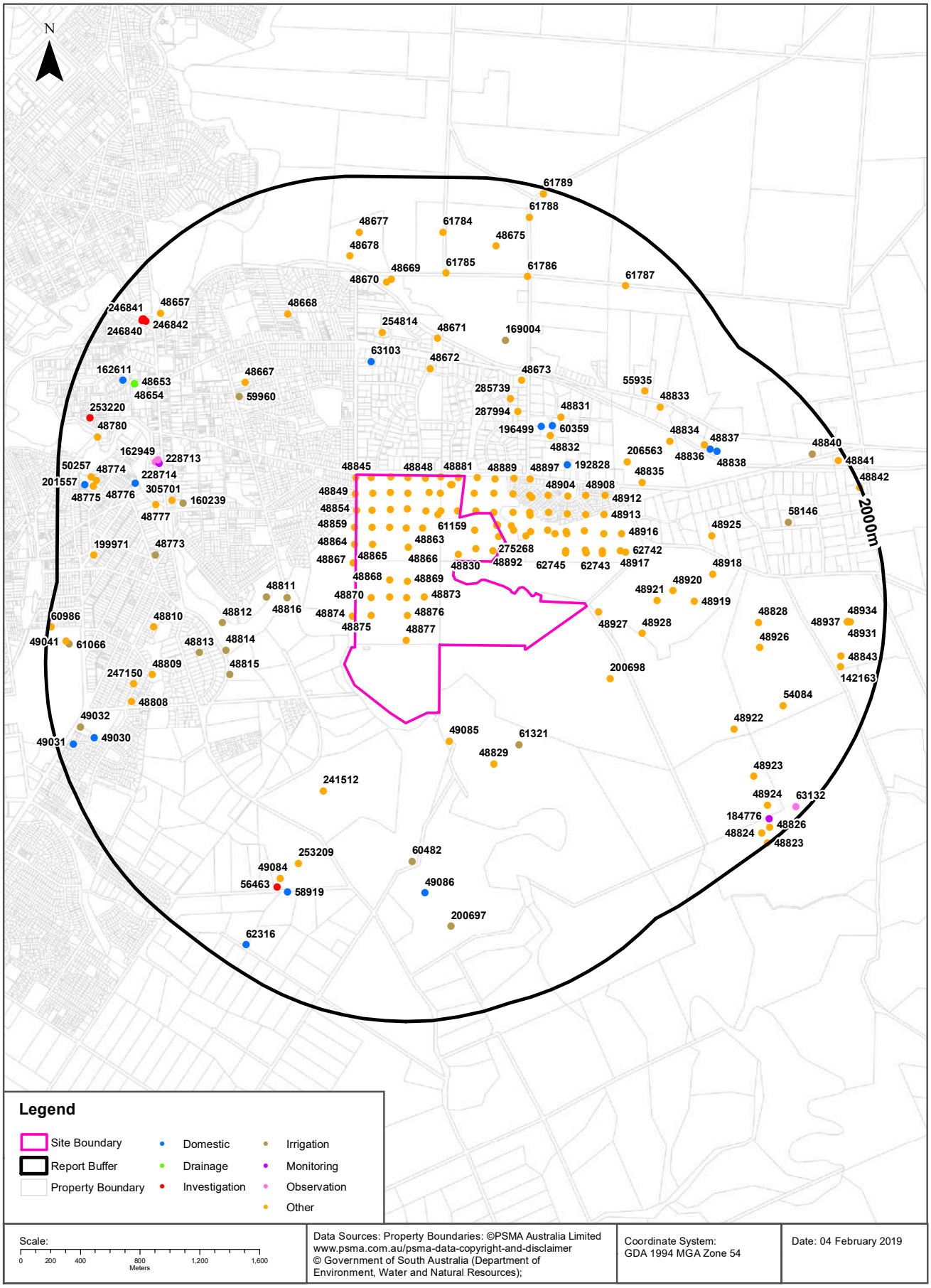
Mines and Mineral Deposits

Mines and mineral deposits within the dataset buffer:

Deposit No.	Name	Class	Status	Commodity	Year	Description	Dist	Dir'n
3592	GAWLER EAST	DEPOSIT	Active Mine	Sand, Clay, Gravel, Limestone	1960	Tertiary sand, clay and limestone deposit on PM 28, and 208 and adjoining area, for production from 1960-2009 of ~3.2Mt of multiple end products for use by the construction industry.	0m	Onsite
3566	MARTINS GULLY	OCCURRENCE	Rehabilitated	Sand		location uncertain, described as section 4, Hundred Nuriootpa, iin Martins Gully Gawler east to Gawler South. Produced 5586 tonnes from 1956-1961.	841m	North West

Drillholes

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Groundwater and Drillholes

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

Groundwater Aquifers

Groundwater aquifers within the dataset buffer:

Aquifer Code	Description	Distance	Direction
30	Fractured Rocks - Cambrian and Precambrian rocks - quartzite, sandstone, limestone, dolomite, slate, marble, siltstone, phyllite, schist and gneiss	0m	Onsite

Drillholes

Drillholes within the dataset buffer:

Drillhole No	Name	Status	Purpose	Drill Date	Max Depth	Ref Elev	Ground Elev	PH	TDS	Yield	DTW	SWL	RSWL	EC	Dist	Dir'n
48877	BAROSSA A 99	Unknown	Construction Materials	1963-02-21	1.83	105.50									0m	Onsite
48854	BAROSSA A 11	Unknown	Construction Materials	1962-10-26	3.66	111.00									0m	Onsite
48871	BAROSSA A 93	Unknown	Construction Materials	1963-02-21	3.05	75.90									0m	Onsite
48865	BAROSSA A 22	Unknown	Construction Materials	1963-02-19	2.44	90.00									0m	Onsite
275268	GW 2			2012-02-08	45.20										0m	Onsite
48848	BAROSSA A 5	Unknown	Construction Materials	1962-10-15	14.02	112.00									0m	Onsite
48851	BAROSSA A 8	Unknown	Construction Materials	1963-02-21	5.49	114.00									0m	Onsite
48857	BAROSSA A 14	Unknown	Construction Materials	1962-10-15	18.90	111.00									0m	Onsite
48868	BAROSSA A 90	Unknown	Construction Materials	1963-02-21	3.66	62.50									0m	Onsite
48845	BAROSSA A 2	Unknown	Construction Materials	1962-10-10	21.34	110.00									0m	Onsite
48888	READYMIX LTD		Exploration	1961-03-10	6.08		115.80								0m	Onsite
48852	BAROSSA A 9	Unknown	Construction Materials	1963-02-21	10.36	114.00									0m	Onsite
48860	BAROSSA A 17	Unknown	Construction Materials	1963-02-19	9.75	94.00									0m	Onsite
48869	BAROSSA A 91	Unknown	Construction Materials	1963-02-21	4.88	69.20									0m	Onsite
48883	READYMIX LTD		Exploration	1961-03-08	25.54		116.12								0m	Onsite
48846	BAROSSA A 3	Unknown	Construction Materials	1962-10-11	9.75	111.00									0m	Onsite
48880	BAROSSA A 35	Unknown	Exploration	1961-03-07	21.28	111.00									0m	Onsite
48872	BAROSSA A 94	Unknown	Construction Materials	1963-02-21	1.22	84.10									0m	Onsite
48866	BAROSSA A 23	Unknown	Construction Materials	1962-10-19	17.07	85.00									0m	Onsite
48863	BAROSSA A 20	Unknown	Construction Materials	1962-10-26	7.92	99.00									0m	Onsite

Drillhole No	Name	Status	Purpose	Drill Date	Max Depth	Ref Elev	Ground Elev	PH	TDS	Yield	DTW	SWL	RSWL	EC	Dist	Dir'n
62317		Operational	Industrial	1990-07-20	134.11		115.39	7.70	4210	12.6281				7460	0m	Onsite
48892	READYMIX LTD		Exploration	1961-03-13	7.90		116.22								0m	Onsite
48875	BAROSSA A 97	Unknown	Construction Materials	1963-02-21	1.83	72.20									0m	Onsite
48858	BAROSSA A 15	Unknown	Construction Materials	1962-10-15	19.51	113.00									0m	Onsite
48881	BAROSSA A 26	Unknown	Exploration	1961-03-08	12.77	114.00									0m	Onsite
48887	READYMIX LTD		Exploration	1961-03-10	6.08		119.93								0m	Onsite
48878	BAROSSA A 25	Unknown	Exploration	1961-03-06	26.75	113.00									0m	Onsite
48855	BAROSSA A 12	Unknown	Construction Materials	1962-10-26	18.90	103.00									0m	Onsite
48861	BAROSSA A 18	Unknown	Construction Materials	1962-10-19	14.02	96.00									0m	Onsite
48847	BAROSSA A 4	Unknown	Construction Materials	1962-10-15	20.12	111.00									0m	Onsite
48873	BAROSSA A 95	Unknown	Construction Materials	1963-02-21	1.22		102.12								0m	Onsite
48850	BAROSSA A 7	Unknown	Construction Materials	1963-02-21	18.90	112.00									0m	Onsite
48879	BAROSSA A 30	Unknown	Exploration	1961-03-07	26.75	116.00									0m	Onsite
48856	BAROSSA A 13	Unknown	Construction Materials	1962-10-15	18.90	109.00									0m	Onsite
48862	BAROSSA A 19	Unknown	Construction Materials	1962-10-26	17.07	98.00									0m	Onsite
48830		Operational		1964-01-01	84.00	110.00		7.50	3827	6.3140				6800	0m	Onsite
48853	BAROSSA A 10	Unknown	Construction Materials	1962-10-15	20.12	115.00									0m	Onsite
48876	BAROSSA A 98	Unknown	Construction Materials	1963-02-21	1.22	98.80									0m	Onsite
48870	BAROSSA A 92	Unknown	Construction Materials	1963-02-21	1.83	63.40									0m	Onsite
48882	BAROSSA A 31	Unknown	Exploration	1961-03-08	25.54	120.00									0m	Onsite
61159	ALSO P.95604	Operational	Industrial	1988-02-25	182.88		109.14	7.40	4328	11.3652				7663	0m	Onsite
48844	BAROSSA A 1	Unknown	Construction Materials	1962-10-10	14.02	119.00									3m	North West
58238	SD 69	Unknown	Exploration	1977-08-16	7.20	111.40									4m	North East
58241	SD 72	Unknown	Exploration	1977-08-18	3.40	105.50									4m	North East
58244	SD 75	Unknown	Exploration	1977-08-19	5.10	113.50									4m	North East
58235	SD 66	Unknown	Exploration	1977-08-11	8.00	112.70									4m	North East
58240	SD 71	Unknown	Exploration	1977-08-17	8.80	111.40									4m	North East
58243	SD 74	Unknown	Exploration	1977-08-19	2.60	113.50									4m	North East
58237	SD 68	Unknown	Exploration	1977-08-15	8.10	111.40									4m	North East
58236	SD 67	Unknown	Exploration	1977-08-15	11.50	111.40									4m	North East
58242	SD 73	Unknown	Exploration	1977-08-18	4.80	105.50									4m	North East
58239	SD 70	Unknown	Exploration	1977-08-16	8.30	111.40									4m	North East
58234	SD 65	Unknown	Exploration	1977-08-11	3.30	112.70									5m	North East
58232	SD 63	Unknown	Exploration	1977-08-10	9.20	112.70									5m	North East

Drillhole No	Name	Status	Purpose	Drill Date	Max Depth	Ref Elev	Ground Elev	PH	TDS	Yield	DTW	SWL	RSWL	EC	Dist	Dir'n
58233	SD 64	Unknown	Exploration	1977-08-10	0.50	112.70									5m	North East
48849	BAROSSA A 6	Unknown	Construction Materials	1962-10-15	10.36	114.00									6m	North West
48864	BAROSSA A 21	Unknown	Construction Materials	1962-10-26	20.73	105.00									9m	North West
48859	BAROSSA A 16	Unknown	Construction Materials	1962-10-26	4.88	108.00									9m	North West
48886	READYMIX LTD		Exploration	1961-03-09	8.97		123.24								14m	North East
48867	BAROSSA A 24	Unknown	Construction Materials	1963-02-21	3.05	93.00									16m	West
48874	BAROSSA A 96	Unknown	Construction Materials	1963-02-21	1.83	64.00									19m	West
48891	BAROSSA A 36	Unknown	Exploration	1961-03-10	11.55	124.00									24m	North East
48885	BAROSSA A 32	Unknown	Exploration	1961-03-09	21.89	123.00									76m	North East
48884	BAROSSA A 27	Unknown	Exploration	1961-03-09	6.69	118.00									84m	North East
48896	BAROSSA A 38	Unknown	Exploration	1961-03-13	21.28	130.00									85m	North East
275267	GW 1			2012-02-06	50.00						43.40	43.40			86m	North East
48927		Operational	Stock		7.60	105.00		8.00	4218	0.0947	6.04	6.04	98.96	7473	87m	East
48890	BAROSSA A 33	Unknown	Exploration	1961-03-10	12.01	129.00									135m	North East
48895	BAROSSA A 37	Unknown	Exploration	1961-03-23	12.16	89.00									138m	North East
62750	RT 09	Backfilled	Exploration	1991-10-11	18.00		126.96								144m	North East
48900	BAROSSA A 49	Unknown	Exploration	1961-03-24	8.82	132.00									183m	North East
48894		Unknown	Exploration	1961-03-17	12.77	128.00			1479					2670	200m	North East
49085	SOUTH PARA RIVER						58.50	8.20	2256					4050	202m	South
48889	BAROSSA A 28	Unknown	Exploration	1961-03-10	16.46	121.00									203m	North East
62749	RT 08	Backfilled	Exploration	1991-10-11	10.00		136.83								230m	North East
48899	BAROSSA A 44	Unknown	Exploration	1961-03-23	12.16	139.00									236m	North East
48893	BAROSSA A 29	Unknown	Exploration	1961-03-17	12.77	122.00									283m	North East
48898	BAROSSA A 40	Unknown	Exploration	1961-03-23	6.38	116.00									289m	North East
48903	BAROSSA A 50	Unknown	Exploration	1961-03-24	9.12	139.00									295m	North East
62748	RT 07	Backfilled	Exploration	1991-10-11	14.00		132.90								298m	North East
62745	RT 04	Backfilled	Exploration	1991-10-11	7.00		140.77								330m	East
62746	RT 05	Backfilled	Exploration	1991-10-11	14.00		140.48								336m	North East
62744	RT 03	Backfilled	Exploration	1991-10-11	5.50		145.05								341m	East
48907	BAROSSA A 55	Unknown	Exploration	1961-03-27	6.08	142.00									345m	East
48902	BAROSSA A 45	Unknown	Exploration	1961-03-24	12.16	135.00									349m	North East
48897	BAROSSA A 39	Unknown	Exploration	1961-03-27	12.16	126.00									353m	North East
62743	RT 02	Abandoned	Exploration	1991-10-11	14.00		145.29								354m	East
48911	BAROSSA A 56	Unknown	Exploration	1961-03-27	5.93	147.00									358m	East

Drillhole No	Name	Status	Purpose	Drill Date	Max Depth	Ref Elev	Ground Elev	PH	TDS	Yield	DTW	SWL	RSWL	EC	Dist	Dir'n
48915	BAROSSA A 57	Unknown	Exploration	1961-03-20	4.88	145.00									372m	East
48901	BAROSSA A 41	Unknown	Exploration	1961-03-22	12.16	130.00									401m	North East
48906	BAROSSA A 51	Unknown	Exploration	1961-03-24	7.60	140.00									411m	North East
48928			Stock				104.88	8.00	4917					8671	414m	East
62747	RT 06	Backfilled	Exploration	1991-10-11	10.00		140.54								416m	East
48917	BAROSSA A 58	Unknown	Exploration	1961-03-20	4.27	147.00									426m	East
62742	RT 01	Abandoned	Exploration	1991-10-11	8.00		146.62								438m	East
48816		Abandoned	Irrigation	1957-01-01	8.40	59.00		8.10	3917	1.2600	8.10	8.10	50.90	6953	458m	West
48905	BAROSSA A 46	Unknown	Exploration	1961-03-27	9.12	133.00									458m	North East
48921	BAROSSA A 61	Unknown	Exploration	1961-11-28	5.47	135.00									473m	East
200698			Stock	2004-06-17	128.00		128.09		2721	1.5000	44.00	44.00	84.09	4870	482m	South East
48914	BAROSSA A 53	Unknown	Exploration	1961-03-17	3.05	137.00									483m	East
48910	BAROSSA A 52	Unknown	Exploration	1961-03-24	4.26	138.00									487m	East
48829	SPRING	Controlled Flowing	Stock				61.37	9.00	2359					4232	499m	South
48904	BAROSSA A 42	Unknown	Exploration	1961-03-22	12.16	126.00									515m	North East
48916	BAROSSA A 54	Unknown	Exploration	1961-03-20	7.32	141.00									527m	East
287994					38.00					1.7000	23.00	23.00			562m	North East
48909	BAROSSA A 47	Unknown	Exploration	1961-03-27	12.16	131.00									571m	North East
61321		Operational	Irrigation	1989-03-07	32.00		70.97	7.80	2636	4.0000				4720	576m	South East
48920	BAROSSA A 60	Unknown	Exploration	1961-11-27	17.63	141.00									587m	East
48811	SOUTH PARA RIVER		Irrigation				48.72		2990					5343	596m	West
285739		Backfilled		2015-07-23	48.00				2624		29.00	29.00		4700	602m	North East
192828			Domestic	2002-02-25	92.00		120.31	7.80	3275	1.8000	39.00	39.00	81.31	5840	608m	North East
196499			Domestic	2003-02-21	60.00		109.81		2773	5.0000	28.00	28.00	81.81	4960	612m	North East
48913	BAROSSA A 48	Unknown	Exploration	1961-03-17	8.53	135.00									612m	North East
48908	READYMIX LTD		Exploration	1961-03-22	6.08		126.88								622m	North East
48832		Abandoned			30.00	113.00		7.00	2681		28.10	28.10	84.90	4800	635m	North East
60359		Abandoned	Domestic	1985-07-09	83.60		110.44	8.10	2671	8.7500	30.50	30.50	79.94	4782	679m	North East
241512				2008-09-03	181.00		138.93		2014	3.5000	88.00	88.00	50.93	3620	687m	South West
48672		Abandoned		1957-01-01	13.41	88.00			1710		11.55	11.55	76.45	3083	717m	North
48919		Unknown	Construction Materials	1961-11-27	3.05	131.00									721m	East
48912	BAROSSA A 43	Unknown	Exploration	1961-03-17	6.08	135.00									739m	North East
48673		Dry			21.00	97.00									746m	North East
48831		Unknown		1973-11-07	76.00	111.00		7.50	2489	22.7300	26.80	26.80	84.20	4462	756m	North East

Drillhole No	Name	Status	Purpose	Drill Date	Max Depth	Ref Elev	Ground Elev	PH	TDS	Yield	DTW	SWL	RSWL	EC	Dist	Dir'n
63103		Abandoned	Domestic; Stock	1991-06-04	90.20		101.06	7.30	5375	2.5000				9450	762m	North
48815		Operational	Irrigation; Stock	1976-05-10	83.82		95.03	7.80	2795					5000	770m	South West
48814		Operational	Irrigation; Stock	1976-05-10	128.01		84.78	8.30	2795					5000	798m	West
48812		Not Operational	Irrigation	1964-03-25	48.77		55.70	8.80	4059	16.4200	4.00	4.00	51.70	7200	861m	West
48918	BAROSSA A 62	Unknown	Exploration	1961-11-27	8.53	133.00									873m	East
48835		Not Operational			63.00	130.00									898m	North East
48671		Backfilled				85.00									919m	North
60482		Operational	Irrigation	1985-11-12	136.80		151.99	8.00	2097	6.2500				3770	925m	South
59960		Operational	Irrigation	1982-12-15	121.00		78.76	7.40	1301	0.9092				2352	946m	North West
169004		Abandoned	Irrigation	1998-03-20	71.00		90.55		2973	1.0000	15.00	15.00	75.55	5310	950m	North
254814				2009-05-20	74.00					3.7884	34.00	34.00			956m	North
48925	BAROSSA A 59	Unknown	Exploration	1961-11-28	7.30	149.00									965m	East
48667		Backfilled					88.88								970m	North West
48813	SOUTH PARA RIVER		Irrigation				95.88		1549					2796	973m	West
206563				2004-06-29	112.00		131.08		4968	3.0000	34.00	34.00	97.08	8760	974m	North East
49086		Operational	Domestic; Irrigation	1974-10-01	70.00	116.00		8.00	1541	10.7300				2780	1146m	South
48828		Operational	Industrial	1971-09-01	93.88	127.00				8.8396	10.06	10.06	116.94		1155m	East
160239			Irrigation	1996-09-12	75.00		71.04	8.10	1821	2.0000				3280	1159m	West
48668		Abandoned		1960-01-20	70.10	77.00			5918	0.6819	21.34	21.34	55.66	10386	1173m	North West
253209				2009-12-03	164.00				2938	6.0000	81.00	81.00		5250	1179m	South West
48926	BAROSSA A 64	Unknown	Exploration	1961-11-28	9.73	147.00									1190m	East
48834		Unknown			57.00	122.00				3.7884	18.84	18.84	103.16		1229m	North East
305701					6.00										1233m	West
48922	BAROSSA A 65	Unknown	Exploration	1961-11-28	9.12	143.00									1281m	South East
48809		Abandoned			21.34		64.86				17.07	17.07	47.79		1288m	West
48670			Tank		4.54		72.90	6.00	111		1.80	1.80	71.10	201	1296m	North
48810		Abandoned			21.34		57.59				17.07	17.07	40.52		1299m	West
48669		Collapsed				75.00									1315m	North
55935		Operational		1977-12-14	136.00		112.03	7.30	1373	1.1000				2481	1320m	North East
228714	MW 1		Monitoring	2006-10-26	20.00		49.36				16.35	16.35	33.01		1324m	North West
228713	MW 2		Monitoring	2006-10-31	20.00		49.15				16.42	16.42	32.73		1330m	North West
49084		Abandoned			54.86	135.00				0.5051					1331m	South West
48836		Backfilled			9.00	115.00									1332m	North East
162950	G 3		Observation	1996-09-27	9.30		49.13								1335m	North West

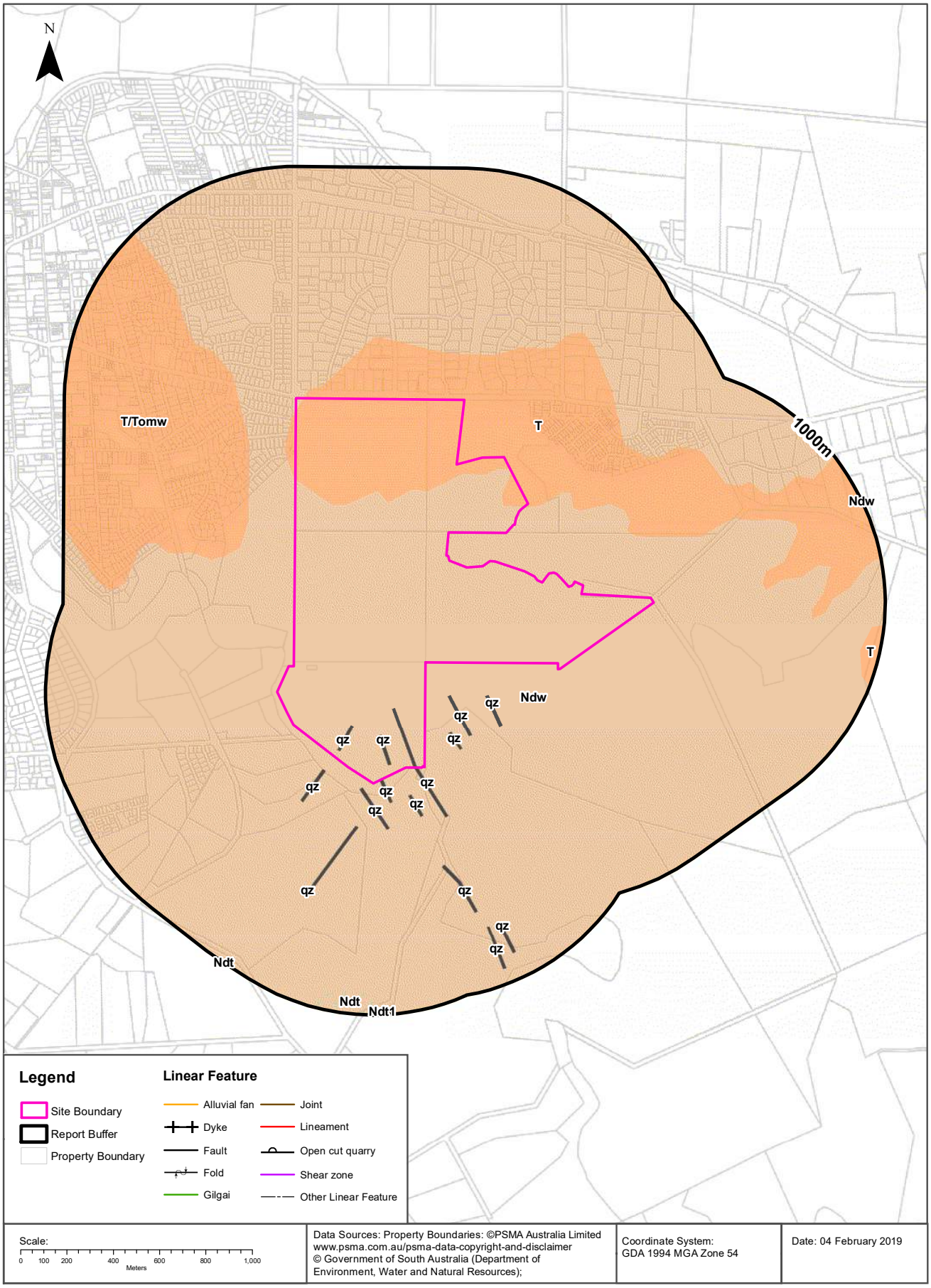
Drillhole No	Name	Status	Purpose	Drill Date	Max Depth	Ref Elev	Ground Elev	PH	TDS	Yield	DTW	SWL	RSWL	EC	Dist	Dir'n
48837		Backfilled	Domestic; Irrigation	1976-07-09	68.22	116.00		7.50	3023	0.3000				5400	1335 m	North East
48777		Unknown		1892-01-30	39.62		45.55			5.6826	9.14	9.14	36.41		1341 m	West
48773		Not Operational	Irrigation		39.62		51.14		1830		24.38	24.38	26.76	3297	1342 m	West
48833					7.64	110.00		7.50	4582		5.69	5.69	104.31	8100	1343 m	North East
162949	G 1		Observation	1996-09-27	9.70		48.54								1349 m	North West
48838		Not Operational	Domestic; Irrigation	1976-07-14	76.30	116.00		7.80	3195	1.9000				5700	1352 m	North East
61785	GAWLER DH 16	Unknown	Exploration	1983-06-30	7.00	83.00									1359 m	North
58919		Operational	Domestic; Irrigation	1982-03-10	98.00		138.38	7.10	3654	3.7900				6500	1379 m	South West
56463		Not Located	Investigation	1978-08-31	91.80	138.18	137.14	7.00	2510	0.0300	50.64	49.60	87.54	4500	1390 m	South West
200697			Irrigation	2004-06-11	158.00		158.55		1546	7.5000	115.00	115.00	43.55	2790	1394 m	South
61786	GAWLER DH 17	Unknown	Exploration	1983-06-30	3.50	104.00									1402 m	North
247150				2008-07-16	18.00		52.02			0.0000	17.50	17.50	34.52		1416 m	West
48808		Abandoned			21.34		52.42				19.40	19.40	33.02		1446 m	West
58146		Abandoned	Irrigation	1979-11-21	60.00	145.00		7.90	3597	0.1000				6400	1466 m	East
48678	RIVER SAMPLE						66.68		4570					8081	1466 m	North
54084		Operational	Industrial; Stock	1971-09-01	78.03	135.00				4.4198					1473 m	East
48776		Operational	Domestic		18.29		47.70								1481 m	West
48675					9.71	91.00		7.00	2134		6.93	6.93	84.07	3834	1554 m	North
48923	BAROSSA A 66	Unknown	Exploration	1961-11-28	12.77	150.00									1594 m	South East
48653		Collapsed	Drainage	1958-11-06	6.08		48.14								1607 m	North West
48654		Abandoned	Drainage	1958-11-07	6.10		48.14								1607 m	North West
48677		Backfilled				75.00									1628 m	North
61784	GAWLER DH 15	Unknown	Exploration	1983-06-30	9.00	97.00									1633 m	North
61787	GAWLER DH 18	Unknown	Exploration	1983-06-30	10.50	114.00									1668 m	North East
162611			Domestic	1995-09-13	32.00		50.42			0.1263					1689 m	North West
48657	NORTH PARA RIVER						44.98		4741					8374	1702 m	North West
48843		Unknown		1976-09-14	128.36	140.00		8.60	2795	8.0000				5000	1734 m	East
48774		Operational	Industrial	1952-02-07	25.30		48.13		1035	0.6314	6.25	6.25	41.88	1874	1741 m	West
49030		Abandoned	Domestic; Irrigation	1930-01-01	29.57	54.00			2826		22.55	22.55	31.45	5055	1744 m	South West
246842	SB4/MW5		Investigation	2007-04-26	19.00		48.33								1748 m	North West
142163		Operational	Industrial	1994-03-21	196.00		143.89	7.80	2636	0.3750				4720	1748 m	East
48933	SPRINGBETT		Exploration	1960-05-31	3.04		139.85								1751 m	East
48934	SPRINGBETT		Exploration	1960-05-31	5.78		139.85								1751 m	East
48936	SPRINGBETT		Exploration	1960-05-31	4.26		139.85								1751 m	East

Drillhole No	Name	Status	Purpose	Drill Date	Max Depth	Ref Elev	Ground Elev	PH	TDS	Yield	DTW	SWL	RSWL	EC	Dist	Dir'n
48932	SPRINGBETT		Exploration	1960-05-31	3.04		139.85								1751 m	East
48937	SPRINGBETT		Exploration	1960-05-31	1.52		139.85								1751 m	East
48931	SPRINGBETT		Exploration	1960-05-31	4.56		139.85								1751 m	East
48930	SPRINGBETT		Exploration	1960-05-31	3.65		139.85								1751 m	East
48938	SPRINGBETT		Exploration	1960-05-31	4.56		139.85								1751 m	East
48935	SPRINGBETT		Exploration	1960-05-31	2.13		139.85								1751 m	East
48929	SPRINGBETT		Exploration	1960-05-31	3.95		139.85								1751 m	East
48780		Abandoned			15.24		45.32								1752 m	North West
199971			Industrial	2004-04-01	50.00		47.08		1614	1.2000	25.00	25.00	22.08	2910	1753 m	West
48775		Operational	Industrial	1963-09-25	27.43		49.59		1245	0.8840	6.08	6.08	43.51	2252	1762 m	West
246841	SB3/MW3		Investigation	2007-04-26	17.50		47.71								1766 m	North West
48939	SPRINGBETT		Exploration	1960-05-31	4.26		140.93								1770 m	East
246839	SB1/MW1		Investigation	2007-04-24	18.00		47.85								1771 m	North West
246840	SB2/MW2		Investigation	2007-04-24	18.00		47.70								1772 m	North West
50257		Operational	Industrial	1979-03-02	40.00		47.08	8.10	1133	4.0000				2052	1776 m	West
61788	GAWLER DH 19	Unknown	Exploration	1983-06-30	7.00	99.00									1789 m	North
48924	BAROSSA A 67	Unknown	Exploration	1961-11-28	7.30	143.00									1796 m	South East
49032		Abandoned	Irrigation	1930-01-01	27.43		51.23		1755		21.64	21.64	29.59	3163	1816 m	West
201557			Domestic	2004-10-27	41.00		50.40		1160	0.7500	24.00	24.00	26.40	2100	1818 m	West
48840		Unknown	Irrigation; Stock	1973-11-22	6.10	125.00		7.70	2909		1.21	1.21	123.79	5200	1823 m	East
253220	MW 1		Investigation	2009-12-03	30.00					0.1250	18.50	18.50			1824 m	North West
62316		Operational	Domestic; Stock	1990-06-01	80.00		134.92	7.40	4407	2.0000				7800	1828 m	South West
61066	GAWLER JOCKEY CLUB	Operational	Irrigation	1987-10-28	57.00		47.18	6.94	1463	12.6281				2640	1849 m	West
49041		Not Operational	Town Water Supply (Public/Municipal)	1946-01-01	67.36	50.49	50.49		618	1.2628	20.73	20.73	29.76	1124	1868 m	West
184776	AL 1A		Monitoring	2000-11-14	30.00		144.16								1873 m	South East
49031		Abandoned	Domestic; Irrigation	1930-01-01	23.46		53.30		4704		23.16	23.16	30.14	8309	1893 m	South West
48824	SCREENINGS LTD. 6	Unknown	Construction Materials	1965-08-28	4.57		147.48								1915 m	South East
48826	SCREENINGS LTD. 9	Unknown	Construction Materials	1965-08-28	18.29		145.84								1917 m	South East
63132	AL-1	Operational	Observation	1992-09-09	24.50		140.69		5608					9846	1938 m	South East
48841		Unknown				130.00									1950 m	East
61789	GAWLER DH 20	Unknown	Exploration	1983-06-30	10.50	110.00									1965 m	North
60986	GAWLER JOCKEY CLUB	Unknown	Recreational	1976-03-10	54.86		47.73	7.30	1412	14.7748				2550	1980 m	West

Drillhole No	Name	Status	Purpose	Drill Date	Max Depth	Ref Elev	Ground Elev	PH	TDS	Yield	DTW	SWL	RSWL	EC	Dist	Dir'n
48823	SCREENINGS LTD. 5	Unknown	Construction Materials	1965-08-28	16.76		148.10								1991 m	South East
48842		Unknown				138.00		6.50	331		10.24	10.24	127.76	601	1997 m	East

Geology 1:100,000

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Geology

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

Surface Geology 1:100,000

Surface Geology Units within the dataset buffer:

Map Unit Code	Name	Description	Parent Name	Province	Age	Min Age	Max Age	Distance
Ndw	Woolshed Flat Shale	Shale, black; dolomitic siltstone; dolomite; grey laminated siltstone.	Bungarider Subgroup	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	0m
qz	Unnamed GIS Unit - see description	Quartz veins/bodies, undifferentiated.		UNKNOWN	MISCELLANEOUS			0m
T	Unnamed GIS Unit - see description	Undifferentiated Tertiary rocks.		UNKNOWN	TERTIARY	Tertiary	Tertiary	0m
T/Tomw	Unnamed GIS Unit - see description	Undifferentiated Tertiary rocks.		UNKNOWN	TERTIARY	Tertiary	Tertiary	202m
Ndt	Stonyfell Quartzite	Quartzite, feldspathic, with shale interbeds; silty sandstone in part schistose and calcareous.	Bungarider Subgroup	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	884m
Ndt1	Unnamed GIS Unit - see description	Quartzite or sandstone interbeds. Based on dotted unit in Prot-du on Adelaide, Onkaparinga, Noarlunga and Echunga 1:50 000 maps.	Stonyfell Quartzite	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	965m

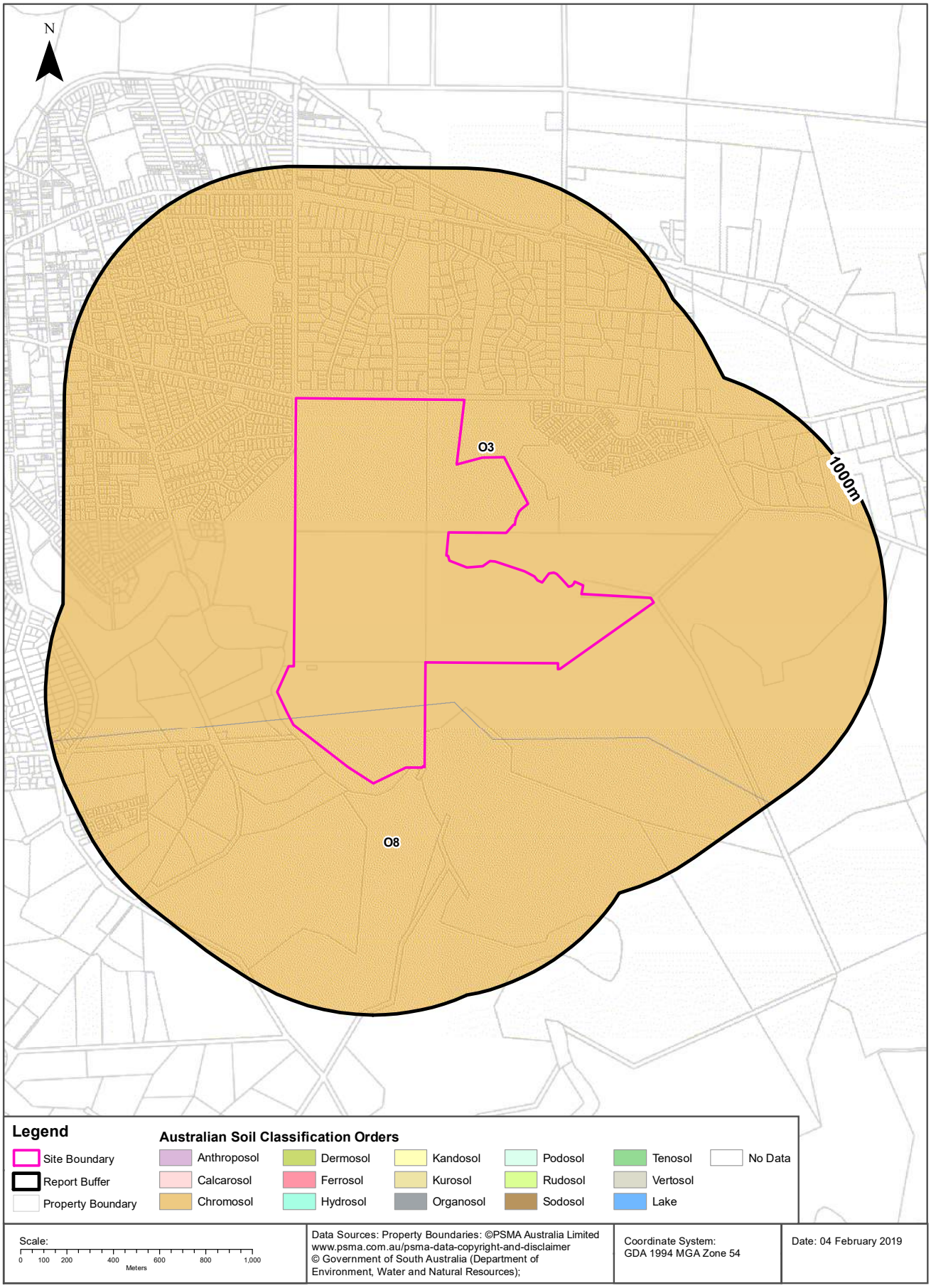
Linear Structures 1:100,000

Linear geological structures within the dataset buffer:

Map Code	Description	Distance
N/A	No features in buffer	

Atlas of Australian Soils

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Soils

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

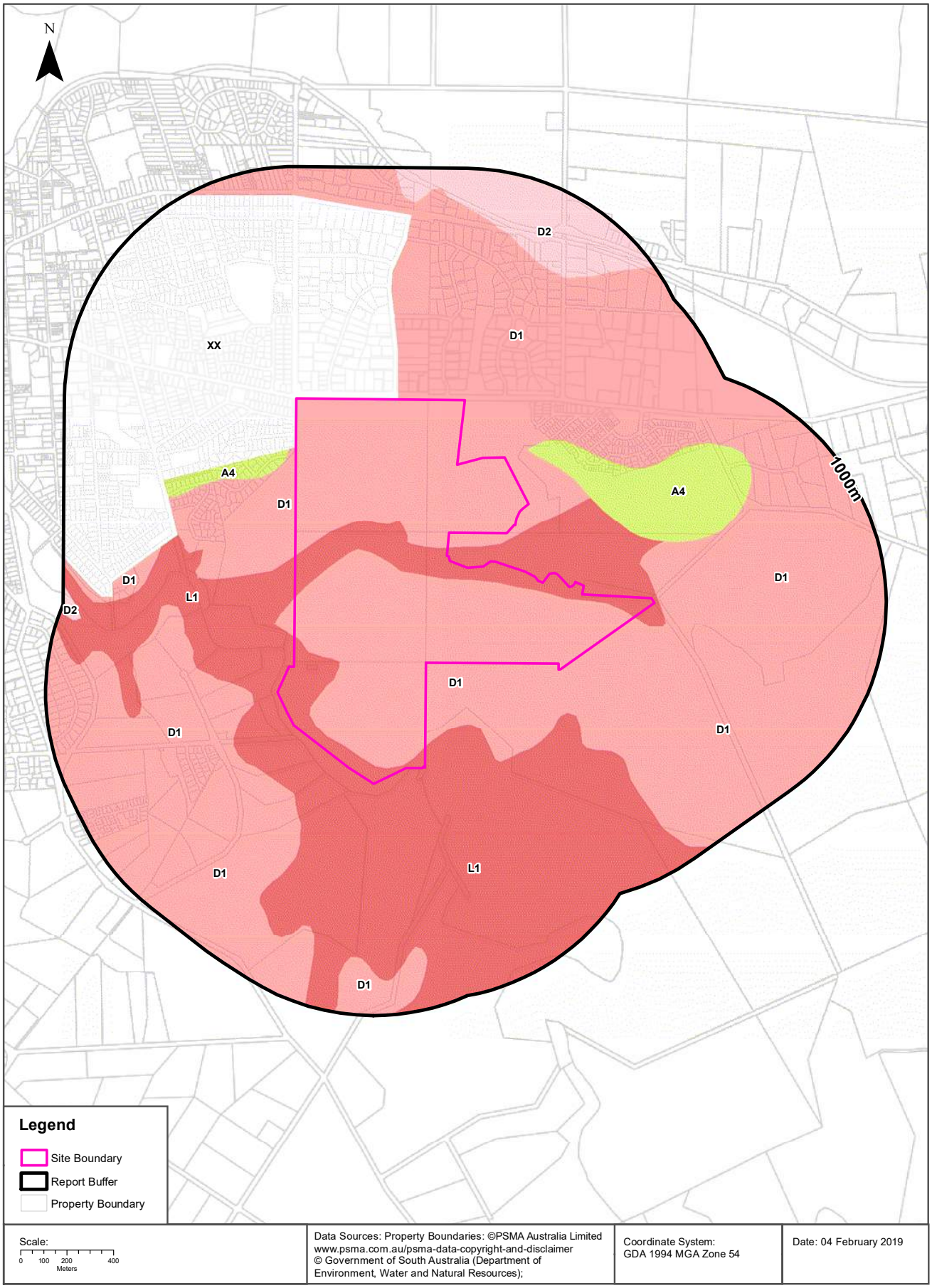
Atlas of Australian Soils

Soil mapping units and Australian Soil Classification orders within the dataset buffer:

Map Unit Code	Soil Order	Map Unit Description	Distance
O3	Chromosol	Hills and valleys: alternating, subparallel hilly ridges and valleys with a general N.-S. trend. Shallow forms of hard alkaline red soils (Dr2.23) with (Um5.41); (Um5.11) and shallow varieties of (Um6) especially (Um6.23) occur on the hilly ridges; while on the hill slopes and in the valleys (Dr2.23) with (Dr2.33), which increases in area towards the northern portion of the unit, occur with small areas of cracking clay soils (Ug5.15, Ug5 16, Ug5 2, and Ug5.3); friable earths (Gn3.13); grey-brown highly calcareous loamy earths (Gc1) in the northern portion of the unit; and also minor areas of soils belonging to groups (Dr3.22), (Dy3.4), and (Dy5.4); while on present stream terraces occur (Dr2.23) and deep varieties of (Um6) with various alluvial soils (unclassified) on the flood-plains.	0m
O8	Chromosol	Rounded hill slopes with some scarps: shallow forms of hard alkaline red soils (Dr2.23) in association with friable loamy soils (Um6.42, Um6.43, and Um6.21); dark structured clays (Uf6.11); smaller areas of shallow red subplastic clay soils (Uf5.31); red friable earths (Gn3.12); cracking clays (Ug5.15, Ug5.16, and Ug5.2) and sandy alkaline yellow mottled soils (Dy5.4 and Dy5.8).	0m

Soil Types

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Soils

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

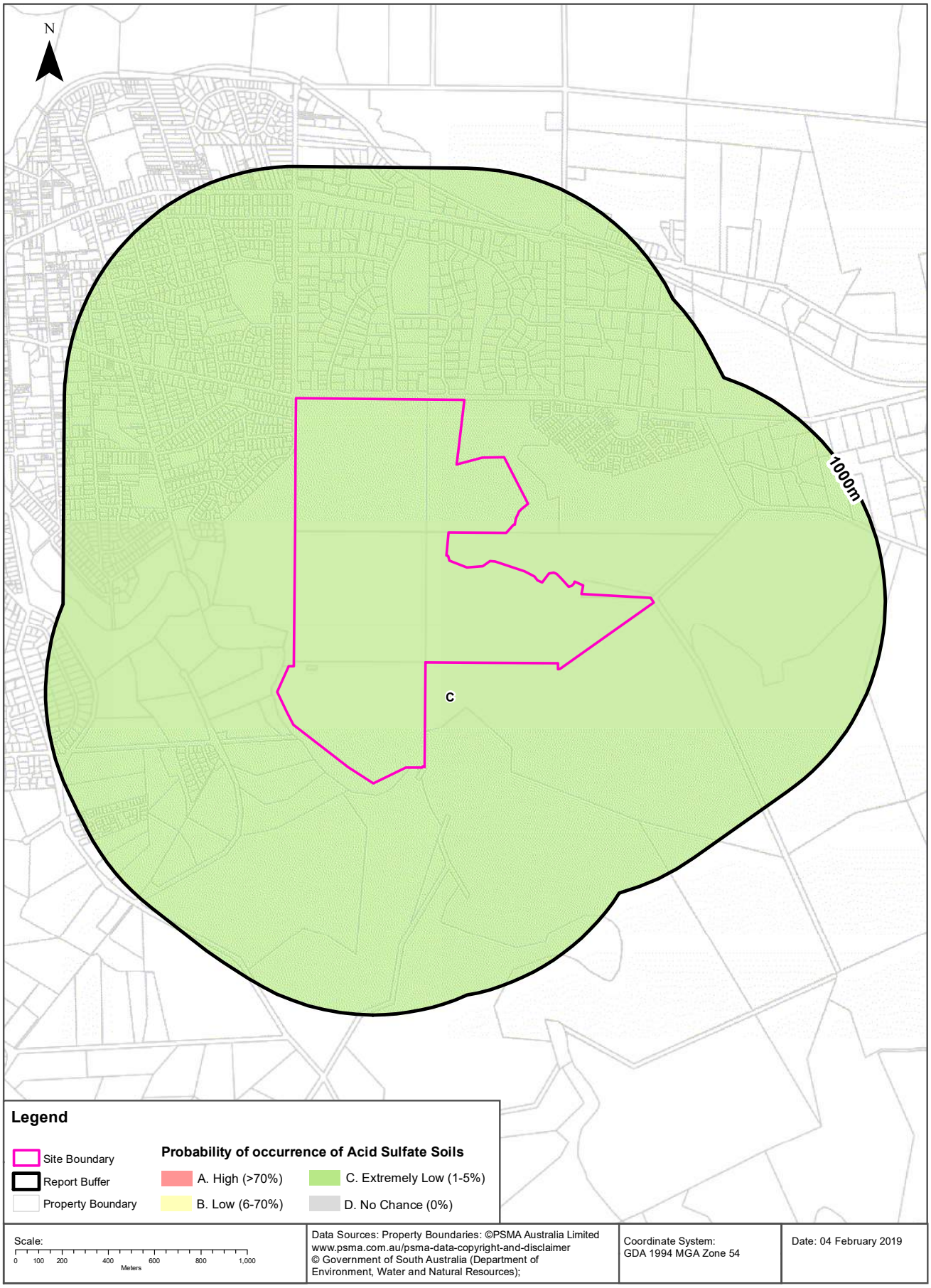
Soil Types

Soil types within the dataset buffer:

Map category code	Soil type description	Distance
D1	Loam over clay on rock	0m
XX	Not applicable - No assessment/analysis undertaken	0m
L1	Shallow soil on rock	0m
A4	Calcareous loam	32m
D2	Loam over red clay	670m

Atlas of Australian Acid Sulfate Soils

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Acid Sulfate Soils

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

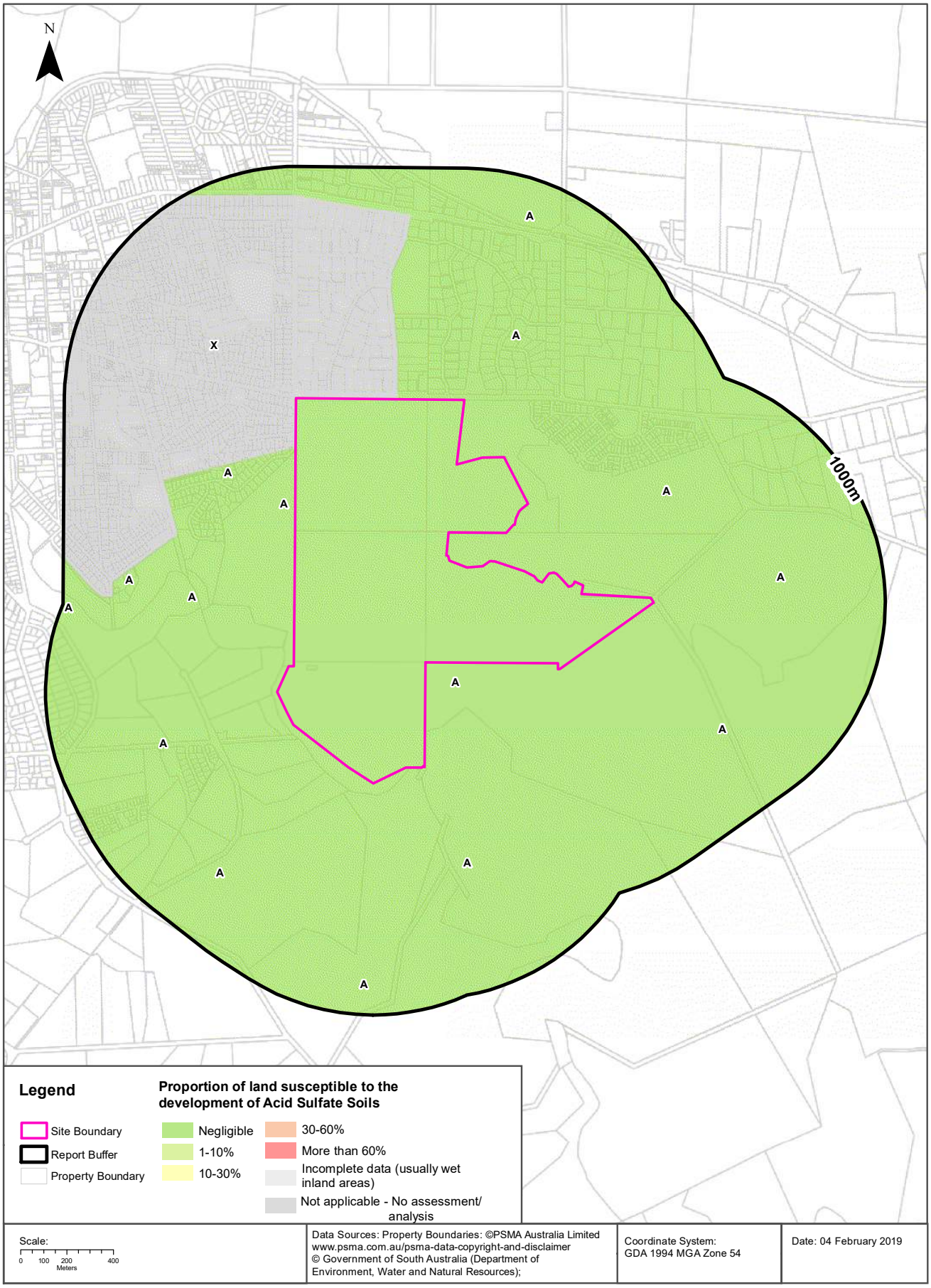
Atlas of Australian Acid Sulfate Soils

Atlas of Australian Acid Sulfate Soil categories within the dataset buffer:

Class	Description	Distance
C	Extremely low probability of occurrence. 1-5% chance of occurrence with occurrences in small localised areas.	0m

Acid Sulfate Soils Potential

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Acid Sulfate Soils

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

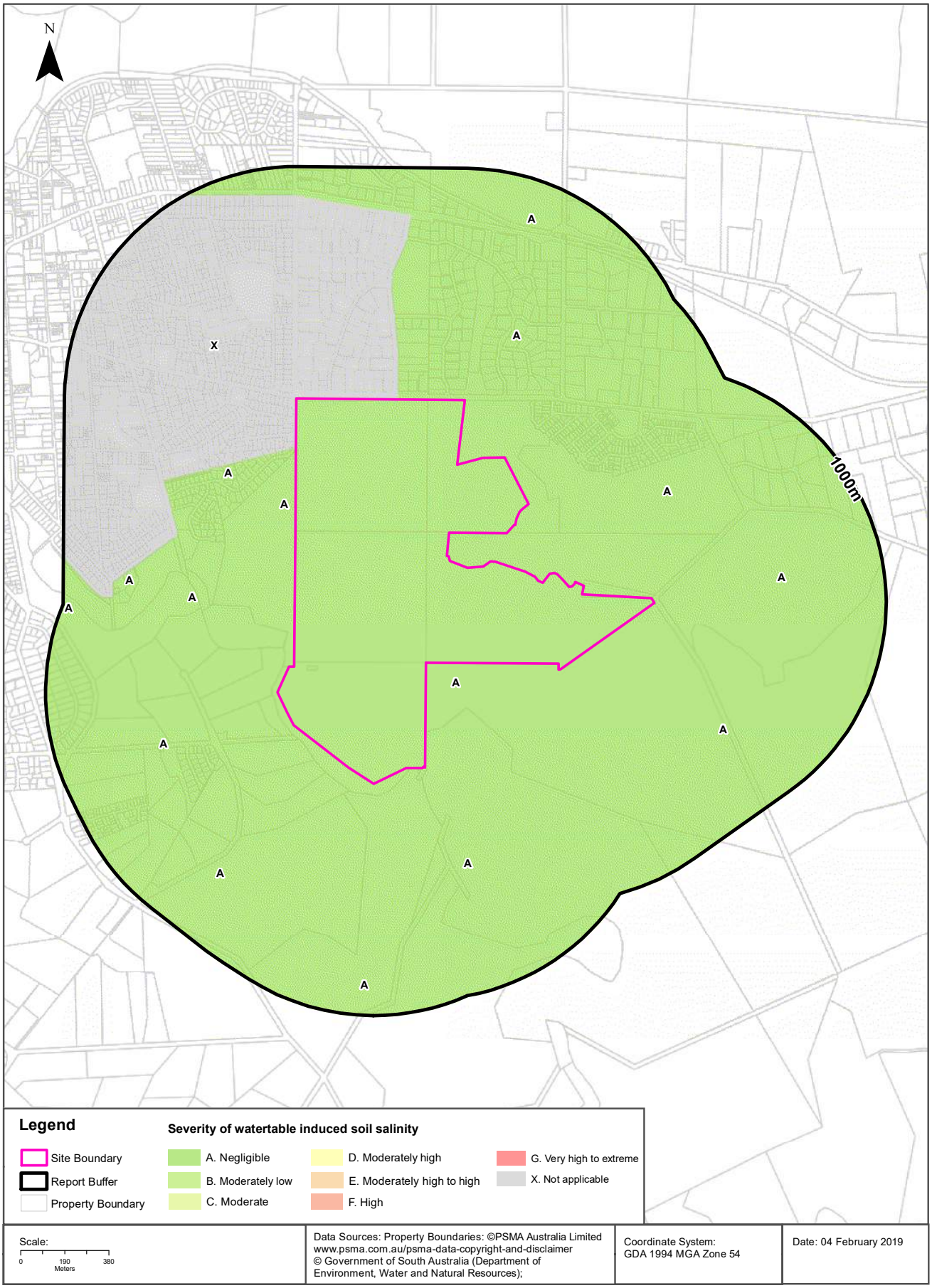
Acid Sulfate Soil Potential

Acid sulfate soil potential within the dataset buffer:

Map category code	Proportion of land susceptible to the development of acid sulfate soils	Distance
A	Negligible	0m
X	Not applicable - No assessment/analysis undertaken	0m

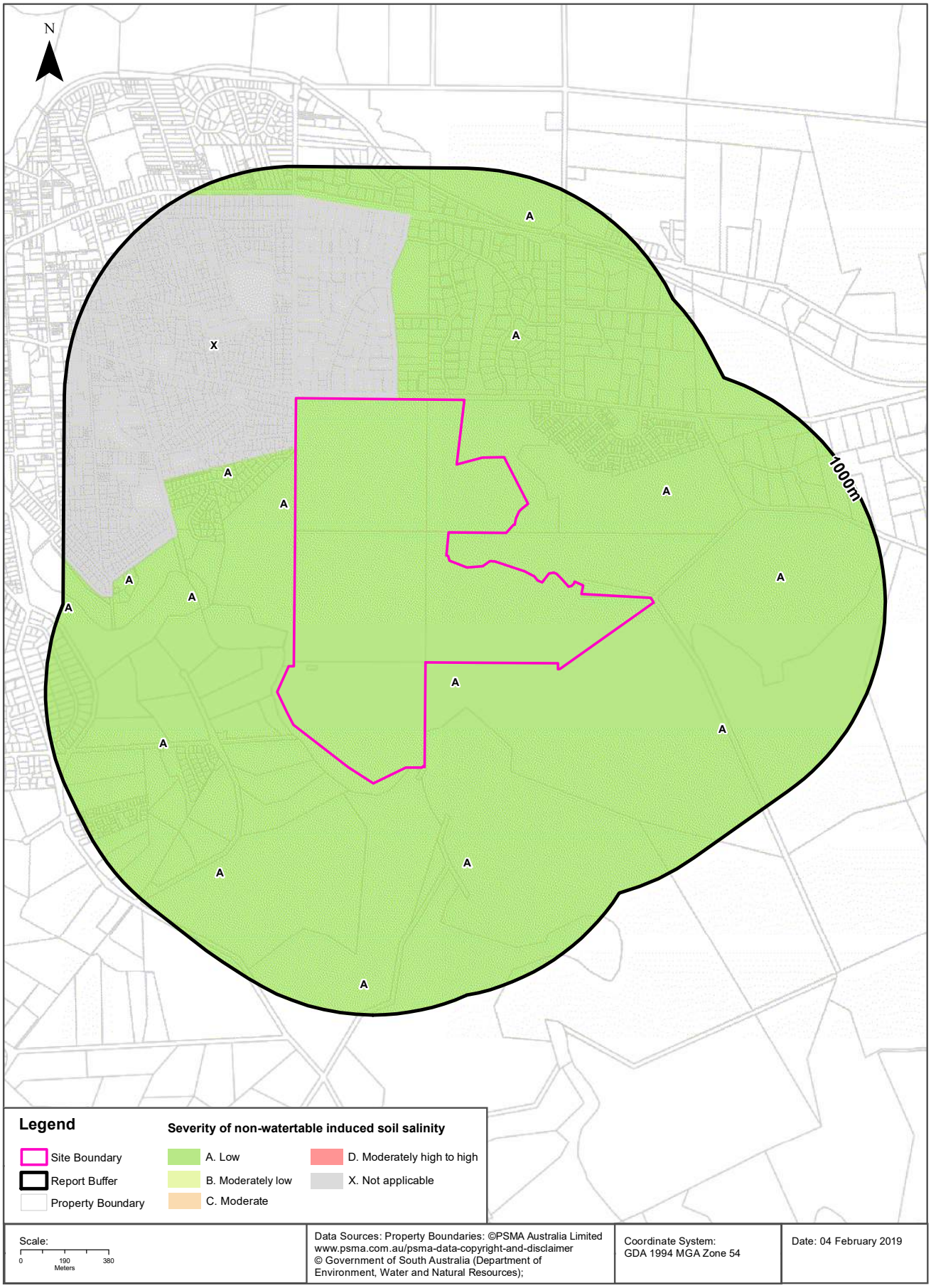
Soil Salinity - Watertable Induced

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



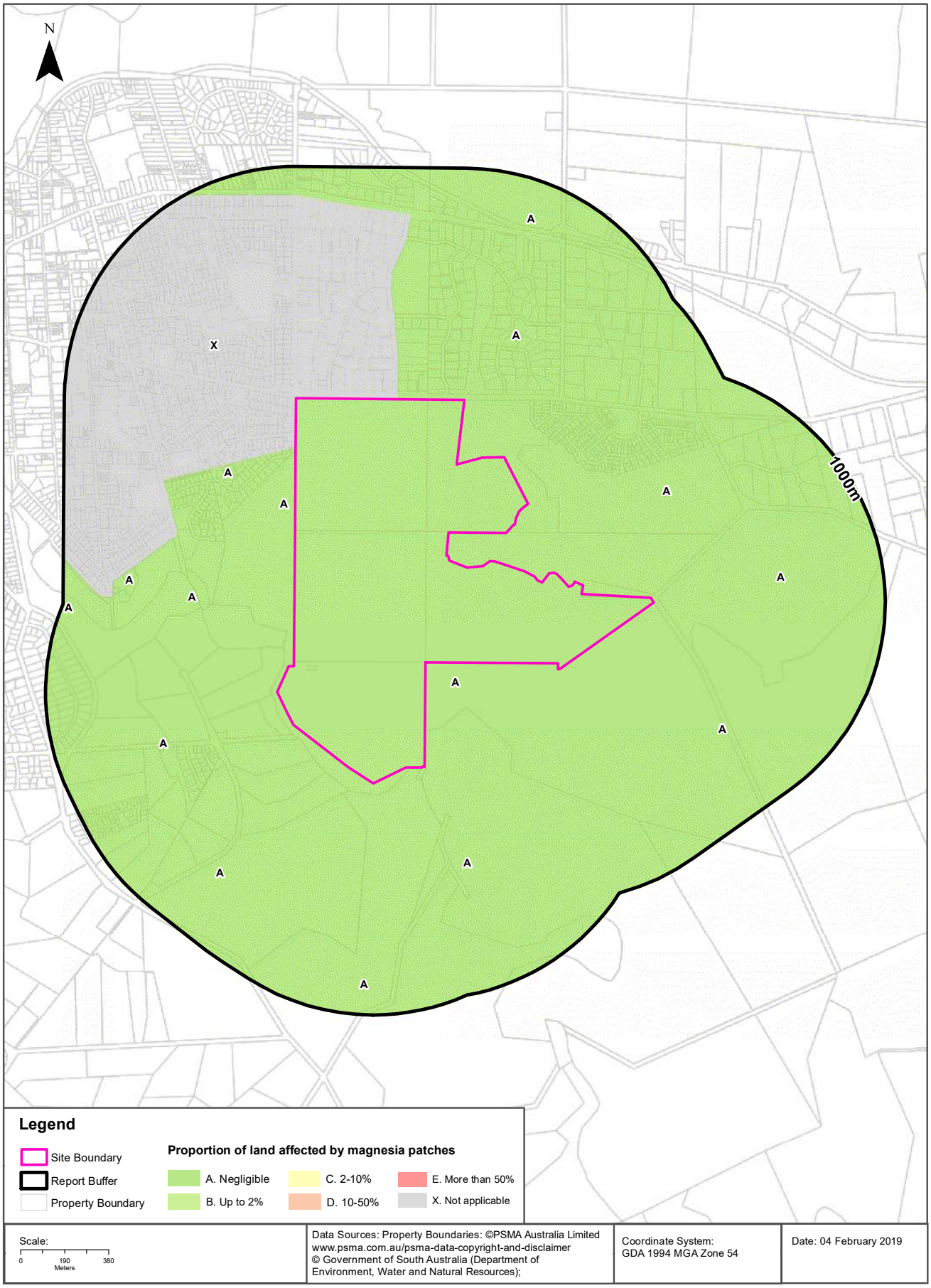
Soil Salinity - Non-watertable

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Soil Salinity - Non-watertable (Magnesia Patches)

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Soil Salinity

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

Soil Salinity - Watertable Induced

Watertable induced soil salinity within the dataset buffer:

Map category code	Severity description	Distance
A	Negligible	0m
X	Not applicable - No assessment/analysis undertaken	0m

Soil Salinity - Non-Watertable

Non-watertable soil salinity within the dataset buffer:

Map category code	Severity description	Surface ECe (dS/m)	Subsoil ECe (dS/m)	Distance
A	Low	<2	<4	0m
X	Not applicable - No assessment/analysis undertaken			0m

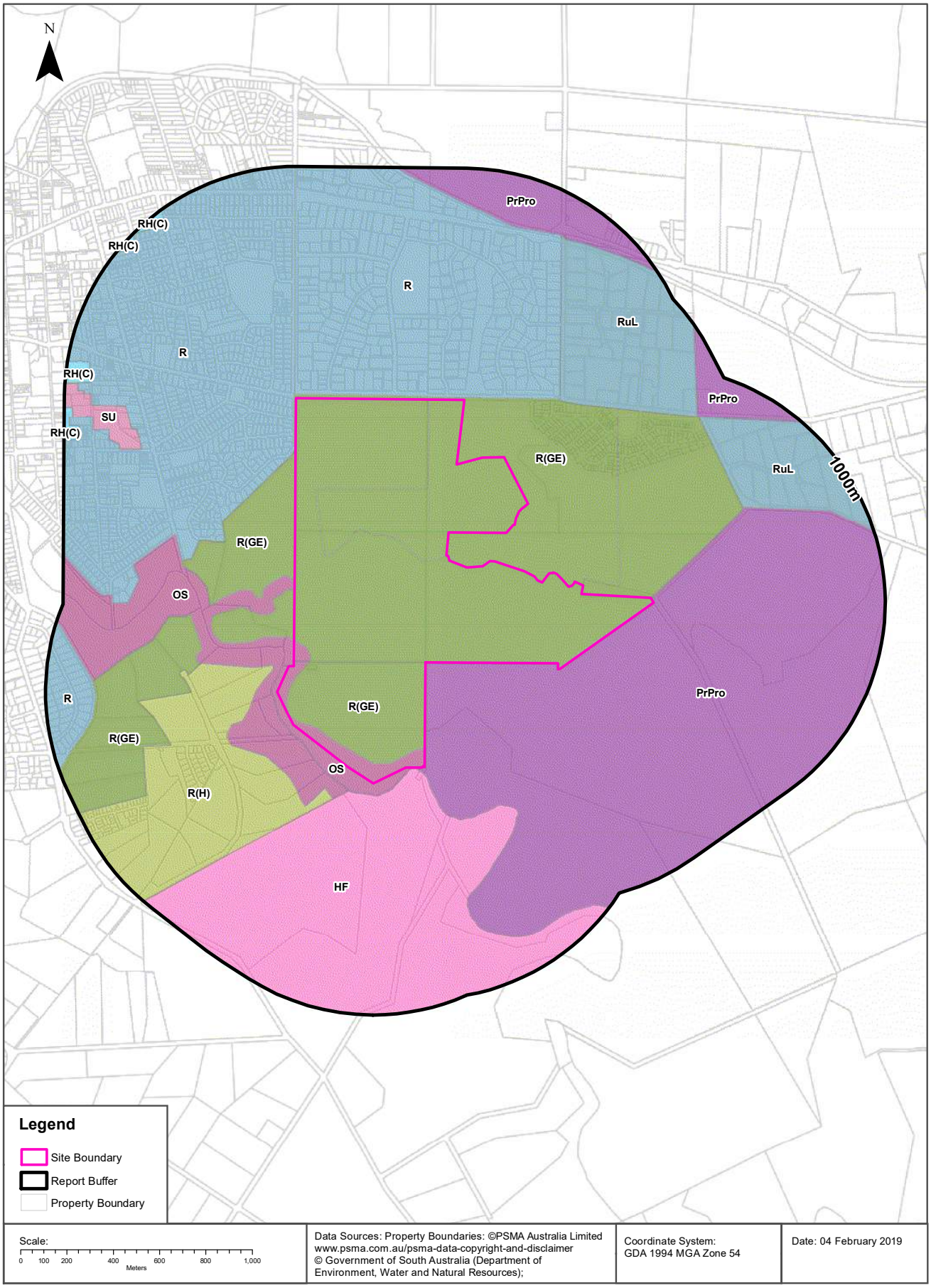
Soil Salinity - Non-Watertable (Magnesia Patches)

Magnesia patches within the dataset buffer:

Map category code	Proportion of land affected by magnesia patches	Distance
A	Negligible	0m
X	Not applicable - No assessment/analysis undertaken	0m

Land Development Zones

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Planning

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

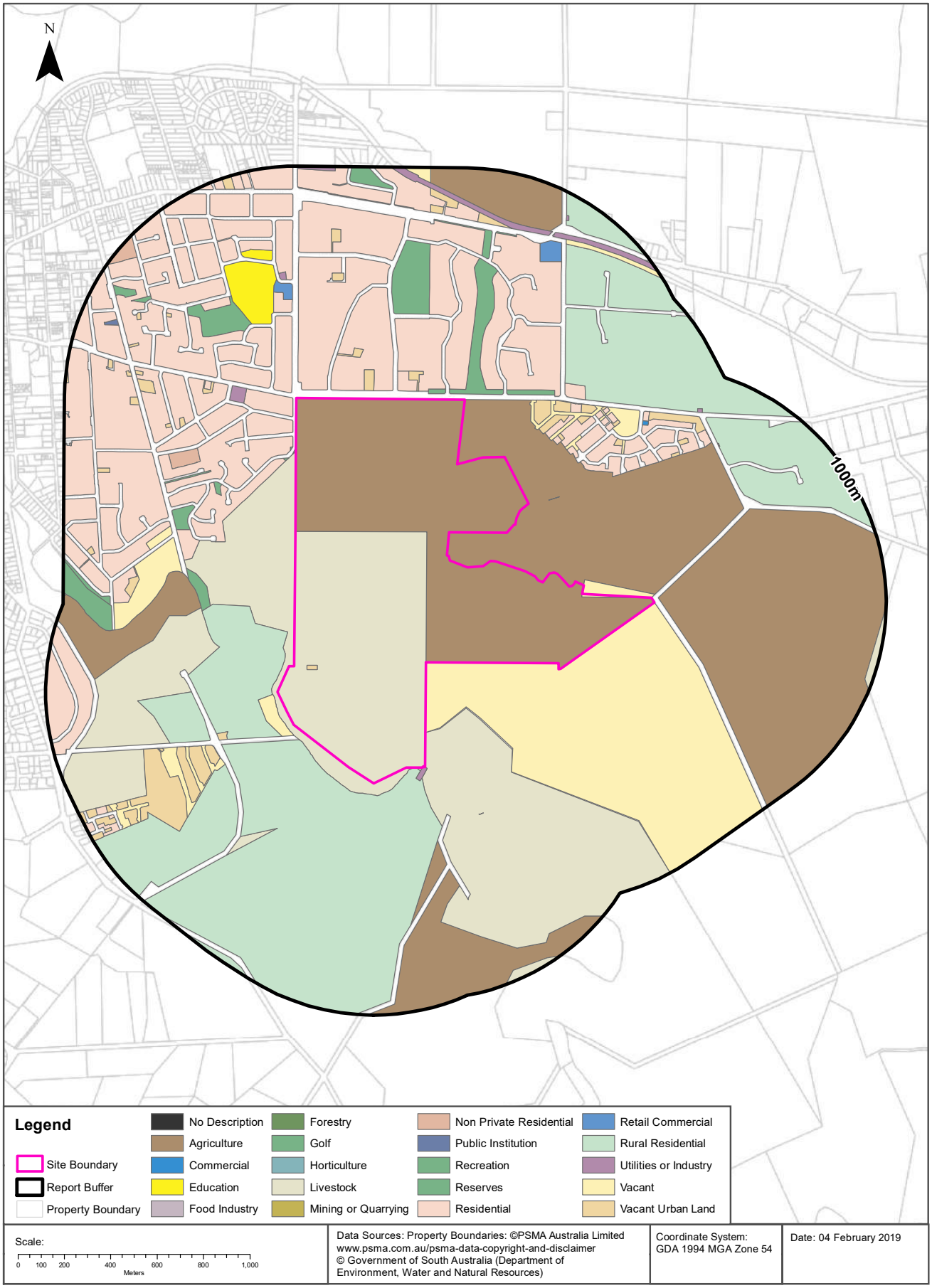
Land Development Zones

Land development zoning within the dataset buffer:

Zone Code	Development Plan Code	Zone Description	Devlopment Category	Distance	Direction
R(GE)	GA	Residential (Gawler East)	RESIDENTIAL	0m	Onsite
R(GE)	BARO	Residential (Gawler East)	RESIDENTIAL	0m	Onsite
OS	BARO	Open Space	OPEN SPACE	0m	Onsite
OS	GA	Open Space	OPEN SPACE	0m	West
PrPro	BARO	Primary Production	PRIMARY PRODUCTION - MINING	0m	East
R	GA	Residential	RESIDENTIAL	0m	North West
HF	PLAY	Hills Face	ENVIRONMENTAL CONSTRAINT	3m	South
R	GA	Residential	RESIDENTIAL	13m	North
R(H)	GA	Residential (Hills)	RESIDENTIAL	55m	South West
RuL	BARO	Rural Living	RURAL LIVING	343m	North East
R(GE)	GA	Residential (Gawler East)	RESIDENTIAL	351m	South West
RuL	BARO	Rural Living	RURAL LIVING	557m	East
SU	GA	Special Use	MISCELLANEOUS	665m	North West
R	GA	Residential	RESIDENTIAL	782m	West
RH(C)	GA	Residential Historic (Conservation)	HISTORIC RESIDENTIAL	890m	North West

Land Use Generalised 2017

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Land Use

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

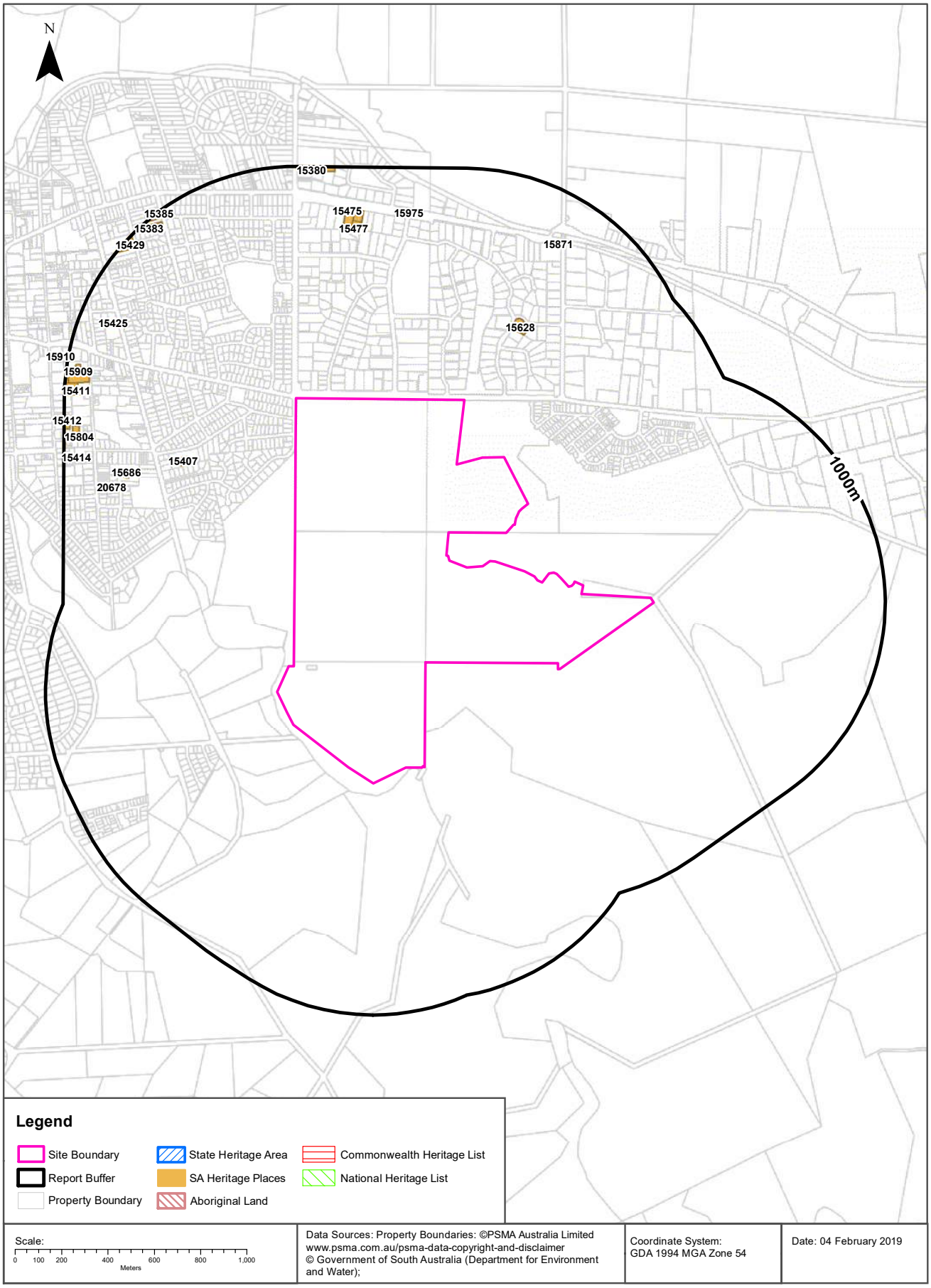
Land Use Generalised 2017

Land use classes within the dataset buffer:

Description	Distance	Direction
Agriculture	0m	Onsite
Livestock	0m	Onsite
Vacant	0m	East
Vacant Urban Land	0m	South West
Vacant	0m	South East
Utilities or Industry	0m	South
Reserves	0m	North West
Rural Residential	3m	South
Residential	14m	North West
Education	338m	North West
Recreation	368m	North
Non Private Residential	412m	North West
Retail Commercial	424m	North West
Commercial	592m	North East
Public Institution	829m	North West

Heritage

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Heritage

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

Commonwealth Heritage List

What are the Commonwealth Heritage List Items located within the dataset buffer?

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

National Heritage List

What are the National Heritage List Items located within the dataset buffer?
Note. Please click on Place Id to activate a hyperlink to online website.

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

State Heritage Areas

State Heritage Areas within the dataset buffer:

Heritage Id	Name	Distance	Direction
N/A	No records in buffer		

SA Heritage Places

SA Heritage Places within the dataset buffer:

Heritage No	Location	Heritage Class	Australian Class	Details	Auth Date	Distance	Direction
15628	2 Lally Drive GAWLER EAST	Local	House	Dwelling, former chaff mill & barn	3/8/2001	372m	North East
15407	1 Deland Avenue GAWLER	State	House	Trevu House Nursing Home (former Dwelling of James Martin MLC)		467m	North West
15686	8 McKinlay Avenue GAWLER EAST	Local	House	Oaklands	3/8/2001	720m	West
20678	1B Dawes Avenue GAWLER EAST	Local	House	Dwelling	3/8/2001	720m	West
15477	7 Eucalypt Drive GAWLER EAST	Local	House	Former Korff farmhouse	3/8/2001	728m	North

Heritage No	Location	Heritage Class	Australian Class	Details	Auth Date	Distance	Direction
15475	6 Eucalypt Drive GAWLER EAST	Local	House	Former Korff barn	3/8/2001	730m	North
15476	7 Eucalypt Drive GAWLER EAST	Local	House	Former Korff farmhouse & attached stable	3/8/2001	762m	North
15871	Barossa Valley Highway GAWLER EAST	State	Hotel - Motel - Inn	Tea Rooms (former Wheatsheaf Hotel)		779m	North East
15975	Lyndoch/Hemaford GAWLER EAST	Local	Historic Sites (unclassified)	Stone culvert under Lyndoch Road	3/8/2001	793m	North
15425	23 East Terrace GAWLER EAST	Local	Historic Sites (unclassified)	Dance Academy, former barn	3/8/2001	829m	North West
15909	3 Turner Street GAWLER EAST	Contributory	House	Dwelling, barn & western perimeter walls	3/8/2001	896m	North West
15411	10 Duffield Street GAWLER EAST	Contributory	House	Coach House	3/8/2001	916m	North West
15804	8 Rudall Street GAWLER EAST	Contributory	House	Dwelling	3/8/2001	934m	North West
15910	1 Turner Street GAWLER EAST	State	House	Dwelling		939m	North West
15383	11 Crown Street GAWLER EAST	Contributory	House	Dwelling	3/8/2001	940m	North West
15429	6-8 East Terrace GAWLER EAST	Local	House	Former Hutchinson Hospital	3/8/2001	952m	North West
15386	7 Crown Street GAWLER EAST	Contributory	House	Dwelling	3/8/2001	972m	North West
15413	20 Duffield Street GAWLER EAST	Contributory	House	Dwelling	3/8/2001	976m	North West
15412	18 Duffield Street GAWLER EAST	Contributory	House	Dwelling	3/8/2001	978m	North West
15380	LOT 72 Cheek Avenue North GAWLER EAST	Local	Cemetery	St George's Anglican Cemetery	3/8/2001	981m	North
15409	Duffield Street GAWLER EAST	Contributory	Fence/Wall	Western stone wall	3/8/2001	985m	North West
15385	5 Crown Street GAWLER EAST	Contributory	House	Dwelling	3/8/2001	989m	North West
15414	22 Duffield Street GAWLER EAST	Contributory	House	Dwelling	3/8/2001	996m	West
15343	8 Bishop Street GAWLER EAST	Contributory	House	Dwelling	3/8/2001	998m	North West

Heritage Places Data Source: Dept of Environment, Water and Natural Resources - South Australia

Aboriginal Land

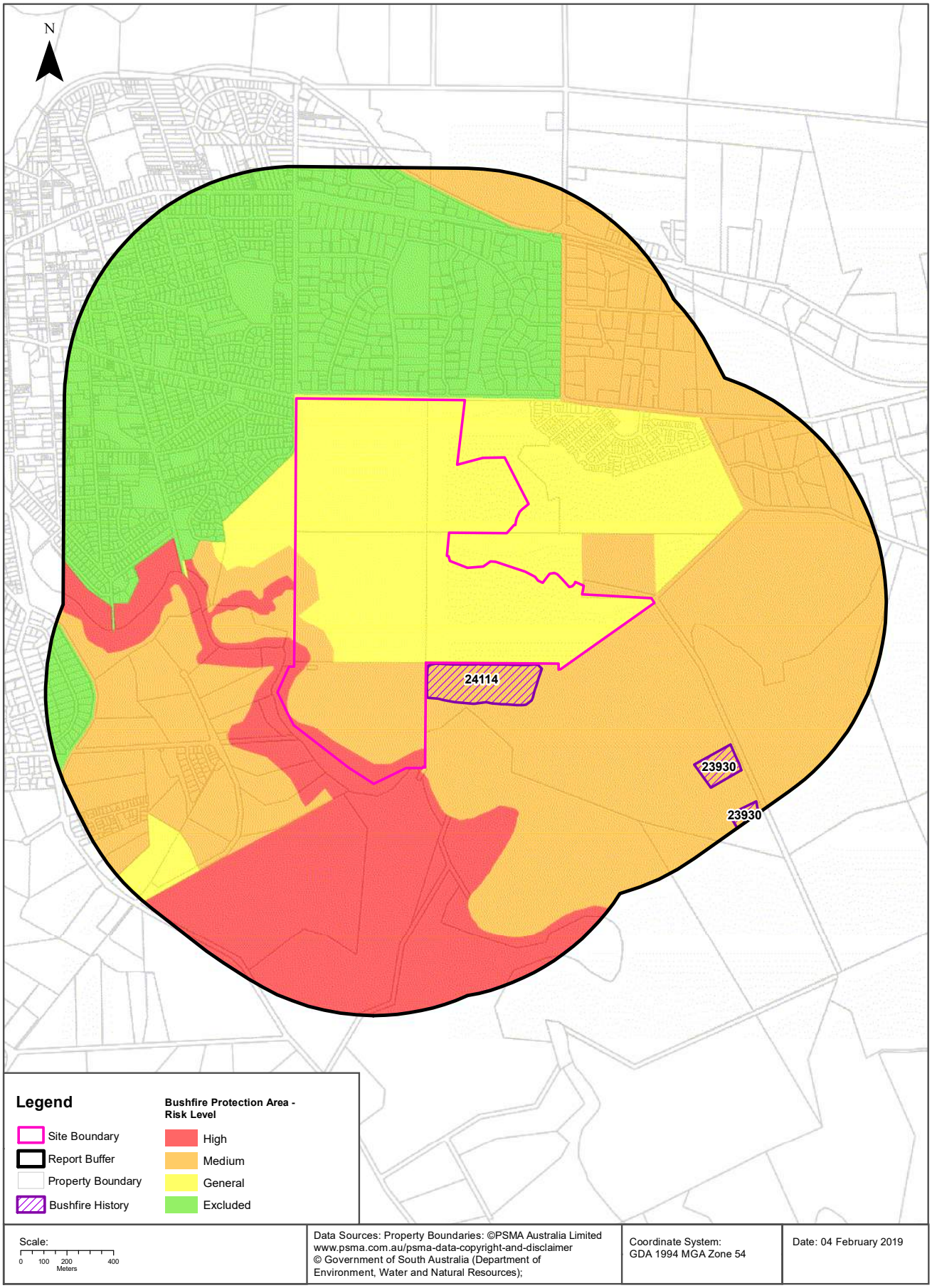
Aboriginal Land within the dataset buffer:

Map Id	Grant Date	Address	Locality	Description	Title	Distance	Direction
N/A	No records in buffer						

Aboriginal Land Data Source: Department of State Development, Resources and Energy - South Australia

Bushfire

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Natural Hazards

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

Bushfire Protection Areas

Bushfire Protection Areas within the dataset buffer:

Map Id	Bushfire Risk Code	Development Plan Code	Additional Development Criteria	Distance	Direction
2436	High	BARO		0m	Onsite
1825	High	GA		0m	Onsite
1826	Medium	GA		0m	Onsite
1827	General	GA		0m	Onsite
2027	Medium	BARO		0m	Onsite
1727	Medium	GA		0m	Onsite
2150	Excluded	GA		0m	West

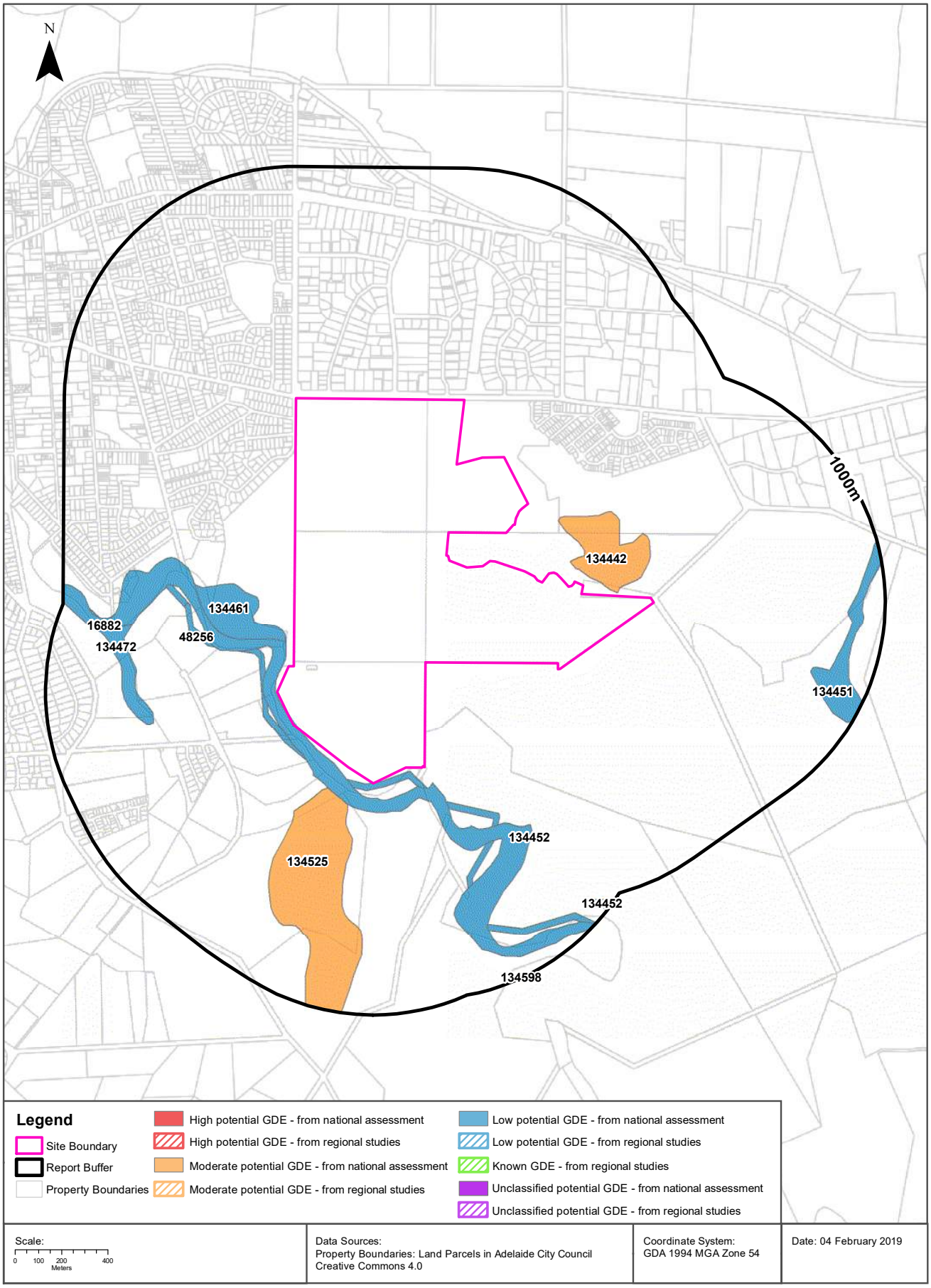
Bushfires and Prescribed Burns History

Bushfires and prescribed burns within the dataset buffer:

Map Id	Incident No.	Incident Name	Incident Type	Date of Fire	Area of Fire	Distance	Direction
24114	209	Para Woodland A16	Prescribed Burn	3/16/2017 12:00:00 AM	7	4m	South East
23930	208	Para Woodlands A15	Prescribed Burn	3/27/2015 12:00:00 AM	3	668m	South East

Groundwater Dependent Ecosystems Atlas

Stages 3 and 4, Springwood Development, Gawler East, SA 5118



Ecological Constraints

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

Groundwater Dependent Ecosystems Atlas

GDEs within the dataset buffer:

MapID	Type	Name	GDE Potential	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance
134452	Terrestrial		Low potential GDE - from national assessment	10	Complex fold belt of prominent ranges in north, chiefly quartzite with vales on weaker rocks; stepped fault blocks and islands in south, mainly of weathered metamorphic rocks with ferruginous cappings.	Vegetation		0m
48256	Aquatic		Low potential GDE - from national assessment	5	Complex fold belt of prominent ranges in north, chiefly quartzite with vales on weaker rocks; stepped fault blocks and islands in south, mainly of weathered metamorphic rocks with ferruginous cappings.	River		0m
134442	Terrestrial		Moderate potential GDE - from national assessment	7	Complex fold belt of prominent ranges in north, chiefly quartzite with vales on weaker rocks; stepped fault blocks and islands in south, mainly of weathered metamorphic rocks with ferruginous cappings.	Vegetation		13m
134461	Terrestrial		Low potential GDE - from national assessment	9	Complex fold belt of prominent ranges in north, chiefly quartzite with vales on weaker rocks; stepped fault blocks and islands in south, mainly of weathered metamorphic rocks with ferruginous cappings.	Vegetation		34m
134525	Terrestrial		Moderate potential GDE - from national assessment	5	Complex fold belt of prominent ranges in north, chiefly quartzite with vales on weaker rocks; stepped fault blocks and islands in south, mainly of weathered metamorphic rocks with ferruginous cappings.	Vegetation		123m
16882	Aquatic		Low potential GDE - from national assessment	10	Complex fold belt of prominent ranges in north, chiefly quartzite with vales on weaker rocks; stepped fault blocks and islands in south, mainly of weathered metamorphic rocks with ferruginous cappings.	River		453m

MapID	Type	Name	GDE Potential	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance
134472	Terrestrial		Low potential GDE - from national assessment	10	Complex fold belt of prominent ranges in north, chiefly quartzite with vales on weaker rocks; stepped fault blocks and islands in south, mainly of weathered metamorphic rocks with ferruginous cappings.	Vegetation		543m
134451	Terrestrial		Low potential GDE - from national assessment	6	Complex fold belt of prominent ranges in north, chiefly quartzite with vales on weaker rocks; stepped fault blocks and islands in south, mainly of weathered metamorphic rocks with ferruginous cappings.	Vegetation		737m
134598	Terrestrial		Low potential GDE - from national assessment	4	Complex fold belt of prominent ranges in north, chiefly quartzite with vales on weaker rocks; stepped fault blocks and islands in south, mainly of weathered metamorphic rocks with ferruginous cappings.	Vegetation		989m

Ecological Constraints

Stages 3 and 4, Springwood Development, Gawler East, SA 5118

Ramsar Wetlands

RamsarWetlands within the dataset buffer:

Wetland	Distance	Direction
No records in buffer		

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Appendix D

Aerial Photographs

Appendix D

Historical Aerial Photographs

1979

Springwood Stage 3 and 4
Gawler East
Preliminary Site Investigation

For

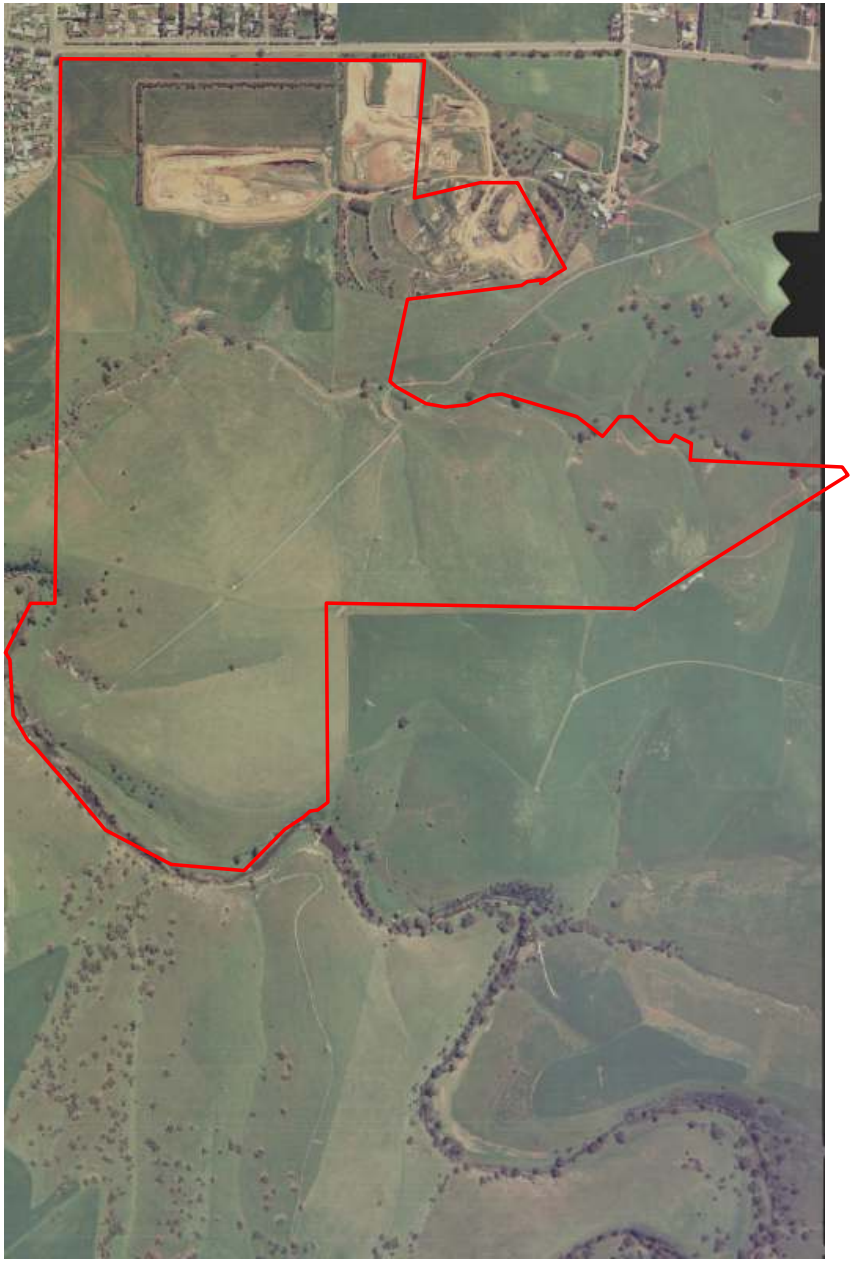
Arcadian Property

LEGEND

Approximate Site Boundary

DELIVERING ENVIRONMENTAL SOLUTIONS

LBW co Details			
Job No.	191076		
Drawn	MF	**Rev.**	0
Checked	MP	**Date**	05.04.2019



Appendix D

Historical Aerial Photographs

1989

Springwood Stage 3 and 4
Gawler East
Preliminary Site Investigation

For

Arcadian Property

LEGEND

Approximate Site Boundary

DELIVERING ENVIRONMENTAL SOLUTIONS

LBW co Details			
Job No.	191076		
Drawn	MF	**Rev.**	0
Checked	MP	**Date**	05.04.2019

Appendix D

Historical Aerial Photographs

2005

Springwood Stage 3 and 4
Gawler East
Preliminary Site Investigation

For

Arcadian Property

LEGEND

Approximate Site Boundary

DELIVERING ENVIRONMENTAL SOLUTIONS

LBW co Details			
Job No.	191076		
Drawn	MF	**Rev.**	0
Checked	MP	**Date**	05.04.2019

Appendix D

Historical Aerial Photographs

2010

Springwood Stage 3 and 4
Gawler East
Preliminary Site Investigation

For

Arcadian Property

LEGEND

Approximate Site Boundary

DELIVERING ENVIRONMENTAL SOLUTIONS

LBW co Details			
Job No.	191076		
Drawn	MF	Rev.	0
Checked	MP	Date	05.04.2019

Appendix D

Historical Aerial Photographs

2014

Springwood Stage 3 and 4
Gawler East
Preliminary Site Investigation

For

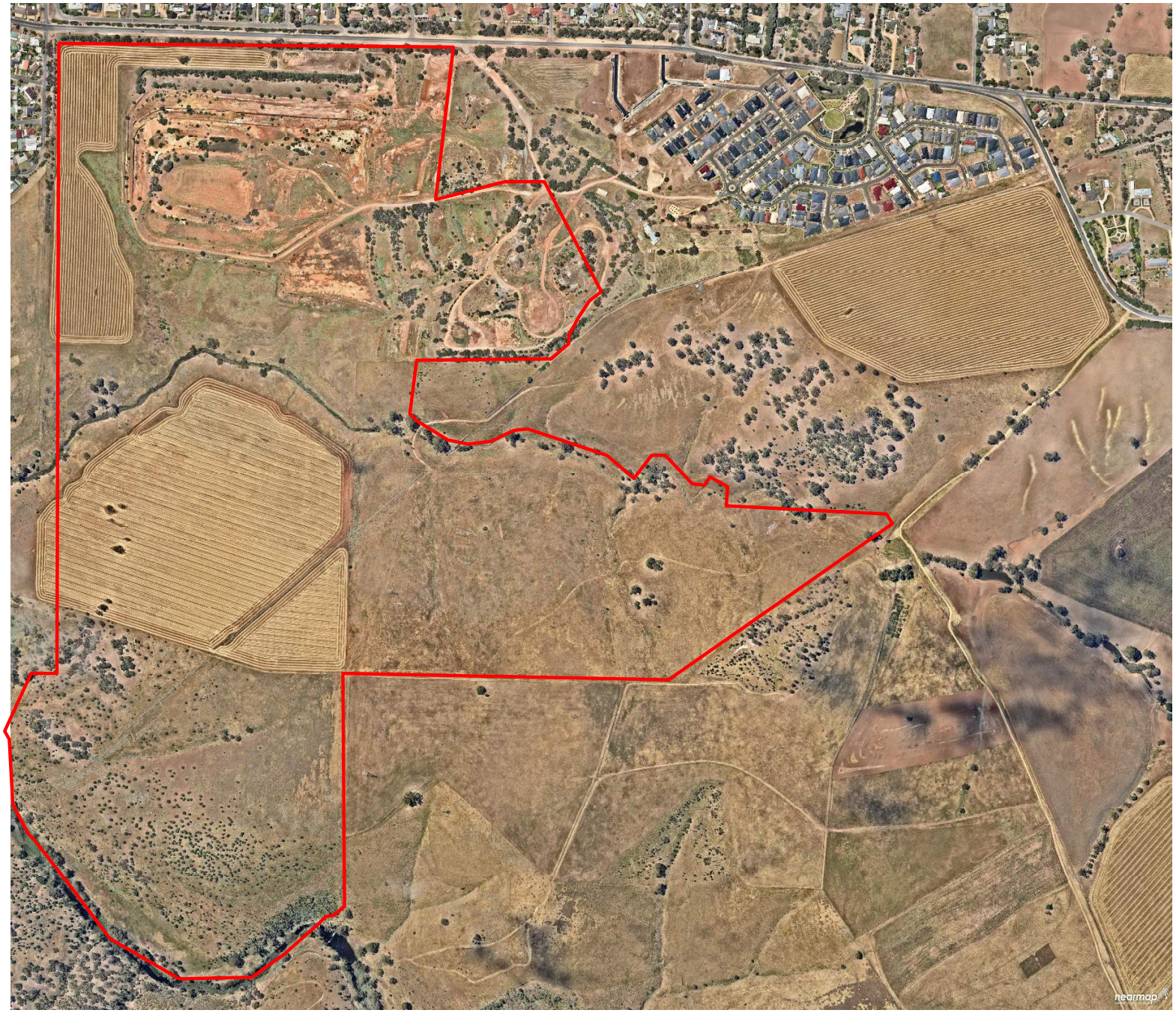
Arcadian Property

LEGEND

Approximate Site Boundary

lbw eo | DELIVERING ENVIRONMENTAL SOLUTIONS

LBW co Details			
Job No.	191076		
Drawn	MF	**Rev.**	0
Checked	MP	**Date**	05.04.2019



Appendix D

Historical Aerial Photographs

2016

Springwood Stage 3 and 4
Gawler East
Preliminary Site Investigation

For

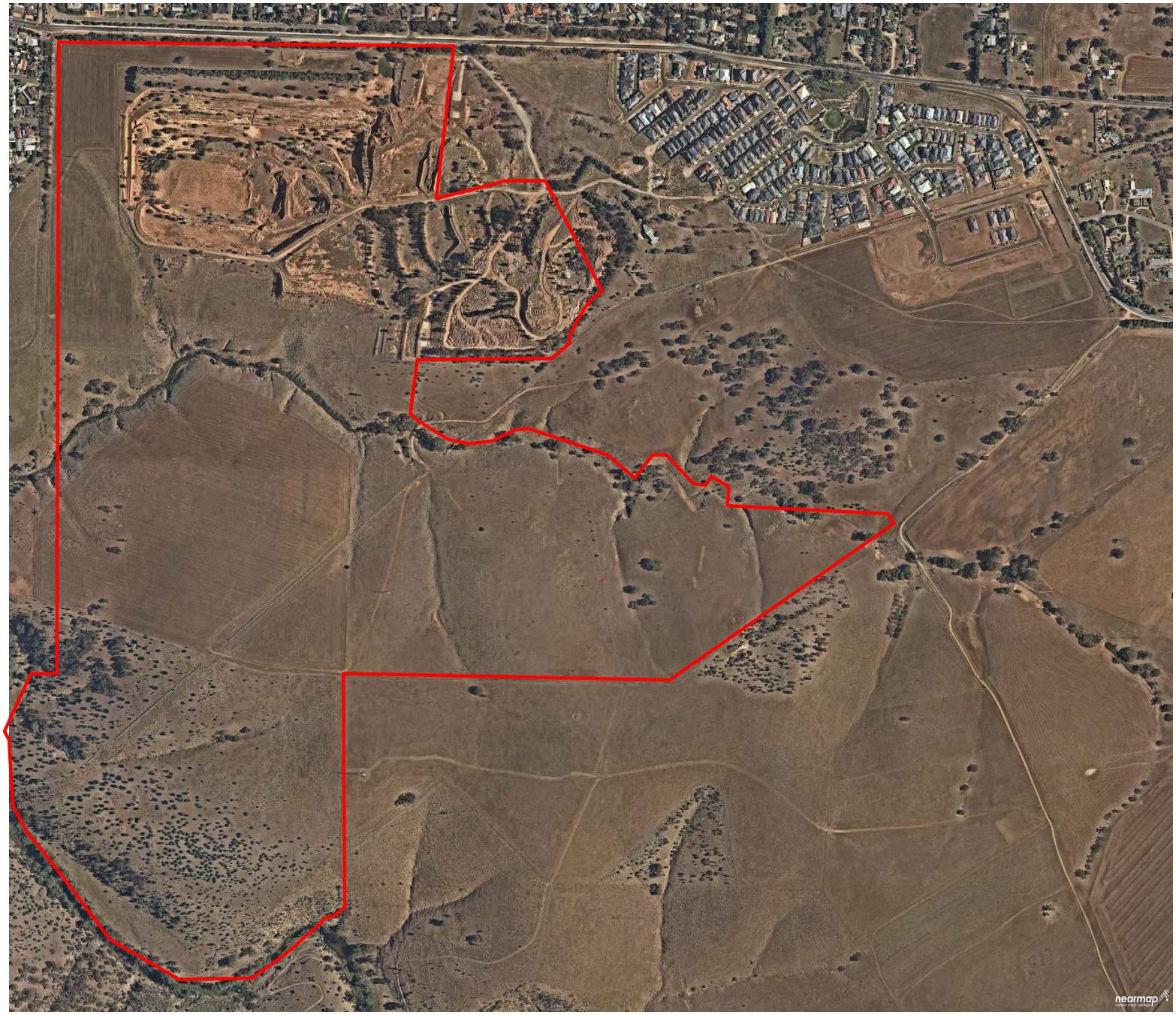
Arcadian Property

LEGEND

Approximate Site Boundary

lbw co DELIVERING ENVIRONMENTAL SOLUTIONS

LBW co Details			
Job No.	191076		
Drawn	MF	Rev.	0
Checked	MP	Date	05.04.2019



Appendix D

Historical Aerial Photographs

2018

Springwood Stage 3 and 4
Gawler East
Preliminary Site Investigation

For

Arcadian Property

LEGEND

Approximate Site Boundary

lbw eo DELIVERING ENVIRONMENTAL SOLUTIONS

LBW co Details			
Job No.	191076		
Drawn	MF	**Rev.**	0
Checked	MP	**Date**	05.04.2019

Appendix E

Sands and McDougall Search Results

Sands and McDougall Search

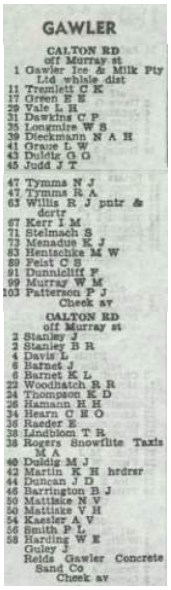
Project Number	191076
Report Title	Preliminary Site Investigation
Site Address	Springwood Stage 3 and 4

On-site

Nearby off-site activities of significance

1973

Pages 359



GAWLER

CALTON RD
off Murray st
1 Gawler Ice & Milk Pty Ltd whsle dist
11 Tremlett C K
17 Green F E
29 Vale L R
31 Dawkins C P
35 Longmire W S
39 Deckmann N A H
41 Grane L W
43 Duldig G G
45 Judd J T
47 Tymms N J
47 Tymms R A
63 Willis R J pntr & dcrtr
67 Kerr I M
71 Stelmach S
73 Menadue K J
83 Hentschke M W
89 Feist C S
91 Dunnicliff F
99 Murray W M
103 Patterson P J
Cheek av

CALTON RD
off Murray st
2 Stanley J
2 Stanley B R
4 Davis L
6 Barnet J
6 Barnet K L
22 Woodhatch R R
24 Thompson K D
26 Hannam R H
34 Hearn C E O
36 Raeder E
38 Lindblom T R
38 Rogers Snowflite Taxis M A
40 Duldig M J
42 Martin K H hrdrsr
44 Duncan J D
46 Barrington B J
50 Mattiske N V
50 Mattiske V H
54 Kaesler A V
56 Smith P L
58 Harding W E
Guley J
Reids Gawler Concrete Sand Co
Cheek av

1963

Pages 380

GAWLER

Appendix F

SA Dangerous Substances Licensing Database Search Results

Government of South Australia
SafeWork SA

Licensing, Customer Services Team

Level 4 World Park A
33 Richmond Road
Keswick SA 5035

GPO Box 465
Adelaide SA 5001

DX 715 Adelaide

Phone 1300 365 255
Email licensing.safework@sa.gov.au

ABN 50-560-588-327

www.safework.sa.gov.au

22 February 2019

Mr Sam Rady
LBW Co Pty Ltd
184 Magill Road
NORWOOD SA 5067

Dear Mr Rady

DANGEROUS SUBSTANCES LICENCE SEARCH

PROPERTY DETAILS: Calton Road, Gawler East 5118

Further to your application for a Dangerous Substance Search dated 6 February 2019 received for the abovementioned site, I advise that there are no current or historical records for this site.

Yours sincerely

MANAGER
CUSTOMER SERVICES TEAM
SAFEWORK SA

Appendix G

EPA Section 7 Search Results

Environment Protection Authority
GPO Box 2607 Adelaide SA 5001
211 Victoria Square Adelaide SA 5000
T (08) 8204 2004
Country areas 1800 623 445

Receipt No :
Admin No : 73272 (52827)

LBW Co
184 Magill Road
NORWOOD SA 5067

Contact: Section 7
Telephone: (08) 8204 2026
Email: epasection7@sa.gov.au

Contact: Public Register
Telephone: (08) 8204 9128
Email: epa.publicregister@sa.gov.au

28 March, 2019

EPA STATEMENT TO FORM 1 - CONTRACTS FOR SALE OF LAND OR BUSINESS

The EPA provides this statement to assist the vendor meet its obligations under section 7(1)(b) of the *Land and Business (Sale and Conveyancing) Act 1994*. A response to the questions prescribed in Schedule 1-Contracts for sale of land or business-forms (Divisions 1 and 2) of the *Land and Business (Sale and Conveyancing) Act 1994* is provided in relation to the land.

I refer to your enquiry concerning the parcel of land comprised in

Title Reference	CT Volume 6186 Folio 896
Address	Allotment 9010 (DP 114845), Calton Road, GAWLER EAST SA 5118

Schedule – Division 1 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS OF MORTGAGES, CHARGES AND PRESCRIBED ENCUMBRANCES AFFECTING THE LAND

7. Environment Protection Act 1993

Does the EPA hold any of the following details relating to the *Environment Protection Act 1993*:

7.1	Section 59 - Environment performance agreement that is registered in relation to the land.	NO
7.2	Section 93 - Environment protection order that is registered in relation to the land.	NO
7.3	Section 93A - Environment protection order relating to cessation of activity that is registered in relation to the land.	NO
7.4	Section 99 - Clean-up order that is registered in relation to the land.	NO
7.5	Section 100 - Clean-up authorisation that is registered in relation to the land.	NO
7.6	Section 103H - Site contamination assessment order that is registered in relation to the land.	NO
7.7	Section 103J - Site remediation order that is registered in relation to the land.	NO

7.8	Section 103N - Notice of declaration of special management area in relation to the land (due to possible existence of site contamination).	NO
7.9	Section 103P - Notation of site contamination audit report in relation to the land.	NO
7.10	Section 103S - Notice of prohibition or restriction on taking water affected by site contamination in relation to the land.	NO

Schedule – Division 2 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS RELATING TO ENVIRONMENT PROTECTION

3-Licences and exemptions recorded by EPA in public register

Does the EPA hold any of the following details in the public register:

a)	details of a current licence issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	NO
b)	details of a licence no longer in force issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	**YES**
c)	details of a current exemption issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
d)	details of an exemption no longer in force issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
e)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to operate a waste depot at the land?	NO
f)	details of a licence issued under the repealed *Waste Management Act 1987* to operate a waste depot at the land?	NO
g)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to produce waste of a prescribed kind (within the meaning of that Act) at the land?	NO

h)	details of a licence issued under the repealed *Waste Management Act 1987* to produce prescribed waste (within the meaning of that Act) at the land?	NO

4-Pollution and site contamination on the land - details recorded by the EPA in public register

Does the EPA hold any of the following details in the public register in relation to the land or part of the land:

a)	details of serious or material environmental harm caused or threatened in the course of an activity (whether or not notified under section 83 of the *Environment Protection Act 1993*)?	NO
b)	details of site contamination notified to the EPA under section 83A of the *Environment Protection Act 1993*?	NO
c)	a copy of a report of an environmental assessment (whether prepared by the EPA or some other person or body and whether or not required under legislation) that forms part of the information required to be recorded in the public register?	NO
d)	a copy of a site contamination audit report?	NO
e)	details of an agreement for the exclusion or limitation of liability for site contamination to which section 103E of the *Environment Protection Act 1993* applies?	NO
f)	details of an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?*	NO
g)	details of an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993?*	NO
h)	details of a notification under section 103Z(1) of the *Environment Protection Act 1993* relating to the commencement of a site contamination audit?	**YES**
i)	details of a notification under section 103Z(2) of the *Environment Protection Act 1993* relating to the termination before completion of a site contamination audit?	NO
j)	details of records, held by the former *South Australian Waste Management Commission* under the repealed *Waste Management Act 1987*, of waste (within the meaning of that Act) having been deposited on the land between 1 January 1983 and 30 April 1995?	NO

5-Pollution and site contamination on the land - other details held by EPA

Does the EPA hold any of the following details in relation to the land or part of the land:

a)	a copy of a report known as a "Health Commission Report" prepared by or on behalf of the *South Australian Health Commission* (under the repealed *South Australian Health Commission Act 1976*)?	NO
b)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?*	NO
c)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993*?	NO

d)	a copy of a pre-1 July 2009 site audit report?	NO
e)	details relating to the termination before completion of a pre-1 July 2009 site audit?	NO

Details and/or copies of environmental assessments, licences,exemptions and records on the Public Register may be obtained from the Environment Protection Authority.

Prior to arranging an examination and/or copies of the required above information please telephone (08) 8204 9128 to contact the Public Register Administrator to ensure the required details are available upon arrival.

All care and diligence has been taken to access the above information from available records. Historical records provided to the EPA concerning matters arising prior to 1 May 1995 are limited and may not be accurate or complete and therefore the EPA cannot confirm the accuracy of the historical information provided.

File Reference: EPA/1874; EPA/14132; SC60456

Environment Protection Authority
GPO Box 2607 Adelaide SA 5001
211 Victoria Square Adelaide SA 5000
T (08) 8204 2004
Country areas 1800 623 445

Receipt No :
Admin No : 67577 (52830)

LBW Co
184 Magill Road
NORWOOD SA 5067

Contact: Section 7
Telephone: (08) 8204 2026
Email: epasection7@sa.gov.au

Contact: Public Register
Telephone: (08) 8204 9128
Email: epa.publicregister@sa.gov.au

28 March, 2019

EPA STATEMENT TO FORM 1 - CONTRACTS FOR SALE OF LAND OR BUSINESS

The EPA provides this statement to assist the vendor meet its obligations under section 7(1)(b) of the *Land and Business (Sale and Conveyancing) Act 1994*. A response to the questions prescribed in Schedule 1-Contracts for sale of land or business-forms (Divisions 1 and 2) of the *Land and Business (Sale and Conveyancing) Act 1994* is provided in relation to the land.

I refer to your enquiry concerning the parcel of land comprised in

Title Reference	CT Volume 6162 Folio 334
Address	Allotment 4 (DP 28814), Balmoral Track, GAWLER EAST SA 5118

Schedule – Division 1 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS OF MORTGAGES, CHARGES AND PRESCRIBED ENCUMBRANCES AFFECTING THE LAND

7. Environment Protection Act 1993

Does the EPA hold any of the following details relating to the *Environment Protection Act 1993*:

7.1	Section 59 - Environment performance agreement that is registered in relation to the land.	NO
7.2	Section 93 - Environment protection order that is registered in relation to the land.	NO
7.3	Section 93A - Environment protection order relating to cessation of activity that is registered in relation to the land.	NO
7.4	Section 99 - Clean-up order that is registered in relation to the land.	NO
7.5	Section 100 - Clean-up authorisation that is registered in relation to the land.	NO
7.6	Section 103H - Site contamination assessment order that is registered in relation to the land.	NO
7.7	Section 103J - Site remediation order that is registered in relation to the land.	NO

7.8	Section 103N - Notice of declaration of special management area in relation to the land (due to possible existence of site contamination).	NO
7.9	Section 103P - Notation of site contamination audit report in relation to the land.	NO
7.10	Section 103S - Notice of prohibition or restriction on taking water affected by site contamination in relation to the land.	NO

Schedule – Division 2 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS RELATING TO ENVIRONMENT PROTECTION

3-Licences and exemptions recorded by EPA in public register

Does the EPA hold any of the following details in the public register:

a)	details of a current licence issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	NO
b)	details of a licence no longer in force issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	NO
c)	details of a current exemption issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
d)	details of an exemption no longer in force issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
e)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to operate a waste depot at the land?	NO
f)	details of a licence issued under the repealed *Waste Management Act 1987* to operate a waste depot at the land?	NO
g)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to produce waste of a prescribed kind (within the meaning of that Act) at the land?	NO

h)	details of a licence issued under the repealed *Waste Management Act 1987* to produce prescribed waste (within the meaning of that Act) at the land?	NO

4-Pollution and site contamination on the land - details recorded by the EPA in public register

Does the EPA hold any of the following details in the public register in relation to the land or part of the land:

a)	details of serious or material environmental harm caused or threatened in the course of an activity (whether or not notified under section 83 of the *Environment Protection Act 1993*)?	NO
b)	details of site contamination notified to the EPA under section 83A of the *Environment Protection Act 1993*?	NO
c)	a copy of a report of an environmental assessment (whether prepared by the EPA or some other person or body and whether or not required under legislation) that forms part of the information required to be recorded in the public register?	**YES**
d)	a copy of a site contamination audit report?	**YES**
e)	details of an agreement for the exclusion or limitation of liability for site contamination to which section 103E of the *Environment Protection Act 1993* applies?	NO
f)	details of an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?*	NO
g)	details of an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993?*	NO
h)	details of a notification under section 103Z(1) of the *Environment Protection Act 1993* relating to the commencement of a site contamination audit?	**YES**
i)	details of a notification under section 103Z(2) of the *Environment Protection Act 1993* relating to the termination before completion of a site contamination audit?	NO
j)	details of records, held by the former *South Australian Waste Management Commission* under the repealed *Waste Management Act 1987*, of waste (within the meaning of that Act) having been deposited on the land between 1 January 1983 and 30 April 1995?	NO

5-Pollution and site contamination on the land - other details held by EPA

Does the EPA hold any of the following details in relation to the land or part of the land:

a)	a copy of a report known as a "Health Commission Report" prepared by or on behalf of the *South Australian Health Commission* (under the repealed *South Australian Health Commission Act 1976*)?	NO
b)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?*	NO
c)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993*?	NO

d)	a copy of a pre-1 July 2009 site audit report?	NO
e)	details relating to the termination before completion of a pre-1 July 2009 site audit?	NO

Details and/or copies of environmental assessments, licences,exemptions and records on the Public Register may be obtained from the Environment Protection Authority.

Prior to arranging an examination and/or copies of the required above information please telephone (08) 8204 9128 to contact the Public Register Administrator to ensure the required details are available upon arrival.

All care and diligence has been taken to access the above information from available records. Historical records provided to the EPA concerning matters arising prior to 1 May 1995 are limited and may not be accurate or complete and therefore the EPA cannot confirm the accuracy of the historical information provided.

File Reference: SC60456

Environment Protection Authority
GPO Box 2607 Adelaide SA 5001
211 Victoria Square Adelaide SA 5000
T (08) 8204 2004
Country areas 1800 623 445

Receipt No :
Admin No : 72785 (52831)

LBW Co
184 Magill Road
NORWOOD SA 5067

Contact: Section 7
Telephone: (08) 8204 2026
Email: epasection7@sa.gov.au

Contact: Public Register
Telephone: (08) 8204 9128
Email: epa.publicregister@sa.gov.au

28 March, 2019

EPA STATEMENT TO FORM 1 - CONTRACTS FOR SALE OF LAND OR BUSINESS

The EPA provides this statement to assist the vendor meet its obligations under section 7(1)(b) of the *Land and Business (Sale and Conveyancing) Act 1994*. A response to the questions prescribed in Schedule 1-Contracts for sale of land or business-forms (Divisions 1 and 2) of the *Land and Business (Sale and Conveyancing) Act 1994* is provided in relation to the land.

I refer to your enquiry concerning the parcel of land comprised in

Title Reference	CT Volume 6184 Folio 173
Address	Allotment 1 (FP 13468), Gauge Station Track, KALBEEBA SA 5118

Schedule – Division 1 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS OF MORTGAGES, CHARGES AND PRESCRIBED ENCUMBRANCES AFFECTING THE LAND

7. Environment Protection Act 1993

Does the EPA hold any of the following details relating to the *Environment Protection Act 1993*:

7.1	Section 59 - Environment performance agreement that is registered in relation to the land.	NO
7.2	Section 93 - Environment protection order that is registered in relation to the land.	NO
7.3	Section 93A - Environment protection order relating to cessation of activity that is registered in relation to the land.	NO
7.4	Section 99 - Clean-up order that is registered in relation to the land.	NO
7.5	Section 100 - Clean-up authorisation that is registered in relation to the land.	NO
7.6	Section 103H - Site contamination assessment order that is registered in relation to the land.	NO
7.7	Section 103J - Site remediation order that is registered in relation to the land.	NO

7.8	Section 103N - Notice of declaration of special management area in relation to the land (due to possible existence of site contamination).	NO
7.9	Section 103P - Notation of site contamination audit report in relation to the land.	NO
7.10	Section 103S - Notice of prohibition or restriction on taking water affected by site contamination in relation to the land.	NO

Schedule – Division 2 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS RELATING TO ENVIRONMENT PROTECTION

3-Licences and exemptions recorded by EPA in public register

Does the EPA hold any of the following details in the public register:

a)	details of a current licence issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	NO
b)	details of a licence no longer in force issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	NO
c)	details of a current exemption issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
d)	details of an exemption no longer in force issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
e)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to operate a waste depot at the land?	NO
f)	details of a licence issued under the repealed *Waste Management Act 1987* to operate a waste depot at the land?	NO
g)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to produce waste of a prescribed kind (within the meaning of that Act) at the land?	NO

h)	details of a licence issued under the repealed *Waste Management Act 1987* to produce prescribed waste (within the meaning of that Act) at the land?	NO

4-Pollution and site contamination on the land - details recorded by the EPA in public register

Does the EPA hold any of the following details in the public register in relation to the land or part of the land:

a)	details of serious or material environmental harm caused or threatened in the course of an activity (whether or not notified under section 83 of the *Environment Protection Act 1993*)?	NO
b)	details of site contamination notified to the EPA under section 83A of the *Environment Protection Act 1993*?	NO
c)	a copy of a report of an environmental assessment (whether prepared by the EPA or some other person or body and whether or not required under legislation) that forms part of the information required to be recorded in the public register?	NO
d)	a copy of a site contamination audit report?	NO
e)	details of an agreement for the exclusion or limitation of liability for site contamination to which section 103E of the *Environment Protection Act 1993* applies?	NO
f)	details of an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?*	NO
g)	details of an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993?*	NO
h)	details of a notification under section 103Z(1) of the *Environment Protection Act 1993* relating to the commencement of a site contamination audit?	**YES**
i)	details of a notification under section 103Z(2) of the *Environment Protection Act 1993* relating to the termination before completion of a site contamination audit?	NO
j)	details of records, held by the former *South Australian Waste Management Commission* under the repealed *Waste Management Act 1987*, of waste (within the meaning of that Act) having been deposited on the land between 1 January 1983 and 30 April 1995?	NO

5-Pollution and site contamination on the land - other details held by EPA

Does the EPA hold any of the following details in relation to the land or part of the land:

a)	a copy of a report known as a "Health Commission Report" prepared by or on behalf of the *South Australian Health Commission* (under the repealed *South Australian Health Commission Act 1976*)?	NO
b)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?*	NO
c)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993*?	NO

d)	a copy of a pre-1 July 2009 site audit report?	NO
e)	details relating to the termination before completion of a pre-1 July 2009 site audit?	NO

Details and/or copies of environmental assessments, licences,exemptions and records on the Public Register may be obtained from the Environment Protection Authority.

Prior to arranging an examination and/or copies of the required above information please telephone (08) 8204 9128 to contact the Public Register Administrator to ensure the required details are available upon arrival.

All care and diligence has been taken to access the above information from available records. Historical records provided to the EPA concerning matters arising prior to 1 May 1995 are limited and may not be accurate or complete and therefore the EPA cannot confirm the accuracy of the historical information provided.

File Reference: SC60456

Environment Protection Authority
GPO Box 2607 Adelaide SA 5001
211 Victoria Square Adelaide SA 5000
T (08) 8204 2004
Country areas 1800 623 445

Receipt No :
Admin No : 81944 (52828)

LBW Co
184 Magill Road
NORWOOD SA 5067

Contact: Section 7
Telephone: (08) 8204 2026
Email: epasection7@sa.gov.au

Contact: Public Register
Telephone: (08) 8204 9128
Email: epa.publicregister@sa.gov.au

28 March, 2019

EPA STATEMENT TO FORM 1 - CONTRACTS FOR SALE OF LAND OR BUSINESS

The EPA provides this statement to assist the vendor meet its obligations under section 7(1)(b) of the *Land and Business (Sale and Conveyancing) Act 1994*. A response to the questions prescribed in Schedule 1-Contracts for sale of land or business-forms (Divisions 1 and 2) of the *Land and Business (Sale and Conveyancing) Act 1994* is provided in relation to the land.

I refer to your enquiry concerning the parcel of land comprised in

Title Reference	CT Volume 6205 Folio 146
Address	Allotment 9010 (DP 114845), Calton Road, GAWLER EAST SA 5118

Schedule – Division 1 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS OF MORTGAGES, CHARGES AND PRESCRIBED ENCUMBRANCES AFFECTING THE LAND

7. Environment Protection Act 1993

Does the EPA hold any of the following details relating to the *Environment Protection Act 1993*:

7.1	Section 59 - Environment performance agreement that is registered in relation to the land.	NO
7.2	Section 93 - Environment protection order that is registered in relation to the land.	NO
7.3	Section 93A - Environment protection order relating to cessation of activity that is registered in relation to the land.	NO
7.4	Section 99 - Clean-up order that is registered in relation to the land.	NO
7.5	Section 100 - Clean-up authorisation that is registered in relation to the land.	NO
7.6	Section 103H - Site contamination assessment order that is registered in relation to the land.	NO
7.7	Section 103J - Site remediation order that is registered in relation to the land.	NO

7.8	Section 103N - Notice of declaration of special management area in relation to the land (due to possible existence of site contamination).	NO
7.9	Section 103P - Notation of site contamination audit report in relation to the land.	NO
7.10	Section 103S - Notice of prohibition or restriction on taking water affected by site contamination in relation to the land.	NO

Schedule – Division 2 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS RELATING TO ENVIRONMENT PROTECTION

3-Licences and exemptions recorded by EPA in public register

Does the EPA hold any of the following details in the public register:

a)	details of a current licence issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	NO
b)	details of a licence no longer in force issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	**YES**
c)	details of a current exemption issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
d)	details of an exemption no longer in force issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
e)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to operate a waste depot at the land?	NO
f)	details of a licence issued under the repealed *Waste Management Act 1987* to operate a waste depot at the land?	NO
g)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to produce waste of a prescribed kind (within the meaning of that Act) at the land?	NO

h)	details of a licence issued under the repealed *Waste Management Act 1987* to produce prescribed waste (within the meaning of that Act) at the land?	NO

4-Pollution and site contamination on the land - details recorded by the EPA in public register

Does the EPA hold any of the following details in the public register in relation to the land or part of the land:

a)	details of serious or material environmental harm caused or threatened in the course of an activity (whether or not notified under section 83 of the *Environment Protection Act 1993*)?	NO
b)	details of site contamination notified to the EPA under section 83A of the *Environment Protection Act 1993*?	NO
c)	a copy of a report of an environmental assessment (whether prepared by the EPA or some other person or body and whether or not required under legislation) that forms part of the information required to be recorded in the public register?	**YES**
d)	a copy of a site contamination audit report?	**YES**
e)	details of an agreement for the exclusion or limitation of liability for site contamination to which section 103E of the *Environment Protection Act 1993* applies?	NO
f)	details of an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?*	NO
g)	details of an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993?*	NO
h)	details of a notification under section 103Z(1) of the *Environment Protection Act 1993* relating to the commencement of a site contamination audit?	**YES**
i)	details of a notification under section 103Z(2) of the *Environment Protection Act 1993* relating to the termination before completion of a site contamination audit?	NO
j)	details of records, held by the former *South Australian Waste Management Commission* under the repealed *Waste Management Act 1987*, of waste (within the meaning of that Act) having been deposited on the land between 1 January 1983 and 30 April 1995?	NO

5-Pollution and site contamination on the land - other details held by EPA

Does the EPA hold any of the following details in relation to the land or part of the land:

a)	a copy of a report known as a "Health Commission Report" prepared by or on behalf of the *South Australian Health Commission* (under the repealed *South Australian Health Commission Act 1976*)?	NO
b)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?*	NO
c)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993*?	NO

d)	a copy of a pre-1 July 2009 site audit report?	NO
e)	details relating to the termination before completion of a pre-1 July 2009 site audit?	NO

Details and/or copies of environmental assessments, licences,exemptions and records on the Public Register may be obtained from the Environment Protection Authority.

Prior to arranging an examination and/or copies of the required above information please telephone (08) 8204 9128 to contact the Public Register Administrator to ensure the required details are available upon arrival.

All care and diligence has been taken to access the above information from available records. Historical records provided to the EPA concerning matters arising prior to 1 May 1995 are limited and may not be accurate or complete and therefore the EPA cannot confirm the accuracy of the historical information provided.

File Reference: EPA/1874; EPA/14132; SC60456

Environment Protection Authority
GPO Box 2607 Adelaide SA 5001
211 Victoria Square Adelaide SA 5000
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Receipt No :
Admin No : 60341 (52829)

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Email: epa.publicregister@sa.gov.au

28 March, 2019

EPA STATEMENT TO FORM 1 - CONTRACTS FOR SALE OF LAND OR BUSINESS

The EPA provides this statement to assist the vendor meet its obligations under section 7(1)(b) of the *Land and Business (Sale and Conveyancing) Act 1994*. A response to the questions prescribed in Schedule 1-Contracts for sale of land or business-forms (Divisions 1 and 2) of the *Land and Business (Sale and Conveyancing) Act 1994* is provided in relation to the land.

I refer to your enquiry concerning the parcel of land comprised in

Title Reference	CT Volume 6118 Folio 249
Address	Allotment 2 (FP 7765), Calton Road, GAWLER EAST SA 5118

Schedule – Division 1 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS OF MORTGAGES, CHARGES AND PRESCRIBED ENCUMBRANCES AFFECTING THE LAND

7. Environment Protection Act 1993

Does the EPA hold any of the following details relating to the *Environment Protection Act 1993*:

7.1	Section 59 - Environment performance agreement that is registered in relation to the land.	NO
7.2	Section 93 - Environment protection order that is registered in relation to the land.	NO
7.3	Section 93A - Environment protection order relating to cessation of activity that is registered in relation to the land.	NO
7.4	Section 99 - Clean-up order that is registered in relation to the land.	NO
7.5	Section 100 - Clean-up authorisation that is registered in relation to the land.	NO
7.6	Section 103H - Site contamination assessment order that is registered in relation to the land.	NO
7.7	Section 103J - Site remediation order that is registered in relation to the land.	NO

7.8	Section 103N - Notice of declaration of special management area in relation to the land (due to possible existence of site contamination).	NO
7.9	Section 103P - Notation of site contamination audit report in relation to the land.	NO
7.10	Section 103S - Notice of prohibition or restriction on taking water affected by site contamination in relation to the land.	NO

Schedule – Division 2 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS RELATING TO ENVIRONMENT PROTECTION

3-Licences and exemptions recorded by EPA in public register

Does the EPA hold any of the following details in the public register:

a)	details of a current licence issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	NO
b)	details of a licence no longer in force issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	NO
c)	details of a current exemption issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
d)	details of an exemption no longer in force issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
e)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to operate a waste depot at the land?	NO
f)	details of a licence issued under the repealed *Waste Management Act 1987* to operate a waste depot at the land?	NO
g)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to produce waste of a prescribed kind (within the meaning of that Act) at the land?	NO

h)	details of a licence issued under the repealed *Waste Management Act 1987* to produce prescribed waste (within the meaning of that Act) at the land?	NO

4-Pollution and site contamination on the land - details recorded by the EPA in public register

Does the EPA hold any of the following details in the public register in relation to the land or part of the land:

a)	details of serious or material environmental harm caused or threatened in the course of an activity (whether or not notified under section 83 of the *Environment Protection Act 1993*)?	NO
b)	details of site contamination notified to the EPA under section 83A of the *Environment Protection Act 1993*?	NO
c)	a copy of a report of an environmental assessment (whether prepared by the EPA or some other person or body and whether or not required under legislation) that forms part of the information required to be recorded in the public register?	NO
d)	a copy of a site contamination audit report?	NO
e)	details of an agreement for the exclusion or limitation of liability for site contamination to which section 103E of the *Environment Protection Act 1993* applies?	NO
f)	details of an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?*	NO
g)	details of an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993?*	NO
h)	details of a notification under section 103Z(1) of the *Environment Protection Act 1993* relating to the commencement of a site contamination audit?	**YES**
i)	details of a notification under section 103Z(2) of the *Environment Protection Act 1993* relating to the termination before completion of a site contamination audit?	NO
j)	details of records, held by the former *South Australian Waste Management Commission* under the repealed *Waste Management Act 1987*, of waste (within the meaning of that Act) having been deposited on the land between 1 January 1983 and 30 April 1995?	NO

5-Pollution and site contamination on the land - other details held by EPA

Does the EPA hold any of the following details in relation to the land or part of the land:

a)	a copy of a report known as a "Health Commission Report" prepared by or on behalf of the *South Australian Health Commission* (under the repealed *South Australian Health Commission Act 1976*)?	NO
b)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?*	NO
c)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993*?	NO

d)	a copy of a pre-1 July 2009 site audit report?	NO
e)	details relating to the termination before completion of a pre-1 July 2009 site audit?	NO

Details and/or copies of environmental assessments, licences,exemptions and records on the Public Register may be obtained from the Environment Protection Authority.

Prior to arranging an examination and/or copies of the required above information please telephone (08) 8204 9128 to contact the Public Register Administrator to ensure the required details are available upon arrival.

All care and diligence has been taken to access the above information from available records. Historical records provided to the EPA concerning matters arising prior to 1 May 1995 are limited and may not be accurate or complete and therefore the EPA cannot confirm the accuracy of the historical information provided.

File Reference: SC60456

Environment Protection Authority
GPO Box 2607 Adelaide SA 5001
211 Victoria Square Adelaide SA 5000
T (08) 8204 2004
Country areas 1800 623 445

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Admin No : 49513 (52832)

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Contact: Public Register
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28 March, 2019

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I refer to your enquiry concerning the parcel of land comprised in

Title Reference	CT Volume 5697 Folio 87
Address	Allotment 94 (FP 163062), Gauge Station Track, KALBEEBA SA 5118

Schedule – Division 1 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS OF MORTGAGES, CHARGES AND PRESCRIBED ENCUMBRANCES AFFECTING THE LAND

7. Environment Protection Act 1993

Does the EPA hold any of the following details relating to the *Environment Protection Act 1993*:

7.1	Section 59 - Environment performance agreement that is registered in relation to the land.	NO
7.2	Section 93 - Environment protection order that is registered in relation to the land.	NO
7.3	Section 93A - Environment protection order relating to cessation of activity that is registered in relation to the land.	NO
7.4	Section 99 - Clean-up order that is registered in relation to the land.	NO
7.5	Section 100 - Clean-up authorisation that is registered in relation to the land.	NO
7.6	Section 103H - Site contamination assessment order that is registered in relation to the land.	NO
7.7	Section 103J - Site remediation order that is registered in relation to the land.	NO

7.8	Section 103N - Notice of declaration of special management area in relation to the land (due to possible existence of site contamination).	NO
7.9	Section 103P - Notation of site contamination audit report in relation to the land.	NO
7.10	Section 103S - Notice of prohibition or restriction on taking water affected by site contamination in relation to the land.	NO

Schedule – Division 2 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS RELATING TO ENVIRONMENT PROTECTION

3-Licences and exemptions recorded by EPA in public register

Does the EPA hold any of the following details in the public register:

a)	details of a current licence issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	NO
b)	details of a licence no longer in force issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	NO
c)	details of a current exemption issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
d)	details of an exemption no longer in force issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
e)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to operate a waste depot at the land?	NO
f)	details of a licence issued under the repealed *Waste Management Act 1987* to operate a waste depot at the land?	NO
g)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to produce waste of a prescribed kind (within the meaning of that Act) at the land?	NO

h)	details of a licence issued under the repealed *Waste Management Act 1987* to produce prescribed waste (within the meaning of that Act) at the land?	NO

4-Pollution and site contamination on the land - details recorded by the EPA in public register

Does the EPA hold any of the following details in the public register in relation to the land or part of the land:

a)	details of serious or material environmental harm caused or threatened in the course of an activity (whether or not notified under section 83 of the *Environment Protection Act 1993*)?	NO
b)	details of site contamination notified to the EPA under section 83A of the *Environment Protection Act 1993*?	NO
c)	a copy of a report of an environmental assessment (whether prepared by the EPA or some other person or body and whether or not required under legislation) that forms part of the information required to be recorded in the public register?	NO
d)	a copy of a site contamination audit report?	NO
e)	details of an agreement for the exclusion or limitation of liability for site contamination to which section 103E of the *Environment Protection Act 1993* applies?	NO
f)	details of an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?*	NO
g)	details of an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993?*	NO
h)	details of a notification under section 103Z(1) of the *Environment Protection Act 1993* relating to the commencement of a site contamination audit?	**YES**
i)	details of a notification under section 103Z(2) of the *Environment Protection Act 1993* relating to the termination before completion of a site contamination audit?	NO
j)	details of records, held by the former *South Australian Waste Management Commission* under the repealed *Waste Management Act 1987*, of waste (within the meaning of that Act) having been deposited on the land between 1 January 1983 and 30 April 1995?	NO

5-Pollution and site contamination on the land - other details held by EPA

Does the EPA hold any of the following details in relation to the land or part of the land:

a)	a copy of a report known as a "Health Commission Report" prepared by or on behalf of the *South Australian Health Commission* (under the repealed *South Australian Health Commission Act 1976*)?	NO
b)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?*	NO
c)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993*?	NO

d)	a copy of a pre-1 July 2009 site audit report?	NO
e)	details relating to the termination before completion of a pre-1 July 2009 site audit?	NO

Details and/or copies of environmental assessments, licences,exemptions and records on the Public Register may be obtained from the Environment Protection Authority.

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File Reference: SC60456

Appendix H

Excerpted Historical Figures

Legend

- Test Pits
- Push Tubes

rem

GAWLER - READYMIX
SITE WIDE TEST PIT AND BOREHOLE LOCATION PLAN
Project: ET-03

Figure 3

JANUARY 2007

05-18912_SCAR_001A

GAWLER - READYMIX
AST TEST PIT AND
BOREHOLE LOCATION PLAN

Project: ET-03

Figure 4

January 2007

0 5 10 20 Meters

Legend

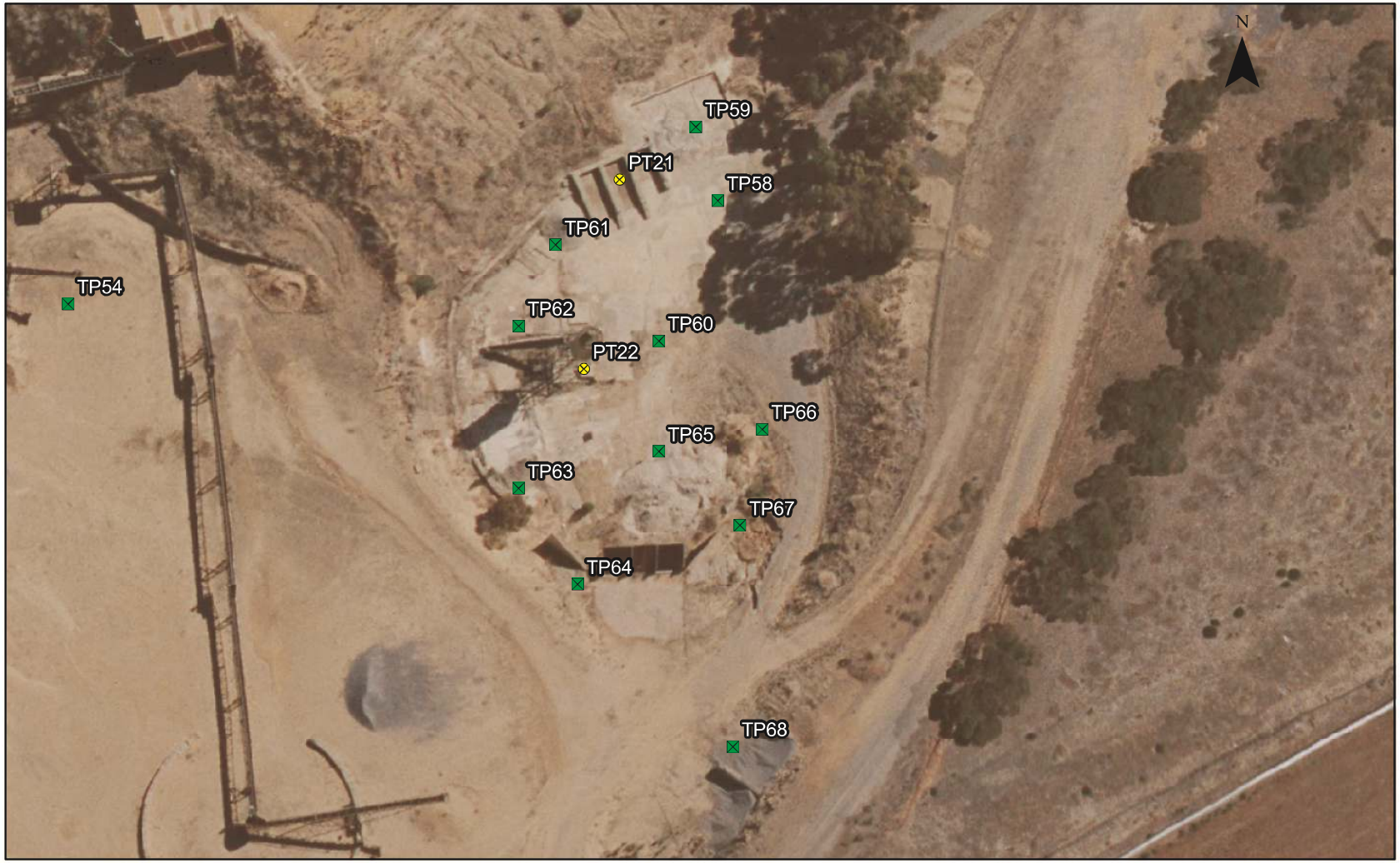
⊗ Push Tubes

GAWLER - READYMIX WORKSHOP TEST PIT AND BOREHOLE LOCATION PLAN

Project: ET-03

Figure 5

November 2006



GAWLER - READYMIX
CONCRETE PLANT TEST PIT
AND BOREHOLE LOCATION PLAN

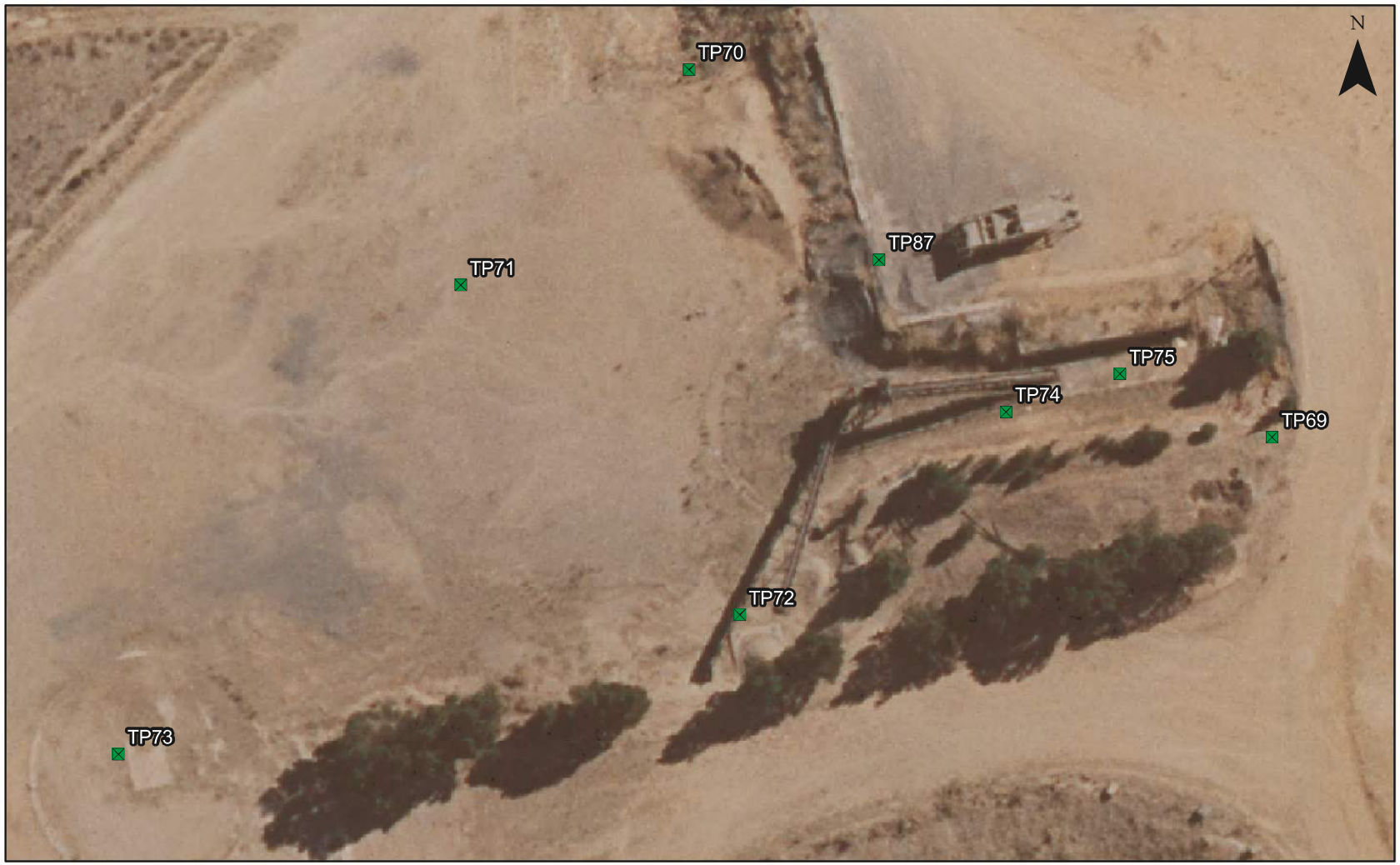
rem

Project: ET-03

Figure 6

November 2006

05-18912_SCAR_001A



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GAWLER - READYMIX
BLENDING PLANT TEST PIT
AND BOREHOLE LOCATION PLAN

Project: ET-03

Figure 7

November 2006

05-18912_SCAR_001A

rem

GAWLER - READYMIX
WASHING PLANT TEST PIT
AND BOREHOLE LOCATION PLAN

Project: ET-03

Figure **8**

November 2006

Appendix I

Site Photographs

Photograph 1: APEI 1— North portion of former quarry. North-facing view.

Photograph 2: APEI 1—South-west portion of former quarry, showing deposited sediments. West -facing view.

Photograph 3: APEI 1—South-east portion of former quarry, showing deposited sediments and stockpiles. South-east facing view.

Photograph 4: APEI 1— South portion of former quarry, showing deposited sediments. South-facing view.

Photograph 5: APEI 2—Former sediment drying pan, showing stockpiled mulch. South-facing view.

Photograph 6: APEI 3—Former stockpile area. North-west facing view.

Photograph 7: APEI 4—Partially filled former sediment pond. North-facing view.

Photograph 8: APEI 4—Abandoned liquid storage container overlooking former quarry. North-west-facing view.

Photograph 9: APEI 5—Former sediment ponds. North-west-facing view.

Photograph 10: APEI 5—Typical sediment pond, with residual pipework. North-west facing view.

Photograph 11: APEI 5—Scrap metal located immediately north of former sediment ponds.

Photograph 12: APEI 6—Former workshop area. South-facing view

Photograph 13: APEIs 7 and 8—Former Washing and Blending Plants. South-facing view.

Photograph 14: APEI 9—Typical stockpiled soil. North-facing view.

Photograph 15: APEI 9—Typical stockpiled soil. West-facing view

Photograph 16: APEI 9—Typical stockpiled soil. North-east facing view.

Photograph 17: APEI 10—Typical stockpiled soil. East-facing view.

Photograph 18: APEI 11—Former Concrete Batching Plant. West-facing view

Photograph 19: APEI 12—Typical stockpiled soil. North-west facing view.

Photograph 20: APEI 14—Fire pit. South-facing view.

Appendix J

Bore and Test Pit Logs

SOIL BORE SB01

PROJECT NUMBER 191076
PROJECT NAME Arcadian Springwood PSI
ADDRESS Calton Road, Gawler East

DRILLING DATE 19/03/2019
DRILLING COMPANY WDS
DRILL RIG Geoprobe
DRILLING METHOD Push Tube
BOREHOLE DIAMETER (mm) 50
TOTAL DEPTH (mBGL) 2.5

COORDINATES ,
COORD SYSTEM
LOGGED BY Sam Rady
CHECKED BY

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	SB01-01		0		FILL (REWORKED NATURAL): silty sand, brown, fine to medium, loose, poorly graded, subangular	D	
			0				
	SB01-02				FILL (REWORKED NATURAL): clay, light red-brown, low-moderate plasticity, hard	D	
0.5			0				
					FILL (REWORKED NATURAL): silty clay, pale brown -white, low plasticity, stiff, with suspected calcareous inclusions	D	
	SB01-03						
1							
					FILL (REWORKED NATURAL): clayey sand, brown, fine and coarse, dense, poorly graded, subangular, with weathered sandy lenses at bottom of unit.	SM	
1.5							
2							
	SB01-04						
2.5			0				
					Termination Depth at: 2.500m		

Disclaimer This log was prepared by LBWco Pty Ltd for environmental purposes only.
produced by ESlog.ESdat.net on 21 Mar 2019

SOIL BORE SB02

PROJECT NUMBER 191076
PROJECT NAME Arcadian Springwood PSI
ADDRESS Calton Road, Gawler East

DRILLING DATE 19/03/2019
DRILLING COMPANY WDS
DRILL RIG Geoprobe
DRILLING METHOD Push Tube
BOREHOLE DIAMETER (mm) 50
TOTAL DEPTH (mBGL) 3.6

COORDINATES ,
COORD SYSTEM
LOGGED BY Sam Rady
CHECKED BY

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	SB02-01		0		FILL (REWORKED NATURAL): clayey sand, brown, fine to medium, loose, poorly graded, subangular	D	
			0				
0.5	SB02-02				FILL (REWORKED NATURAL): gravelly sand, brown -white, fine and coarse, loose, poorly graded, subangular, with suspected calcareous inclusions	D	
1			0				
	SB02-03				FILL (REWORKED NATURAL): sand, brown, fine to medium, loose, poorly graded, subangular	D	
1.5			0				
	SB02-04				FILL (REWORKED NATURAL): gravelly sand, brown-orange -white, fine to medium, medium dense, poorly graded, subangular	D	
2							
2.5							
3							
3.5							
					Termination Depth at: 3.600m		

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produced by ESlog.ESdat.net on 21 Mar 2019

SOIL BORE SB03

PROJECT NUMBER 191076
PROJECT NAME Arcadian Springwood PSI
ADDRESS Calton Road, Gawler East

DRILLING DATE 19/03/2019
DRILLING COMPANY WDS
DRILL RIG Geoprobe
DRILLING METHOD Push Tube
BOREHOLE DIAMETER (mm) 50
TOTAL DEPTH (mBGL) 1.700

COORDINATES ,
COORD SYSTEM
LOGGED BY Sam Rady
CHECKED BY

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	SB03-01		0		FILL (REWORKED NATURAL): gravelly sand, brown, fine to medium, loose, poorly graded, angular	D	
					FILL (REWORKED NATURAL): sand, brown-orange, fine to medium, loose, well graded, subrounded	D	
			0				
	SB03-02				FILL (REWORKED NATURAL): silty sand, brown, fine to medium, medium dense, well graded, subrounded, with gravel	D	
0.5							
			0				
	SB03-03				GRAVELLY SAND: red-orange -brown, fine and coarse, dense, poorly graded, angular	D	
1							
1.5			0				
	SB03-04				SAND: grey -white, coarse, very dense, poorly graded, angular, with calcareous inclusions	D	
					Termination Depth at:1.700 m		

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SOIL BORE SB04

PROJECT NUMBER 191076
PROJECT NAME Arcadian Springwood PSI
ADDRESS Calton Road, Gawler East

DRILLING DATE 19/03/2019
DRILLING COMPANY WDS
DRILL RIG Geoprobe
DRILLING METHOD Push Tube
BOREHOLE DIAMETER (mm) 50
TOTAL DEPTH (mBGL) 4.8

COORDINATES ,
COORD SYSTEM
LOGGED BY Sam Rady
CHECKED BY

COMMENTS

Depth (mBGL)	Samples	Duplicate	Triplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
0	SB04-01	SB04-02	SB04-03	0		FILL (REWORKED NATURAL): clay, red-brown, moderate plasticity, hard	D	
0.5						FILL (REWORKED NATURAL): clay, red-brown, high plasticity, very stiff	VM	
1	SB04-04			0				
1.5								
2				0				
	SB04-05							
2.5						FILL (REWORKED NATURAL): clay, brown, high plasticity, very stiff	wet	
3				0				
	SB04-06							
3.5								
4								
4.5				0				
	SB04-07							
				0		GRAVELLY SAND: brown-orange, fine and coarse, dense, poorly graded, subangular	SM	
	SB04-08							
						Termination Depth at: 4.800m		

SOIL BORE SB05

PROJECT NUMBER 191076	**DRILLING DATE** 19/03/2019	**COORDINATES** ,
PROJECT NAME Arcadian Springwood PSI	**DRILLING COMPANY** WDS	**COORD SYSTEM**
ADDRESS Calton Road, Gawler East	**DRILL RIG** Geoprobe	**LOGGED BY** Sam Rady
	DRILLING METHOD Push Tube	**CHECKED BY**
	BOREHOLE DIAMETER (mm) 50	
	TOTAL DEPTH (mBGL)	

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	SB05-01		0		FILL (REWORKED NATURAL): silty sand, brown, fine and coarse, loose, poorly graded, subrounded	D	
			0				
	SB05-02						
0.5					GRAVELLY SAND: red-brown, fine and coarse, dense, poorly graded, subangular	D	
1			0				
	SB05-03						
1.5							
2							
			0				
2.5	SB05-04						
3							
3.5							
4					SAND: brown, coarse, very loose, well graded, subrounded	D	
					SAND: red-brown with white mottling, fine and coarse, medium dense, poorly graded, subangular, with calcareous inclusions	SM	
4.5			0				
	SB05-05						
					Termination Depth at: 4.800m		

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SOIL BORE SB06

PROJECT NUMBER 191076
PROJECT NAME Arcadian Springwood PSI
ADDRESS Calton Road, Gawler East

DRILLING DATE 19/03/2019
DRILLING COMPANY WDS
DRILL RIG Geoprobe
DRILLING METHOD Push Tube
BOREHOLE DIAMETER (mm) 50
TOTAL DEPTH (mBGL) 3.600

COORDINATES ,
COORD SYSTEM
LOGGED BY Sam Rady
CHECKED BY

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	SB06-01		0		FILL (REWORKED NATURAL): silty sand, brown, fine and coarse, loose, poorly graded, subangular	D	
			0				
	SB06-02				FILL (REWORKED NATURAL): sand, red-brown, fine and coarse, loose, poorly graded, subangular, with calcareous inclusions	D	
0.5							
1							
1.5			0				
	SB06-03		0				
	SB06-04				GRAVELLY SAND: red-brown -white, fine and coarse, medium dense, poorly graded, subangular, trace calcareous inclusions	D	
2							
2.5							
3							
3.5			0				
	SB06-05						
					Termination Depth at:3.600 m		

TEST PIT : TP01

PROJECT NUMBER 191076	**EXCAVATION DATE** 20/03/2019	**COORDINATES** ,
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Geoprobe	**COORD SYSTEM**
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** Sam Rady
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP01-01				FILL: sandy cobbles, grey-brown, fine to medium, loose, poorly graded, subangular	D	
0.5	TP01-02				FILL (REWORKED NATURAL): gravelly sand, brown-orange, fine and coarse, loose, poorly graded, subrounded	D	
1							
	TP01-03				FILL (REWORKED NATURAL): silty clay, dark brown, moderate plasticity, stiff, with gravel	SM	
1.5							
	TP01-04						
2					Termination Depth at:2.000 m		

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TEST PIT : TP02

PROJECT NUMBER 191076	**EXCAVATION DATE** 20/03/2019	**COORDINATES** ,
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM**
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)**	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m)	**LOGGED BY** Sam Rady
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP02-01	TP02-06			FILL: sand, brown, fine to medium, loose, poorly graded, subrounded	D	
	TP02-02				FILL (REWORKED NATURAL): sand, brown-orange, fine to medium, loose, poorly graded, subrounded	D	
0.5	TP02-03				FILL (REWORKED NATURAL): silty clay, dark brown, moderate plasticity, stiff, with gravel	SM	
1							
1.5	TP02-04				FILL (REWORKED NATURAL): sandy clay, red-brown with light brown mottling, moderate-high plasticity, stiff	SM	
2					Termination Depth at:2.000 m		

TEST PIT : TP03

PROJECT NUMBER 191076	**EXCAVATION DATE** 20/03/2019	**COORDINATES** ,
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM**
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** Sam Rady
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP03-01				FILL: sandy cobbles, grey-brown, fine to medium, loose, poorly graded, subangular	D	
	TP03-02				FILL (REWORKED NATURAL): gravelly sand, red-brown, fine and coarse, loose, poorly graded, subrounded	D	
0.5	TP03-03				FILL (REWORKED NATURAL): gravelly sand, brown-orange, fine and coarse, loose, poorly graded, subrounded	D	
1							
					FILL (REWORKED NATURAL): clay, brown-orange, fine and coarse, subrounded, with sand	D	
1.5							
	TP03-04						
2					Termination Depth at:2.000 m		

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TEST PIT : TP04

PROJECT NUMBER 191076	**EXCAVATION DATE** 20/03/2019	**COORDINATES** ,
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM**
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** Sam Rady
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
0	TP04-01				FILL (REWORKED NATURAL): clayey sand, brown with white mottling, fine to medium, medium dense, well graded, subrounded, with calcareous inclusions	D	
0.5							
1	TP04-02						
	TP04-03				CLAYEY SAND: brown, fine to medium, medium dense, well graded, subrounded	D	
1.5							
	TP04-04						
2					Termination Depth at:2.000 m		

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TEST PIT : TP05

PROJECT NUMBER 191076	**EXCAVATION DATE** 20/03/2019 11:08:32 AM	**COORDINATES** ,
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM**
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** Sam Rady
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
0	TP05-01				FILL (REWORKED NATURAL): gravelly sand, brown, fine to medium, medium dense, well graded, subrounded, with rock fragments	D	
0.5							
1	TP05-02						
1.5	TP05-03				SAND: brown, fine to medium, medium dense, well graded, subrounded, with weathered rock, pale, sedimentary, possibly limestone	D	
	TP05-04						
2					Termination Depth at:2.000 m		

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TEST PIT : TP06

PROJECT NUMBER 191076	**EXCAVATION DATE** 20/03/2019 12:49:14 PM	**COORDINATES** ,
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM**
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** Sam Rady
	TOTAL DEPTH (mBGL) 1.500	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP06-01				FILL: gravelly sand, brown with light brown mottling, fine to medium, medium dense, poorly graded, subangular	D	
0.5	TP06-02				SCHIST: green -brown, moderately weathered		
1	TP06-03						
1.5					Termination Depth at:1.500 m		

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TEST PIT : TP07

PROJECT NUMBER 191076	**EXCAVATION DATE** 20/03/2019	**COORDINATES** ,
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM**
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** Sam Rady
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP07-01				FILL (REWORKED NATURAL): sandy clay, red-brown, moderate plasticity, stiff	D	
0.5	TP07-02				CLAYEY SAND: light brown with white mottling, fine to medium, medium dense, well graded, subrounded, with calcareous inclusions	D	
1							
1.5	TP07-03						
	TP07-04						
2					Termination Depth at:2.000 m		

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TEST PIT : TP08

PROJECT NUMBER 191076	**EXCAVATION DATE** 20/03/2019	**COORDINATES** ,
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM**
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** Sam Rady
	TOTAL DEPTH (mBGL) 0.600	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP08-01				CLAYEY SAND: light brown, fine to medium, medium dense, well graded, subrounded	D	
0.5	TP08-02				SANDY COBBLES: grey-brown, fine to medium, medium dense, poorly graded, angular, with weathered schist	D	
	TP08-03						
					Termination Depth at:0.600 m		

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TEST PIT : TP09

PROJECT NUMBER 191076	**EXCAVATION DATE** 20/03/2019	**COORDINATES** ,
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM**
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** Sam Rady
	TOTAL DEPTH (mBGL) 1.800	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP09-01				FILL: gravelly sand, brown, fine to medium, loose, poorly graded, subangular	D	
0.5	TP09-02				CLAY: dark brown, moderate plasticity, very stiff, with rootlets, trace ash & cinders	SM	
1							
1.5	TP09-03				SCHIST: green -brown, moderately weathered	D	
	TP09-04						
					Termination Depth at:1.800 m		

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TEST PIT : TP10

PROJECT NUMBER 191076	**EXCAVATION DATE** 21/03/2019	**COORDINATES** -34°36.350' S, 138°46.291' E
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM** Latitude, Longitude
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** T Horwood
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP10-01		0		FILL (REWORKED NATURAL): clay, brown, low plasticity, stiff, with rootlets, with rock fragments	D	
	TP10-02		0		FILL (REWORKED NATURAL): sandy clay, brown-orange, low plasticity, soft	SM	
0.5							
1							
	TP10-03		0		FILL (REWORKED NATURAL): clayey sand, brown-orange, low plasticity	SM	
1.5							
					CLAYEY SAND: grey-brown, fine to medium, loose, poorly graded, subangular	D	
	TP10-04		0				
2					Termination Depth at:2.000 m		

TEST PIT : TP11

PROJECT NUMBER 191076	**EXCAVATION DATE** 21/03/2019	**COORDINATES** -34°36.370' S, 138°46.299' E
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM** Latitude, Longitude
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** T Horwood
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP11-01		0		FILL: clay, brown, low-moderate plasticity, stiff, with rootlets, with rock fragments	D	
	TP11-02		0		FILL: sand, light orange, coarse, loose, with gravel		
0.5							
1	TP11-03		0		SANDY CLAY: light brown-orange, moderate plasticity	SM	
1.5							
					CLAY: brown-orange, moderate plasticity	wet	
	TP11-04		0				
2					Termination Depth at:2.000 m		

TEST PIT : TP12

PROJECT NUMBER 191076
PROJECT NAME Arcadian Springwood PSI
ADDRESS Calton Road, Gawler East

EXCAVATION DATE 21/03/2019
MACHINERY Excavator
TEST PIT LENGTH (m) 3
TEST PIT WIDTH (m) 0.6
TOTAL DEPTH (mBGL) 2.000

COORDINATES -34°36.401' S, 138°46.299' E
COORD SYSTEM Latitude, Longitude
GROUND ELEVATION (mAHD)
LOGGED BY T Horwood
CHECKED BY

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP12-01		0		FILL: cobbles, brown-orange, fine to coarse, very loose, poorly graded, with sand, with gravel, with rock fragments	D	
	TP12-02		0		FILL: cobbles, pale brown-orange, fine to coarse, very loose, poorly graded, with sand, with gravel, with rock fragments	D	
0.5							
					FILL: sand, brown, fine to coarse, very loose, poorly graded, with sand, with gravel, with rock fragments	D	
1							
1.5							
	TP12-03		0				
2					Termination Depth at:2.000 m		

TEST PIT : TP13

PROJECT NUMBER 191076	**EXCAVATION DATE** 21/03/2019	**COORDINATES** -34°36.349' S, 138°45.487' E
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM** Latitude, Longitude
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** T Horwood
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP13-01		0		FILL: gravel, blue -grey, fine to coarse, very loose, poorly graded, angular, with sand, with gravel	D	
	TP13-02	TP13-06	0		FILL: sand, brown-orange, fine to coarse, loose, poorly graded, with gravel, with rock fragments	D	
0.5	TP13-03		0		FILL: sand, brown, fine to coarse, loose, poorly graded, with gravel, with rock fragments	SM	
1							
					CLAY: brown-orange, fine to coarse, moderate plasticity, trace rock fragments	VM	
1.5							
	TP13-04		0				
2					Termination Depth at:2.000 m		

TEST PIT : TP14

PROJECT NUMBER 191076	**EXCAVATION DATE** 21/03/2019	**COORDINATES** -34°36.311' S, 138°46.025' E
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM** Latitude, Longitude
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** T Horwood
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP14-01	TP14-05	0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, stiff	D	
	TP14-02		0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, stiff	VM	
0.5							
					FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, very soft	wet	
1							
1.5							
	TP14-03		0				
2					Termination Depth at: 2.000 m		

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TEST PIT : TP15.

PROJECT NUMBER 191076	**EXCAVATION DATE** 21/03/2019	**COORDINATES** -34°36.322' S, 138°45.990' E
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM** Latitude, Longitude
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** T Horwood
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP15.-01		0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, stiff	D	
	TP15.-02		0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, stiff	VM	
0.5							
					FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, very soft	wet	
1							
1.5							
	TP15.-03		0				
2					Termination Depth at: 2.000 m		

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TEST PIT : TP16

PROJECT NUMBER 191076	**EXCAVATION DATE** 21/03/2019	**COORDINATES** -34°36.314' S, 138°45.965' E
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM** Latitude, Longitude
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** T Horwood
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP16-01		0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, stiff	D	
	TP16-02		0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, stiff	SM	
0.5	TP16-03		0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, soft	wet	
1							
					FILL (REWORKED NATURAL): clay, red-brown, moderate plasticity, very soft	S	
1.5							
	TP16-04		0				
2					Termination Depth at: 2.000 m		

TEST PIT : TP17

PROJECT NUMBER 191076	**EXCAVATION DATE** 21/03/2019	**COORDINATES** -34°36.331' S, 138°45.969' E
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM** Latitude, Longitude
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** T Horwood
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP17-01		0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, stiff	D	
	TP17-02		0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, stiff	VM	
0.5							
					FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, very soft	wet	
1							
1.5							
	TP17-03		0				
2					Termination Depth at: 2.000 m		

TEST PIT : TP18

PROJECT NUMBER 191076	**EXCAVATION DATE** 21/03/2019	**COORDINATES** -34°36.331' S, 138°46.029' E
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM** Latitude, Longitude
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** T Horwood
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP18-01		0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, stiff	D	
	TP18-02		0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, stiff	SM	
0.5	TP18-03		0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, soft	wet	
1							
					FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, stiff	D	
1.5							
	TP18-04		0				
2					Termination Depth at: 2.000 m		

TEST PIT : TP19

PROJECT NUMBER 191076	**EXCAVATION DATE** 21/03/2019	**COORDINATES** -34°36.362' S, 138°45.988' E
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM** Latitude, Longitude
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** T Horwood
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP19-01		0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, stiff	D	
	TP19-02		0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, soft	wet	
0.5							
					FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, very soft	S	
1							
1.5							
	TP19-03		0				
2					Termination Depth at: 2.000 m		

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TEST PIT : TP20

PROJECT NUMBER 191076	**EXCAVATION DATE** 21/03/2019	**COORDINATES** -34°36.364' S, 138°45.945' E
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM** Latitude, Longitude
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** T Horwood
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP20-01		0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, stiff	D	
	TP20-02		0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, soft	wet	
0.5							
					FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, very soft	S	
1							
1.5							
	TP20-03		0				
2					Termination Depth at: 2.000 m		

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TEST PIT : TP21

PROJECT NUMBER 191076	**EXCAVATION DATE** 21/03/2019	**COORDINATES** -34°36.337' S, 138°46.107' E
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM** Latitude, Longitude
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** T Horwood
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP21-01		0		FILL (REWORKED NATURAL): clay, red-brown -orange, low plasticity, with rootlets	D	
	TP21-02		0		FILL (REWORKED NATURAL): clay, red-brown, low-moderate plasticity, stiff	SM	
0.5							
1							
1.5					CLAYEY SAND: light brown, fine to medium, loose, with gravel, with rock fragments	SM	
	TP21-03		0				
2					Termination Depth at: 2.000 m		

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TEST PIT : TP22

PROJECT NUMBER 191076	**EXCAVATION DATE** 22/03/2019	**COORDINATES** -34.60347128, 138.7712471
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM** Latitude, Longitude
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** T Horwood
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP22-01		0		FILL (REWORKED NATURAL): sandy clay, brown, low-moderate plasticity, hard, trace rock fragments	D	
	TP22-02		0		FILL (REWORKED NATURAL): sandy clay, red-brown, low-moderate plasticity, hard, trace rock fragments	D	
0.5							
1	TP22-03		0		FILL (REWORKED NATURAL): sandy clay, red-brown, low-moderate plasticity, stiff	SM	
1.5					CLAY: red-brown, low-moderate plasticity, stiff	SM	
	TP22-04		0				
2					Termination Depth at: 2.000 m		

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TEST PIT : TP23

PROJECT NUMBER 191076	**EXCAVATION DATE** 22/03/2019	**COORDINATES** -34.60354271, 138.77100384
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM** Latitude, Longitude
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** T Horwood
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP23-01	TP23-05	0		FILL (REWORKED NATURAL): sandy clay, brown, low-moderate plasticity, hard, trace rock fragments, trace rootlets	D	
	TP23-02		0		CLAYEY SAND: brown-orange, fine to medium, loose, with gravel	SM	
0.5							
					CLAY: red-brown with grey mottling, low-moderate plasticity, stiff	M	
1							
1.5							
	TP23-03		0				
2					Termination Depth at: 2.000 m		

TEST PIT : TP24

PROJECT NUMBER 191076	**EXCAVATION DATE** 22/03/2019	**COORDINATES** -34.60420074, 138.77112164
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM** Latitude, Longitude
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** T Horwood
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP24-01		0		FILL (REWORKED NATURAL): sandy clay, red-brown, low plasticity, hard, trace rootlets	D	
	TP24-02		0		FILL (REWORKED NATURAL): sandy clay, red-brown, low plasticity, hard, with rock fragments	D	
0.5							
	TP24-03		0		FILL (REWORKED NATURAL): clayey sand, red-brown, fine to medium, low plasticity, with rock fragments	D	
1							
					FILL (REWORKED NATURAL): sand, red-brown, fine to coarse, low plasticity, with rock fragments, with clay	D	
1.5							
	TP24-04		0				
2					Termination Depth at: 2.000 m		

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TEST PIT : TP25

PROJECT NUMBER 191076	**EXCAVATION DATE** 22/03/2019	**COORDINATES** -34.60751025, 138.77323923
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM** Latitude, Longitude
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** T Horwood
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP25-01		0		FILL (REWORKED NATURAL): clay, brown, low-moderate plasticity, hard, with rock fragments, trace rootlets	D	
	TP25-02		0		FILL (REWORKED NATURAL): clayey sand, brown, fine to medium, medium dense, poorly graded, with rock fragments	D	
0.5							
1							
1.5					FILL (REWORKED NATURAL): clayey sand, dark brown, fine to medium, medium dense, poorly graded, trace rock fragments	D	
	TP25-03		0				
2					Termination Depth at: 2.000 m		

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TEST PIT : TP26

PROJECT NUMBER 191076	**EXCAVATION DATE** 22/03/2019	**COORDINATES** -34.60753279, 138.77312523
PROJECT NAME Arcadian Springwood PSI	**MACHINERY** Excavator	**COORD SYSTEM** Latitude, Longitude
ADDRESS Calton Road, Gawler East	**TEST PIT LENGTH (m)** 3	**GROUND ELEVATION (mAHD)**
	TEST PIT WIDTH (m) 0.6	**LOGGED BY** T Horwood
	TOTAL DEPTH (mBGL) 2.000	**CHECKED BY**

COMMENTS

Depth (mBGL)	Samples	Duplicate	PID (ppm)	Graphic Log	Material Description	Moisture	Additional Observations
	TP26-01		0		FILL (REWORKED NATURAL): sandy clay, brown, low-moderate plasticity, hard, with rock fragments, with rootlets, with gravel	D	
	TP26-02		0		FILL (REWORKED NATURAL): clayey sand, brown, fine to medium, low plasticity, loose, with rock fragments	D	
0.5							
					FILL: sand, grey-brown, fine to medium, loose, poorly graded, with rock fragments	D	
1							
1.5							
	TP26-03		0				
2					Termination Depth at: 2.000 m		

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Appendix K

Tabulated Analytical Data

Chemical Summary Table

					Metals													
					Arsenic	Barium	Beryllium	Cadmium	Chromium (hexavalent)	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					2	10	1	0.4	0.5	2	2	5	50	5	5	0.1	2	2	5
Location	**Field ID**	**Depth**	**Date**	**Sample Type**															
Soil Bore	SB01-01	0.0 - 0.1	19/03/2019	Normal	<5	10	<1	<1	<0.5	5	<2	<5	5,970	<5	16	<0.1	<2	<2	<5
Soil Bore	SB01-03	0.9 - 1.0	19/03/2019	Normal	<5	-	-	<1	-	29	-	**7**	-	**6**	-	<0.1	**11**	-	**13**
Soil Bore	SB01-04	2.1 - 2.2	19/03/2019	Normal	<5	-	-	<1	-	24	-	**6**	-	**6**	-	<0.1	**8**	-	**14**
Soil Bore	SB02-01	0.0 - 0.1	19/03/2019	Normal	5	-	-	<1	-	24	-	**5**	-	<5	-	<0.1	**4**	-	**10**
Soil Bore	SB02-04	1.5 - 1.6	19/03/2019	Normal	<5	-	-	<1	-	7	-	<5	-	<5	-	<0.1	<2	-	<5
Soil Bore	SB03-01	0.0 - 0.1	19/03/2019	Normal	<5	20	<1	<1	<0.5	12	<2	<5	19,000	<5	13	<0.1	<2	<2	<5
Sest Pit	SB03-02	0.35 - 0.45	19/03/2019	Normal	<5	-	-	<1	-	11	-	<5	-	<5	-	<0.1	**4**	-	<5
Sest Pit	SB03-03	0.9 - 1.0	19/03/2019	Normal	<5	-	-	<1	-	13	-	<5	-	<5	-	<0.1	<2	-	<5
Soil Bore	SB04-01	0.0 - 0.3	19/03/2019	Normal	10	-	-	<1	-	47	-	**8**	-	<5	-	<0.1	**4**	-	**11**
Soil Bore	*SB04-02*	*0.0 - 0.3*	*19/03/2019*	*Field_D*	*6*	-	-	*<1*	-	*36*	-	**6**	-	*<5*	-	*<0.1*	*4*	-	*14*
Soil Bore	*SB04-03*	*0.0 - 0.3*	*19/03/2019*	*Interlab_D*	*11*	-	-	*<0.4*	-	*54*	-	**9.0**	-	**6.6**	-	*<0.1*	**6.1**	-	*19*
Soil Bore	SB04-04	0.9 - 1.0	19/03/2019	Normal	7	-	-	<1	-	38	-	**6**	-	<5	-	<0.1	**4**	-	**11**
Soil Bore	SB04-06	3.3 - 3.4	19/03/2019	Normal	5	30	<1	<1	<0.5	40	<2	**6**	52,200	**5**	30	<0.1	**4**	<2	**12**
Sest Pit	SB05-01	0.0 - 0.1	19/03/2019	Normal	<5	-	-	<1	-	16	-	<5	-	<5	-	<0.1	**4**	-	**8**
Sest Pit	SB05-03	1.2 - 1.3	19/03/2019	Normal	<5	-	-	<1	-	10	-	<5	-	<5	-	<0.1	<2	-	<5
Sest Pit	SB05-05	4.7 - 4.8	19/03/2019	Normal	<5	-	-	<1	-	10	-	<5	-	<5	-	<0.1	<2	-	<5
Sest Pit	SB06-02	0.3 - 0.4	19/03/2019	Normal	<5	60	<1	<1	<0.5	11	<2	<5	12,200	<5	39	<0.1	**3**	<2	<5
Sest Pit	SB06-05	3.5 - 3.6	19/03/2019	Normal	<5	-	-	<1	-	8	-	<5	-	<5	-	<0.1	<2	-	<5
Test Pit	TP01-01	0.0 - 0.1	20/03/2019	Normal	<5	80	<1	<1	<0.5	58	11	**21**	41,300	**9**	99	<0.1	**17**	<2	**41**
Test Pit	TP01-03	1.4 - 1.5	20/03/2019	Normal	<5	-	-	<1	-	7	-	<5	-	<5	-	<0.1	<2	-	<5
Test Pit	TP02-02	0.3 - 0.4	20/03/2019	Normal	<5	-	-	<1	-	12	-	<5	-	<5	-	<0.1	<2	-	<5
Test Pit	TP02-04	1.5 - 1.6	20/03/2019	Normal	<5	-	-	<1	-	19	-	**6**	-	**6**	-	<0.1	**6**	-	**10**
Test Pit	*TP02-05*	*0.0 - 0.1*	*20/03/2019*	*Field_D*	*<5*	-	-	*<1*	-	*6*	-	*<5*	-	*<5*	-	*<0.1*	*<2*	-	*<5*
Test Pit	*TP02-06*	*0.0 - 0.1*	*20/03/2019*	*Interlab_D*	*2.1*	-	-	*<0.4*	-	*6.9*	-	*<5*	-	*<5*	-	*<0.1*	*<5*	-	*<5*
Test Pit	TP03-02	0.3 - 0.4	20/03/2019	Normal	<5	-	-	<1	-	13	-	<5	-	<5	-	<0.1	**2**	-	<5
Test Pit	TP03-04	1.9 - 2.0	20/03/2019	Normal	<5	-	-	<1	-	22	-	**6**	-	**7**	-	<0.1	**8**	-	**13**
Test Pit	TP04-01	0.0 - 0.1	20/03/2019	Normal	<5	-	-	<1	-	28	-	**11**	-	**6**	-	<0.1	**11**	-	**18**
Test Pit	TP04-03	1.4 - 1.5	20/03/2019	Normal	<5	-	-	<1	-	25	-	**9**	-	**7**	-	<0.1	**17**	-	**15**
Test Pit	TP05-02	1.0 - 1.1	20/03/2019	Normal	<5	-	-	<1	-	32	-	**12**	-	**6**	-	<0.1	**9**	-	**23**
Test Pit	TP05-03	1.5 - 1.6	20/03/2019	Normal	<5	-	-	<1	-	40	-	**8**	-	**5**	-	<0.1	**12**	-	**24**
Test Pit	TP06-01	0.0 - 0.1	20/03/2019	Normal	<5	-	-	<1	-	45	-	**24**	-	**8**	-	<0.1	**24**	-	**35**
Test Pit	TP06-02	0.5 - 0.6	20/03/2019	Normal	7	-	-	<1	-	42	-	**16**	-	**11**	-	<0.1	**22**	-	**41**
Test Pit	TP07-01	0.0 - 0.1	20/03/2019	Normal	<5	70	1	<1	<0.5	32	7	**19**	30,600	**8**	212	<0.1	**18**	<2	**24**
Test Pit	TP07-02	0.5 - 0.6	20/03/2019	Normal	<5	-	-	<1	-	37	-	**19**	-	**9**	-	<0.1	**20**	-	**26**
Test Pit	TP08-01	0.0 - 0.1	20/03/2019	Normal	5	-	-	<1	-	40	-	**33**	-	**14**	-	<0.1	**10**	-	**30**
Test Pit	TP08-02	0.4 - 0.5	20/03/2019	Normal	<5	-	-	<1	-	33	-	**17**	-	**10**	-	<0.1	**13**	-	**36**
Test Pit	TP09-01	0.0 - 0.1	20/03/2019	Normal	<5	-	-	<1	-	35	-	**16**	-	**8**	-	<0.1	**11**	-	**36**
Test Pit	TP09-02	0.5 - 0.6	20/03/2019	Normal	<5	-	-	<1	-	34	-	**19**	-	**9**	-	<0.1	**12**	-	**31**
Test Pit	TP10-01	0.0 - 0.1	21/03/2019	Normal	5	-	-	<1	-	36	-	**8**	-	**6**	-	<0.1	**7**	-	**22**
Test Pit	TP10-03	1.1 - 1.2	21/03/2019	Normal	<5	-	-	<1	-	23	-	**12**	-	**6**	-	<0.1	**14**	-	**17**
Test Pit	TP11-01	0.0 - 0.1	21/03/2019	Normal	6	-	-	<1	-	31	-	**6**	-	<5	-	<0.1	**3**	-	**10**

Chemical Summary Table

					Metals														
					Arsenic	Barium	Beryllium	Cadmium	Chromium (hexavalent)	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					2	10	1	0.4	0.5	2	2	5	50	5	5	0.1	2	2	5
Location	**Field ID**	**Depth**	**Date**	**Sample Type**															
Test Pit	TP11-03	1.0 - 1.1	21/03/2019	Normal	6	-	-	<1	-	22	-	<5	-	<5	-	<0.1	**3**	-	**10**
Test Pit	TP12-01	0.0 - 0.1	21/03/2019	Normal	<5	<10	<1	<1	<0.5	4	<2	<5	7,240	<5	10	<0.1	<2	<2	<5
Test Pit	TP12-03	1.9 - 2.0	21/03/2019	Normal	<5	-	-	<1	-	15	-	<5	-	<5	-	<0.1	**3**	-	**8**
Test Pit	TP13-02	0.2 - 0.3	21/03/2019	Normal	<5	-	-	<1	-	6	-	<5	-	<5	-	<0.1	<2	-	<5
Test Pit	TP13-03	0.5 - 0.6	21/03/2019	Normal	<5	-	-	<1	-	4	-	<5	-	<5	-	<0.1	<2	-	**7**
Test Pit	*TP13-05*	*0.2 - 0.3*	*21/03/2019*	*Field_D*	*<5*	-	-	*<1*	-	*8*	-	*<5*	-	*<5*	-	*<0.1*	*<2*	-	*<5*
Test Pit	*TP13-06*	*0.2 - 0.3*	*21/03/2019*	*Interlab_D*	*2.5*	-	-	*<0.4*	-	*9.2*	-	*<5*	-	*<5*	-	*<0.1*	*<5*	-	*<5*
Test Pit	TP14-01	0.0 - 0.1	21/03/2019	Normal	6	-	-	<1	-	46	-	**7**	-	**7**	-	<0.1	**5**	-	**13**
Test Pit	TP14-03	1.9 - 2.0	21/03/2019	Normal	8	-	-	<1	-	36	-	**6**	-	<5	-	<0.1	**3**	-	**10**
Test Pit	*TP14-04*	*0.0 - 0.1*	*21/03/2019*	*Field_D*	*6*	-	-	*<1*	-	*45*	-	***7***	-	***6***	-	*<0.1*	***4***	-	***13***
Test Pit	*TP14-05*	*0.0 - 0.1*	*21/03/2019*	*Interlab_D*	*6.6*	-	-	*<0.4*	-	*53*	-	***7.6***	-	***9.8***	-	*<0.1*	***6.9***	-	***19***
Test Pit	TP15-02	0.2 - 0.3	21/03/2019	Normal	6	40	<1	<1	<0.5	45	<2	**7**	58,600	**5**	30	<0.1	**4**	<2	**12**
Test Pit	TP15-03	1.9 - 2.0	21/03/2019	Normal	10	-	-	<1	-	39	-	**7**	-	**5**	-	<0.1	**5**	-	**16**
Test Pit	TP16-01	0.0 - 0.1	21/03/2019	Normal	6	-	-	<1	-	44	-	**7**	-	**6**	-	<0.1	**4**	-	**13**
Test Pit	TP16-03	0.5 - 0.6	21/03/2019	Normal	9	-	-	<1	-	38	-	**6**	-	<5	-	<0.1	**5**	-	**15**
Test Pit	TP17-02	0.2 - 0.3	21/03/2019	Normal	6	-	-	<1	-	44	-	**7**	-	**6**	-	<0.1	**5**	-	**14**
Test Pit	TP17-03	1.9 - 2.0	21/03/2019	Normal	9	-	-	<1	-	42	-	**7**	-	<5	-	<0.1	**4**	-	**13**
Test Pit	TP18-01	0.0 - 0.1	21/03/2019	Normal	7	-	-	<1	-	45	-	**7**	-	**7**	-	<0.1	**5**	-	**14**
Test Pit	TP18-03	0.5 - 0.6	21/03/2019	Normal	7	-	-	<1	-	30	-	**5**	-	<5	-	<0.1	**3**	-	**11**
Test Pit	TP19-01	0.0 - 0.1	21/03/2019	Normal	9	-	-	<1	-	45	-	**7**	-	<5	-	<0.1	**4**	-	**14**
Test Pit	TP19-03	1.9 - 2.0	21/03/2019	Normal	7	-	-	<1	-	40	-	**7**	-	**5**	-	<0.1	**4**	-	**12**
Test Pit	TP20-01	0.0 - 0.1	21/03/2019	Normal	8	-	-	<1	-	46	-	**8**	-	**7**	-	<0.1	**6**	-	**18**
Test Pit	TP20-03	1.9 - 2.0	21/03/2019	Normal	10	-	-	<1	-	51	-	**7**	-	<5	-	<0.1	**4**	-	**10**
Test Pit	TP21-01	0.0 - 0.1	21/03/2019	Normal	<5	-	-	<1	-	10	-	<5	-	<5	-	<0.1	<2	-	<5
Test Pit	TP21-03	1.9 - 2.0	21/03/2019	Normal	<5	-	-	<1	-	13	-	<5	-	<5	-	<0.1	**6**	-	**7**
Test Pit	TP22-01	0.0 - 0.1	22/03/2019	Normal	7	-	-	<1	-	24	-	**11**	-	**9**	-	<0.1	**15**	-	**18**
Test Pit	TP22-03	1.0 - 1.1	22/03/2019	Normal	12	-	-	<1	-	26	-	**12**	-	**13**	-	<0.1	**26**	-	**19**
Test Pit	TP23-01	0.0 - 0.1	22/03/2019	Normal	7	-	-	<1	-	22	-	**10**	-	**10**	-	<0.1	**13**	-	**15**
Test Pit	TP23-02	0.2 - 0.3	22/03/2019	Normal	<5	-	-	<1	-	28	-	**10**	-	**12**	-	<0.1	**11**	-	**18**
Test Pit	*TP23-04*	*0.0 - 0.1*	*22/03/2019*	*Field_D*	*8*	-	-	*<1*	-	*25*	-	***12***	-	***10***	-	*<0.1*	***14***	-	***18***
Test Pit	*TP23-05*	*0.0 - 0.1*	*22/03/2019*	*Interlab_D*	*10*	-	-	*<0.4*	-	*39*	-	***13***	-	***14***	-	*<0.1*	***21***	-	***33***
Test Pit	TP24-01	0.0 - 0.1	22/03/2019	Normal	<5	210	<1	<1	<0.5	24	<2	**6**	24,100	<5	42	<0.1	**5**	<2	**52**
Test Pit	TP24-03	0.8 - 0.9	22/03/2019	Normal	<5	-	-	<1	-	20	-	<5	-	<5	-	<0.1	**3**	-	**7**
Test Pit	TP25-01	0.0 - 0.1	22/03/2019	Normal	<5	-	-	<1	-	24	-	**12**	-	**8**	-	<0.1	**12**	-	**18**
Test Pit	TP25-02	0.3 - 0.4	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP25-03	1.9 - 2.0	22/03/2019	Normal	<5	-	-	<1	-	23	-	**12**	-	**8**	-	<0.1	**15**	-	**17**
Test Pit	TP26-01	0.0 - 0.1	22/03/2019	Normal	<5	-	-	<1	-	24	-	**13**	-	**8**	-	<0.1	**13**	-	**17**
Test Pit	TP26-03	1.9 - 2.0	22/03/2019	Normal	<5	-	-	<1	-	15	-	**10**	-	**6**	-	<0.1	**10**	-	**11**
Surface	TP27-01	-	20/03/2019	Normal	6	-	-	<1	-	40	-	**11**	-	**6**	-	<0.1	**8**	-	**22**
Surface	TP28-01	-	20/03/2019	Normal	<5	-	-	<1	-	38	-	**14**	-	**6**	-	<0.1	**10**	-	**28**
Surface	TP29-01	-	20/03/2019	Normal	<5	-	-	<1	-	25	-	<5	-	<5	-	<0.1	**3**	-	**9**

Chemical Summary Table

					Metals														
					Arsenic	Barium	Beryllium	Cadmium	Chromium (hexavalent)	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					2	10	1	0.4	0.5	2	2	5	50	5	5	0.1	2	2	5
Location	**Field ID**	**Depth**	**Date**	**Sample Type**															
Surface	TP30-01	-	20/03/2019	Normal	<5	-	-	<1	-	13	-	<5	-	<5	-	<0.1	<2	-	<5
Stockpile	TP31-01	-	21/03/2019	Normal	<5	-	-	<1	-	19	-	**24**	-	**5**	-	<0.1	**10**	-	**11**
Surface	TP31-02	-	21/03/2019	Normal	<5	-	-	<1	-	20	-	**18**	-	**6**	-	<0.1	**9**	-	**13**
Stockpile	TP32-01	-	20/03/2019	Normal	<5	-	-	<1	-	19	-	**9**	-	<5	-	<0.1	**8**	-	**11**
Stockpile	TP33-01	-	20/03/2019	Normal	<5	-	-	<1	-	41	-	**26**	-	**12**	-	<0.1	**16**	-	**36**
Stockpile	TP34-01	-	20/03/2019	Normal	<5	-	-	<1	-	20	-	**11**	-	**6**	-	<0.1	**9**	-	**19**
Stockpile	TP35-01	-	20/03/2019	Normal	<5	-	-	<1	-	22	-	**11**	-	**7**	-	<0.1	**10**	-	**16**
Stockpile	TP36-01	-	20/03/2019	Normal	<5	-	-	<1	-	21	-	**14**	-	**6**	-	<0.1	**9**	-	**17**
Stockpile	TP37-01	-	20/03/2019	Normal	<5	-	-	<1	-	17	-	**8**	-	<5	-	<0.1	**7**	-	**7**
Stockpile	TP38-01	-	20/03/2019	Normal	<5	-	-	<1	-	26	-	**22**	-	**8**	-	<0.1	**11**	-	**16**
Stockpile	TP39-01	-	20/03/2019	Normal	<5	-	-	<1	-	17	-	**6**	-	<5	-	<0.1	**5**	-	**8**
Stockpile	TP40-01	-	22/03/2019	Normal	<5	-	-	<1	-	15	-	**10**	-	<5	-	<0.1	**10**	-	**12**
Surface	TP40-02	-	22/03/2019	Normal	<5	-	-	<1	-	23	-	**13**	-	**7**	-	<0.1	**12**	-	**14**
Stockpile	TP40-03	-	22/03/2019	Normal	<5	-	-	<1	-	16	-	**11**	-	**5**	-	<0.1	**11**	-	**14**
Stockpile	*TP40-04*	*-*	*22/03/2019*	*Interlab_D*	*3.3*	*-*	*-*	*<0.4*	*-*	*19*	*-*	***9.9***	*-*	***6.6***	*-*	*<0.1*	***12***	*-*	***21***
Stockpile	TP41-01	-	22/03/2019	Normal	<5	80	<1	<1	<0.5	20	5	**10**	17,500	**6**	138	<0.1	**10**	<2	**17**
Surface	TP41-02	-	22/03/2019	Normal	<5	-	-	<1	-	28	-	**14**	-	**8**	-	<0.1	**14**	-	**19**
Stockpile	TP42-01	-	22/03/2019	Normal	<5	-	-	<1	-	20	-	**13**	-	**6**	-	<0.1	**12**	-	**14**
Surface	TP42-02	-	22/03/2019	Normal	<5	-	-	<1	-	18	-	**12**	-	**7**	-	<0.1	**11**	-	**16**
Stockpile	TP43-01	-	21/03/2019	Normal	<5	190	<1	<1	<0.5	54	15	**22**	36,900	**6**	141	<0.1	**18**	<2	**37**
Surface	TP43-02	-	21/03/2019	Normal	<5	-	-	<1	-	57	-	**23**	-	**6**	-	<0.1	**19**	-	**40**
Stockpile	TP44-01	-	21/03/2019	Normal	<5	-	-	<1	-	13	-	**5**	-	<5	-	<0.1	**6**	-	**6**
Surface	TP44-02	-	21/03/2019	Normal	<5	-	-	<1	-	15	-	**7**	-	**9**	-	<0.1	**6**	-	**13**
Stockpile	TP45-01	-	21/03/2019	Normal	<5	-	-	<1	-	56	-	**30**	-	**10**	-	<0.1	**22**	-	**46**
Surface	TP45-02	-	21/03/2019	Normal	<5	-	-	<1	-	56	-	**28**	-	**11**	-	<0.1	**21**	-	**42**
Stockpile	TP46-01	-	21/03/2019	Normal	5	-	-	<1	-	14	-	**5**	-	<5	-	<0.1	**6**	-	**10**
Surface	TP46-02	-	21/03/2019	Normal	<5	-	-	<1	-	21	-	**7**	-	**6**	-	<0.1	**8**	-	**12**
Stockpile	TP47-01	-	21/03/2019	Normal	<5	-	-	<1	-	51	-	**18**	-	**7**	-	<0.1	**16**	-	**33**
Surface	TP47-02	-	21/03/2019	Normal	<5	-	-	<1	-	52	-	**20**	-	**8**	-	<0.1	**17**	-	**36**
Stockpile	TP48-01	-	21/03/2019	Normal	5	-	-	<1	-	25	-	**24**	-	<5	-	<0.1	**7**	-	**15**
Surface	TP48-02	-	21/03/2019	Normal	<5	-	-	<1	-	26	-	**14**	-	**7**	-	<0.1	**12**	-	**16**
Stockpile	TP49-01	-	21/03/2019	Normal	<5	-	-	<1	-	28	-	**16**	-	**8**	-	<0.1	**16**	-	**19**
Surface	TP49-02	-	21/03/2019	Normal	<5	-	-	<1	-	32	-	**15**	-	**8**	-	<0.1	**14**	-	**22**
Stockpile	TP50-01	-	21/03/2019	Normal	<5	-	-	<1	-	20	-	**14**	-	**8**	-	<0.1	**10**	-	**16**
Surface	TP50-02	-	21/03/2019	Normal	<5	-	-	<1	-	21	-	**12**	-	**8**	-	<0.1	**11**	-	**15**
Stockpile	TP51-01	-	21/03/2019	Normal	8	100	<1	<1	<0.5	24	7	**9**	24,600	**8**	232	<0.1	**12**	<2	**15**
Surface	TP51-02	-	21/03/2019	Normal	<5	-	-	<1	-	31	-	**16**	-	**10**	-	<0.1	**18**	-	**21**
Stockpile	*TP51-03*	*-*	*21/03/2019*	*Field_D*	*8*	*-*	*-*	*<1*	*-*	*24*	*-*	***10***	*-*	***10***	*-*	*<0.1*	***13***	*-*	***17***
Stockpile	TP51-04	-	21/03/2019	Normal	8	-	-	<1	-	21	-	**8**	-	**8**	-	<0.1	**12**	-	**15**
Stockpile	TP52-01	-	21/03/2019	Normal	<5	-	-	<1	-	17	-	**10**	-	**14**	-	<0.1	**8**	-	**20**
Surface	TP52-02	-	21/03/2019	Normal	<5	-	-	<1	-	16	-	**14**	-	**5**	-	<0.1	**10**	-	**12**

Chemical Summary Table

					Metals													
					Arsenic	Barium	Beryllium	Cadmium	Chromium (hexavalent)	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					2	10	1	0.4	0.5	2	2	5	50	5	5	0.1	2	2	5
Location	**Field ID**	**Depth**	**Date**	**Sample Type**															
Stockpile	TP53-01	-	21/03/2019	Normal	<5	-	-	<1	-	14	-	**8**	-	**10**	-	<0.1	**6**	-	**14**
Surface	TP53-02	-	21/03/2019	Normal	<5	-	-	<1	-	12	-	**7**	-	**9**	-	<0.1	**5**	-	**14**
Stockpile	TP54-01	-	21/03/2019	Normal	<5	-	-	<1	-	29	-	**15**	-	**9**	-	<0.1	**14**	-	**19**
Surface	TP54-02	-	21/03/2019	Normal	<5	-	-	<1	-	23	-	**12**	-	**7**	-	<0.1	**12**	-	**17**
Surface	TP55-01	-	22/03/2019	Normal	6	120	1	<1	<0.5	21	10	**10**	18,800	**9**	240	<0.1	**13**	<2	**15**
Surface	TP56-01	-	22/03/2019	Normal	<5	-	-	<1	-	13	-	<5	-	**5**	-	<0.1	**5**	-	**7**
Stockpile	SP01-01	-	20/03/2019	Normal	6	-	-	<1	-	29	-	**31**	-	<5	-	<0.1	**15**	-	**23**
Stockpile	SP02-01	-	20/03/2019	Normal	<5	-	-	<1	-	8	-	**6**	-	**8**	-	<0.1	**4**	-	**130**
Stockpile	SP03-01	-	20/03/2019	Normal	<5	-	-	<1	-	18	-	**14**	-	<5	-	<0.1	**9**	-	**11**
Stockpile	SP04-01	-	20/03/2019	Normal	<5	80	<1	<1	<0.5	19	5	**12**	20,500	**5**	136	<0.1	**10**	<2	**12**
Stockpile	SP05-01	-	20/03/2019	Normal	<5	-	-	<1	-	11	-	**27**	-	<5	-	<0.1	**7**	-	**13**
Stockpile	SP06-01	-	20/03/2019	Normal	<5	-	-	<1	-	17	-	**10**	-	**5**	-	<0.1	**10**	-	**13**
Stockpile	SP07-01	-	20/03/2019	Normal	<5	-	-	<1	-	25	-	**12**	-	**6**	-	<0.1	**11**	-	**16**
Stockpile	SP08-01	-	20/03/2019	Normal	<5	-	-	<1	-	25	-	**16**	-	**6**	-	<0.1	**12**	-	**18**

Chemical Summary Table

					PAH																			BTEX						
					Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzo[b+j]fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Total PAH	Carcinogenic PAH (BaP TEQ zero LOR)	Carcinogenic PAH (BaP TEQ Half LOR)	Carcinogenic PAH (BaP TEQ LOR)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	Total BTEX
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.1	0.1	0.1	0.1	0.2	0.3	0.2
Location	**Field ID**	**Depth**	**Date**	**Sample Type**																											
Soil Bore	SB01-01	0.0 - 0.1	19/03/2019	Normal	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Soil Bore	SB01-03	0.9 - 1.0	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Soil Bore	SB01-04	2.1 - 2.2	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Soil Bore	SB02-01	0.0 - 0.1	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Soil Bore	SB02-04	1.5 - 1.6	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Soil Bore	SB03-01	0.0 - 0.1	19/03/2019	Normal	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Sest Pit	SB03-02	0.35 - 0.45	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Sest Pit	SB03-03	0.9 - 1.0	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Soil Bore	SB04-01	0.0 - 0.3	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Soil Bore	*SB04-02*	*0.0 - 0.3*	*19/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*<1*	-	-	-	-	-	-	*<0.2*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.2*
Soil Bore	*SB04-03*	*0.0 - 0.3*	*19/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*<0.5*	-	-	-	-	-	-	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.2*	*<0.3*	-
Soil Bore	SB04-04	0.9 - 1.0	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Soil Bore	SB04-06	3.3 - 3.4	19/03/2019	Normal	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Sest Pit	SB05-01	0.0 - 0.1	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	0.7	0.7	0.7
Sest Pit	SB05-03	1.2 - 1.3	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Sest Pit	SB05-05	4.7 - 4.8	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Sest Pit	SB06-02	0.3 - 0.4	19/03/2019	Normal	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Sest Pit	SB06-05	3.5 - 3.6	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP01-01	0.0 - 0.1	20/03/2019	Normal	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP01-03	1.4 - 1.5	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP02-02	0.3 - 0.4	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP02-04	1.5 - 1.6	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	*TP02-05*	*0.0 - 0.1*	*20/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*<1*	-	-	-	-	-	-	*<0.2*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.2*
Test Pit	*TP02-06*	*0.0 - 0.1*	*20/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*<0.5*	-	-	-	-	-	-	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.2*	*<0.3*	-
Test Pit	TP03-02	0.3 - 0.4	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP03-04	1.9 - 2.0	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP04-01	0.0 - 0.1	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP04-03	1.4 - 1.5	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP05-02	1.0 - 1.1	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP05-03	1.5 - 1.6	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP06-01	0.0 - 0.1	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP06-02	0.5 - 0.6	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP07-01	0.0 - 0.1	20/03/2019	Normal	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP07-02	0.5 - 0.6	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP08-01	0.0 - 0.1	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP08-02	0.4 - 0.5	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP09-01	0.0 - 0.1	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP09-02	0.5 - 0.6	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP10-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP10-03	1.1 - 1.2	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP11-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2

Chemical Summary Table

					PAH																				BTEX						
					Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzo[b+j]fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Total PAH	Carcinogenic PAH (BaP TEQ zero LOR)	Carcinogenic PAH (BaP TEQ Half LOR)	Carcinogenic PAH (BaP TEQ LOR)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	Total BTEX
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.1	0.1	0.1	0.1	0.2	0.3	0.2
Location	**Field ID**	**Depth**	**Date**	**Sample Type**																											
Test Pit	TP11-03	1.0 - 1.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP12-01	0.0 - 0.1	21/03/2019	Normal	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP12-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP13-02	0.2 - 0.3	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP13-03	0.5 - 0.6	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	*TP13-05*	*0.2 - 0.3*	*21/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*<1*	-	-	-	-	-	-	*<0.2*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.2*
Test Pit	*TP13-06*	*0.2 - 0.3*	*21/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*<0.5*	-	-	-	-	-	-	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.2*	*<0.3*	-
Test Pit	TP14-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP14-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	*TP14-04*	*0.0 - 0.1*	*21/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*<1*	-	-	-	-	-	-	*<0.2*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.2*
Test Pit	*TP14-05*	*0.0 - 0.1*	*21/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*<0.5*	-	-	-	-	-	-	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.2*	*<0.3*	-
Test Pit	TP15-02	0.2 - 0.3	21/03/2019	Normal	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP15-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP16-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP16-03	0.5 - 0.6	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP17-02	0.2 - 0.3	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP17-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP18-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP18-03	0.5 - 0.6	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP19-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP19-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP20-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP20-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP21-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP21-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP22-01	0.0 - 0.1	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP22-03	1.0 - 1.1	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP23-01	0.0 - 0.1	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP23-02	0.2 - 0.3	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	*TP23-04*	*0.0 - 0.1*	*22/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*<1*	-	-	-	-	-	-	*<0.2*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.2*
Test Pit	*TP23-05*	*0.0 - 0.1*	*22/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*<0.5*	-	-	-	-	-	-	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.2*	*<0.3*	-
Test Pit	TP24-01	0.0 - 0.1	22/03/2019	Normal	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP24-03	0.8 - 0.9	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP25-01	0.0 - 0.1	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP25-02	0.3 - 0.4	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP25-03	1.9 - 2.0	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP26-01	0.0 - 0.1	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Test Pit	TP26-03	1.9 - 2.0	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP27-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP28-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP29-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2

Chemical Summary Table

					PAH																				BTEX						
					Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzo[b+j]fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Total PAH	Carcinogenic PAH (BaP TEQ zero LOR)	Carcinogenic PAH (BaP TEQ Half LOR)	Carcinogenic PAH (BaP TEQ LOR)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	Total BTEX
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.1	0.1	0.1	0.1	0.2	0.3	0.2
Location	**Field ID**	**Depth**	**Date**	**Sample Type**																											
Surface	TP30-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP31-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP31-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP32-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP33-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP34-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP35-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP36-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP37-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP38-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP39-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP40-01	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP40-02	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP40-03	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	*TP40-04*	-	*22/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*<0.5*	-	-	-	-	-	-	*<0.1*	*<0.1*	*<0.1*	*<0.1*	*<0.2*	*<0.3*	-
Stockpile	TP41-01	-	22/03/2019	Normal	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP41-02	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP42-01	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP42-02	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP43-01	-	21/03/2019	Normal	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP43-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP44-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP44-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP45-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP45-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP46-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP46-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP47-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP47-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP48-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP48-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP49-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP49-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP50-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP50-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP51-01	-	21/03/2019	Normal	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP51-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	*TP51-03*	-	*21/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*<1*	-	-	-	-	-	-	*<0.2*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.5*	*<0.2*
Stockpile	TP51-04	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP52-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP52-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2

Chemical Summary Table

					PAH																				BTEX						
					Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzo[b+j]fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Total PAH	Carcinogenic PAH (BaP TEQ zero LOR)	Carcinogenic PAH (BaP TEQ Half LOR)	Carcinogenic PAH (BaP TEQ LOR)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	Total BTEX
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.1	0.1	0.1	0.1	0.2	0.3	0.2
Location	**Field ID**	**Depth**	**Date**	**Sample Type**																											
Stockpile	TP53-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP53-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	TP54-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP54-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP55-01	-	22/03/2019	Normal	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Surface	TP56-01	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	SP01-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	SP02-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	SP03-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	SP04-01	-	20/03/2019	Normal	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	SP05-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	SP06-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	SP07-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Stockpile	SP08-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2

Chemical Summary Table

					Organochlorine Pesticides																							
					4,4-DDD	4,4-DDE	4,4-DDT	DDT+DDE+DDD	a-BHC	b-BHC	d-BHC	g-BHC (Lindane)	Aldrin	Dieldrin	Aldrin + Dieldrin	chlordane	Chlordane (cis)	Chlordane (trans)	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	Heptachlor	Heptachlor epoxide	Methoxychlor
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2
Location	**Field ID**	**Depth**	**Date**	**Sample Type**																								
Soil Bore	SB01-01	0.0 - 0.1	19/03/2019	Normal	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Soil Bore	SB01-03	0.9 - 1.0	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soil Bore	SB01-04	2.1 - 2.2	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soil Bore	SB02-01	0.0 - 0.1	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soil Bore	SB02-04	1.5 - 1.6	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soil Bore	SB03-01	0.0 - 0.1	19/03/2019	Normal	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Sest Pit	SB03-02	0.35 - 0.45	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sest Pit	SB03-03	0.9 - 1.0	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soil Bore	SB04-01	0.0 - 0.3	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soil Bore	*SB04-02*	*0.0 - 0.3*	*19/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soil Bore	*SB04-03*	*0.0 - 0.3*	*19/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soil Bore	SB04-04	0.9 - 1.0	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soil Bore	SB04-06	3.3 - 3.4	19/03/2019	Normal	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Sest Pit	SB05-01	0.0 - 0.1	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sest Pit	SB05-03	1.2 - 1.3	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sest Pit	SB05-05	4.7 - 4.8	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sest Pit	SB06-02	0.3 - 0.4	19/03/2019	Normal	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Sest Pit	SB06-05	3.5 - 3.6	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP01-01	0.0 - 0.1	20/03/2019	Normal	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Test Pit	TP01-03	1.4 - 1.5	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP02-02	0.3 - 0.4	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP02-04	1.5 - 1.6	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	*TP02-05*	*0.0 - 0.1*	*20/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	*TP02-06*	*0.0 - 0.1*	*20/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP03-02	0.3 - 0.4	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP03-04	1.9 - 2.0	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP04-01	0.0 - 0.1	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP04-03	1.4 - 1.5	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP05-02	1.0 - 1.1	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP05-03	1.5 - 1.6	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP06-01	0.0 - 0.1	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP06-02	0.5 - 0.6	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP07-01	0.0 - 0.1	20/03/2019	Normal	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Test Pit	TP07-02	0.5 - 0.6	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP08-01	0.0 - 0.1	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP08-02	0.4 - 0.5	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP09-01	0.0 - 0.1	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP09-02	0.5 - 0.6	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP10-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP10-03	1.1 - 1.2	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP11-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	9 of 16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Chemical Summary Table

					Organochlorine Pesticides																							
					4,4-DDD	4,4-DDE	4,4-DDT	DDT+DDE+DDD	a-BHC	b-BHC	d-BHC	g-BHC (Lindane)	Aldrin	Dieldrin	Aldrin + Dieldrin	chlordane	Chlordane (cis)	Chlordane (trans)	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	Heptachlor	Heptachlor epoxide	Methoxychlor
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2
Location	**Field ID**	**Depth**	**Date**	**Sample Type**																								
Test Pit	TP11-03	1.0 - 1.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP12-01	0.0 - 0.1	21/03/2019	Normal	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Test Pit	TP12-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP13-02	0.2 - 0.3	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP13-03	0.5 - 0.6	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	*TP13-05*	*0.2 - 0.3*	*21/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	*TP13-06*	*0.2 - 0.3*	*21/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP14-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP14-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	*TP14-04*	*0.0 - 0.1*	*21/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	*TP14-05*	*0.0 - 0.1*	*21/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP15-02	0.2 - 0.3	21/03/2019	Normal	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Test Pit	TP15-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP16-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP16-03	0.5 - 0.6	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP17-02	0.2 - 0.3	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP17-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP18-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP18-03	0.5 - 0.6	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP19-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP19-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP20-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP20-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP21-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP21-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP22-01	0.0 - 0.1	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP22-03	1.0 - 1.1	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP23-01	0.0 - 0.1	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP23-02	0.2 - 0.3	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	*TP23-04*	*0.0 - 0.1*	*22/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	*TP23-05*	*0.0 - 0.1*	*22/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP24-01	0.0 - 0.1	22/03/2019	Normal	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Test Pit	TP24-03	0.8 - 0.9	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP25-01	0.0 - 0.1	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP25-02	0.3 - 0.4	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP25-03	1.9 - 2.0	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP26-01	0.0 - 0.1	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test Pit	TP26-03	1.9 - 2.0	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP27-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP28-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP29-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Chemical Summary Table

					Organochlorine Pesticides																							
					4,4-DDD	4,4-DDE	4,4-DDT	DDT+DDE+DDD	a-BHC	b-BHC	d-BHC	g-BHC (Lindane)	Aldrin	Dieldrin	Aldrin + Dieldrin	chlordane	Chlordane (cis)	Chlordane (trans)	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	Heptachlor	Heptachlor epoxide	Methoxychlor
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2
Location	**Field ID**	**Depth**	**Date**	**Sample Type**																								
Surface	TP30-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP31-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP31-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP32-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP33-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP34-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP35-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP36-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP37-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP38-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP39-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP40-01	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP40-02	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP40-03	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	*TP40-04*	-	*22/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP41-01	-	22/03/2019	Normal	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Surface	TP41-02	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP42-01	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP42-02	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP43-01	-	21/03/2019	Normal	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Surface	TP43-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP44-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP44-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP45-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP45-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP46-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP46-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP47-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP47-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP48-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP48-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP49-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP49-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP50-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP50-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP51-01	-	21/03/2019	Normal	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Surface	TP51-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	*TP51-03*	-	*21/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP51-04	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP52-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP52-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Chemical Summary Table

					Organochlorine Pesticides																							
					4,4-DDD	4,4-DDE	4,4-DDT	DDT+DDE+DDD	a-BHC	b-BHC	d-BHC	g-BHC (Lindane)	Aldrin	Dieldrin	Aldrin + Dieldrin	chlordane	Chlordane (cis)	Chlordane (trans)	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	Heptachlor	Heptachlor epoxide	Methoxychlor
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2
Location	**Field ID**	**Depth**	**Date**	**Sample Type**																								
Stockpile	TP53-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP53-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	TP54-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP54-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface	TP55-01	-	22/03/2019	Normal	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Surface	TP56-01	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	SP01-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	SP02-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	SP03-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	SP04-01	-	20/03/2019	Normal	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Stockpile	SP05-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	SP06-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	SP07-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stockpile	SP08-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Chemical Summary Table

					Phenols				Halogenated Benzenes	Halogenated Phenols	Inorganics											Polychlorinated Biphenyls	Anions	pH
					2-methylphenol	3-&4-methylphenol	Total Phenols	Sum of Phenols	Hexachlorobenzene	Pentachlorophenol	Calcium/Magnesium Ratio	Exchangeable Sodium	Cation Exchange Capacity (CEC)	Exchangeable Sodium Percent	Exchangeable Magnesium	Exchangeable Calcium	Exchangeable Potassium	Moisture Content	Moisture Content (105°C)	pH (aqueous extract)	pH (Lab)	PCBs (Sum of total)	Sulphate	pH (CaCl2)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	cmol/kg	cmol/kg	%	cmol/kg	cmol/kg	cmol/kg	%	%	pH_Units	pH_Units	mg/kg	mg/kg	pH Unit
EQL					0.5	1	0.5	0.5	0.05	2		0.2	0.2		0.2	0.2	0.2	0.1	1	0.1	0.01	0.1	30	0.1
Location	**Field ID**	**Depth**	**Date**	**Sample Type**																				
Soil Bore	SB01-01	0.0 - 0.1	19/03/2019	Normal	<0.5	<1	<0.5	<0.5	<0.05	<2	-	-	-	-	-	-	-	<1.0	-	-	-	<0.1	<50	-
Soil Bore	SB01-03	0.9 - 1.0	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	13.5	-	-	-	-	160	8.2
Soil Bore	SB01-04	2.1 - 2.2	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	13.0	-	-	-	-	240	8.2
Soil Bore	SB02-01	0.0 - 0.1	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5	-	-	-	-	<50	7.8
Soil Bore	SB02-04	1.5 - 1.6	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	5.8	-	-	-	-	100	8.1
Soil Bore	SB03-01	0.0 - 0.1	19/03/2019	Normal	<0.5	<1	<0.5	<0.5	<0.05	<2	-	-	-	-	-	-	-	1.7	-	-	-	<0.1	<50	-
Sest Pit	SB03-02	0.35 - 0.45	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	7.6	-	-	-	-	<50	8.0
Sest Pit	SB03-03	0.9 - 1.0	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2	-	-	-	-	<50	7.4
Soil Bore	SB04-01	0.0 - 0.3	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	10.2	-	-	-	-	150	7.7
Soil Bore	*SB04-02*	*0.0 - 0.3*	*19/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*8.8*	-	-	-	-	*130*	*7.8*
Soil Bore	*SB04-03*	*0.0 - 0.3*	*19/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*12*	*8.8*	-	-	*230*	-
Soil Bore	SB04-04	0.9 - 1.0	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	27.2	-	-	-	-	300	7.0
Soil Bore	SB04-06	3.3 - 3.4	19/03/2019	Normal	<0.5	<1	<0.5	<0.5	<0.05	<2	-	-	-	-	-	-	-	36.1	-	-	-	<0.1	280	-
Sest Pit	SB05-01	0.0 - 0.1	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	5.2	-	-	-	-	60	7.9
Sest Pit	SB05-03	1.2 - 1.3	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	5.2	-	-	-	-	50	8.0
Sest Pit	SB05-05	4.7 - 4.8	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5	-	-	-	-	<50	7.7
Sest Pit	SB06-02	0.3 - 0.4	19/03/2019	Normal	<0.5	<1	<0.5	<0.5	<0.05	<2	-	-	-	-	-	-	-	5.0	-	-	-	<0.1	<50	-
Sest Pit	SB06-05	3.5 - 3.6	19/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	9.3	-	-	-	-	50	6.9
Test Pit	TP01-01	0.0 - 0.1	20/03/2019	Normal	<0.5	<1	<0.5	<0.5	<0.05	<2	-	-	-	-	-	-	-	1.7	-	-	-	<0.1	<50	-
Test Pit	TP01-03	1.4 - 1.5	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	7.8	-	-	-	-	70	7.9
Test Pit	TP02-02	0.3 - 0.4	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	7.9	-	-	-	-	150	7.8
Test Pit	TP02-04	1.5 - 1.6	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	16.8	-	-	-	-	270	8.0
Test Pit	*TP02-05*	*0.0 - 0.1*	*20/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*<1.0*	-	-	-	-	*<50*	*6.5*
Test Pit	*TP02-06*	*0.0 - 0.1*	*20/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*<1*	*7.5*	-	-	*<30*	-
Test Pit	TP03-02	0.3 - 0.4	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	6.4	-	-	-	-	230	8.0
Test Pit	TP03-04	1.9 - 2.0	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	17.4	-	-	-	-	320	8.1
Test Pit	TP04-01	0.0 - 0.1	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	6.3	-	-	-	-	<50	7.7
Test Pit	TP04-03	1.4 - 1.5	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	13.6	-	-	-	-	<50	7.9
Test Pit	TP05-02	1.0 - 1.1	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	5.4	-	-	-	-	50	7.6
Test Pit	TP05-03	1.5 - 1.6	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	11.6	-	-	-	-	580	8.0
Test Pit	TP06-01	0.0 - 0.1	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	4.8	-	-	-	-	70	8.0
Test Pit	TP06-02	0.5 - 0.6	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	14.9	-	-	-	-	<50	8.1
Test Pit	TP07-01	0.0 - 0.1	20/03/2019	Normal	<0.5	<1	<0.5	<0.5	<0.05	<2	-	-	-	-	-	-	-	7.9	-	-	-	<0.1	<50	-
Test Pit	TP07-02	0.5 - 0.6	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	10.2	-	-	-	-	<50	7.3
Test Pit	TP08-01	0.0 - 0.1	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.3	-	-	-	-	<50	7.8
Test Pit	TP08-02	0.4 - 0.5	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	6.0	-	-	-	-	<50	7.9
Test Pit	TP09-01	0.0 - 0.1	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.2	-	-	-	-	700	8.1
Test Pit	TP09-02	0.5 - 0.6	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	10.0	-	-	-	-	150	8.0
Test Pit	TP10-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	5.5	-	-	-	-	<50	7.7
Test Pit	TP10-03	1.1 - 1.2	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	15.4	-	-	-	-	70	8.0
Test Pit	TP11-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.9	-	-	-	-	<50	7.0

Chemical Summary Table

					Phenols				Halogenated Benzenes	Halogenated Phenols	Inorganics											Polychlorinated Biphenyls	Anions	pH
					2-methylphenol	3-&4-methylphenol	Total Phenols	Sum of Phenols	Hexachlorobenzene	Pentachlorophenol	Calcium/Magnesium Ratio	Exchangeable Sodium	Cation Exchange Capacity (CEC)	Exchangeable Sodium Percent	Exchangeable Magnesium	Exchangeable Calcium	Exchangeable Potassium	Moisture Content	Moisture Content (105°C)	pH (aqueous extract)	pH (Lab)	PCBs (Sum of total)	Sulphate	pH (CaCl2)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	cmol/kg	cmol/kg	%	cmol/kg	cmol/kg	cmol/kg	%	%	pH_Units	pH_Units	mg/kg	mg/kg	pH Unit
EQL					0.5	1	0.5	0.5	0.05	2		0.2	0.2		0.2	0.2	0.2	0.1	1	0.1	0.01	0.1	30	0.1
Location	**Field ID**	**Depth**	**Date**	**Sample Type**																				
Test Pit	TP11-03	1.0 - 1.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	18.6	-	-	-	-	170	7.5
Test Pit	TP12-01	0.0 - 0.1	21/03/2019	Normal	<0.5	<1	<0.5	<0.5	<0.05	<2	-	-	-	-	-	-	-	<1.0	-	-	-	<0.1	-	-
Test Pit	TP12-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	4.0	-	-	-	-	-	8.0
Test Pit	TP13-02	0.2 - 0.3	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5	-	-	-	-	-	8.0
Test Pit	TP13-03	0.5 - 0.6	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.3	-	-	-	-	-	8.0
Test Pit	*TP13-05*	*0.2 - 0.3*	*21/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*4.0*	-	-	-	-	-	*8.0*
Test Pit	*TP13-06*	*0.2 - 0.3*	*21/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*3.6*	*9.4*	-	-	-	-
Test Pit	TP14-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	8.3	-	-	-	-	730	7.7
Test Pit	TP14-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	35.1	-	-	-	-	190	7.5
Test Pit	*TP14-04*	*0.0 - 0.1*	*21/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*8.4*	-	-	-	-	*750*	*7.5*
Test Pit	*TP14-05*	*0.0 - 0.1*	*21/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*8.0*	*8.3*	-	-	*1,000*	-
Test Pit	TP15-02	0.2 - 0.3	21/03/2019	Normal	<0.5	<1	<0.5	<0.5	<0.05	<2	-	-	-	-	-	-	-	27.2	-	-	-	<0.1	300	-
Test Pit	TP15-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	47.0	-	-	-	-	400	7.4
Test Pit	TP16-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	5.1	-	-	-	-	230	7.5
Test Pit	TP16-03	0.5 - 0.6	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	30.8	-	-	-	-	270	7.3
Test Pit	TP17-02	0.2 - 0.3	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	8.9	-	-	-	-	390	7.4
Test Pit	TP17-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	40.7	-	-	-	-	330	7.5
Test Pit	TP18-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	5.4	-	-	-	-	380	7.5
Test Pit	TP18-03	0.5 - 0.6	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	28.4	-	-	-	-	200	7.4
Test Pit	TP19-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.5	-	-	-	-	60	7.7
Test Pit	TP19-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	35.0	-	-	-	-	250	7.0
Test Pit	TP20-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.6	-	-	-	-	140	7.9
Test Pit	TP20-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	44.4	-	-	-	-	460	6.9
Test Pit	TP21-01	0.0 - 0.1	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-	-	-	<50	7.5
Test Pit	TP21-03	1.9 - 2.0	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	12.3	-	-	-	-	120	8.1
Test Pit	TP22-01	0.0 - 0.1	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.8	-	-	-	-	110	8.3
Test Pit	TP22-03	1.0 - 1.1	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	19.8	-	-	-	-	270	8.3
Test Pit	TP23-01	0.0 - 0.1	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	5.8	-	-	-	-	130	8.2
Test Pit	TP23-02	0.2 - 0.3	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	17.3	-	-	-	-	650	8.0
Test Pit	*TP23-04*	*0.0 - 0.1*	*22/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*5.4*	-	-	-	-	-	*8.3*
Test Pit	*TP23-05*	*0.0 - 0.1*	*22/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*6.4*	*9.8*	-	-	-	-
Test Pit	TP24-01	0.0 - 0.1	22/03/2019	Normal	<0.5	<1	<0.5	<0.5	<0.05	<2	-	-	-	-	-	-	-	4.0	-	-	-	<0.1	420	-
Test Pit	TP24-03	0.8 - 0.9	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	7.1	-	-	-	-	100	7.4
Test Pit	TP25-01	0.0 - 0.1	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	4.6	-	-	-	-	-	8.1
Test Pit	TP25-02	0.3 - 0.4	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	15.4	-	-	-	-	240	-
Test Pit	TP25-03	1.9 - 2.0	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	10.4	-	-	-	-	120	8.0
Test Pit	TP26-01	0.0 - 0.1	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	4.2	-	-	-	-	190	8.0
Test Pit	TP26-03	1.9 - 2.0	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	11.2	-	-	-	-	60	8.0
Surface	TP27-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	1.9	-	-	-	-	<50	7.6
Surface	TP28-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	<50	7.4
Surface	TP29-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	-	-	-	-	170	7.7

Chemical Summary Table

					Phenols				Halogenated Benzenes	Halogenated Phenols	Inorganics											Polychlorinated Biphenyls	Anions	pH
					2-methylphenol	3-&4-methylphenol	Total Phenols	Sum of Phenols	Hexachlorobenzene	Pentachlorophenol	Calcium/Magnesium Ratio	Exchangeable Sodium	Cation Exchange Capacity (CEC)	Exchangeable Sodium Percent	Exchangeable Magnesium	Exchangeable Calcium	Exchangeable Potassium	Moisture Content	Moisture Content (105°C)	pH (aqueous extract)	pH (Lab)	PCBs (Sum of total)	Sulphate	pH (CaCl2)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	cmol/kg	cmol/kg	%	cmol/kg	cmol/kg	cmol/kg	%	%	pH_Units	pH_Units	mg/kg	mg/kg	pH Unit
EQL					0.5	1	0.5	0.5	0.05	2		0.2	0.2		0.2	0.2	0.2	0.1	1	0.1	0.01	0.1	30	0.1
Location	**Field ID**	**Depth**	**Date**	**Sample Type**																				
Surface	TP30-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	110	6.8
Stockpile	TP31-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4	-	-	-	-	-	7.9
Surface	TP31-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	4.6	-	-	-	-	-	8.0
Stockpile	TP32-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	4.0	-	-	-	-	-	7.9
Stockpile	TP33-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-	7.5
Stockpile	TP34-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	4.6	-	-	-	-	-	7.8
Stockpile	TP35-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	4.0	-	-	-	-	-	7.7
Stockpile	TP36-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.1	-	-	-	-	-	7.8
Stockpile	TP37-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5	-	-	-	-	-	8.0
Stockpile	TP38-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2	-	-	-	-	-	7.5
Stockpile	TP39-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-	8.0
Stockpile	TP40-01	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.4	-	-	-	-	-	8.0
Surface	TP40-02	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4	-	-	-	-	-	7.9
Stockpile	TP40-03	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.4	-	-	-	-	-	7.9
Stockpile	*TP40-04*	-	*22/03/2019*	*Interlab_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*2.5*	*8.9*	-	-	-	-
Stockpile	TP41-01	-	22/03/2019	Normal	<0.5	<1	<0.5	<0.5	<0.05	<2	-	-	-	-	-	-	-	2.3	-	-	-	<0.1	-	-
Surface	TP41-02	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.5	-	-	-	-	-	7.6
Stockpile	TP42-01	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	-	-	-	-	-	7.8
Surface	TP42-02	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	-	-	-	-	-	7.8
Stockpile	TP43-01	-	21/03/2019	Normal	<0.5	<1	<0.5	<0.5	<0.05	<2	-	-	-	-	-	-	-	2.8	-	-	-	<0.1	-	-
Surface	TP43-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	4.1	-	-	-	-	-	8.0
Stockpile	TP44-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.2	-	-	-	-	-	7.9
Surface	TP44-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.9	-	-	-	-	-	7.8
Stockpile	TP45-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.4	-	-	-	-	-	8.0
Surface	TP45-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	-	-	-	-	-	7.8
Stockpile	TP46-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.7	-	-	-	-	-	7.6
Surface	TP46-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4	-	-	-	-	-	7.5
Stockpile	TP47-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	4.7	-	-	-	-	-	7.9
Surface	TP47-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.5	-	-	-	-	-	7.9
Stockpile	TP48-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-	8.3
Surface	TP48-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	4.0	-	-	-	-	-	8.0
Stockpile	TP49-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4	-	-	-	-	-	7.8
Surface	TP49-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4	-	-	-	-	-	7.8
Stockpile	TP50-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.1	-	-	-	-	-	7.9
Surface	TP50-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-	-	-	-	7.9
Stockpile	TP51-01	-	21/03/2019	Normal	<0.5	<1	<0.5	<0.5	<0.05	<2	-	-	-	-	-	-	-	3.1	-	-	-	<0.1	-	-
Surface	TP51-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.9	-	-	-	-	-	7.8
Stockpile	*TP51-03*	-	*21/03/2019*	*Field_D*	-	-	-	-	-	-	-	-	-	-	-	-	-	*3.4*	-	-	-	-	-	*8.2*
Stockpile	TP51-04	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-	-	-	-	8.1
Stockpile	TP52-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5	-	-	-	-	-	6.8
Surface	TP52-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.2	-	-	-	-	-	8.0

Chemical Summary Table

					Phenols				Halogenated Benzenes	Halogenated Phenols	Inorganics											Polychlorinated Biphenyls	Anions	pH
					2-methylphenol	3-&4-methylphenol	Total Phenols	Sum of Phenols	Hexachlorobenzene	Pentachlorophenol	Calcium/Magnesium Ratio	Exchangeable Sodium	Cation Exchange Capacity (CEC)	Exchangeable Sodium Percent	Exchangeable Magnesium	Exchangeable Calcium	Exchangeable Potassium	Moisture Content	Moisture Content (103°C)	pH (aqueous extract)	pH (Lab)	PCBs (Sum of total)	Sulphate	pH (CaCl2)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	cmol/kg	cmol/kg	%	cmol/kg	cmol/kg	cmol/kg	%	%	pH_Units	pH_Units	mg/kg	mg/kg	pH Unit
EQL					0.5	1	0.5	0.5	0.05	2		0.2	0.2		0.2	0.2	0.2	0.1	1	0.1	0.01	0.1	30	0.1
Location	**Field ID**	**Depth**	**Date**	**Sample Type**																				
Stockpile	TP53-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	-	-	-	-	-	7.1
Surface	TP53-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-	7.0
Stockpile	TP54-01	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	4.0	-	-	-	-	-	7.8
Surface	TP54-02	-	21/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.9	-	-	-	-	-	7.8
Surface	TP55-01	-	22/03/2019	Normal	<0.5	<1	<0.5	<0.5	<0.05	<2	-	-	-	-	-	-	-	2.8	-	-	-	<0.1	-	-
Surface	TP56-01	-	22/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-	-	-	-	8.0
Stockpile	SP01-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-	-	-	-	8.2
Stockpile	SP02-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	-	7.7
Stockpile	SP03-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	3.1	-	-	-	-	-	8.0
Stockpile	SP04-01	-	20/03/2019	Normal	<0.5	<1	<0.5	<0.5	<0.05	<2	-	-	-	-	-	-	-	3.0	-	-	-	<0.1	100	-
Stockpile	SP05-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-	-	-	8.0
Stockpile	SP06-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.4	-	-	-	-	-	7.9
Stockpile	SP07-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	-	-	-	-	-	7.8
Stockpile	SP08-01	-	20/03/2019	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2	-	-	-	-	-	7.7

Duplicate Summary Table

		Location Code	Soil Bore			Soil Bore		
		Field ID	SB04-01	SB04-02		SB04-01	SB04-03	
		Depth	0.0 - 0.1	0.0 - 0.1		0.0 - 0.1	0.0 - 0.1	
		Date	19/03/2019	19/03/2019		19/03/2019	19/03/2019	
		Sample Type	Normal	Field_D	RPD	Normal	Interlab_D	RPD
	Unit	EQL						
Metals								
Arsenic	mg/kg	2	10	6	NA	10	11	10
Barium	mg/kg	10	-	-	-	-	-	-
Beryllium	mg/kg	1	-	-	-	-	-	-
Cadmium	mg/kg	0.4	<1	<1	NA	<1	<0.4	NA
Chromium (hexavalent)	mg/kg	0.5	-	-	-	-	-	-
Chromium (III+VI)	mg/kg	2	47	36	27	47	54	14
Cobalt	mg/kg	2	-	-	-	-	-	-
Copper	mg/kg	5	8	6	NA	8	9.0	NA
Iron	mg/kg	50	-	-	-	-	-	-
Lead	mg/kg	5	<5	<5	NA	<5	6.6	NA
Manganese	mg/kg	5	-	-	-	-	-	-
Mercury	mg/kg	0.1	<0.1	<0.1	NA	<0.1	<0.1	NA
Nickel	mg/kg	2	4	4	NA	4	6.1	NA
Silver	mg/kg	2	-	-	-	-	-	-
Zinc	mg/kg	5	11	14	NA	11	19	53
PAH								
Naphthalene	mg/kg	0.5	<1	<1	NA	<1	<0.5	NA
BTEX								
Benzene	mg/kg	0.1	<0.2	<0.2	NA	<0.2	<0.1	NA
Toluene	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Ethylbenzene	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Xylene (o)	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Xylene (m & p)	mg/kg	0.2	<0.5	<0.5	NA	<0.5	<0.2	NA
Xylene Total	mg/kg	0.3	<0.5	<0.5	NA	<0.5	<0.3	NA
Total BTEX	mg/kg	0.2	<0.2	<0.2	NA	<0.2	-	-
Inorganics								
pH (aqueous extract)	pH_Units	0.1	-	-	-	-	8.8	-
Anions								
Sulphate	mg/kg	30	150	130	NA	150	230	42
SPOCAS								
pH (CaCl2)	pH Unit	0.1	7.7	7.8	1	7.7	-	-

Highlighted values indicate duplicate pairs above RPD guidelne of 30 or otherwise demonstrating low precision.
NA - RPD not calculated as one or more concentrations below 5x LOR. Duplicate pair demonstrates acceptable precision.
LP - RPD not calculated as one or more concentrations below 5x LOR. Duplicate pair demonstrates low precision.

Duplicate Summary Table

		Location Code	Test Pit			Test Pit		
		Field ID	TP02-02	TP02-05		TP02-02	TP02-06	
		Depth	0.0 - 0.1	0.0 - 0.1		0.0 - 0.1	0.0 - 0.1	
		Date	20/03/2019	20/03/2019		20/03/2019	20/03/2019	
		Sample Type	Normal	Field_D	RPD	Normal	Interlab_D	RPD
	Unit	EQL						
Metals								
Arsenic	mg/kg	2	<5	<5	NA	<5	2.1	NA
Barium	mg/kg	10	-	-	-	-	-	-
Beryllium	mg/kg	1	-	-	-	-	-	-
Cadmium	mg/kg	0.4	<1	<1	NA	<1	<0.4	NA
Chromium (hexavalent)	mg/kg	0.5	-	-	-	-	-	-
Chromium (III+VI)	mg/kg	2	12	6	LP	12	6.9	LP
Cobalt	mg/kg	2	-	-	-	-	-	-
Copper	mg/kg	5	<5	<5	NA	<5	<5	NA
Iron	mg/kg	50	-	-	-	-	-	-
Lead	mg/kg	5	<5	<5	NA	<5	<5	NA
Manganese	mg/kg	5	-	-	-	-	-	-
Mercury	mg/kg	0.1	<0.1	<0.1	NA	<0.1	<0.1	NA
Nickel	mg/kg	2	<2	<2	NA	<2	<5	NA
Silver	mg/kg	2	-	-	-	-	-	-
Zinc	mg/kg	5	<5	<5	NA	<5	<5	NA
PAH								
Naphthalene	mg/kg	0.5	<1	<1	NA	<1	<0.5	NA
BTEX								
Benzene	mg/kg	0.1	<0.2	<0.2	NA	<0.2	<0.1	NA
Toluene	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Ethylbenzene	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Xylene (o)	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Xylene (m & p)	mg/kg	0.2	<0.5	<0.5	NA	<0.5	<0.2	NA
Xylene Total	mg/kg	0.3	<0.5	<0.5	NA	<0.5	<0.3	NA
Total BTEX	mg/kg	0.2	<0.2	<0.2	NA	<0.2	-	-
Inorganics								
pH (aqueous extract)	pH_Units	0.1	-	-	-	-	7.5	-
Anions								
Sulphate	mg/kg	30	150	<50	LP	150	<30	LP
SPOCAS								
pH (CaCl2)	pH Unit	0.1	7.8	6.5	18	7.8	-	-

Highlighted values indicate duplicate pairs above RPD guideln
NA - RPD not calculated as one or more concentrations below
LP - RPD not calculated as one or more concentrations below

Duplicate Summary Table

		Location Code	Test Pit			Test Pit		
		Field ID	TP13-02	TP13-05		TP13-02	TP13-06	
		Depth	0.2 - 0.3	0.2 - 0.3		0.2 - 0.3	0.2 - 0.3	
		Date	21/03/2019	21/03/2019		21/03/2019	21/03/2019	
		Sample Type	Normal	Field_D	RPD	Normal	Interlab_D	RPD
	Unit	EQL						
Metals								
Arsenic	mg/kg	2	<5	<5	NA	<5	2.5	NA
Barium	mg/kg	10	-	-	-	-	-	-
Beryllium	mg/kg	1	-	-	-	-	-	-
Cadmium	mg/kg	0.4	<1	<1	NA	<1	<0.4	NA
Chromium (hexavalent)	mg/kg	0.5	-	-	-	-	-	-
Chromium (III+VI)	mg/kg	2	6	8	NA	6	9.2	NA
Cobalt	mg/kg	2	-	-	-	-	-	-
Copper	mg/kg	5	<5	<5	NA	<5	<5	NA
Iron	mg/kg	50	-	-	-	-	-	-
Lead	mg/kg	5	<5	<5	NA	<5	<5	NA
Manganese	mg/kg	5	-	-	-	-	-	-
Mercury	mg/kg	0.1	<0.1	<0.1	NA	<0.1	<0.1	NA
Nickel	mg/kg	2	<2	<2	NA	<2	<5	NA
Silver	mg/kg	2	-	-	-	-	-	-
Zinc	mg/kg	5	<5	<5	NA	<5	<5	NA
PAH								
Naphthalene	mg/kg	0.5	<1	<1	NA	<1	<0.5	NA
BTEX								
Benzene	mg/kg	0.1	<0.2	<0.2	NA	<0.2	<0.1	NA
Toluene	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Ethylbenzene	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Xylene (o)	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Xylene (m & p)	mg/kg	0.2	<0.5	<0.5	NA	<0.5	<0.2	NA
Xylene Total	mg/kg	0.3	<0.5	<0.5	NA	<0.5	<0.3	NA
Total BTEX	mg/kg	0.2	<0.2	<0.2	NA	<0.2	-	-
Inorganics								
pH (aqueous extract)	pH_Units	0.1	-	-	-	-	9.4	-
Anions								
Sulphate	mg/kg	30	-	-	-	-	-	-
SPOCAS								
pH (CaCl2)	pH Unit	0.1	8.0	8.0	0	8.0	-	-

Highlighted values indicate duplicate pairs above RPD guideln
NA - RPD not calculated as one or more concentrations below
LP - RPD not calculated as one or more concentrations below

Duplicate Summary Table

		Location Code	Test Pit			Test Pit		
		Field ID	TP14-01	TP14-04		TP14-01	TP14-05	
		Depth	0.0 - 0.1	0.0 - 0.1		0.0 - 0.1	0.0 - 0.1	
		Date	21/03/2019	21/03/2019		21/03/2019	21/03/2019	
		Sample Type	Normal	Field_D	RPD	Normal	Interlab_D	RPD
	Unit	EQL						
Metals								
Arsenic	mg/kg	2	6	6	NA	6	6.6	NA
Barium	mg/kg	10	-	-	-	-	-	-
Beryllium	mg/kg	1	-	-	-	-	-	-
Cadmium	mg/kg	0.4	<1	<1	NA	<1	<0.4	NA
Chromium (hexavalent)	mg/kg	0.5	-	-	-	-	-	-
Chromium (III+VI)	mg/kg	2	46	45	2	46	53	14
Cobalt	mg/kg	2	-	-	-	-	-	-
Copper	mg/kg	5	7	7	NA	7	7.6	NA
Iron	mg/kg	50	-	-	-	-	-	-
Lead	mg/kg	5	7	6	NA	7	9.8	NA
Manganese	mg/kg	5	-	-	-	-	-	-
Mercury	mg/kg	0.1	<0.1	<0.1	NA	<0.1	<0.1	NA
Nickel	mg/kg	2	5	4	NA	5	6.9	NA
Silver	mg/kg	2	-	-	-	-	-	-
Zinc	mg/kg	5	13	13	NA	13	19	NA
PAH								
Naphthalene	mg/kg	0.5	<1	<1	NA	<1	<0.5	NA
BTEX								
Benzene	mg/kg	0.1	<0.2	<0.2	NA	<0.2	<0.1	NA
Toluene	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Ethylbenzene	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Xylene (o)	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Xylene (m & p)	mg/kg	0.2	<0.5	<0.5	NA	<0.5	<0.2	NA
Xylene Total	mg/kg	0.3	<0.5	<0.5	NA	<0.5	<0.3	NA
Total BTEX	mg/kg	0.2	<0.2	<0.2	NA	<0.2	-	-
Inorganics								
pH (aqueous extract)	pH_Units	0.1	-	-	-	-	8.3	-
Anions								
Sulphate	mg/kg	30	730	750	3	730	1,000	31
SPOCAS								
pH (CaCl2)	pH Unit	0.1	7.7	7.5	3	7.7	-	-

Highlighted values indicate duplicate pairs above RPD guideln
NA - RPD not calculated as one or more concentrations below
LP - RPD not calculated as one or more concentrations below

Duplicate Summary Table

		Location Code	Stockpile			Stockpile		
		Field ID	TP51-01	TP51-03		TP40-01	TP40-04	
		Depth	-	-		-	-	
		Date	21/03/2019	21/03/2019		22/03/2019	22/03/2019	
		Sample Type	Normal	Field_D	RPD	Normal	Interlab_D	RPD
	Unit	EQL						
Metals								
Arsenic	mg/kg	2	8	8	NA	<5	3.3	NA
Barium	mg/kg	10	100	-	-	-	-	-
Beryllium	mg/kg	1	<1	-	-	-	-	-
Cadmium	mg/kg	0.4	<1	<1	NA	<1	<0.4	NA
Chromium (hexavalent)	mg/kg	0.5	<0.5	-	-	-	-	-
Chromium (III+VI)	mg/kg	2	24	24	0	15	19	24
Cobalt	mg/kg	2	7	-	-	-	-	-
Copper	mg/kg	5	9	10	NA	10	9.9	NA
Iron	mg/kg	50	24,600	-	-	-	-	-
Lead	mg/kg	5	8	10	NA	<5	6.6	NA
Manganese	mg/kg	5	232	-	-	-	-	-
Mercury	mg/kg	0.1	<0.1	<0.1	NA	<0.1	<0.1	NA
Nickel	mg/kg	2	12	13	8	10	12	18
Silver	mg/kg	2	<2	-	-	-	-	-
Zinc	mg/kg	5	15	17	NA	12	21	NA
PAH								
Naphthalene	mg/kg	0.5	<0.5	<1	NA	<1	<0.5	NA
BTEX								
Benzene	mg/kg	0.1	<0.2	<0.2	NA	<0.2	<0.1	NA
Toluene	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Ethylbenzene	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Xylene (o)	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Xylene (m & p)	mg/kg	0.2	<0.5	<0.5	NA	<0.5	<0.2	NA
Xylene Total	mg/kg	0.3	<0.5	<0.5	NA	<0.5	<0.3	NA
Total BTEX	mg/kg	0.2	<0.2	<0.2	NA	<0.2	-	-
Inorganics								
pH (aqueous extract)	pH_Units	0.1	-	-	-	-	8.9	-
Anions								
Sulphate	mg/kg	30	-	-	-	-	-	-
SPOCAS								
pH (CaCl2)	pH Unit	0.1	-	8.2	-	8.0	-	-

Highlighted values indicate duplicate pairs above RPD guideln
NA - RPD not calculated as one or more concentrations below
LP - RPD not calculated as one or more concentrations below

Duplicate Summary Table

		Location Code	Test Pit			Test Pit		
		Field ID	TP23-01	TP23-04		TP23-01	TP23-05	
		Depth	0.0 - 0.1	0.0 - 0.1		0.0 - 0.1	0.0 - 0.1	
		Date	22/03/2019	22/03/2019		22/03/2019	22/03/2019	
		Sample Type	Normal	Field_D	RPD	Normal	Interlab_D	RPD
	Unit	EQL						
Metals								
Arsenic	mg/kg	2	7	8	NA	7	10	NA
Barium	mg/kg	10	-	-	-	-	-	-
Beryllium	mg/kg	1	-	-	-	-	-	-
Cadmium	mg/kg	0.4	<1	<1	NA	<1	<0.4	NA
Chromium (hexavalent)	mg/kg	0.5	-	-	-	-	-	-
Chromium (III+VI)	mg/kg	2	22	25	13	22	39	56
Cobalt	mg/kg	2	-	-	-	-	-	-
Copper	mg/kg	5	10	12	NA	10	13	NA
Iron	mg/kg	50	-	-	-	-	-	-
Lead	mg/kg	5	10	10	NA	10	14	NA
Manganese	mg/kg	5	-	-	-	-	-	-
Mercury	mg/kg	0.1	<0.1	<0.1	NA	<0.1	<0.1	NA
Nickel	mg/kg	2	13	14	7	13	21	47
Silver	mg/kg	2	-	-	-	-	-	-
Zinc	mg/kg	5	15	18	NA	15	33	LP
PAH								
Naphthalene	mg/kg	0.5	<1	<1	NA	<1	<0.5	NA
BTEX								
Benzene	mg/kg	0.1	<0.2	<0.2	NA	<0.2	<0.1	NA
Toluene	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Ethylbenzene	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Xylene (o)	mg/kg	0.1	<0.5	<0.5	NA	<0.5	<0.1	NA
Xylene (m & p)	mg/kg	0.2	<0.5	<0.5	NA	<0.5	<0.2	NA
Xylene Total	mg/kg	0.3	<0.5	<0.5	NA	<0.5	<0.3	NA
Total BTEX	mg/kg	0.2	<0.2	<0.2	NA	<0.2	-	-
Inorganics								
pH (aqueous extract)	pH_Units	0.1	-	-	-	-	9.8	-
Anions								
Sulphate	mg/kg	30	130	-	-	130	-	-
SPOCAS								
pH (CaCl2)	pH Unit	0.1	8.2	8.3	1	8.2	-	-

Highlighted values indicate duplicate pairs above RPD guideln
NA - RPD not calculated as one or more concentrations below
LP - RPD not calculated as one or more concentrations below

Blanks Summary Table

		Field ID	RINSE-01	RINSE-02	RINSE-03	RINSE-04	TB-01	TB-03
		Date	19/03/2019	20/03/2019	21/03/2019	22/03/2019	19/03/2019	22/03/2019
		Sample Type	Rinsate	Rinsate	Rinsate	Rinsate	Trip_B	Trip_B
		Unit						
Metals	Arsenic	mg/L	<0.001	-	-	<0.001	-	-
	Cadmium	mg/L	<0.0001	-	-	<0.0001	-	-
	Chromium (III+VI)	mg/L	<0.001	-	-	<0.001	-	-
	Copper	mg/L	<0.001	-	-	<0.001	-	-
	Lead	mg/L	<0.001	-	-	<0.001	-	-
	Mercury	mg/L	<0.0001	-	-	<0.0001	-	-
	Nickel	mg/L	<0.001	-	-	<0.001	-	-
	Zinc	mg/L	<0.005	-	-	<0.005	-	-
PAH	Naphthalene	µg/L	-	<5	<5	<5	<5	<5
TRH	TRH C6-C10	µg/L	-	<20	<20	<20	<20	<20
	TRH C6-C10 less BTEX (F1)	µg/L	-	<20	<20	<20	<20	<20
	TRH >C10-C16	µg/L	-	-	-	<100	-	-
	TRH >C10-C16 less Napthalene (F2)	µg/L	-	-	-	<100	-	-
	TRH >C16-C34	µg/L	-	-	-	<100	-	-
	TRH >C34-C40	µg/L	-	-	-	<100	-	-
	TRH >C10-C40 (sum of fractions)	µg/L	-	-	-	<100	-	-
BTEX	Benzene	µg/L	-	<1	<1	<1	<1	<1
	Toluene	µg/L	-	<2	<2	<2	<2	<2
	Ethylbenzene	µg/L	-	<2	<2	<2	<2	<2
	Xylene (o)	µg/L	-	<2	<2	<2	<2	<2
	Xylene (m & p)	µg/L	-	<2	<2	<2	<2	<2
	Xylene Total	µg/L	-	<2	<2	<2	<2	<2
	Total BTEX	µg/L	-	<1	<1	<1	<1	<1
Inorganics	pH (Lab)	pH_Units	-	-	-	5.37	-	-

Appendix L

Laboratory Certificates of Analysis

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1904231**	Page	: 1 of 40
Client	: **LBW CO PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MARK PETERSON	Contact	: Kieren Burns
Address	: 184 MAGILL ROAD NORWOOD SA, AUSTRALIA 5067	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +61881625130
Project	: 191076	Date Samples Received	: 22-Mar-2019 10:25
Order number	:	Date Analysis Commenced	: 25-Mar-2019
C-O-C number	: 191076_COC_20190319	Issue Date	: 29-Mar-2019 14:41
Sampler	: ----		
Site	: Springwood Development PSI		
Quote number	: AD/014/19		
No. of samples received	: 93		
No. of samples analysed	: 59		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero
- EP080: Particular sample EM-1904231-022 shows minor BTEX hits. Confirmed by re-analysis.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB01-01	SB01-03	SB01-04	SB02-01	SB02-04
				Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-002	EM1904231-004	EM1904231-005	EM1904231-006	EM1904231-009
					Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract									
pH (CaCl2)	----	0.1	pH Unit		----	8.2	8.2	7.8	8.1
EA055: Moisture Content									
Moisture Content	----	1.0	%		----	13.5	13.0	2.5	5.8
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		<1.0	----	----	----	----
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)									
Sulfate as SO4 2-	14808-79-8	50	mg/kg		<50	160	240	<50	100
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	5	<5
Barium	7440-39-3	10	mg/kg		10	----	----	----	----
Beryllium	7440-41-7	1	mg/kg		<1	----	----	----	----
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		5	29	24	24	7
Cobalt	7440-48-4	2	mg/kg		<2	----	----	----	----
Copper	7440-50-8	5	mg/kg		<5	7	6	5	<5
Iron	7439-89-6	50	mg/kg		5970	----	----	----	----
Lead	7439-92-1	5	mg/kg		<5	6	6	<5	<5
Manganese	7439-96-5	5	mg/kg		16	----	----	----	----
Nickel	7440-02-0	2	mg/kg		<2	11	8	4	<2
Silver	7440-22-4	2	mg/kg		<2	----	----	----	----
Zinc	7440-66-6	5	mg/kg		<5	13	14	10	<5
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)									
Hexavalent Chromium	18540-29-9	0.5	mg/kg		<0.5	----	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	1	mg/kg		<1	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	----	----	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg		<0.05	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB01-01	SB01-03	SB01-04	SB02-01	SB02-04
				Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-002	EM1904231-004	EM1904231-005	EM1904231-006	EM1904231-009
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
delta-BHC	319-86-8	0.05	mg/kg		<0.05	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg		<0.05	----	----	----	----
Aldrin	309-00-2	0.05	mg/kg		<0.05	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	----	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	----	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	----	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	----	----	----	----
Dieldrin	60-57-1	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	----	----	----	----
Endrin	72-20-8	0.05	mg/kg		<0.05	----	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	----	----	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	----	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	----	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	----	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	----	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	----	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	----	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	----	----	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		<0.5	----	----	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg		<0.5	----	----	----	----
2-Methylphenol	95-48-7	0.5	mg/kg		<0.5	----	----	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg		<1	----	----	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg		<0.5	----	----	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		<0.5	----	----	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		<0.5	----	----	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		<0.5	----	----	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		<0.5	----	----	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		<0.5	----	----	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		<0.5	----	----	----	----
Pentachlorophenol	87-86-5	2	mg/kg		<2	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB01-01	SB01-03	SB01-04	SB02-01	SB02-04
				Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-002	EM1904231-004	EM1904231-005	EM1904231-006	EM1904231-009
					Result	Result	Result	Result	Result
EP075(SIM)A: Phenolic Compounds - Continued									
^ Sum of Phenols	----	0.5	mg/kg		<0.5	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB01-01	SB01-03	SB01-04	SB02-01	SB02-04
				Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-002	EM1904231-004	EM1904231-005	EM1904231-006	EM1904231-009
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**90.7**	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**89.8**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**88.1**	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**101**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**97.5**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**89.6**	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**103**	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%		**126**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		**107**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**73.8**	**79.9**	**83.6**	**81.6**	**83.7**
Toluene-D8	2037-26-5	0.2	%		**80.8**	**82.9**	**84.7**	**81.8**	**80.0**
4-Bromofluorobenzene	460-00-4	0.2	%		**70.6**	**76.8**	**80.7**	**79.3**	**79.3**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SB03-01	SB03-02	SB03-03	SB04-01	SB04-02
			Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904231-010	EM1904231-011	EM1904231-012	EM1904231-014	EM1904231-015
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	----	8.0	7.4	7.7	7.8
EA055: Moisture Content								
Moisture Content	----	1.0	%	----	7.6	2.2	10.2	8.8
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	1.7	----	----	----	----
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)								
Sulfate as SO4 2-	14808-79-8	50	mg/kg	<50	<50	<50	150	130
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	10	6
Barium	7440-39-3	10	mg/kg	20	----	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	12	11	13	47	36
Cobalt	7440-48-4	2	mg/kg	<2	----	----	----	----
Copper	7440-50-8	5	mg/kg	<5	<5	<5	8	6
Iron	7439-89-6	50	mg/kg	19000	----	----	----	----
Lead	7439-92-1	5	mg/kg	<5	<5	<5	<5	<5
Manganese	7439-96-5	5	mg/kg	13	----	----	----	----
Nickel	7440-02-0	2	mg/kg	<2	4	<2	4	4
Silver	7440-22-4	2	mg/kg	<2	----	----	----	----
Zinc	7440-66-6	5	mg/kg	<5	<5	<5	11	14
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)								
Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	----	----	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	1	mg/kg	<1	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB03-01	SB03-02	SB03-03	SB04-01	SB04-02
				Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-010	EM1904231-011	EM1904231-012	EM1904231-014	EM1904231-015
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
delta-BHC	319-86-8	0.05	mg/kg		<0.05	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg		<0.05	----	----	----	----
Aldrin	309-00-2	0.05	mg/kg		<0.05	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	----	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	----	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	----	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	----	----	----	----
Dieldrin	60-57-1	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	----	----	----	----
Endrin	72-20-8	0.05	mg/kg		<0.05	----	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	----	----	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	----	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	----	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	----	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	----	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	----	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	----	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	----	----	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		<0.5	----	----	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg		<0.5	----	----	----	----
2-Methylphenol	95-48-7	0.5	mg/kg		<0.5	----	----	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg		<1	----	----	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg		<0.5	----	----	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		<0.5	----	----	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		<0.5	----	----	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		<0.5	----	----	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		<0.5	----	----	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		<0.5	----	----	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		<0.5	----	----	----	----
Pentachlorophenol	87-86-5	2	mg/kg		<2	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB03-01	SB03-02	SB03-03	SB04-01	SB04-02
				Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-010	EM1904231-011	EM1904231-012	EM1904231-014	EM1904231-015
					Result	Result	Result	Result	Result
EP075(SIM)A: Phenolic Compounds - Continued									
^ Sum of Phenols	----	0.5	mg/kg		<0.5	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB03-01	SB03-02	SB03-03	SB04-01	SB04-02
				Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-010	EM1904231-011	EM1904231-012	EM1904231-014	EM1904231-015
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**91.9**	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**85.8**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**83.7**	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**98.7**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**94.4**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**86.4**	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**103**	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%		**124**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		**105**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**102**	**82.6**	**84.6**	**102**	**87.2**
Toluene-D8	2037-26-5	0.2	%		**106**	**88.4**	**87.1**	**109**	**93.9**
4-Bromofluorobenzene	460-00-4	0.2	%		**102**	**78.9**	**78.5**	**101**	**84.6**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB04-04	SB04-06	SB05-01	SB05-03	SB05-05
				Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-016	EM1904231-018	EM1904231-022	EM1904231-024	EM1904231-026
					Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract									
pH (CaCl2)	----	0.1	pH Unit		7.0	----	7.9	8.0	7.7
EA055: Moisture Content									
Moisture Content	----	1.0	%		27.2	----	5.2	5.2	4.5
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		----	36.1	----	----	----
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)									
Sulfate as SO4 2-	14808-79-8	50	mg/kg		300	280	60	50	<50
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		7	5	<5	<5	<5
Barium	7440-39-3	10	mg/kg		----	30	----	----	----
Beryllium	7440-41-7	1	mg/kg		----	<1	----	----	----
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		38	40	16	10	10
Cobalt	7440-48-4	2	mg/kg		----	<2	----	----	----
Copper	7440-50-8	5	mg/kg		6	6	<5	<5	<5
Iron	7439-89-6	50	mg/kg		----	52200	----	----	----
Lead	7439-92-1	5	mg/kg		<5	5	<5	<5	<5
Manganese	7439-96-5	5	mg/kg		----	30	----	----	----
Nickel	7440-02-0	2	mg/kg		4	4	4	<2	<2
Silver	7440-22-4	2	mg/kg		----	<2	----	----	----
Zinc	7440-66-6	5	mg/kg		11	12	8	<5	<5
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)									
Hexavalent Chromium	18540-29-9	0.5	mg/kg		----	<0.5	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	1	mg/kg		----	<1	----	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		----	<0.1	----	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		----	<0.05	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		----	<0.05	----	----	----
beta-BHC	319-85-7	0.05	mg/kg		----	<0.05	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg		----	<0.05	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB04-04	SB04-06	SB05-01	SB05-03	SB05-05
				Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-016	EM1904231-018	EM1904231-022	EM1904231-024	EM1904231-026
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
delta-BHC	319-86-8	0.05	mg/kg		----	<0.05	----	----	----
Heptachlor	76-44-8	0.05	mg/kg		----	<0.05	----	----	----
Aldrin	309-00-2	0.05	mg/kg		----	<0.05	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		----	<0.05	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg		----	<0.05	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg		----	<0.05	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		----	<0.05	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg		----	<0.05	----	----	----
Dieldrin	60-57-1	0.05	mg/kg		----	<0.05	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		----	<0.05	----	----	----
Endrin	72-20-8	0.05	mg/kg		----	<0.05	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		----	<0.05	----	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		----	<0.05	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		----	<0.05	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		----	<0.05	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		----	<0.05	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		----	<0.2	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		----	<0.05	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg		----	<0.2	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		----	<0.05	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		----	<0.05	----	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		----	<0.5	----	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg		----	<0.5	----	----	----
2-Methylphenol	95-48-7	0.5	mg/kg		----	<0.5	----	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg		----	<1	----	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg		----	<0.5	----	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		----	<0.5	----	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		----	<0.5	----	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		----	<0.5	----	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		----	<0.5	----	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		----	<0.5	----	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		----	<0.5	----	----	----
Pentachlorophenol	87-86-5	2	mg/kg		----	<2	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB04-04	SB04-06	SB05-01	SB05-03	SB05-05
				Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-016	EM1904231-018	EM1904231-022	EM1904231-024	EM1904231-026
					Result	Result	Result	Result	Result
EP075(SIM)A: Phenolic Compounds - Continued									
^ Sum of Phenols	----	0.5	mg/kg		----	<0.5	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		----	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg		----	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg		----	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg		----	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg		----	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg		----	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg		----	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg		----	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		----	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	<0.5	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	<0.5	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	**0.6**	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	**1.2**	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB04-04	SB04-06	SB05-01	SB05-03	SB05-05
				Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00	19-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-016	EM1904231-018	EM1904231-022	EM1904231-024	EM1904231-026
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	**0.7**	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	**0.7**	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	**0.7**	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	**88.4**	----	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		----	**86.6**	----	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		----	**81.3**	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	**97.8**	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		----	**94.5**	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		----	**84.6**	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	**99.4**	----	----	----
Anthracene-d10	1719-06-8	0.5	%		----	**124**	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		----	**104**	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**68.4**	**68.9**	**86.5**	**78.9**	**87.6**
Toluene-D8	2037-26-5	0.2	%		**78.1**	**67.2**	**88.4**	**80.0**	**92.6**
4-Bromofluorobenzene	460-00-4	0.2	%		**67.4**	**68.3**	**114**	**76.0**	**83.4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB06-02	SB06-05	TP01-01	TP01-03	TP02-02
				Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-028	EM1904231-031	EM1904231-032	EM1904231-034	EM1904231-037
					Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract									
pH (CaCl2)	----	0.1	pH Unit		----	6.9	----	7.9	7.8
EA055: Moisture Content									
Moisture Content	----	1.0	%		----	9.3	----	7.8	7.9
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		5.0	----	1.7	----	----
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)									
Sulfate as SO4 2-	14808-79-8	50	mg/kg		<50	50	<50	70	150
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg		60	----	80	----	----
Beryllium	7440-41-7	1	mg/kg		<1	----	<1	----	----
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		11	8	58	7	12
Cobalt	7440-48-4	2	mg/kg		<2	----	11	----	----
Copper	7440-50-8	5	mg/kg		<5	<5	21	<5	<5
Iron	7439-89-6	50	mg/kg		12200	----	41300	----	----
Lead	7439-92-1	5	mg/kg		<5	<5	9	<5	<5
Manganese	7439-96-5	5	mg/kg		39	----	99	----	----
Nickel	7440-02-0	2	mg/kg		3	<2	17	<2	<2
Silver	7440-22-4	2	mg/kg		<2	----	<2	----	----
Zinc	7440-66-6	5	mg/kg		<5	<5	41	<5	<5
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)									
Hexavalent Chromium	18540-29-9	0.5	mg/kg		<0.5	----	<0.5	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	1	mg/kg		<1	----	<1	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	----	<0.1	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	----	<0.05	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	----	<0.05	----	----
beta-BHC	319-85-7	0.05	mg/kg		<0.05	----	<0.05	----	----
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	----	<0.05	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB06-02	SB06-05	TP01-01	TP01-03	TP02-02
				Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-028	EM1904231-031	EM1904231-032	EM1904231-034	EM1904231-037
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
delta-BHC	319-86-8	0.05	mg/kg		<0.05	----	<0.05	----	----
Heptachlor	76-44-8	0.05	mg/kg		<0.05	----	<0.05	----	----
Aldrin	309-00-2	0.05	mg/kg		<0.05	----	<0.05	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	----	<0.05	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	----	<0.05	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	----	<0.05	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	----	<0.05	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	----	<0.05	----	----
Dieldrin	60-57-1	0.05	mg/kg		<0.05	----	<0.05	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	----	<0.05	----	----
Endrin	72-20-8	0.05	mg/kg		<0.05	----	<0.05	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	----	<0.05	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	----	<0.05	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	----	<0.05	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	----	<0.05	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	----	<0.05	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	----	<0.2	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	----	<0.05	----	----
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	----	<0.2	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	----	<0.05	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	----	<0.05	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		<0.5	----	<0.5	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg		<0.5	----	<0.5	----	----
2-Methylphenol	95-48-7	0.5	mg/kg		<0.5	----	<0.5	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg		<1	----	<1	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg		<0.5	----	<0.5	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		<0.5	----	<0.5	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		<0.5	----	<0.5	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		<0.5	----	<0.5	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		<0.5	----	<0.5	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		<0.5	----	<0.5	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		<0.5	----	<0.5	----	----
Pentachlorophenol	87-86-5	2	mg/kg		<2	----	<2	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB06-02	SB06-05	TP01-01	TP01-03	TP02-02
				Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-028	EM1904231-031	EM1904231-032	EM1904231-034	EM1904231-037
					Result	Result	Result	Result	Result
EP075(SIM)A: Phenolic Compounds - Continued									
^ Sum of Phenols	----	0.5	mg/kg		<0.5	----	<0.5	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	----	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	----	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	----	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	----	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	----	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	----	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	----	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	----	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	----	<0.5	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	----	<0.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	----	0.6	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	----	1.2	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB06-02	SB06-05	TP01-01	TP01-03	TP02-02
				Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-028	EM1904231-031	EM1904231-032	EM1904231-034	EM1904231-037
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**87.0**	----	**94.2**	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**84.0**	----	**83.7**	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**86.0**	----	**85.2**	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**94.8**	----	**96.8**	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**90.9**	----	**93.7**	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**81.4**	----	**79.5**	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**97.8**	----	**98.0**	----	----
Anthracene-d10	1719-06-8	0.5	%		**121**	----	**123**	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		**103**	----	**103**	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**79.8**	**80.6**	**73.7**	**74.0**	**78.3**
Toluene-D8	2037-26-5	0.2	%		**88.1**	**86.4**	**79.5**	**81.4**	**84.3**
4-Bromofluorobenzene	460-00-4	0.2	%		**74.9**	**78.8**	**72.0**	**71.6**	**69.4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP02-04	TP02-05	TP03-02	TP03-04	TP04-01
			Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904231-039	EM1904231-040	EM1904231-043	EM1904231-045	EM1904231-046
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	8.0	6.5	8.0	8.1	7.7
EA055: Moisture Content								
Moisture Content	----	1.0	%	16.8	<1.0	6.4	17.4	6.3
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)								
Sulfate as SO4 2-	14808-79-8	50	mg/kg	270	<50	230	320	<50
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	19	6	13	22	28
Copper	7440-50-8	5	mg/kg	6	<5	<5	6	11
Lead	7439-92-1	5	mg/kg	6	<5	<5	7	6
Nickel	7440-02-0	2	mg/kg	6	<2	2	8	11
Zinc	7440-66-6	5	mg/kg	10	<5	<5	13	18
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP02-04	TP02-05	TP03-02	TP03-04	TP04-01
				Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-039	EM1904231-040	EM1904231-043	EM1904231-045	EM1904231-046
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**97.6**	**96.4**	**78.0**	**79.0**	**81.8**
Toluene-D8	2037-26-5	0.2	%		**84.6**	**86.7**	**72.5**	**70.4**	**73.2**
4-Bromofluorobenzene	460-00-4	0.2	%		**117**	**116**	**91.6**	**92.2**	**100**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP04-03	TP05-02	TP05-03	TP06-01	TP06-02
			Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904231-048	EM1904231-051	EM1904231-052	EM1904231-054	EM1904231-055
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	7.9	7.6	8.0	8.0	8.1
EA055: Moisture Content								
Moisture Content	----	1.0	%	13.6	5.4	11.6	4.8	14.9
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)								
Sulfate as SO4 2-	14808-79-8	50	mg/kg	<50	50	580	70	<50
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	7
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	25	32	40	45	42
Copper	7440-50-8	5	mg/kg	9	12	8	24	16
Lead	7439-92-1	5	mg/kg	7	6	5	8	11
Nickel	7440-02-0	2	mg/kg	17	9	12	24	22
Zinc	7440-66-6	5	mg/kg	15	23	24	35	41
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP04-03	TP05-02	TP05-03	TP06-01	TP06-02
				Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-048	EM1904231-051	EM1904231-052	EM1904231-054	EM1904231-055
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**79.7**	**84.0**	**88.0**	**88.2**	**81.2**
Toluene-D8	2037-26-5	0.2	%		**68.6**	**76.1**	**75.6**	**79.7**	**74.1**
4-Bromofluorobenzene	460-00-4	0.2	%		**88.0**	**100**	**95.8**	**109**	**96.4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP07-01	TP07-02	TP08-01	TP08-02	TP09-01
				Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-057	EM1904231-058	EM1904231-062	EM1904231-063	EM1904231-066
					Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract									
pH (CaCl2)	----	0.1	pH Unit		----	7.3	7.8	7.9	8.1
EA055: Moisture Content									
Moisture Content	----	1.0	%		----	10.2	3.3	6.0	3.2
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		7.9	----	----	----	----
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)									
Sulfate as SO4 2-	14808-79-8	50	mg/kg		<50	<50	<50	<50	700
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	5	<5	<5
Barium	7440-39-3	10	mg/kg		70	----	----	----	----
Beryllium	7440-41-7	1	mg/kg		1	----	----	----	----
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		32	37	40	33	35
Cobalt	7440-48-4	2	mg/kg		7	----	----	----	----
Copper	7440-50-8	5	mg/kg		19	19	33	17	16
Iron	7439-89-6	50	mg/kg		30600	----	----	----	----
Lead	7439-92-1	5	mg/kg		8	9	14	10	8
Manganese	7439-96-5	5	mg/kg		212	----	----	----	----
Nickel	7440-02-0	2	mg/kg		18	20	10	13	11
Silver	7440-22-4	2	mg/kg		<2	----	----	----	----
Zinc	7440-66-6	5	mg/kg		24	26	30	36	36
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)									
Hexavalent Chromium	18540-29-9	0.5	mg/kg		<0.5	----	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	1	mg/kg		<1	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	----	----	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg		<0.05	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP07-01	TP07-02	TP08-01	TP08-02	TP09-01
				Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-057	EM1904231-058	EM1904231-062	EM1904231-063	EM1904231-066
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
delta-BHC	319-86-8	0.05	mg/kg		<0.05	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg		<0.05	----	----	----	----
Aldrin	309-00-2	0.05	mg/kg		<0.05	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	----	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	----	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	----	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	----	----	----	----
Dieldrin	60-57-1	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	----	----	----	----
Endrin	72-20-8	0.05	mg/kg		<0.05	----	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	----	----	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	----	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	----	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	----	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	----	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	----	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	----	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	----	----	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		<0.5	----	----	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg		<0.5	----	----	----	----
2-Methylphenol	95-48-7	0.5	mg/kg		<0.5	----	----	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg		<1	----	----	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg		<0.5	----	----	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		<0.5	----	----	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		<0.5	----	----	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		<0.5	----	----	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		<0.5	----	----	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		<0.5	----	----	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		<0.5	----	----	----	----
Pentachlorophenol	87-86-5	2	mg/kg		<2	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP07-01	TP07-02	TP08-01	TP08-02	TP09-01
				Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-057	EM1904231-058	EM1904231-062	EM1904231-063	EM1904231-066
					Result	Result	Result	Result	Result
EP075(SIM)A: Phenolic Compounds - Continued									
^ Sum of Phenols	----	0.5	mg/kg		<0.5	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP07-01	TP07-02	TP08-01	TP08-02	TP09-01
				Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-057	EM1904231-058	EM1904231-062	EM1904231-063	EM1904231-066
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**91.1**	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**88.7**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**97.9**	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**98.6**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**95.4**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**83.2**	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**97.1**	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%		**127**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		**108**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**85.4**	**89.1**	**81.1**	**81.5**	**92.4**
Toluene-D8	2037-26-5	0.2	%		**83.8**	**81.7**	**77.4**	**77.0**	**87.0**
4-Bromofluorobenzene	460-00-4	0.2	%		**108**	**110**	**98.0**	**100**	**104**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP09-02	TP27-01	TP28-01	TP29-01	TP30-01
			Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904231-067	EM1904231-070	EM1904231-071	EM1904231-072	EM1904231-073
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	8.0	7.6	7.4	7.7	6.8
EA055: Moisture Content								
Moisture Content	----	1.0	%	10.0	1.9	<1.0	2.0	1.3
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)								
Sulfate as SO4 2-	14808-79-8	50	mg/kg	150	<50	<50	170	110
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	6	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	34	40	38	25	13
Copper	7440-50-8	5	mg/kg	19	11	14	<5	<5
Lead	7439-92-1	5	mg/kg	9	6	6	<5	<5
Nickel	7440-02-0	2	mg/kg	12	8	10	3	<2
Zinc	7440-66-6	5	mg/kg	31	22	28	9	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP09-02	TP27-01	TP28-01	TP29-01	TP30-01
				Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-067	EM1904231-070	EM1904231-071	EM1904231-072	EM1904231-073
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**80.7**	**76.5**	**87.4**	**85.2**	**81.8**
Toluene-D8	2037-26-5	0.2	%		**82.4**	**78.8**	**73.3**	**75.2**	**77.6**
4-Bromofluorobenzene	460-00-4	0.2	%		**104**	**102**	**95.2**	**94.1**	**94.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP32-01	TP33-01	TP34-01	TP35-01	TP36-01
			Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904231-074	EM1904231-075	EM1904231-076	EM1904231-077	EM1904231-078
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	7.9	7.5	7.8	7.7	7.8
EA055: Moisture Content								
Moisture Content	----	1.0	%	4.0	2.0	4.6	4.0	2.1
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	19	41	20	22	21
Copper	7440-50-8	5	mg/kg	9	26	11	11	14
Lead	7439-92-1	5	mg/kg	<5	12	6	7	6
Nickel	7440-02-0	2	mg/kg	8	16	9	10	9
Zinc	7440-66-6	5	mg/kg	11	36	19	16	17
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP32-01	TP33-01	TP34-01	TP35-01	TP36-01
				Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-074	EM1904231-075	EM1904231-076	EM1904231-077	EM1904231-078
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**74.3**	**84.2**	**88.5**	**74.3**	**83.2**
Toluene-D8	2037-26-5	0.2	%		**81.9**	**83.8**	**92.4**	**77.3**	**85.8**
4-Bromofluorobenzene	460-00-4	0.2	%		**69.9**	**74.0**	**79.5**	**66.1**	**73.8**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP37-01	TP38-01	TP39-01	SP01-01	SP02-01
			Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904231-079	EM1904231-080	EM1904231-081	EM1904231-082	EM1904231-083
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	8.0	7.5	8.0	8.2	7.7
EA055: Moisture Content								
Moisture Content	----	1.0	%	2.5	2.2	2.3	3.0	<1.0
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	6	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	17	26	17	29	8
Copper	7440-50-8	5	mg/kg	8	22	6	31	6
Lead	7439-92-1	5	mg/kg	<5	8	<5	<5	8
Nickel	7440-02-0	2	mg/kg	7	11	5	15	4
Zinc	7440-66-6	5	mg/kg	7	16	8	23	130
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP37-01	TP38-01	TP39-01	SP01-01	SP02-01
				Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-079	EM1904231-080	EM1904231-081	EM1904231-082	EM1904231-083
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**71.0**	**83.5**	**82.9**	**81.8**	**86.5**
Toluene-D8	2037-26-5	0.2	%		**73.7**	**87.3**	**87.3**	**82.6**	**91.1**
4-Bromofluorobenzene	460-00-4	0.2	%		**65.7**	**76.8**	**76.4**	**73.5**	**77.2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SP03-01	SP04-01	SP05-01	SP06-01	SP07-01
				Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-084	EM1904231-085	EM1904231-086	EM1904231-087	EM1904231-088
					Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract									
pH (CaCl2)	----	0.1	pH Unit		8.0	----	8.0	7.9	7.8
EA055: Moisture Content									
Moisture Content	----	1.0	%		3.1	----	<1.0	2.4	2.6
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		----	3.0	----	----	----
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)									
Sulfate as SO4 2-	14808-79-8	50	mg/kg		----	100	----	----	----
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg		----	80	----	----	----
Beryllium	7440-41-7	1	mg/kg		----	<1	----	----	----
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		18	19	11	17	25
Cobalt	7440-48-4	2	mg/kg		----	5	----	----	----
Copper	7440-50-8	5	mg/kg		14	12	27	10	12
Iron	7439-89-6	50	mg/kg		----	20500	----	----	----
Lead	7439-92-1	5	mg/kg		<5	5	<5	5	6
Manganese	7439-96-5	5	mg/kg		----	136	----	----	----
Nickel	7440-02-0	2	mg/kg		9	10	7	10	11
Silver	7440-22-4	2	mg/kg		----	<2	----	----	----
Zinc	7440-66-6	5	mg/kg		11	12	13	13	16
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)									
Hexavalent Chromium	18540-29-9	0.5	mg/kg		----	<0.5	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	1	mg/kg		----	<1	----	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		----	<0.1	----	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		----	<0.05	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		----	<0.05	----	----	----
beta-BHC	319-85-7	0.05	mg/kg		----	<0.05	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg		----	<0.05	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SP03-01	SP04-01	SP05-01	SP06-01	SP07-01
				Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-084	EM1904231-085	EM1904231-086	EM1904231-087	EM1904231-088
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
delta-BHC	319-86-8	0.05	mg/kg		----	<0.05	----	----	----
Heptachlor	76-44-8	0.05	mg/kg		----	<0.05	----	----	----
Aldrin	309-00-2	0.05	mg/kg		----	<0.05	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		----	<0.05	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg		----	<0.05	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg		----	<0.05	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		----	<0.05	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg		----	<0.05	----	----	----
Dieldrin	60-57-1	0.05	mg/kg		----	<0.05	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		----	<0.05	----	----	----
Endrin	72-20-8	0.05	mg/kg		----	<0.05	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		----	<0.05	----	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		----	<0.05	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		----	<0.05	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		----	<0.05	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		----	<0.05	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		----	<0.2	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		----	<0.05	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg		----	<0.2	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		----	<0.05	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		----	<0.05	----	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		----	<0.5	----	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg		----	<0.5	----	----	----
2-Methylphenol	95-48-7	0.5	mg/kg		----	<0.5	----	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg		----	<1	----	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg		----	<0.5	----	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		----	<0.5	----	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		----	<0.5	----	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		----	<0.5	----	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		----	<0.5	----	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		----	<0.5	----	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		----	<0.5	----	----	----
Pentachlorophenol	87-86-5	2	mg/kg		----	<2	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SP03-01	SP04-01	SP05-01	SP06-01	SP07-01
				Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-084	EM1904231-085	EM1904231-086	EM1904231-087	EM1904231-088
					Result	Result	Result	Result	Result
EP075(SIM)A: Phenolic Compounds - Continued									
^ Sum of Phenols	----	0.5	mg/kg		----	<0.5	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		----	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg		----	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg		----	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg		----	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg		----	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg		----	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg		----	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg		----	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		----	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	<0.5	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	<0.5	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	**0.6**	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	**1.2**	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SP03-01	SP04-01	SP05-01	SP06-01	SP07-01
				Client sampling date / time	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00	20-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904231-084	EM1904231-085	EM1904231-086	EM1904231-087	EM1904231-088
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	**89.4**	----	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		----	**83.6**	----	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		----	**86.1**	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	**98.1**	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		----	**94.4**	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		----	**82.0**	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	**102**	----	----	----
Anthracene-d10	1719-06-8	0.5	%		----	**126**	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		----	**107**	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**68.9**	**73.9**	**84.1**	**75.1**	**74.3**
Toluene-D8	2037-26-5	0.2	%		**75.2**	**76.7**	**88.4**	**84.3**	**83.0**
4-Bromofluorobenzene	460-00-4	0.2	%		**63.7**	**66.5**	**77.4**	**69.8**	**69.2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SP08-01	----	----	----	----
			Client sampling date / time	20-Mar-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1904231-089	--------	--------	--------	--------
				Result	----	----	----	----
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	**7.7**	----	----	----	----
EA055: Moisture Content								
Moisture Content	----	1.0	%	**2.2**	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	**25**	----	----	----	----
Copper	7440-50-8	5	mg/kg	**16**	----	----	----	----
Lead	7439-92-1	5	mg/kg	**6**	----	----	----	----
Nickel	7440-02-0	2	mg/kg	**12**	----	----	----	----
Zinc	7440-66-6	5	mg/kg	**18**	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	----	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SP08-01	----	----	----	----
				Client sampling date / time	20-Mar-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EM1904231-089	--------	--------	--------	--------
					Result	----	----	----	----
EP080: BTEXN - Continued									
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	----	----	----
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	----	----	----	----
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg		<1	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**102**	----	----	----	----
Toluene-D8	2037-26-5	0.2	%		**106**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		**90.8**	----	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				Client sample ID	**RINSE-01**	**TB-01**	**Rinse-02**	**----**	**----**
				Client sampling date / time	19-Mar-2019 00:00	19-Mar-2019 00:00	20-Mar-2019 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EM1904231-001**	**EM1904231-021**	**EM1904231-041**	**--------**	**--------**
					Result	Result	Result	----	----
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		----	<20	<20	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		----	<20	<20	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		----	<20	<20	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		----	<1	<1	----	----
Toluene	108-88-3	2	µg/L		----	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L		----	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		----	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L		----	<2	<2	----	----
^ **Total Xylenes**	----	2	µg/L		----	<2	<2	----	----
^ **Sum of BTEX**	----	1	µg/L		----	<1	<1	----	----
Naphthalene	91-20-3	5	µg/L		----	<5	<5	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		----	**91.1**	**78.4**	----	----
Toluene-D8	2037-26-5	2	%		----	**93.5**	**89.9**	----	----
4-Bromofluorobenzene	460-00-4	2	%		----	**90.3**	**87.7**	----	----

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	36	140
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	38	128
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	33	139
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1904350**	Page	: 1 of 48
Client	: **LBW CO PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MARK PETERSON	Contact	: Kieren Burns
Address	: 184 MAGILL ROAD NORWOOD SA, AUSTRALIA 5067	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +61881625130
Project	: 191076	Date Samples Received	: 26-Mar-2019 10:20
Order number	:	Date Analysis Commenced	: 26-Mar-2019
C-O-C number	: 191076_COC_20190321	Issue Date	: 04-Apr-2019 10:52
Sampler	: ----		
Site	: Springwood Development PSI		
Quote number	: AD/014/19		
No. of samples received	: 103		
No. of samples analysed	: 79		

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Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Arenie Vijayaratnam	Non-metals prep supervisor	Melbourne Inorganics, Springvale, VIC
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics, Mayfield West, NSW
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ALS is not NATA accredited for the analysis of Exchangeable Cations on Alkaline Soils when performed under ALS Method ED006.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP10-01	TP10-03	TP11-01	TP11-03	TP31-01
			Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904350-002	EM1904350-004	EM1904350-006	EM1904350-008	EM1904350-010
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	7.7	8.0	7.0	7.5	7.9
EA055: Moisture Content								
Moisture Content	----	1.0	%	5.5	15.4	2.9	18.6	3.4
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)								
Sulfate as SO4 2-	14808-79-8	50	mg/kg	<50	70	<50	170	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	5	<5	6	6	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	36	23	31	22	19
Copper	7440-50-8	5	mg/kg	8	12	6	<5	24
Lead	7439-92-1	5	mg/kg	6	6	<5	<5	5
Nickel	7440-02-0	2	mg/kg	7	14	3	3	10
Zinc	7440-66-6	5	mg/kg	22	17	10	10	11
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP10-01	TP10-03	TP11-01	TP11-03	TP31-01
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-002	EM1904350-004	EM1904350-006	EM1904350-008	EM1904350-010
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**85.3**	**80.2**	**84.5**	**81.0**	**81.7**
Toluene-D8	2037-26-5	0.2	%		**84.3**	**81.7**	**87.8**	**76.7**	**85.6**
4-Bromofluorobenzene	460-00-4	0.2	%		**81.9**	**83.5**	**84.4**	**77.3**	**80.5**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP31-02	TP48-01	TP48-02	TP43-01	TP43-02
			Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904350-011	EM1904350-012	EM1904350-013	EM1904350-014	EM1904350-015
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	8.0	8.3	8.0	----	8.0
EA055: Moisture Content								
Moisture Content	----	1.0	%	4.6	2.3	4.0	----	4.1
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	----	----	2.8	----
EG005(ED093)T: Total Metals by ICP-AES								
Barium	7440-39-3	10	mg/kg	----	----	----	190	----
Beryllium	7440-41-7	1	mg/kg	----	----	----	<1	----
Cobalt	7440-48-4	2	mg/kg	----	----	----	15	----
Iron	7439-89-6	50	mg/kg	----	----	----	36900	----
Manganese	7439-96-5	5	mg/kg	----	----	----	141	----
Silver	7440-22-4	2	mg/kg	----	----	----	<2	----
Arsenic	7440-38-2	5	mg/kg	<5	5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	20	25	26	54	57
Copper	7440-50-8	5	mg/kg	18	24	14	22	23
Lead	7439-92-1	5	mg/kg	6	<5	7	6	6
Nickel	7440-02-0	2	mg/kg	9	7	12	18	19
Zinc	7440-66-6	5	mg/kg	13	15	16	37	40
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)								
Hexavalent Chromium	18540-29-9	0.5	mg/kg	----	----	----	<0.5	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	1	mg/kg	----	----	----	<1	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	----	----	<0.1	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	----	----	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	----	----	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg	----	----	----	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg	----	----	----	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg	----	----	----	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg	----	----	----	<0.05	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP31-02	TP48-01	TP48-02	TP43-01	TP43-02
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-011	EM1904350-012	EM1904350-013	EM1904350-014	EM1904350-015
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
Aldrin	309-00-2	0.05	mg/kg		----	----	----	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		----	----	----	<0.05	----
^ **Total Chlordane (sum)**	----	0.05	mg/kg		----	----	----	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg		----	----	----	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		----	----	----	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg		----	----	----	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg		----	----	----	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg		----	----	----	<0.05	----
Endrin	72-20-8	0.05	mg/kg		----	----	----	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		----	----	----	<0.05	----
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg		----	----	----	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg		----	----	----	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		----	----	----	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		----	----	----	<0.05	----
4.4`-DDT	50-29-3	0.2	mg/kg		----	----	----	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg		----	----	----	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg		----	----	----	<0.2	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg		----	----	----	<0.05	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg		----	----	----	<0.05	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		----	----	----	<0.5	----
2-Chlorophenol	95-57-8	0.5	mg/kg		----	----	----	<0.5	----
2-Methylphenol	95-48-7	0.5	mg/kg		----	----	----	<0.5	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg		----	----	----	<1	----
2-Nitrophenol	88-75-5	0.5	mg/kg		----	----	----	<0.5	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		----	----	----	<0.5	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		----	----	----	<0.5	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		----	----	----	<0.5	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		----	----	----	<0.5	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		----	----	----	<0.5	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		----	----	----	<0.5	----
Pentachlorophenol	87-86-5	2	mg/kg		----	----	----	<2	----
^ **Sum of Phenols**	----	0.5	mg/kg		----	----	----	<0.5	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP31-02	TP48-01	TP48-02	TP43-01	TP43-02
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-011	EM1904350-012	EM1904350-013	EM1904350-014	EM1904350-015
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Naphthalene	91-20-3	0.5	mg/kg		----	----	----	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		----	----	----	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		----	----	----	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		----	----	----	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		----	----	----	<0.5	----
Anthracene	120-12-7	0.5	mg/kg		----	----	----	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg		----	----	----	<0.5	----
Pyrene	129-00-0	0.5	mg/kg		----	----	----	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	----	----	<0.5	----
Chrysene	218-01-9	0.5	mg/kg		----	----	----	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		----	----	----	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	----	----	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	----	----	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	----	----	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	----	----	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	----	----	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	----	----	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	----	----	<0.5	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	----	----	**0.6**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	----	----	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP31-02	TP48-01	TP48-02	TP43-01	TP43-02
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-011	EM1904350-012	EM1904350-013	EM1904350-014	EM1904350-015
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	----	----	98.8	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		----	----	----	93.3	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		----	----	----	96.2	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	----	----	102	----
2-Chlorophenol-D4	93951-73-6	0.5	%		----	----	----	101	----
2.4.6-Tribromophenol	118-79-6	0.5	%		----	----	----	90.5	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	----	----	106	----
Anthracene-d10	1719-06-8	0.5	%		----	----	----	115	----
4-Terphenyl-d14	1718-51-0	0.5	%		----	----	----	108	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		80.6	87.0	81.6	86.2	86.7
Toluene-D8	2037-26-5	0.2	%		86.3	83.0	80.9	82.3	85.8
4-Bromofluorobenzene	460-00-4	0.2	%		82.7	81.0	80.5	82.6	82.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP49-01	TP49-02	TP44-01	TP44-02	TP46-01
			Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904350-016	EM1904350-017	EM1904350-018	EM1904350-019	EM1904350-020
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	7.8	7.8	7.9	7.8	7.6
EA055: Moisture Content								
Moisture Content	----	1.0	%	3.4	3.4	3.2	2.9	2.7
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	28	32	13	15	14
Copper	7440-50-8	5	mg/kg	16	15	5	7	5
Lead	7439-92-1	5	mg/kg	8	8	<5	9	<5
Nickel	7440-02-0	2	mg/kg	16	14	6	6	6
Zinc	7440-66-6	5	mg/kg	19	22	6	13	10
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP49-01	TP49-02	TP44-01	TP44-02	TP46-01
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-016	EM1904350-017	EM1904350-018	EM1904350-019	EM1904350-020
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**86.6**	**88.5**	**101**	**98.9**	**96.5**
Toluene-D8	2037-26-5	0.2	%		**82.8**	**77.2**	**88.9**	**87.0**	**83.4**
4-Bromofluorobenzene	460-00-4	0.2	%		**84.6**	**81.4**	**87.9**	**82.1**	**82.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP46-02	TP45-01	TP45-02	TP47-01	TP47-02
			Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904350-021	EM1904350-022	EM1904350-023	EM1904350-024	EM1904350-025
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	7.5	8.0	7.8	7.9	7.9
EA055: Moisture Content								
Moisture Content	----	1.0	%	3.4	2.4	2.6	4.7	3.5
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	21	56	56	51	52
Copper	7440-50-8	5	mg/kg	7	30	28	18	20
Lead	7439-92-1	5	mg/kg	6	10	11	7	8
Nickel	7440-02-0	2	mg/kg	8	22	21	16	17
Zinc	7440-66-6	5	mg/kg	12	46	42	33	36
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP46-02	TP45-01	TP45-02	TP47-01	TP47-02
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-021	EM1904350-022	EM1904350-023	EM1904350-024	EM1904350-025
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**96.1**	**105**	**72.1**	**71.5**	**71.7**
Toluene-D8	2037-26-5	0.2	%		**79.3**	**79.9**	**92.4**	**92.0**	**94.6**
4-Bromofluorobenzene	460-00-4	0.2	%		**80.5**	**78.7**	**84.8**	**86.0**	**85.4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP12-01	TP12-03	TP13-02	TP13-03	TP13-05
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-026	EM1904350-028	EM1904350-030	EM1904350-031	EM1904350-033
					Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract									
pH (CaCl2)	----	0.1	pH Unit		----	8.0	8.0	8.0	8.0
EA055: Moisture Content									
Moisture Content	----	1.0	%		----	4.0	4.5	3.3	4.0
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		<1.0	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES									
Barium	7440-39-3	10	mg/kg		<10	----	----	----	----
Beryllium	7440-41-7	1	mg/kg		<1	----	----	----	----
Cobalt	7440-48-4	2	mg/kg		<2	----	----	----	----
Iron	7439-89-6	50	mg/kg		7240	----	----	----	----
Manganese	7439-96-5	5	mg/kg		10	----	----	----	----
Silver	7440-22-4	2	mg/kg		<2	----	----	----	----
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		4	15	6	4	8
Copper	7440-50-8	5	mg/kg		<5	<5	<5	<5	<5
Lead	7439-92-1	5	mg/kg		<5	<5	<5	<5	<5
Nickel	7440-02-0	2	mg/kg		<2	3	<2	<2	<2
Zinc	7440-66-6	5	mg/kg		<5	8	<5	7	<5
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)									
Hexavalent Chromium	18540-29-9	0.5	mg/kg		<0.5	----	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	1	mg/kg		<1	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	----	----	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg		<0.05	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	----	----	----	----
delta-BHC	319-86-8	0.05	mg/kg		<0.05	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg		<0.05	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP12-01	TP12-03	TP13-02	TP13-03	TP13-05
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-026	EM1904350-028	EM1904350-030	EM1904350-031	EM1904350-033
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
Aldrin	309-00-2	0.05	mg/kg		<0.05	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	----	----	----	----
^ **Total Chlordane (sum)**	----	0.05	mg/kg		<0.05	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	----	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	----	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	----	----	----	----
Dieldrin	60-57-1	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	----	----	----	----
Endrin	72-20-8	0.05	mg/kg		<0.05	----	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	----	----	----	----
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	----	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	----	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	----	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	----	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	----	----	----	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg		<0.05	----	----	----	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	----	----	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		<0.5	----	----	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg		<0.5	----	----	----	----
2-Methylphenol	95-48-7	0.5	mg/kg		<0.5	----	----	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg		<1	----	----	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg		<0.5	----	----	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		<0.5	----	----	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		<0.5	----	----	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		<0.5	----	----	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		<0.5	----	----	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		<0.5	----	----	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		<0.5	----	----	----	----
Pentachlorophenol	87-86-5	2	mg/kg		<2	----	----	----	----
^ **Sum of Phenols**	----	0.5	mg/kg		<0.5	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP12-01	TP12-03	TP13-02	TP13-03	TP13-05
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-026	EM1904350-028	EM1904350-030	EM1904350-031	EM1904350-033
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP12-01	TP12-03	TP13-02	TP13-03	TP13-05
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-026	EM1904350-028	EM1904350-030	EM1904350-031	EM1904350-033
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**89.5**	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**99.8**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**105**	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**111**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**109**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**101**	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**115**	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%		**128**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		**120**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**74.2**	**71.1**	**77.3**	**77.6**	**67.5**
Toluene-D8	2037-26-5	0.2	%		**82.9**	**89.2**	**95.6**	**96.2**	**82.5**
4-Bromofluorobenzene	460-00-4	0.2	%		**79.6**	**84.1**	**86.0**	**85.4**	**75.8**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP52-01	TP52-02	TP54-01	TP54-02	TP53-01
			Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904350-034	EM1904350-035	EM1904350-036	EM1904350-037	EM1904350-038
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	6.8	8.0	7.8	7.8	7.1
EA055: Moisture Content								
Moisture Content	----	1.0	%	2.5	3.2	4.0	2.9	1.6
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	17	16	29	23	14
Copper	7440-50-8	5	mg/kg	10	14	15	12	8
Lead	7439-92-1	5	mg/kg	14	5	9	7	10
Nickel	7440-02-0	2	mg/kg	8	10	14	12	6
Zinc	7440-66-6	5	mg/kg	20	12	19	17	14
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP52-01	TP52-02	TP54-01	TP54-02	TP53-01
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-034	EM1904350-035	EM1904350-036	EM1904350-037	EM1904350-038
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**71.7**	**76.0**	**73.2**	**69.4**	**80.4**
Toluene-D8	2037-26-5	0.2	%		**88.6**	**94.3**	**91.1**	**86.9**	**101**
4-Bromofluorobenzene	460-00-4	0.2	%		**82.9**	**85.9**	**81.6**	**80.3**	**91.6**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP53-02	TP51-01	TP51-02	TP51-03	TP51-04
			Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904350-039	EM1904350-040	EM1904350-041	EM1904350-042	EM1904350-043
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	7.0	----	7.8	8.2	8.1
EA055: Moisture Content								
Moisture Content	----	1.0	%	1.3	----	2.9	3.4	3.0
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	3.1	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Barium	7440-39-3	10	mg/kg	----	100	----	----	----
Beryllium	7440-41-7	1	mg/kg	----	<1	----	----	----
Cobalt	7440-48-4	2	mg/kg	----	7	----	----	----
Iron	7439-89-6	50	mg/kg	----	24600	----	----	----
Manganese	7439-96-5	5	mg/kg	----	232	----	----	----
Silver	7440-22-4	2	mg/kg	----	<2	----	----	----
Arsenic	7440-38-2	5	mg/kg	<5	8	<5	8	8
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	12	24	31	24	21
Copper	7440-50-8	5	mg/kg	7	9	16	10	8
Lead	7439-92-1	5	mg/kg	9	8	10	10	8
Nickel	7440-02-0	2	mg/kg	5	12	18	13	12
Zinc	7440-66-6	5	mg/kg	14	15	21	17	15
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)								
Hexavalent Chromium	18540-29-9	0.5	mg/kg	----	<0.5	----	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	1	mg/kg	----	<1	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	<0.1	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	<0.05	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	<0.05	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	----	<0.05	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	----	<0.05	----	----	----
delta-BHC	319-86-8	0.05	mg/kg	----	<0.05	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	----	<0.05	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP53-02	TP51-01	TP51-02	TP51-03	TP51-04
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-039	EM1904350-040	EM1904350-041	EM1904350-042	EM1904350-043
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
Aldrin	309-00-2	0.05	mg/kg		----	<0.05	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		----	<0.05	----	----	----
^ **Total Chlordane (sum)**	----	0.05	mg/kg		----	<0.05	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg		----	<0.05	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		----	<0.05	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg		----	<0.05	----	----	----
Dieldrin	60-57-1	0.05	mg/kg		----	<0.05	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		----	<0.05	----	----	----
Endrin	72-20-8	0.05	mg/kg		----	<0.05	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		----	<0.05	----	----	----
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg		----	<0.05	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		----	<0.05	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		----	<0.05	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		----	<0.05	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		----	<0.2	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		----	<0.05	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg		----	<0.2	----	----	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg		----	<0.05	----	----	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg		----	<0.05	----	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		----	<0.5	----	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg		----	<0.5	----	----	----
2-Methylphenol	95-48-7	0.5	mg/kg		----	<0.5	----	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg		----	<1	----	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg		----	<0.5	----	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		----	<0.5	----	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		----	<0.5	----	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		----	<0.5	----	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		----	<0.5	----	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		----	<0.5	----	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		----	<0.5	----	----	----
Pentachlorophenol	87-86-5	2	mg/kg		----	<2	----	----	----
^ **Sum of Phenols**	----	0.5	mg/kg		----	<0.5	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP53-02	TP51-01	TP51-02	TP51-03	TP51-04
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-039	EM1904350-040	EM1904350-041	EM1904350-042	EM1904350-043
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Naphthalene	91-20-3	0.5	mg/kg		----	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		----	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg		----	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg		----	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg		----	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg		----	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg		----	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg		----	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg		----	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		----	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	<0.5	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	<0.5	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	**0.6**	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	**1.2**	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP53-02	TP51-01	TP51-02	TP51-03	TP51-04
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-039	EM1904350-040	EM1904350-041	EM1904350-042	EM1904350-043
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	90.9	----	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		----	93.8	----	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		----	97.3	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	99.4	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		----	97.9	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		----	84.6	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	102	----	----	----
Anthracene-d10	1719-06-8	0.5	%		----	112	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		----	105	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		89.4	79.2	93.0	79.8	83.7
Toluene-D8	2037-26-5	0.2	%		84.5	84.6	90.4	84.9	87.1
4-Bromofluorobenzene	460-00-4	0.2	%		82.0	83.0	86.0	79.6	88.0

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP50-01	TP50-02	TP14-01	TP14-03	TP14-04
			Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904350-044	EM1904350-045	EM1904350-046	EM1904350-048	EM1904350-049
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	7.9	7.9	7.7	7.5	7.5
EA055: Moisture Content								
Moisture Content	----	1.0	%	3.1	3.0	8.3	35.1	8.4
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)								
Sulfate as SO4 2-	14808-79-8	50	mg/kg	----	----	730	190	750
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	6	8	6
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	20	21	46	36	45
Copper	7440-50-8	5	mg/kg	14	12	7	6	7
Lead	7439-92-1	5	mg/kg	8	8	7	<5	6
Nickel	7440-02-0	2	mg/kg	10	11	5	3	4
Zinc	7440-66-6	5	mg/kg	16	15	13	10	13
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP50-01	TP50-02	TP14-01	TP14-03	TP14-04
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-044	EM1904350-045	EM1904350-046	EM1904350-048	EM1904350-049
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**79.6**	**90.2**	**84.7**	**65.3**	**85.2**
Toluene-D8	2037-26-5	0.2	%		**86.2**	**90.5**	**89.2**	**67.0**	**87.4**
4-Bromofluorobenzene	460-00-4	0.2	%		**78.9**	**85.1**	**80.2**	**68.4**	**87.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP15-02	TP15-03	TP16-01	TP16-03	TP17-02
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-051	EM1904350-052	EM1904350-053	EM1904350-055	EM1904350-058
					Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract									
pH (CaCl2)	----	0.1	pH Unit		----	7.4	7.5	7.3	7.4
EA055: Moisture Content									
Moisture Content	----	1.0	%		----	47.0	5.1	30.8	8.9
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		27.2	----	----	----	----
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)									
Sulfate as SO4 2-	14808-79-8	50	mg/kg		300	400	230	270	390
EG005(ED093)T: Total Metals by ICP-AES									
Barium	7440-39-3	10	mg/kg		40	----	----	----	----
Beryllium	7440-41-7	1	mg/kg		<1	----	----	----	----
Cobalt	7440-48-4	2	mg/kg		<2	----	----	----	----
Iron	7439-89-6	50	mg/kg		58600	----	----	----	----
Manganese	7439-96-5	5	mg/kg		30	----	----	----	----
Silver	7440-22-4	2	mg/kg		<2	----	----	----	----
Arsenic	7440-38-2	5	mg/kg		6	10	6	9	6
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		45	39	44	38	44
Copper	7440-50-8	5	mg/kg		7	7	7	6	7
Lead	7439-92-1	5	mg/kg		5	5	6	<5	6
Nickel	7440-02-0	2	mg/kg		4	5	4	5	5
Zinc	7440-66-6	5	mg/kg		12	16	13	15	14
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)									
Hexavalent Chromium	18540-29-9	0.5	mg/kg		<0.5	----	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	1	mg/kg		<1	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	----	----	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg		<0.05	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP15-02	TP15-03	TP16-01	TP16-03	TP17-02
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-051	EM1904350-052	EM1904350-053	EM1904350-055	EM1904350-058
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
delta-BHC	319-86-8	0.05	mg/kg		<0.05	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg		<0.05	----	----	----	----
Aldrin	309-00-2	0.05	mg/kg		<0.05	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	----	----	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	----	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	----	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	----	----	----	----
Dieldrin	60-57-1	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	----	----	----	----
Endrin	72-20-8	0.05	mg/kg		<0.05	----	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	----	----	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	----	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	----	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	----	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	----	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	----	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	----	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	----	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	----	----	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		<0.5	----	----	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg		<0.5	----	----	----	----
2-Methylphenol	95-48-7	0.5	mg/kg		<0.5	----	----	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg		<1	----	----	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg		<0.5	----	----	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		<0.5	----	----	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		<0.5	----	----	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		<0.5	----	----	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		<0.5	----	----	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		<0.5	----	----	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		<0.5	----	----	----	----
Pentachlorophenol	87-86-5	2	mg/kg		<2	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP15-02	TP15-03	TP16-01	TP16-03	TP17-02
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-051	EM1904350-052	EM1904350-053	EM1904350-055	EM1904350-058
					Result	Result	Result	Result	Result
EP075(SIM)A: Phenolic Compounds - Continued									
^ Sum of Phenols	----	0.5	mg/kg		<0.5	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP15-02	TP15-03	TP16-01	TP16-03	TP17-02
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-051	EM1904350-052	EM1904350-053	EM1904350-055	EM1904350-058
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**91.2**	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**94.3**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**97.9**	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**114**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**112**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**96.7**	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**116**	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%		**127**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		**120**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**82.9**	**86.4**	**96.7**	**83.3**	**82.7**
Toluene-D8	2037-26-5	0.2	%		**76.5**	**76.0**	**85.8**	**80.4**	**82.2**
4-Bromofluorobenzene	460-00-4	0.2	%		**77.1**	**71.8**	**81.1**	**83.6**	**81.6**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP17-03	TP18-01	TP18-03	TP21-01	TP21-03
			Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904350-059	EM1904350-060	EM1904350-062	EM1904350-064	EM1904350-066
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	7.5	7.5	7.4	7.5	8.1
EA055: Moisture Content								
Moisture Content	----	1.0	%	40.7	5.4	28.4	3.0	12.3
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)								
Sulfate as SO4 2-	14808-79-8	50	mg/kg	330	380	200	<50	120
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	9	7	7	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	42	45	30	10	13
Copper	7440-50-8	5	mg/kg	7	7	5	<5	<5
Lead	7439-92-1	5	mg/kg	<5	7	<5	<5	<5
Nickel	7440-02-0	2	mg/kg	4	5	3	<2	6
Zinc	7440-66-6	5	mg/kg	13	14	11	<5	7
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP17-03	TP18-01	TP18-03	TP21-01	TP21-03
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-059	EM1904350-060	EM1904350-062	EM1904350-064	EM1904350-066
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**75.9**	**93.1**	**91.4**	**93.7**	**95.2**
Toluene-D8	2037-26-5	0.2	%		**75.5**	**87.1**	**89.9**	**87.1**	**80.6**
4-Bromofluorobenzene	460-00-4	0.2	%		**77.8**	**84.5**	**80.6**	**84.2**	**76.1**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP19-01	TP19-03	TP20-01	TP20-03	TP40-01
			Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	22-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904350-067	EM1904350-069	EM1904350-070	EM1904350-072	EM1904350-073
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	7.7	7.0	7.9	6.9	8.0
EA055: Moisture Content								
Moisture Content	----	1.0	%	3.5	35.0	3.6	44.4	2.4
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)								
Sulfate as SO4 2-	14808-79-8	50	mg/kg	60	250	140	460	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	9	7	8	10	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	45	40	46	51	15
Copper	7440-50-8	5	mg/kg	7	7	8	7	10
Lead	7439-92-1	5	mg/kg	<5	5	7	<5	<5
Nickel	7440-02-0	2	mg/kg	4	4	6	4	10
Zinc	7440-66-6	5	mg/kg	14	12	18	10	12
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP19-01	TP19-03	TP20-01	TP20-03	TP40-01
				Client sampling date / time	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	21-Mar-2019 00:00	22-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-067	EM1904350-069	EM1904350-070	EM1904350-072	EM1904350-073
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**86.6**	**89.4**	**88.3**	**83.5**	**82.3**
Toluene-D8	2037-26-5	0.2	%		**87.2**	**91.7**	**87.1**	**84.8**	**85.2**
4-Bromofluorobenzene	460-00-4	0.2	%		**89.2**	**92.1**	**95.7**	**87.1**	**85.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP40-02	TP40-03	TP41-01	TP41-02	TP42-01
			Client sampling date / time	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904350-074	EM1904350-075	EM1904350-076	EM1904350-077	EM1904350-078
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	7.9	7.9	----	7.6	7.8
EA055: Moisture Content								
Moisture Content	----	1.0	%	3.4	2.4	----	3.5	2.6
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	----	2.3	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Barium	7440-39-3	10	mg/kg	----	----	80	----	----
Beryllium	7440-41-7	1	mg/kg	----	----	<1	----	----
Cobalt	7440-48-4	2	mg/kg	----	----	5	----	----
Iron	7439-89-6	50	mg/kg	----	----	17500	----	----
Manganese	7439-96-5	5	mg/kg	----	----	138	----	----
Silver	7440-22-4	2	mg/kg	----	----	<2	----	----
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	23	16	20	28	20
Copper	7440-50-8	5	mg/kg	13	11	10	14	13
Lead	7439-92-1	5	mg/kg	7	5	6	8	6
Nickel	7440-02-0	2	mg/kg	12	11	10	14	12
Zinc	7440-66-6	5	mg/kg	14	14	17	19	14
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)								
Hexavalent Chromium	18540-29-9	0.5	mg/kg	----	----	<0.5	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	1	mg/kg	----	----	<1	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	----	<0.1	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	----	<0.05	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	----	<0.05	----	----
beta-BHC	319-85-7	0.05	mg/kg	----	----	<0.05	----	----
gamma-BHC	58-89-9	0.05	mg/kg	----	----	<0.05	----	----
delta-BHC	319-86-8	0.05	mg/kg	----	----	<0.05	----	----
Heptachlor	76-44-8	0.05	mg/kg	----	----	<0.05	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP40-02	TP40-03	TP41-01	TP41-02	TP42-01
				Client sampling date / time	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-074	EM1904350-075	EM1904350-076	EM1904350-077	EM1904350-078
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
Aldrin	309-00-2	0.05	mg/kg		----	----	<0.05	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		----	----	<0.05	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg		----	----	<0.05	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg		----	----	<0.05	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		----	----	<0.05	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg		----	----	<0.05	----	----
Dieldrin	60-57-1	0.05	mg/kg		----	----	<0.05	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		----	----	<0.05	----	----
Endrin	72-20-8	0.05	mg/kg		----	----	<0.05	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		----	----	<0.05	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		----	----	<0.05	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		----	----	<0.05	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		----	----	<0.05	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		----	----	<0.05	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		----	----	<0.2	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		----	----	<0.05	----	----
Methoxychlor	72-43-5	0.2	mg/kg		----	----	<0.2	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		----	----	<0.05	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		----	----	<0.05	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		----	----	<0.5	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg		----	----	<0.5	----	----
2-Methylphenol	95-48-7	0.5	mg/kg		----	----	<0.5	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg		----	----	<1	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg		----	----	<0.5	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		----	----	<0.5	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		----	----	<0.5	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		----	----	<0.5	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		----	----	<0.5	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		----	----	<0.5	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		----	----	<0.5	----	----
Pentachlorophenol	87-86-5	2	mg/kg		----	----	<2	----	----
^ Sum of Phenols	----	0.5	mg/kg		----	----	<0.5	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP40-02	TP40-03	TP41-01	TP41-02	TP42-01
				Client sampling date / time	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-074	EM1904350-075	EM1904350-076	EM1904350-077	EM1904350-078
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Naphthalene	91-20-3	0.5	mg/kg		----	----	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		----	----	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg		----	----	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg		----	----	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg		----	----	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg		----	----	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg		----	----	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg		----	----	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	----	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg		----	----	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		----	----	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	----	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	----	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	----	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	----	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	----	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	----	<0.5	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	----	<0.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	----	0.6	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	----	1.2	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP40-02	TP40-03	TP41-01	TP41-02	TP42-01
				Client sampling date / time	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-074	EM1904350-075	EM1904350-076	EM1904350-077	EM1904350-078
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	----	88.3	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		----	----	97.3	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		----	----	98.0	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	----	105	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		----	----	104	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		----	----	90.8	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	----	109	----	----
Anthracene-d10	1719-06-8	0.5	%		----	----	120	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		----	----	114	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		94.8	90.9	85.5	82.6	86.7
Toluene-D8	2037-26-5	0.2	%		95.6	85.2	84.6	90.8	88.6
4-Bromofluorobenzene	460-00-4	0.2	%		94.4	88.9	86.1	85.4	87.6

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP42-02	TP25-01	TP25-02	TP25-03	TP26-01
			Client sampling date / time	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904350-079	EM1904350-080	EM1904350-082	EM1904350-083	EM1904350-084
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	7.8	8.1	----	8.0	8.0
EA055: Moisture Content								
Moisture Content	----	1.0	%	2.6	4.6	----	10.4	4.2
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	----	15.4	----	----
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)								
Sulfate as SO4 2-	14808-79-8	50	mg/kg	----	----	240	120	190
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	----	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	<1	<1
Chromium	7440-47-3	2	mg/kg	18	24	----	23	24
Copper	7440-50-8	5	mg/kg	12	12	----	12	13
Lead	7439-92-1	5	mg/kg	7	8	----	8	8
Nickel	7440-02-0	2	mg/kg	11	12	----	15	13
Zinc	7440-66-6	5	mg/kg	16	18	----	17	17
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	----	<0.1	<0.1
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	----	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	----	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	----	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	----	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	----	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	----	<50	<50
EP080: BTEXN								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP42-02	TP25-01	TP25-02	TP25-03	TP26-01
				Client sampling date / time	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-079	EM1904350-080	EM1904350-082	EM1904350-083	EM1904350-084
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	----	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	----	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	----	<1	<1
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**96.7**	**82.4**	----	**83.7**	**85.0**
Toluene-D8	2037-26-5	0.2	%		**95.6**	**88.2**	----	**87.3**	**84.4**
4-Bromofluorobenzene	460-00-4	0.2	%		**97.7**	**85.1**	----	**88.3**	**86.5**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP26-03	TP55-01	TP56-01	TP24-01	TP24-03
				Client sampling date / time	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-086	EM1904350-087	EM1904350-088	EM1904350-089	EM1904350-091
					Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract									
pH (CaCl2)	----	0.1	pH Unit		8.0	----	8.0	----	7.4
EA055: Moisture Content									
Moisture Content	----	1.0	%		11.2	----	3.0	----	7.1
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		----	2.8	----	4.0	----
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)									
Sulfate as SO4 2-	14808-79-8	50	mg/kg		60	----	----	420	100
EG005(ED093)T: Total Metals by ICP-AES									
Barium	7440-39-3	10	mg/kg		----	120	----	210	----
Beryllium	7440-41-7	1	mg/kg		----	1	----	<1	----
Cobalt	7440-48-4	2	mg/kg		----	10	----	<2	----
Iron	7439-89-6	50	mg/kg		----	18800	----	24100	----
Manganese	7439-96-5	5	mg/kg		----	240	----	42	----
Silver	7440-22-4	2	mg/kg		----	<2	----	<2	----
Arsenic	7440-38-2	5	mg/kg		<5	6	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		15	21	13	24	20
Copper	7440-50-8	5	mg/kg		10	10	<5	6	<5
Lead	7439-92-1	5	mg/kg		6	9	5	<5	<5
Nickel	7440-02-0	2	mg/kg		10	13	5	5	3
Zinc	7440-66-6	5	mg/kg		11	15	7	52	7
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)									
Hexavalent Chromium	18540-29-9	0.5	mg/kg		----	<0.5	----	<0.5	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	1	mg/kg		----	<1	----	<1	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		----	<0.1	----	<0.1	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		----	<0.05	----	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		----	<0.05	----	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg		----	<0.05	----	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg		----	<0.05	----	<0.05	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP26-03	TP55-01	TP56-01	TP24-01	TP24-03
				Client sampling date / time	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-086	EM1904350-087	EM1904350-088	EM1904350-089	EM1904350-091
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
delta-BHC	319-86-8	0.05	mg/kg		----	<0.05	----	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg		----	<0.05	----	<0.05	----
Aldrin	309-00-2	0.05	mg/kg		----	<0.05	----	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		----	<0.05	----	<0.05	----
^ Total Chlordane (sum)	----	0.05	mg/kg		----	<0.05	----	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg		----	<0.05	----	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		----	<0.05	----	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg		----	<0.05	----	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg		----	<0.05	----	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg		----	<0.05	----	<0.05	----
Endrin	72-20-8	0.05	mg/kg		----	<0.05	----	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		----	<0.05	----	<0.05	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		----	<0.05	----	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg		----	<0.05	----	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		----	<0.05	----	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		----	<0.05	----	<0.05	----
4.4`-DDT	50-29-3	0.2	mg/kg		----	<0.2	----	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg		----	<0.05	----	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg		----	<0.2	----	<0.2	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		----	<0.05	----	<0.05	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		----	<0.05	----	<0.05	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		----	<0.5	----	<0.5	----
2-Chlorophenol	95-57-8	0.5	mg/kg		----	<0.5	----	<0.5	----
2-Methylphenol	95-48-7	0.5	mg/kg		----	<0.5	----	<0.5	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg		----	<1	----	<1	----
2-Nitrophenol	88-75-5	0.5	mg/kg		----	<0.5	----	<0.5	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg		----	<0.5	----	<0.5	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg		----	<0.5	----	<0.5	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg		----	<0.5	----	<0.5	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		----	<0.5	----	<0.5	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg		----	<0.5	----	<0.5	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg		----	<0.5	----	<0.5	----
Pentachlorophenol	87-86-5	2	mg/kg		----	<2	----	<2	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP26-03	TP55-01	TP56-01	TP24-01	TP24-03
				Client sampling date / time	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-086	EM1904350-087	EM1904350-088	EM1904350-089	EM1904350-091
					Result	Result	Result	Result	Result
EP075(SIM)A: Phenolic Compounds - Continued									
^ Sum of Phenols	----	0.5	mg/kg		----	<0.5	----	<0.5	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	<0.5	----	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		----	<0.5	----	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		----	<0.5	----	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		----	<0.5	----	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		----	<0.5	----	<0.5	----
Anthracene	120-12-7	0.5	mg/kg		----	<0.5	----	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg		----	<0.5	----	<0.5	----
Pyrene	129-00-0	0.5	mg/kg		----	<0.5	----	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	<0.5	----	<0.5	----
Chrysene	218-01-9	0.5	mg/kg		----	<0.5	----	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		----	<0.5	----	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	<0.5	----	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	<0.5	----	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	<0.5	----	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	<0.5	----	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	<0.5	----	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	<0.5	----	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	<0.5	----	<0.5	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	**0.6**	----	**0.6**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	**1.2**	----	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP26-03	TP55-01	TP56-01	TP24-01	TP24-03
				Client sampling date / time	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-086	EM1904350-087	EM1904350-088	EM1904350-089	EM1904350-091
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	**93.5**	----	**92.0**	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		----	**93.9**	----	**97.4**	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		----	**95.2**	----	**99.9**	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	**96.4**	----	**97.9**	----
2-Chlorophenol-D4	93951-73-6	0.5	%		----	**96.3**	----	**97.3**	----
2.4.6-Tribromophenol	118-79-6	0.5	%		----	**81.1**	----	**78.0**	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	**102**	----	**99.9**	----
Anthracene-d10	1719-06-8	0.5	%		----	**112**	----	**113**	----
4-Terphenyl-d14	1718-51-0	0.5	%		----	**105**	----	**103**	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**89.0**	**86.3**	**88.0**	**82.8**	**83.0**
Toluene-D8	2037-26-5	0.2	%		**83.7**	**86.8**	**85.6**	**78.4**	**81.1**
4-Bromofluorobenzene	460-00-4	0.2	%		**86.2**	**87.8**	**87.6**	**81.4**	**82.6**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP22-01	TP22-03	TP23-01	TP23-02	TP23-04
			Client sampling date / time	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EM1904350-093	EM1904350-095	EM1904350-097	EM1904350-098	EM1904350-100
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	8.3	8.3	8.2	8.0	8.3
EA055: Moisture Content								
Moisture Content	----	1.0	%	3.8	19.8	5.8	17.3	5.4
ED040N: Sulfate - Calcium Phosphate Soluble (NEPM)								
Sulfate as SO4 2-	14808-79-8	50	mg/kg	110	270	130	650	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	7	12	7	<5	8
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	24	26	22	28	25
Copper	7440-50-8	5	mg/kg	11	12	10	10	12
Lead	7439-92-1	5	mg/kg	9	13	10	12	10
Nickel	7440-02-0	2	mg/kg	15	26	13	11	14
Zinc	7440-66-6	5	mg/kg	18	19	15	18	18
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP22-01	TP22-03	TP23-01	TP23-02	TP23-04
				Client sampling date / time	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00
Compound	CAS Number	LOR	Unit		EM1904350-093	EM1904350-095	EM1904350-097	EM1904350-098	EM1904350-100
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**89.9**	**84.1**	**89.1**	**93.5**	**88.7**
Toluene-D8	2037-26-5	0.2	%		**88.8**	**73.4**	**79.8**	**81.9**	**74.8**
4-Bromofluorobenzene	460-00-4	0.2	%		**90.3**	**78.5**	**83.6**	**85.6**	**79.5**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**Composite 01**	**----**	**----**	**----**	**----**
			Client sampling date / time	22-Mar-2019 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM1904350-103**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	**7.7**	**----**	**----**	**----**	**----**
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**19.3**	**----**	**----**	**----**	**----**
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	**68**	**----**	**----**	**----**	**----**
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	**2.60**	**----**	**----**	**----**	**----**
ED006: Exchangeable Cations on Alkaline Soils								
ø Exchangeable Calcium	----	0.2	meq/100g	**4.5**	**----**	**----**	**----**	**----**
ø Exchangeable Magnesium	----	0.2	meq/100g	**5.7**	**----**	**----**	**----**	**----**
ø Exchangeable Potassium	----	0.2	meq/100g	**0.9**	**----**	**----**	**----**	**----**
ø Exchangeable Sodium	----	0.2	meq/100g	**5.7**	**----**	**----**	**----**	**----**
ø Cation Exchange Capacity	----	0.2	meq/100g	**16.8**	**----**	**----**	**----**	**----**
ø Exchangeable Calcium Percent	----	0.2	%	**27.0**	**----**	**----**	**----**	**----**
ø Exchangeable Magnesium Percent	----	0.2	%	**33.7**	**----**	**----**	**----**	**----**
ø Exchangeable Potassium Percent	----	0.2	%	**5.1**	**----**	**----**	**----**	**----**
ø Exchangeable Sodium Percent	----	0.2	%	**34.1**	**----**	**----**	**----**	**----**
ø Calcium/Magnesium Ratio	----	0.2	-	**0.8**	**----**	**----**	**----**	**----**
ø Magnesium/Potassium Ratio	----	0.2	-	**6.6**	**----**	**----**	**----**	**----**
EG005(ED093)T: Total Metals by ICP-AES								
Iron	7439-89-6	0.005	%	**4.86**	**----**	**----**	**----**	**----**
EP004: Organic Matter								
Organic Matter	----	0.5	%	<0.5	**----**	**----**	**----**	**----**
Total Organic Carbon	----	0.5	%	<0.5	**----**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	RINSE-03	RINSE-04	TB-03	----	----
				Client sampling date / time	21-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	----	----
Compound	CAS Number	LOR	Unit		EM1904350-001	EM1904350-081	EM1904350-101	--------	--------
					Result	Result	Result	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		----	**5.37**	----	----	----
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		----	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		----	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L		----	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L		----	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L		----	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L		----	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L		----	<0.005	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		----	<0.0001	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	----	----
C10 - C14 Fraction	----	50	µg/L		----	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L		----	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L		----	<50	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		----	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	----	----
>C10 - C16 Fraction	----	100	µg/L		----	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L		----	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L		----	<100	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		----	<100	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		----	<100	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	----	----
Toluene	108-88-3	2	µg/L		<2	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	----	----
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				Client sample ID	**RINSE-03**	**RINSE-04**	**TB-03**	**----**	**----**
				Client sampling date / time	21-Mar-2019 00:00	22-Mar-2019 00:00	22-Mar-2019 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EM1904350-001**	**EM1904350-081**	**EM1904350-101**	**--------**	**--------**
					Result	Result	Result	----	----
EP080: BTEXN - Continued									
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	**----**	**----**
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	**----**	**----**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**94.5**	**88.0**	**95.9**	**----**	**----**
Toluene-D8	2037-26-5	2	%		**93.7**	**88.2**	**92.9**	**----**	**----**
4-Bromofluorobenzene	460-00-4	2	%		**96.4**	**90.4**	**96.8**	**----**	**----**

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	36	140
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	38	128
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	33	139
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

LBW co Pty Ltd
184 Magill Road
Norwood
SA 5069

Attention: **Mark Peterson**

Report **647273-S**
Project name SPRINGWOOD DEVELOPMENT PSI
Project ID 191076
Received Date Mar 25, 2019

Client Sample ID			**SB04-03**	**TP02-06**
Sample Matrix			**Soil**	**Soil**
Eurofins | mgt Sample No.			**M19-Ma35294**	**M19-Ma35296**
Date Sampled			**Mar 19, 2019**	**Mar 20, 2019**
Test/Reference	LOR	Unit		
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				
TRH C6-C9	20	mg/kg	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	< 50
BTEX				
Benzene	0.1	mg/kg	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	98	102
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	8.8	7.5
Sulphate (as SO4)	30	mg/kg	230	< 30
% Moisture	1	%	12	< 1
Heavy Metals				
Arsenic	2	mg/kg	11	2.1
Cadmium	0.4	mg/kg	< 0.4	< 0.4
Chromium	5	mg/kg	54	6.9
Copper	5	mg/kg	9.0	< 5
Lead	5	mg/kg	6.6	< 5
Mercury	0.1	mg/kg	< 0.1	< 0.1
Nickel	5	mg/kg	6.1	< 5
Zinc	5	mg/kg	19	< 5

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Mar 26, 2019	14 Day
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Mar 26, 2019	14 Day
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Mar 26, 2019	14 Day
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Melbourne	Mar 26, 2019	14 Day
- Method: LTM-ORG-2150 VOCs in Soils Liquid and other Aqueous Matrices			
pH (1:5 Aqueous extract at 25°C as rec.)	Melbourne	Mar 26, 2019	7 Day
- Method: LTM-GEN-7090 pH in soil by ISE			
Sulphate (as SO4)	Melbourne	Mar 26, 2019	28 Day
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Metals M8	Melbourne	Mar 26, 2019	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Melbourne	Mar 26, 2019	14 Day
- Method: LTM-GEN-7080 Moisture			

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NATA # 1261
Site # 23736

Company Name:	LBW co Pty Ltd	**Order No.:**		**Received:**	Mar 25, 2019 2:00 PM
Address:	184 Magill Road	**Report #:**	647273	**Due:**	Apr 1, 2019
	Norwood	**Phone:**	08 8331 2417	**Priority:**	5 Day
	SA 5069	**Fax:**	08 8331 2415	**Contact Name:**	Mark Peterson
Project Name:	SPRINGWOOD DEVELOPMENT PSI				
Project ID:	191076				

Eurofins | mgt Analytical Services Manager : Savini Suduweli

Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	Sulphate (as SO4)	Metals M8	BTEX	Moisture Set	Total Recoverable Hydrocarbons
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217											
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 23736											
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	SB04-03	Mar 19, 2019		Soil	M19-Ma35294	X	X	X	X	X	X
2	TP02-06	Mar 20, 2019		Soil	M19-Ma35296	X	X	X	X	X	X
Test Counts						2	2	2	2	2	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure, April 2011 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.2 2018
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.2 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	98			70-130	Pass	
TRH C10-C14	%	120			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	99			70-130	Pass	
Toluene	%	115			70-130	Pass	
Ethylbenzene	%	123			70-130	Pass	
m&p-Xylenes	%	113			70-130	Pass	
Xylenes - Total	%	117			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	104			70-130	Pass	
TRH C6-C10	%	92			70-130	Pass	
TRH >C10-C16	%	117			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	110			80-120	Pass	
Cadmium	%	103			80-120	Pass	
Chromium	%	117			80-120	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Copper			%	116			80-120	Pass	
Lead			%	116			80-120	Pass	
Mercury			%	113			75-125	Pass	
Nickel			%	112			80-120	Pass	
Zinc			%	110			80-120	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	M19-Ma31739	NCP	%	95			70-130	Pass	
TRH C10-C14	M19-Ma32373	NCP	%	106			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	M19-Ma31739	NCP	%	87			70-130	Pass	
Toluene	M19-Ma31739	NCP	%	95			70-130	Pass	
Ethylbenzene	M19-Ma31739	NCP	%	96			70-130	Pass	
m&p-Xylenes	M19-Ma31739	NCP	%	90			70-130	Pass	
o-Xylene	M19-Ma31739	NCP	%	95			70-130	Pass	
Xylenes - Total	M19-Ma31739	NCP	%	91			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	M19-Ma31739	NCP	%	86			70-130	Pass	
TRH C6-C10	M19-Ma31739	NCP	%	88			70-130	Pass	
TRH >C10-C16	M19-Ma32373	NCP	%	103			70-130	Pass	
Spike - % Recovery									
				Result 1					
Sulphate (as SO4)	M19-Ma29785	NCP	%	114			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	M19-Ma35630	NCP	%	111			75-125	Pass	
Cadmium	M19-Ma35630	NCP	%	114			75-125	Pass	
Chromium	M19-Ma35630	NCP	%	120			75-125	Pass	
Copper	M19-Ma35630	NCP	%	117			75-125	Pass	
Lead	M19-Ma35630	NCP	%	117			75-125	Pass	
Mercury	M19-Ma35630	NCP	%	120			70-130	Pass	
Nickel	M19-Ma35630	NCP	%	116			75-125	Pass	
Zinc	M19-Ma35630	NCP	%	117			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	M19-Ma37615	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	M19-Ma32417	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	M19-Ma32417	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	M19-Ma32417	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	M19-Ma37615	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	M19-Ma37615	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	M19-Ma37615	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	M19-Ma37615	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	M19-Ma37615	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	M19-Ma37615	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	

Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	M19-Ma37615	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	M19-Ma37615	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH >C10-C16	M19-Ma32417	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	M19-Ma32417	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	M19-Ma32417	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
pH (1:5 Aqueous extract at 25°C as rec.)	B19-Ma34751	NCP	pH Units	9.1	9.3	pass	30%	Pass	
Sulphate (as SO4)	M19-Ma29781	NCP	mg/kg	< 30	< 30	<1	30%	Pass	
% Moisture	M19-Ma35294	CP	%	12	12	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	M19-Ma35630	NCP	mg/kg	4.1	4.3	3.0	30%	Pass	
Cadmium	M19-Ma35630	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	M19-Ma35630	NCP	mg/kg	5.9	6.0	2.0	30%	Pass	
Copper	M19-Ma35630	NCP	mg/kg	7.8	7.9	1.0	30%	Pass	
Lead	M19-Ma35630	NCP	mg/kg	22	22	<1	30%	Pass	
Mercury	M19-Ma35630	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	M19-Ma35630	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Zinc	M19-Ma35630	NCP	mg/kg	70	72	3.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.

Authorised By

Savini Suduweli	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Harry Bacalis	Senior Analyst-Volatile (VIC)
Joseph Edouard	Senior Analyst-Organic (VIC)
Julie Kay	Senior Analyst-Inorganic (VIC)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

LBW co Pty Ltd
184 Magill Road
Norwood
SA 5069

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **Mark Peterson**

Report **647553-S**
Project name SPRINGWOOD DEVELOPMENT PSI
Project ID 191076
Received Date Mar 26, 2019

Client Sample ID			**TP13-06**	**TP14-05**	**TP40-04**	**TP23-05**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**M19-Ma37524**	**M19-Ma37525**	**M19-Ma37526**	**M19-Ma37527**
Date Sampled			**Mar 21, 2019**	**Mar 21, 2019**	**Mar 22, 2019**	**Mar 22, 2019**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	< 50	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	58	69	61	69
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	< 100	< 100
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	9.4	8.3	8.9	9.8
Sulphate (as SO4)	30	mg/kg	-	1000	-	-
% Moisture	1	%	3.6	8.0	2.5	6.4
Heavy Metals						
Arsenic	2	mg/kg	2.5	6.6	3.3	10
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	9.2	53	19	39
Copper	5	mg/kg	< 5	7.6	9.9	13
Lead	5	mg/kg	< 5	9.8	6.6	14
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	< 5	6.9	12	21
Zinc	5	mg/kg	< 5	19	21	33

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Mar 28, 2019	14 Day
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Mar 28, 2019	14 Day
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Mar 28, 2019	14 Day
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Melbourne	Mar 28, 2019	14 Day
- Method: LTM-ORG-2150 VOCs in Soils Liquid and other Aqueous Matrices			
pH (1:5 Aqueous extract at 25°C as rec.)	Melbourne	Mar 28, 2019	7 Day
- Method: LTM-GEN-7090 pH in soil by ISE			
Sulphate (as SO4)	Melbourne	Mar 28, 2019	28 Day
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Metals M8	Melbourne	Mar 28, 2019	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Melbourne	Mar 27, 2019	14 Day
- Method: LTM-GEN-7080 Moisture			

ABN– 50 005 085 521
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Site # 1254 & 14271

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Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
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NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Company Name:	LBW co Pty Ltd	**Order No.:**		**Received:**	Mar 26, 2019 6:15 PM
Address:	184 Magill Road	**Report #:**	647553	**Due:**	Apr 3, 2019
	Norwood	**Phone:**	08 8331 2417	**Priority:**	5 Day
	SA 5069	**Fax:**	08 8331 2415	**Contact Name:**	Mark Peterson
Project Name:	SPRINGWOOD DEVELOPMENT PSI				
Project ID:	191076				

Eurofins | mgt Analytical Services Manager : Savini Suduweli

Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	Sulphate (as SO4)	Metals M8	BTEX	Moisture Set	Total Recoverable Hydrocarbons
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217											
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 23736											
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	TP13-06	Mar 21, 2019		Soil	M19-Ma37524	X		X	X	X	X
2	TP14-05	Mar 21, 2019		Soil	M19-Ma37525	X	X	X	X	X	X
3	TP40-04	Mar 22, 2019		Soil	M19-Ma37526	X		X	X	X	X
4	TP23-05	Mar 22, 2019		Soil	M19-Ma37527	X		X	X	X	X
Test Counts						4	1	4	4	4	4

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure, April 2011 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.2 2018
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.2 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	102			70-130	Pass	
TRH C10-C14	%	129			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	110			70-130	Pass	
Toluene	%	104			70-130	Pass	
Ethylbenzene	%	111			70-130	Pass	
m&p-Xylenes	%	104			70-130	Pass	
Xylenes - Total	%	108			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	106			70-130	Pass	
TRH C6-C10	%	93			70-130	Pass	
TRH >C10-C16	%	130			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	110			80-120	Pass	
Cadmium	%	102			80-120	Pass	
Chromium	%	120			80-120	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Copper			%	114			80-120	Pass	
Lead			%	119			80-120	Pass	
Mercury			%	113			75-125	Pass	
Nickel			%	111			80-120	Pass	
Zinc			%	110			80-120	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S19-Ma35101	NCP	%	87			70-130	Pass	
TRH C10-C14	S19-Ma35149	NCP	%	79			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S19-Ma35101	NCP	%	83			70-130	Pass	
Toluene	S19-Ma35101	NCP	%	78			70-130	Pass	
Ethylbenzene	S19-Ma35101	NCP	%	83			70-130	Pass	
m&p-Xylenes	S19-Ma35101	NCP	%	79			70-130	Pass	
o-Xylene	S19-Ma35101	NCP	%	89			70-130	Pass	
Xylenes - Total	S19-Ma35101	NCP	%	82			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S19-Ma35101	NCP	%	79			70-130	Pass	
TRH C6-C10	S19-Ma35101	NCP	%	82			70-130	Pass	
TRH >C10-C16	S19-Ma35149	NCP	%	77			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	M19-Ma39542	NCP	%	103			75-125	Pass	
Cadmium	M19-Ma39542	NCP	%	107			75-125	Pass	
Chromium	M19-Ma39542	NCP	%	118			75-125	Pass	
Copper	M19-Ma39542	NCP	%	110			75-125	Pass	
Lead	M19-Ma39542	NCP	%	116			75-125	Pass	
Mercury	M19-Ma39542	NCP	%	110			70-130	Pass	
Nickel	M19-Ma39542	NCP	%	107			75-125	Pass	
Zinc	M19-Ma39542	NCP	%	118			75-125	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C16-C34	M19-Ma35506	NCP	%	47			70-130	Fail	Q08
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	K19-Ma37480	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	S19-Ma35138	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S19-Ma35138	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S19-Ma35138	NCP	mg/kg	< 50	82	59	30%	Fail	Q15
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	K19-Ma37480	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	K19-Ma37480	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	K19-Ma37480	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	K19-Ma37480	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	K19-Ma37480	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	K19-Ma37480	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	

Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	K19-Ma37480	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	K19-Ma37480	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH >C10-C16	S19-Ma35138	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
pH (1:5 Aqueous extract at 25°C as rec.)	M19-Ma39815	NCP	pH Units	9.3	9.3	pass	30%	Pass	
% Moisture	M19-Ma37517	NCP	%	7.4	8.0	8.0	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	M19-Ma39542	NCP	mg/kg	4.3	4.3	<1	30%	Pass	
Cadmium	M19-Ma39542	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	M19-Ma39542	NCP	mg/kg	12	13	1.0	30%	Pass	
Copper	M19-Ma39542	NCP	mg/kg	11	11	<1	30%	Pass	
Lead	M19-Ma39542	NCP	mg/kg	20	19	<1	30%	Pass	
Mercury	M19-Ma39542	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	M19-Ma39542	NCP	mg/kg	6.2	6.1	1.0	30%	Pass	
Zinc	M19-Ma39542	NCP	mg/kg	49	49	1.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
Q08	The matrix spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference
Q15	The RPD reported passes Eurofins | mgt's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

Savini Suduweli	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Harry Bacalis	Senior Analyst-Volatile (VIC)
Joseph Edouard	Senior Analyst-Organic (VIC)
Julie Kay	Senior Analyst-Inorganic (VIC)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

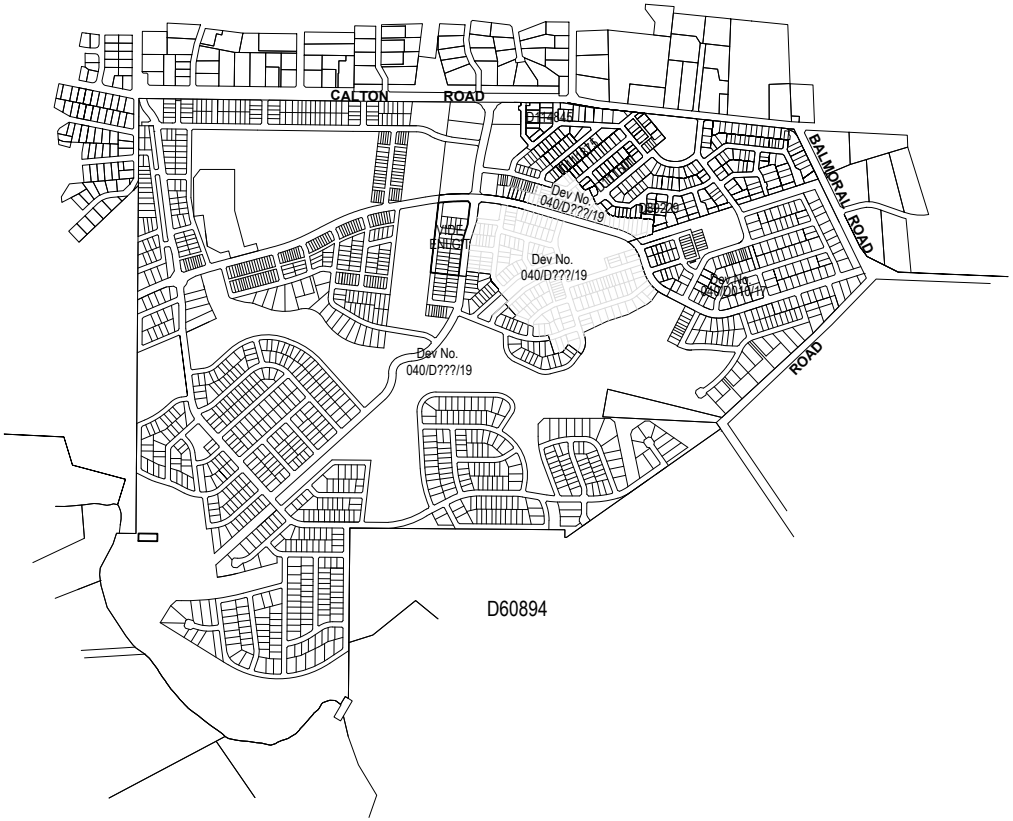
Appendix M

Site Development Plans

Development No. / /
Town of Gawler

Proposed Plan of Division
Allotment 9002 in Dev No. 490/D???/19
Hundred of Barossa
in the area named
GAWLER EAST

PT CT 6205/146



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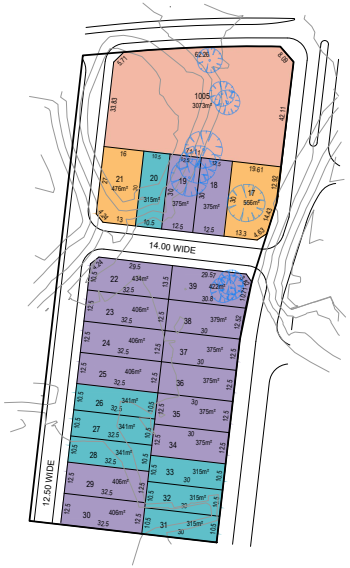

	Super Conventional (22+)	0
	Conventional (20)	0
	Traditional (17 - 19)	0
	Courtyard (14 - 17)	2
	Villa (12.5)	14
	Villa (10.5)	7
	Terrace	0
	Total	23
	Other	1
	Total	24

Regulated tree

No. of proposed allotments	24
Area of division	1.521ha
Reserve area	0.000ha
Length of new roads	790m

Contour interval 2m.
Datum AHD.

Vide Titles for disposition of easements

Road pavements shown are indicative only.

Not to be used for detailed engineering design.

Dimensions and areas are subject to survey.

 Original Sheet Size A1

Glenn Ian Hordacre
LICENSED SURVEYOR

REF:	A010816.0000
DWG NO.:	A010816-CG PROP2 REV C
REVISION:	C
DEL	12.06.2019

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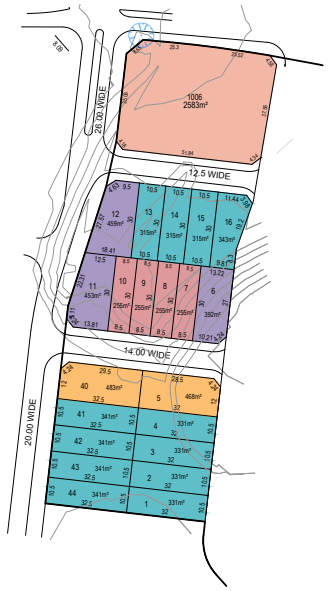
+ Property + Land Development +
+ Construction + Mining +
+ Spatial Information Management +

Alexander Symonds Surveying Consultants

Development No. / /
Town of Gawler

Proposed Plan of Division
Allotment 9000 in Dev No. 490/D???/19
Hundred of Barossa
in the area named
GAWLER EAST

PT CT 6212/430
PT CT 6205/146
PT CT 6162/334



0 10 20 40 60 80 100 m

1:1000

N
W E
S

	Super Conventional (22+)	0
	Conventional (20)	0
	Traditional (17 - 19)	0
	Courtyard (14 - 17)	2
	Villa (12.5)	3
	Villa (10.5)	12
	Terrace	4
	Total	21
	Other	1
	Total	22

No. of proposed allotments	22
Area of division	1.149ha
Reserve area	0.000ha
Length of new roads	120m

Contour interval 2m.
Datum AHD.

Vide Titles for disposition of easements

Road pavements shown are indicative only.

Not to be used for detailed engineering design.

Dimensions and areas are subject to survey.

 Original Sheet Size A1

Glenn Ian Hordacre
LICENSED SURVEYOR

REF:	A010816.0000
DWG NO.:	A010816-CG PROP3 REV A
REVISION:	B
DEL	10.06.2019

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+ Construction + Mining +
+ Spatial Information Management +

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Warwick Mittiga
Springwood Gawler East
7 Easton Drive
Gawler East SA 5118

January 22, 2020

Project: Request for Information on Iron-grass (*Lomandra*) Temperate Grassland and Flinders Worm-lizard (*Aprasia pseudopulchella*) in relation to a Proposed Plan of Division at Gawler East (Including DA490/D026/19, DA960/D025/19, DA490/D025/19, DA490D027/19 & DA490/D028/19)

Dear Warwick,

We refer to the request for further information in relation to the proposed Plan of Division by Springwood Development Nominees Pty. Ltd. at Gawler East (including DA490/D026/19, DA960/D025/19, DA490/D025/19, DA490D027/19 and DA490/D028/19). As requested, please refer below to the additional information provided on Iron-grass (*Lomandra*) Temperate Grassland and Flinders Worm-lizard (*Aprasia pseudopulchella*) in relation to the proposed 'Springwood' plan of division.

Iron-grass (*Lomandra*) Temperate Grassland

The Iron-grass (*Lomandra*) Temperate Grassland has not been assessed under the criteria of the EPBC Act (using the methods as specified for the Threatened Ecological Community (TEC)). The review undertaken for the Project was completed in March 2019 whereas the assessment of the Iron-grass (*Lomandra*) Temperate Grassland is required to be undertaken in spring. Spring is the optimum time for the assessment of the Iron-grass (*Lomandra*) Temperate Grassland as flora species diversity is highest at this time and flora diversity is one of the key assessment criteria. Therefore it is assumed that the Iron-grass (*Lomandra*) Temperate Grassland will qualify as the TEC under the EPBC Act but this has yet to be confirmed. The assessment of

the Iron-grass (*Lomandra*) Temperate Grassland against the TEC criteria will be required for the referral under the EPBC Act.

It is considered that there won't be a significant direct or indirect impact on the Iron-grass (*Lomandra*) Temperate Grassland within the Project Area, provided management recommendations, made in relation to the future management of the area are implemented. These management recommendations, and the development of associated management plans, will be undertaken as part of the EPBC referral.

The total size of the Iron-grass (*Lomandra*) Temperate Grassland area within the Project Area is currently estimated to be 1.22ha (Figure 1). The total area of impact on the Iron-grass (*Lomandra*) Temperate Grassland is estimated to be 0.12ha (based on the current layout) whilst the future Iron-grass (*Lomandra*) Temperate Grassland area is approximately 0.70ha in size (Figure 1).

Flinders Worm-lizard (*Aprasia pseudopulchella*)

No Flinders Worm-lizards (*Aprasia pseudopulchella*) were recorded during the detailed fauna surveys undertaken across the Project Area (KBR 2010). As detailed in the KBR report, the Flinders Worm-lizard (*Aprasia pseudopulchella*), which is endemic to SA, has had its state rating removed (in 2008) as it is known to be relatively common and widespread. The national rating for the species have not been updated since the inception of the EPBC Act in 1999. This creates a situation where at a state level the species is considered to be common but at a national level it is considered to be of conservation significance. The South Australian Museum considers the species to be common and widespread (M. Hutchinson pers. comm).

The potential habitat for the species was mapped across the site by KBR (2010). The habitat on site was classified as either marginal (poor quality) or fair to good quality. Figure 1 details the habitat and it relates to the development. As the habitat for Flinders Worm-lizard within the Project Area is generally within steeper gullies, very little habitat classified as fair to good quality will be impacted upon by the Project. The majority of areas considered to be marginal are also avoided by the Project.

Mitigation measures

As part of the ecological strategy for the proposed development of the Project, the following mitigation hierarchy has been implemented in the following way:

Avoid clearance of native vegetation

The Springwood Master Plan concept and Proposed Plan of Division has been designed where possible to avoid and minimise the impact on the Iron-grass (Lomandra) Temperate Grassland area. A small portion of the Iron-grass (approximately 0.12 ha), south of Spring Creek, is proposed to be dissected by a new Collector Road which will provide required access to the new Springwood Community to the south of Spring Creek. There are a number of factors that have necessitated the location of a Collector Road in this location as follows:

- The need to provide two (2) separate road crossings of Spring Creek that are physically separated for equitable traffic collection and distribution to the residential catchment to the south of Spring Creek and located to accommodate two separate choices of egress from this area (minimum) in the event of a Bushfire;
- The steep local topography and gradient of the banks of Spring Creek which limit the physical and economic provision or road infrastructure and connections across Spring Creek; and
- The inter-relationship and coordination of the proposed road network with the proposed stormwater management and treatment system at Springwood, noting that the proposed collector road crossing of Spring Creek has been coordinated with the location of in-line stormwater detention in Spring Creek, to control the release of stormwater to pre-development flow levels.

Minimise the extent, duration and intensity of impacts of the clearance on biodiversity to the fullest possible extent

The road width through the Iron-grass (*Lomandra*) Temperate Grassland area is the minimum width required (20 m road reserve and 9m wide carriageway). Any areas disturbed during construction but not required for the operation of the road within the Iron-grass (*Lomandra*) Temperate Grassland area will be rehabilitated. A detailed Vegetation Management Plan (VMP) and a Construction Environmental Management Plan (CEMP) will be prepared for the Project to ensure no damage to the Iron-grass (*Lomandra*) Temperate Grassland area occurs outside of the construction footprint.

Rehabilitate/restore ecosystems that have been degraded, and to restore ecosystems that have been degraded, or destroyed by the impact of clearance that cannot be avoided or further minimized, such as allowing for the re-establishment of the vegetation

Whilst a small area of Iron-grass (*Lomandra*) Temperate Grassland area may be directly impacted as part of the Project (subject to detailed future surveys), the remaining areas will be incorporated into the open space network and managed for conservation. This will require a management plan to be developed and implemented. It is likely that regular weed control will be required across the remaining Iron-grass (*Lomandra*) Temperate Grassland area to improve the quality over the long term. The area of Iron-grass (*Lomandra*) Temperate Grassland is currently unmanaged and is not covered by a management plan or management agreement. The proposed development will allow a management plan to be developed for this vegetation community within the Project Area and ensure management actions are implemented to enhance and improve the biodiversity values of the site over the long-term.

Offset any adverse impact on native vegetation that cannot be avoided or further minimized to provide a significant environmental benefit that outweighs that impact.

Offsets are intended to compensate for any residual adverse impacts. An offset will be required to compensate for the clearance within the Iron-grass (*Lomandra*) Temperate Grassland area. Figure 1 details the location of the proposed offset. A management plan will be developed for this area detailing the specific actions required to restore and manage this area.

Offset strategies have been proposed and implemented for Iron-grass (*Lomandra*) Temperate Grassland on several Project's across South Australia. These include:

- Hornsdale Wind Farm – the offset strategy involved securing an area of similar habitat and implementing a range of management actions including the management of grazing, weed removal, fencing and rabbit control;
- Kanmantoo Mine – the offset strategy for this project involved implementing management on retained Iron-grass (*Lomandra*) Temperate Grassland within the Project Area as well as revegetating a grassland area adjacent to the project site; and
- Willogoleche Wind Farm – involved providing an Iron-grass (*Lomandra*) Temperate Grassland offset area adjacent to the project site, implementing control measures during construction and rehabilitating Iron-grass (*Lomandra*) Temperate Grassland areas that were disturbed during construction but not required for the operation of the Project.

As detailed in the EBS Ecology report, the Project will be referred under the EPBC Act and clearance applications for any native vegetation clearance will be submitted under the *Native Vegetation Act 1991.*

Yours sincerely,

Dr Travis How
Director
EBS Ecology

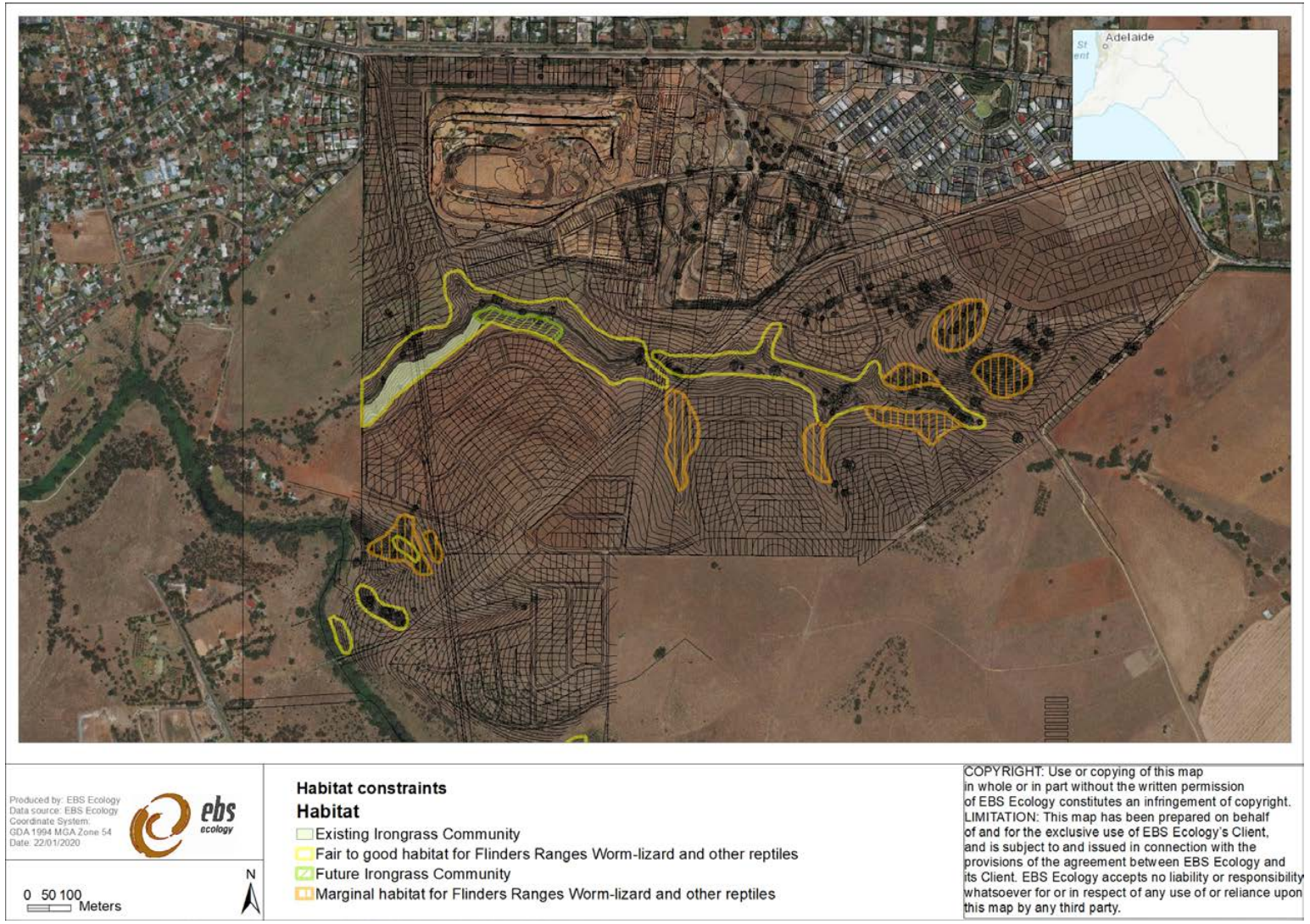

Figure 1. The area of Iron-grass (*Lomandra*) Temperate Grassland and Flinders Worm-lizard (*Aprasia psuedopulchella*) habitat identified within the proposed Springwood development site. (Source data: Gawler East Ecological Survey - Kellogg Brown & Root Pty. Ltd. 20 Aug 2010)

WALLBRIDGE GILBERT AZTEC

MEMORANDUM

DATE: 22nd November 2019

PROJECT NUMBER: WGA 070975

TO: SPRINGWOOD PARK URBAN DEVELOPMENT

ATTENTION: Richard Dwyer

SUBJECT: STORMWATER MANAGEMENT – SCAP RESPONSES

---

1. INTRODUCTION

The Town of Gawler (Council) has provided comments to SCAP in relation to the stormwater management strategy (Strategy) prepared by WGA (June 2019). Following our meeting (7th November 2019) between Council and DPTI, 4 key issues have been raised by Council. This memorandum is prepared in response to these issues. However, we have not necessarily repeated content from the Strategy report in this paper.

These issues are outlined below in no particular order. Herewith we provide our responses accordingly to acknowledge, address and respond to each specific item. Please note that in most cases, the issues would be addressed through the detailed engineering design process, and therefore does not necessarily fall within the realms of planning approval.

2. IMPACT ON HIGH BIODIVERSITY AREAS

Council has raised concerns with regards to the impact on sensitive areas due to the proposed road crossing and detention dam embankment.

The resulting works will require some removal of vegetation from within the creek bed to facilitate the construction of the above mentioned infrastructure. We also note the Strategy will result in significant additional instream vegetation to be established as part of the on line wetland ponds. These systems will provide a far greater level of instream vegetation than currently exists. The design of these systems will be based on establishing a complex mix of local indigenous species along with various aquatic zones to create a riverine structure that will provide biodiversity and babtat opportunities. These works are proposed along the current weed infested sections of Spring Creek east of the watermain crossing.

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WGASA Pty Ltd
ABN 97 617 437 724

3. DETENTION BASIN – ON-LINE VS OFF-LINE ARRANGEMENT

The Strategy is based on providing a detention basin on-line, which means that it utilises the valley of the waterway to accommodate the detention volume. This provides the most efficient and sustainable approach for this type of terrain.

Council has indicated its preference for consideration of an off-line detention storage, we note that the following considerations for an off-line storage is not warranted on the basis of:

- Several basins will be required throughout the development and will require more storage compared to the proposed singe storage.
- Councll will take on additional assets by having to maintain more basins and discharge control structures throughout the development.
- Significant earthworks would be required at each basin due to the steep topography and will result in far greater land disturbance.
- Due to the topography, it is not possible to intercept the whole development into offline detention basin(s).
- There are many examples of similar installations throughout neighbouring Council areas (including Gawler) where detention storages have been constructed online within first, second and third order creek lines. Some examples have been provided below as reference.

Council has raised concerns with regards to loss of in stream vegetation. However, we note that this is a native vegetation matter. Our Consultant team will be seeking a separate approval through the Native Vegetation Council. Furthermore, we wish to point out that through the implementation of the stormwater strategy, there will be significant opportunities to off-set the loss of the common reeds species via the proposed instream wetland ponds and other measures as outlined in the Strategy.

Figure 1: Online detention basin on a third or fourth order waterway upstream of an urban area, north of Potts Road, Gawler

Figure 2: Online flood control dam /detention basin in Cobbler Creek (first order creek) located within the conservation park, Cobbler Creek Conservation Park, Golden Grove.

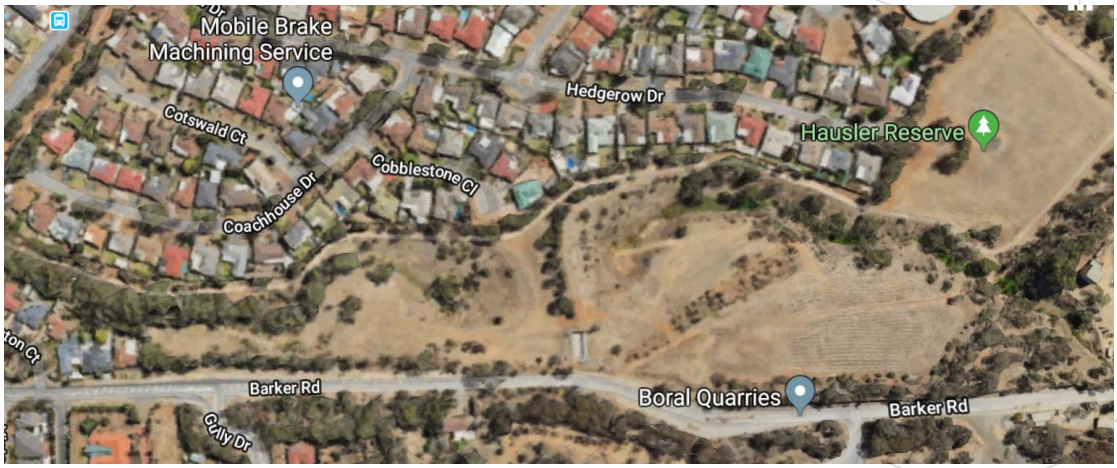


Figure 3: Online flood control dam /detention basin on waterway (third or fourth order creek) located in Highbury.

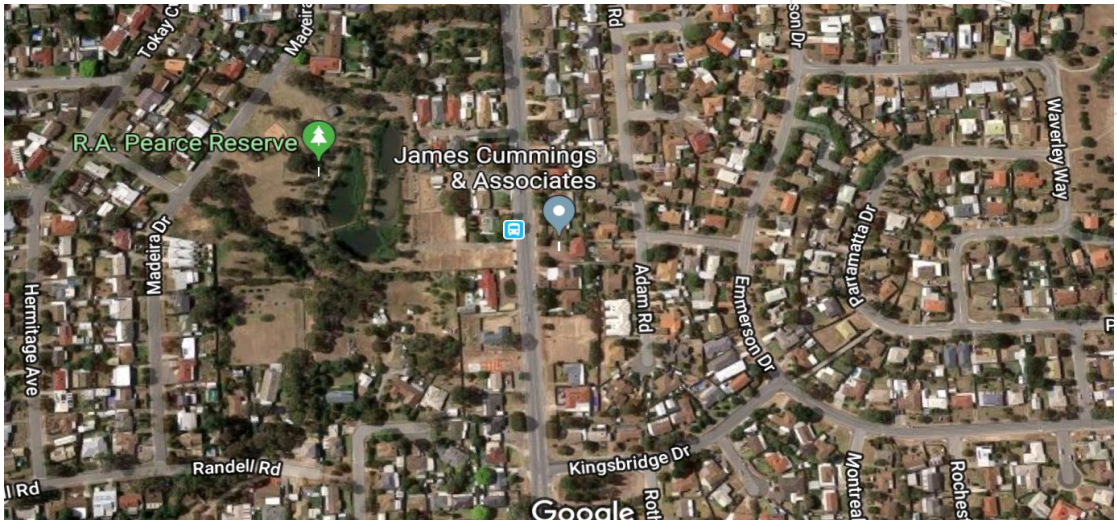


Figure 4: Online flood control dam /detention basin on Morphett Creek (first order creek) located in Morphett Vale.

There are many more examples of on-line detention dams within the fringe areas of Adelaide. We would be pleased to outline more examples upon request.

4. DETENTION BASIN – DISCHARGE CONTROL

The detention basin in the Strategy has been based on accommodating a volume of excess runoff from the Development. This volume is based on controlling the post development peak flow to the pre-development flow for the critical 1% AEP event. We acknowledge the request to control the full suite of design storms to ensure post development peak flows are released to their pre-development flow rates. This will require a hydraulic control chamber incorporating multistage discharge control.

Devices to control a full range of flow frequencies are not uncommon and WGA has undertaken similar designs for other greenfield land developments. We propose to control the following range of flow frequencies; 63%, 20%, 10% 5% and 1% AEP critical events. The design of this structure will be carried as part of the detailed engineering design of the detention basin.

5. DOWNSTREAM EROSION RISK

It is widely understood that urbanisation of rural sites near to existing waterways does pose an increased risk of instream erosion. We believe the Strategy currently addresses this risk along Spring Creek within the development by:

- Providing source control measures within the development to manage the frequent flow events.
- Each treatment system, (ecological sponge, infiltration wells, wetland biofiltration system) provides storage to manage and release 90% of annual post development flows over a 2 - 3 day period.
- Where practical, the strategy seeks to reduce the connectivity (I.e. increase the disconnection) of stormwater released from the urban development to Spring Creek
- The Strategy calls for a system of vegetated wetland ponds, pools and riffles to control in-stream velocity to mitigate the risk of erosion.
- Increase the vegetation density of the common reed species with the existing in-stream marsh along the bed of Spring Creek along the western half of the development.
- Restrict downstream peak flow rates to the pre-development flow rate for each critical rain event for, 63%, 20%, 10% 5% and 1% AEP events.

Notwithstanding the last dot point, it should be noted that the regional detention basin will control discharge to pre-development flow rates, this won't address the increased frequency of flows.

We acknowledge that while the Strategy has addressed the erosion risk within the Development site, downstream risks within the private property equally may need to be addressed. To this end, we recommend that a watercourse assessment of the downstream reach (approximate reach length of 300m to confluence with the South Para River) be undertaken to determine if any measures are required to mitigate erosion risks.

This memorandum has been prepared in support of the stormwater management Strategy report (June 2019) and has provided responses to Council's issues raised at the meeting (7th November 2019). We believe the current strategy has been developed to achieve a pragmatic, balanced and responsive approach for the management of stormwater on the development site.

This approach is also focussed on preservation of existing areas of high environmental value, while also providing opportunities to facilitate buffers by creating new areas that will contribute to similar values. We believe this current strategy will deliver an integrated approach that considers both the environment and stormwater management together. This Strategy demonstrates the role that stormwater can play in contributing to ecosystem services.

We note that in formulating the current Strategy, the Environment Protection Authority (EPA) and Department for Water (DEW)_ were engaged along with Council. Based on the merits of the

strategy, EPA and DEW have provided in principle support, given the topographic and other physical site constraints, with the knowledge and appreciation of the benefits the Strategy will achieve with respect to:

- Protection of existing environmental values
- The number of opportunities provided to offset impacts resulting from construction of the road crossing and detention basin
- The integration of stormwater management with the environment
- The adoption of sustainable WSUD approaches to managing stormwater with a focus on source control, frequent flow management and stormwater treatment, and
- The opportunity the Strategy offers to improve the environmental condition, function and value of Spring Creek.

We note from Council's response document that there are several other comments that will require resolution. It was agreed with Council (at the meeting) that these are minor and can be resolved as part of the engineering design process. Our team will be in direct engagement with Council officers to address remaining issues as part of the engineering design.

We trust that for the purposes of addressing the main issues, that this memorandum provides the confidence and information to SCAP to enable subsequent assessment to continue. Should there be any further queries regarding our responses, please do not hesitate to contact the undersigned.

Yours faithfully

Joe La Spina
Principal Stormwater Engineer
Chartered Professional Engineer
for
WALLBRIDGE GILBERT AZTEC

JL:jvd

REF: S165350

DATE: 16 January 2020

Ekistics
PO Box 32
GOODWOOD SA 5034

Attention: Mr. Richard Dwyer

Dear Richard,

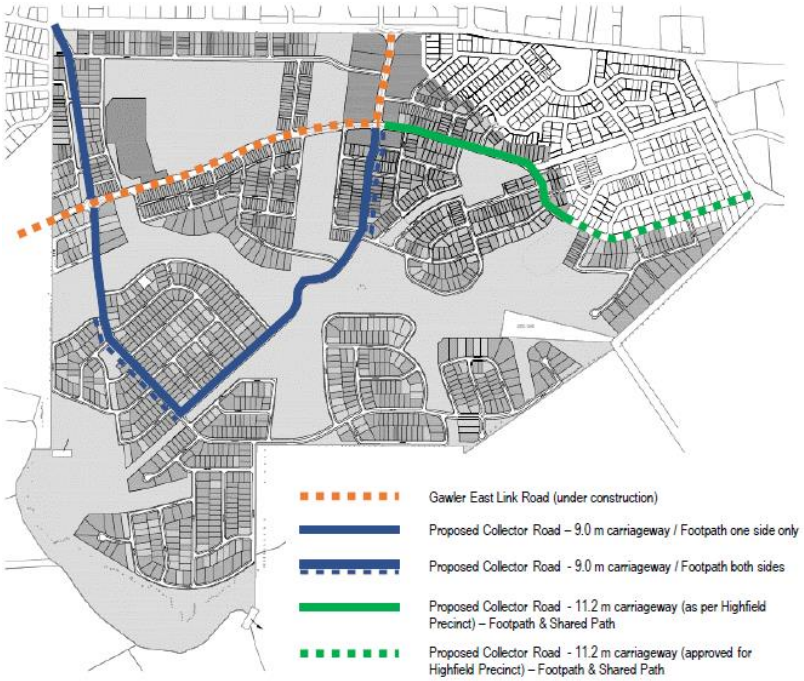
RE: SPRINGWOOD LAND DIVISION – RESPONSE TO RFI: COLLECTOR ROADS

We refer to your email dated 15 January regarding the RFI received from the Department of Planning Transport and Infrastructure (DPTI) in relation to the Springwood Land Division.

We understand that following a review of the plans and GTA's Transport Impact Assessment (TIA) dated 13 June 2019, the Town of Gawler has provided DPTI with comments accepting the proposed road reserve widths but not supporting carriageway widths of less than 11.2 metres for collector roads. DPTI has noted GTA's reference to a 9-metre-wide carriageway for some collector roads proposed within the land division and has sought clarification as to whether this remains within the proposal.

We can confirm that as outlined in the TIA, a series of 9-metre wide and 11.2-metre collector roads are proposed within the Springwood Land Division, as shown in Figure 1.

Figure 1: Proposed Collector Road Network



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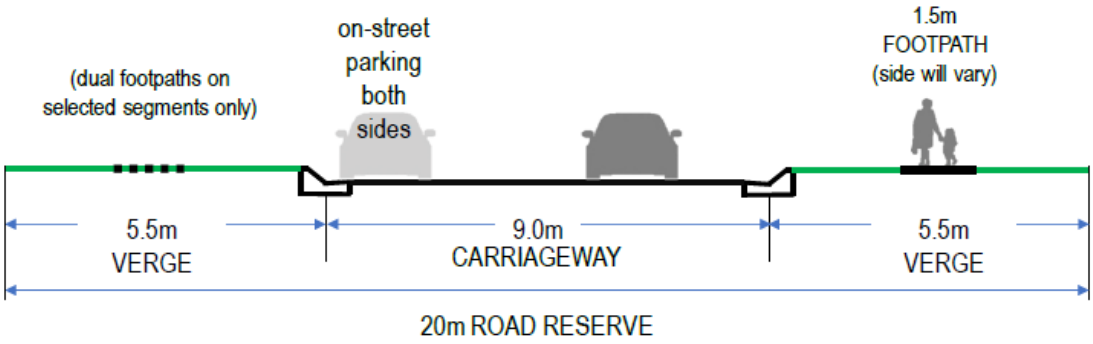
Where 9-metre-wide carriageways are provided for collector roads, the cross section proposed for the road reserve is shown in Figure 2.

Figure 2: Proposed Collector Road Cross Section



Guidance Documents

Guidance for the width of collector roads is provided within AMCORD – A national Resource Document for Residential Development (1997). Guidance has also been sought from the City of Onkaparinga which published its road network plan in 2005 and was subsequently revised with the last revision published in 2016, incorporating revised road cross sections.

AMCORD, generally recommends carriageway widths of between 7.0 metres and 7.5 metres for collector roads while the City of Onkaparinga permits 9 metre-wide carriageways along its urban collector roads.

Proposed 9-Metre-Wide Carriageway Collector Roads

The proposal to provide 9-metre-wide collector roads exceeds the requirements of AMCORD and meets the requirements of City of Onkaparinga's road network plan. The collector roads identified as having a 9 metre carriageway are considered minor in comparison to the Gawler East Link Road and Highfield Precinct Collector Road. Their primary function is to serve as access roads between the local and arterial network.

The proposed carriageway will facilitate on-street parking when required while providing two-way traffic movements. From a road safety perspective, the 9-metre-wide carriageway will assist in achieving voluntary compliance with the urban default speed limit, particularly when parking occurs, creating a road environment consistent with a 50km/h speed environment.

By adopting 11.2-metre-wide carriageways for minor collector roads, particularly when there are low levels of parking, there is a risk that vehicle speeds will significantly increase as a result of the wider and more open road environment. Under such circumstances it is not desirable to construct local area traffic management (LATM) as a means of enforcing the speed since collector roads should be kept free from such devices.

Industry best practice, especially for new road construction, is to manage vehicle speed through design of the road and roadside environment.

Based on the above, GTA considers the proposal to provide 9 metre wide carriageways along the minor collector roads appropriate since the proposed carriageway width:

- Reflects the intended function of the road
- Will assist with self-regulation of the default speed limit
- Will provide a suitable road environment for pedestrian and bicycle movements

- Is in line with industry accepted guidance documents and collector road cross sections adopted by other local government authorities.

Naturally, should you have any questions or require any further information, please do not hesitate to contact me on (08) 8334 3600.

Yours sincerely

GTA CONSULTANTS

Paul Froggatt
Associate Director

Environment Protection Authority
GPO Box 2607 Adelaide SA 5001
211 Victoria Square Adelaide SA 5000
T (08) 8204 2004
Country areas 1800 623 445

EPA Reference: 34633

17 January 2020

Ms Biljana Prokic
Land Division Coordinator
State Commission Assessment Panel
L5
50 FLINDERS Street
ADELAIDE SA 5000

Dear Ms Prokic

ADVICE FOR REGARD - Activity of Environmental Significance

Development Application No.	960/D025/19 & 490/D026/19
Applicant	Arcadian Communities (Alexander Symonds)
Location	A2 FP 7765, A4 DP28814, A9010 and A9011 DP114845, A7030 DP 119118 HD Barossa, A1 FP13468, HD Barossa and Munno Para, Lot 1, 2, 9010, 9011, Balmoral Road, Gawler East & Kalbeeba SA 5118 HD Barossa
Activity of Environmental Significance	Schedule 8 Item 10(b); Schedule 21 Item
Proposal	Land division to create 1,180 allotments (application 4) - (Land division reference 960/D025/19) - to be known as Springwood Development (located across Gawler and Barossa Council areas) EDALA reference 65314

Decision Notification	A copy of the decision notification must be forwarded to: Client Services Officer Environment Protection Authority GPO Box 2607 ADELAIDE SA 5001

I refer to the above development application forwarded to the Environment Protection Authority (EPA) in accordance with Section 37 of the *Development Act 1993*. The proposed development involves an activity of environmental significance as described above.

The following response is provided in accordance with Section 37(4)(a)(i) of the *Development Act 1993* and Schedule 8 Item 10(b) of the *Development Regulations 2008*.

In determining this response the EPA had regard to and sought to further the objects of the *Environment Protection Act 1993*, and also had regard to:

- the General Environmental Duty, as defined in Part 4, Section 25 (1) of the Act; and
- relevant Environment Protection Policies made under Part 5 of the Act.

Please direct all queries relating to the contents of this correspondence to Robert De Zeeuw on telephone (08) 8204 1112 or facsimile (08) 8124 4673 or email Robert.DeZeeuw@sa.gov.au.

THE PROPOSAL

This development application (DA) proposes a residential land division to create 1,180 allotments which is part of the Springwood development (Application 4). This DA is one of four applications, including a 188 allotment division which has also been referred to the EPA (DA 490/D025/19).

It is understood from the Staging Plan (drawing REF: A010816, DWG NO.: A010816-CG STAGING PLAN REV D, REVISION: C, DEL 21.11.2019 by Alexander Symmonds) that the proposal contains the following 'stages':

- V2 (portion of)
- V3 (portion of)
- V4 (portion of)
- V5
- V6
- V7
- V8
- V9
- V10

The sequence these 'stages' intended to be developed and indicative time frames around this and associated infrastructure is unclear. Notwithstanding, the EPA has undertaken an assessment of both applications, and this response will reference both applications where necessary.

SITE DESCRIPTION

The site of the proposed development is 185.6 hectares in area.

More specifically, the subject land comprises the following Certificates of Title:

- Volume 6233 Folio 59 (Allotment 7047, DP 123025)
- Volume 6205 Folio 146 (Allotment 9010, DP 114845)
- Volume 6186 Folio 869 (Allotment 9011, DP 114845)
- Volume 6118 Folio 249 (Allotment 2, F7765)
- Volume 6184 Folio 173 (Allotment 1, F13468)
- Volume 6162 Folio 334 (Allotment 4, D28814)

The subject land is located within the Town of Gawler and Barossa Council and is located to the east of the Gawler township.

The relevant and applicable Development Plans are the Gawler (CT) Development Plan (consolidated 20 February 2018) and the Barossa Council (Consolidated 1 November 2018).

The portion of the land in the Barossa Council area is split into two zones:

- Open Space Zone
- Residential (Gawler East) Zone.

The portion of land in the Town of Gawler is also split into two zones:

- Open Space Zone
- Residential (Gawler East) Zone.

The subject land is currently vacant and utilised for the purposes of primary production (grazing and agriculture).

The site was inspected by EPA staff during the consideration of this DA and has been viewed using mapping information available to the EPA, including recent aerial imagery, and considered according to existing knowledge of the site and the locality.

CONSIDERATION

Advice in this letter includes consideration of the location with respect to existing land uses and is aimed at protecting the environment and avoiding potential adverse impacts upon the locality.

When assessing DAs referred to the EPA in accordance with the requirements of the *Development Act 1993*, section 57 of the *Environment Protection Act 1993* ('the EP Act') states that the EPA must have regard to, and seek to further, the objects of the EP Act and have regard to the general environmental duty, any relevant environment protection policies and the waste strategy for the State adopted under the *Zero Waste SA Act 2004* (if relevant).

The 'Discussion Relating to Advice' and 'Advice' sections of the following response are provided in accordance with section 37(4)(a)(i) of the Development Act and Schedule 8 Item 10(b) of the Development Regulations.

The 'Other Comments' section of this response is to assist the relevant to authority undertake an environmental assessment of those parts of the application outside the scope of the activity of environmental significance that triggered the referral to the EPA.

ENVIRONMENTAL ISSUES

DISCUSSION RELATING TO ADVICE

Interface Between Land Uses

The site is not located within the EPA's recommended evaluation distance of any EPA licensed site as specified in the EPA publication *Evaluation distances for effective air quality and noise management* (dated August 2016). In addition, the site is not located adjacent a major road or rail line. As such, the EPA considers that future occupants of the proposed allotments are unlikely to be exposed to any adverse noise and/or air quality impacts.

Water Quality

Staging

Documentation provided to support the proposal includes a stormwater strategy by WGA titled "Springwood Urban development, revision E, dated 13 June 2019" (stormwater strategy). In addition, Ekistics have provided additional information in letters dated 22 November and 23 December 2019, with additional information responding to EPA and other agencies queries.

The stormwater strategy provides the general sequencing for implementation of various key Water Sensitive Urban Design (WSUD) features for the overall development of 1,415 allotments. The strategy has been established ensuring most stages within the development would feature a WSUD system such as a wetland, wetland pond and bio-filtration system. The proponent has advised that it is difficult to provide a specific or definitive outline of infrastructure that would be implemented over a course of time, or even which 'stages'.

Stormwater management implementation sequencing has been outlined in the stormwater strategy. However this is generalised, without clear time frames and refers to villages rather than the two development applications presented to the EPA. The following information on the principles of how stormwater implementation sequencing would occur throughout the various development applications has been provided as follows:

- Each stage
    - Stormwater drains into individual WSUD systems. Consider partial construction depending upon catchment area contributing to each system.
- Village Centre
    - Stormwater managed within proposed systems (Nodes 1 and 2)
- Village 3
    - Stormwater to be managed effectively within several treatment systems constructed partially or fully (depending upon area of contributing catchments)
    - Construct temporary sedimentation basin A in Spring Creek
    - Construct 50% of the in-stream wetland ponds integrated as part of the rock riffle installations
- Village 4
    - Stormwater to be managed effectively within several treatment systems constructed partially or fully (depending upon area of contributing catchments
- Village 5
    - Stormwater to be managed effectively within several treatment system constructed partially or fully (depending upon area of contributing catchments)
    - Construct another 25% of the in-stream wetland ponds integrated as part of the rock riffle installations
- Villages 6 and 7
    - Stormwater to be managed effectively within several treatment systems constructed partially or fully (depending upon area of contributing catchments)
- Villages 8 and 9
    - Stormwater to be managed effectively within several treatment systems constructed partially or fully (depending upon area of contributing catchments)
- Village 10

- Stormwater to be managed effectively within several treatment systems constructed partially or fully (depending upon area of contributing catchments)
- Construct the regional trash rack at the first stage of Village 10
- Construct the remaining 25% of in-stream wetland ponds and complete all temporary basins including Wetland Pond A

Stormwater Management

Land subdivision and subsequent built development is generally associated with vegetation clearance and increased impermeable surfaces that would increase runoff and pollutants in stormwater. Land surfaces can be left open and vulnerable to the erosive powers of water and wind, particularly during the construction phase.

The principles of WSUD assist in offsetting the effects of urban development through improving management of urban stormwater and are considered best practice stormwater management. When carefully planned, designed, constructed and maintained, WSUD can achieve multiple objectives including the protection of receiving waters. The EPA considers that best management practices demonstrate compliance with the general environmental duty as defined in section 25 of the EP Act. The EPA strongly supports a range of WSUD elements in new developments that would also meet stormwater quality targets as per the table below.

Pollutant	**Current best practice performance objective**
Suspended solids (SS)	80% reduction in average annual pollutant load compared to an equivalent urban catchment with no water quality management
Total phosphorus (TP)	60% reduction in average annual pollutant load compared to an equivalent urban catchment with no water quality management
Total nitrogen (TN)	45% reduction in average annual pollutant load compared to an equivalent urban catchment with no water quality management
Litter	90% reduction in litter/gross pollutants

The stormwater strategy outlines a concept stormwater strategy for the overall development including a number of WSUD features in a treatment train approach. These features include:

- trash racks on Spring Creek
- creation of wetland pools and macrophyte zones within Spring Creek
- wetlands
- vegetated swales
- infiltration wells.

It is proposed that some of these features would be within the existing Spring Creek. The EPA advises that stormwater quality treatment and WSUD features should generally be located offline from existing water bodies such as Spring Creek (i.e. prior to discharge into the waterbody). However, given the nature and topography of the subject site, and as discussed with WGA, the EPA considers online treatment as a 'reasonable and practical' solution for the operational phase of the development (once development and construction activities are completed) provided all stormwater is treated prior to its discharge to the existing marsh area of the creek.

MUSIC modelling has been undertaken on the concept strategy outlined with the results of the modelling provided for the overall pollutant reductions from the development, as well as areas upstream of the marsh area and at each individual outlets. These results indicate that the stormwater runoff objectives outlined in Table 1 can be met based on the concept strategy outlined. This is acceptable to the EPA.

The EPA notes that the detailed engineering design will refine how these features are developed. The staged nature of the development is acknowledged, with detailed engineering design for each stage to be completed over a number of years. The EPA considers it is crucial that the detailed design of the stormwater management systems for each proposed stage of the development achieve the outcomes outlined in the concept stormwater strategy. The EPA notes that in correspondence from *Ekistics* dated 23 December 2019 have stated that *"stormwater quality treatment measures will be adopted for each Stage"*.

Wastewater

The planning report by Ekistics has advised that there is an existing wastewater network installed in 2015 as part of the existing Springwood development which is owned and operated by SA Water and currently drains to the Calton Road sewer, servicing 387 allotments (both built and future dwellings). SA Water has advised that a portion of the proposed development can be serviced via the existing wastewater infrastructure within Calton Road.

It is understood that SA Water requirements to service the development beyond 660 residential allotments would trigger a sewer pumping network to be installed, extending from the site's western boundary to the gravity main installed within the Gawler East Link Road and Potts Road. Furthermore it is understood that SA Water is currently updating their internal sewer concept plans for the proposed development (based on the proposed road and allotment layout) and this would be used as the basis for detailed stage design for wastewater infrastructure. The EPA therefore considers this arrangement acceptable. A condition is recommended below in this regard.

OTHER COMMENTS

Construction Management

<u>Soil Erosion and Drainage Management</u>

Development of a Soil Erosion and Drainage Management Plan (SEDMP) is the first step in outlining how erosion and capture of eroded sediment and pollutants would be managed during the construction phase. The stormwater strategy provided an outline that the construction contractor is to develop Construction Environment Management Plans (CEMP) including Soil Erosion and Drainage Management Plans (SEDMP) for each 'stage' of the development. These are to be prepared in consultation with

Barossa Council and the Town of Gawler, with the detailed design for each stage to include a site specific SEDMP to be submitted as part of engineering approval. The EPA advises that CEMP and SEDMP implementation should be actively managed by the proponents during development and should the measures identified fail to achieve adequate compliance with the *Environment Protection (Water Quality) Policy 2015*, the measures identified would need to be modified accordingly.

It is further stated that the SEDMP *"will require a sequence of management techniques to work collectively"* and that all WSUD systems are proposed to function to *"intercept sediments during construction and upon completion reworked to create their final operational treatment form and accordingly in the operational phase function as stormwater treatment"*. However, many of the WSUD features are planned as in stream features such as wetland ponds. As stated above, the EPA's first preference is that such WSUD features are offline however for this site it is considered that online treatment is a reasonable and practical solution for the operational phase of the development. However, instream sedimentation basins during the construction phase are not usually considered appropriate under any circumstances.

In the correspondence from Ekistics dated 23 December 2019 it is stated that *"all WSUD measures for each stage will be set up as 'offline' sedimentation basins during the construction phase. These will then be completed when the development stage is completed to facilitate operational phase stormwater treatment"*. It is acknowledged that in some instances during the construction phase the SEDMP measures could be exceeded in large rain events, and/or it may not be practical to intercept all sediment given the steep topography. Accordingly, *"Sedimentation Pond A' is located at a proposed instream wetland pond and like all other WSUD measures 'Sedimentation Pond A' will be converted to provide instream stormwater treatment"*. This acknowledges, managing erosion and capturing sediment on the steep topography particularly, during large rain events may be challenging, and hence the placement of the 'Sedimentation Pond A' prior to the marsh zone.

The management of erosion and capture of soil and other pollutants would require stringent controls are put in place and actively managed and maintained throughout the development and construction phase. Sediment capture of the proposal downstream of 'Sedimentation Pond A' must be achieved prior to discharge into the creek or waterbodies. This would require ongoing and significant management by the proponent and the Council(s) throughout the extended development phase.

As such, during site works particular attention must be given to protecting land stability and to the immediate rehabilitation and stabilisation after disturbance of the land surface. The development of the SEDMP in accordance with the *Stormwater Pollution Prevention: Code of Practice for the Building and Construction Industry* (found at: www.epa.sa.gov.au/files/47790_bccop1.pdf) should be prepared prior to construction commencing. It should include responsibilities for maintenance and corrective actions. The SEDMP must be implemented and maintained throughout the construction process.

The SCAP should therefore ensure that the SEDMP is prepared, implemented and maintained throughout the construction process. The SEDMP may form part of a Construction Environmental Management Plan (CEMP). Given the topography of the site and vicinity to watercourses, a condition is recommended below in this regard.

Construction Environment Management Plan

During construction, efforts should be made to minimise dust and noise emissions generated from site works. The EPA considers that air quality may be affected by machinery and vehicular movement

during site works and any open stockpiling of soil or building materials at the site. Dust generation can also be expected if the site development occurs during dry weather periods and this has the potential to impact on nearby residences.

Therefore, the SCAP should consider seeking a CEMP be prepared and implemented throughout the construction process to address the mitigation or minimisation of noise and air quality impacts (especially dust) during the construction phase.

Site Contamination

Any change in land use from industrial, commercial or agricultural/horticultural activities to a more sensitive land use (i.e. residential) can give rise to an inherent risk of potential site contamination.

Summary of EPA records

The EPA has received a site contamination audit commencement notification for each of the certificates of title relating to this DA. The EPA has received two site contamination audit reports and associated site contamination audit statements (SCAR & SCAS respectively). The SCAR/SCAS relate to Stages 1 and 2 of the Springwood development.

The following SCARs relate to the full portion of CT 6212/430 and a portion of CTs 6205/146 and 6162/334:

- *Site Contamination Audit Report, Stage 1 Gawler East Development, Calton Rd, Gawler East SA*, prepared by Phillip Hitchcock and dated 29 March 2011 (EPA reference 60456-001A) and
- *Site Contamination Audit Report Stage 2 Gawler East Development, Calton Rd, Gawler East, South Australia*, prepared by Phillip Hitchcock and dated 21 June 2013 (EPA reference 60456-002)

The remaining portions of CTs 6205/146 and 6162/334 and the whole area of CTs 6186/896, 6118/249 & 6184/173 remain the subject of an active site contamination audit.

Stages 1 and 2

The EPA understands that some of the land subject to the DA (all of CT 6212/430 and portions of CTs 6205/146 and 6162/334 were the subject of the above Site Contamination Audit Reports, completed by Mr Phillip Hitchcock, a Site Contamination Auditor appointed in accordance Part 10A of the *Environment Protection Act 1993*.

The Site Contamination Audit Reports state that the site is suitable for unrestricted land use with no specific conditions or recommendations are required to be implemented at the site.

The EPA notes that some time (greater than 3 years) has lapsed since the completion of the Site Contamination Audit Report and the EPA is unaware whether a potentially contaminating land use has occurred on the site in the intervening period. The planning authority should therefore consider whether any of these activities may have occurred and if so, if the audit conditions have not been complied with, then the site may no longer be suitable for the intended use and a new site contamination audit may be warranted.

Therefore it is recommended that preliminary desktop investigations, which may take the form of a Preliminary Site Investigation (PSI) report be required to be completed for the time period since the submission of the site contamination audit reports (2011 and 2013 respectively) to present. The PSI should:

- be prepared by a certified site contamination practitioner in accordance with Schedules A and B of the *National Environment Protection (Assessment of Site Contamination) Measure 1999 (*as amended in 2013 - the NEPM); and
- document the preliminary investigations at the site carried out in accordance with the NEPM; and
- determine whether a potentially contaminating land use as described in Schedule 3 of the *Environment Protection Regulations 2009* has occurred with the potential to affect the subject site since the completion of the site audit report dated 29 March 2011 and 21 June 2013 respectively; and
- provide statements in relation to the existence of site contamination at the site. Statements by certified site contamination practitioners in relation to site contamination must be clearly qualified as to the existence of site contamination at the site by specifying the land uses that were taken into account in forming that opinion as required by Section 103Z of the Environment Protection Act.

Stages 3 and 4

The remaining portions of CTs 6205/146 and 6162/334 and the whole area of CTs 6186/896, 6118/249 and 6184/173 remain the subject of a site contamination audit which is yet to be completed.

Auditors may issue interim audit advice to assist in the planning and development process where an audit is being carried out but is not yet completed. Interim advice should only be used a means of informing planning authorities on the likely suitability of land for its intended use and does not of itself constitute an audit report. By issuing interim audit advice the auditor provides an opinion that based on the knowledge available at that time, it should be possible for the audit site to be made suitable for the proposed use(s). Interim advice should be followed by a subsequent audit report to fully satisfy the needs of a planning authority.

In providing interim audit advice in this instance, the auditor must consider:

- the nature and extent of any site contamination present or remaining on or below the surface of the site;
- what remediation is or remains necessary for a specified use or range of uses; and
- the likelihood of achieving the desired audit outcome (ie that the site is suitable for its intended use) based on (i) and (ii) above.

In order to provide this advice, there must have been sufficient assessment of the nature and extent of any site contamination present for the auditor to form an opinion regarding what remediation may be necessary (i.e. the assessment of the site must satisfy the requirements of the auditor). Further assessment should generally not be required.

Where remediation is or remains necessary for the specified use or range of uses, the auditor must have considered and endorsed relevant remediation management plans. The endorsement of the

auditor and a copy of the remediation management plan(s) must be provided with the interim audit advice.

The planning authority is advised that when a change of land use to a sensitive use is proposed and site contamination is suspected or known to exist; the health, safety and environmental implications of site contamination must be given due consideration. The planning authority must be satisfied that the site is suitable for the use proposed.

It is essential that an applicant be requested to demonstrate that the site is suitable for the proposed use. If a planning authority has reason to suspect that the subject land is, or has the potential to be contaminated (i.e. through the presence of known site contamination or a potentially contaminating land use having been carried out), it is essential that the applicant is requested to demonstrate that the site is suitable for the use proposed.

The EPA notes that the report *Preliminary Site Investigation, Springwood Development Stages 3 & 4, Gawler East, South Australia,* prepared by LBWco Pty Ltd and dated 13 June 2019, provided with the development application, identified that the following potentially contaminating activities had occurred at the site:

- Concrete batching works
- Wastewater storage, treatment or disposal
- Chemical storage
- Mineral processing, metallurgical laboratories or mining or extractive industries
- The storage at a discrete premises of the business of –
    - 500 litres or more of a liquid listed substance

As potentially contaminating activities have been undertaken at the site and/or site contamination has been identified to exist, the EPA recommends the use of site contamination auditors accredited by the EPA as appropriate persons to assess the suitability of a site for the intended use where site contamination is known to exist or a potentially contaminating activity has been undertaken and a sensitive use of the land is proposed. Statements by site contamination consultants or certified site contamination practitioners in relation to the suitability of land for sensitive use in these circumstances are not considered appropriate.

Therefore, before making a decision on this development application, the planning authority must be satisfied that the site is suitable for the intended residential use. This may include further detailed site investigations (DSI) in accordance with the *National Environment Protection (Assessment of Site Contamination) Measure (2013)* https://www.legislation.gov.au/Details/F2013C00288 and/or a Site Contamination Auditor accredited by the EPA under Part 10A of the *Environment Protection Act 1993* be engaged to carry out a Site Contamination Audit.

If the DSI identifies the presence of site contamination at the site, a Site Contamination Auditor accredited by the EPA under Part 10A of the *Environment Protection Act 1993* should be engaged to complete a Site Contamination Audit Report to ensure the subject land is suitable for the proposed sensitive land use.

If during any site works, contamination is identified which poses actual or potential harm to the health or safety of human beings or the environment that is not trivial, taking into account the land use, or harm to water that is not trivial, the applicant may need to remediate the contamination in

accordance with EPA guidelines. A note in this regard is advised.

CONCLUSION

Once the planning authority is satisfied with the suitability of the land division from a site contamination perspective, the EPA considers that the environmental impacts can be kept within acceptable limits provided the proposed development is established in accordance with the advised conditions and notes provided below.

ADVICE

The planning authority is advised to attach the following conditions to any approval:

1. The detailed design of the stormwater management system must meet the outcomes at each outlet point modelled in the concept design outlined in *Springwood communities, Springwood Urban Development, Springwood Park Urban Development Project No. 070975 Doc No. WGA070975-RP-CV-0012 Rev. E* , dated 13 June 2019. Note: The outlets are identified in Figure 6.2 and Table 6.3 of *Springwood communities, Springwood Urban Development, Springwood Park Urban Development Project No. 070975 Doc No. WGA070975-RP-CV-0012 Rev. E*.
2. A Soil Erosion and Drainage Management Plan (SEDMP) be prepared and implemented for the entirety of each stage of the development in accordance with the *Code of Practice for the building and construction* industry to prevent soil sediment and pollutants leaving the site or entering watercourses during development of the site.

The following notes provide important information for the benefit of the applicant and are requested to be included in any approval:

- The applicant is reminded of its general environmental duty, as required by Section 25 of the *Environment Protection Act*, to take all reasonable and practicable measures to ensure that the activities on the whole site, including during construction, do not pollute the environment in a way which causes or may cause environmental harm.
- The applicant is reminded that due care should be taken to prevent or minimise adverse impacts and to appropriately manage stormwater runoff during construction and post-construction. Guidance can be found in the EPA's *Stormwater Pollution Prevention Code of Practice for the Building and Construction* Industry: http://www.epa.sa.gov.au/files/47790_bccop1.pdf
- If during any site works, contamination is identified which poses actual or potential harm to the health or safety of human beings or the environment that is not trivial, taking into account the land use, or harm to water that is not trivial, the applicant may need to remediate the contamination in accordance with EPA guidelines
- EPA information sheets, guidelines documents, codes of practice, technical bulletins etc can be accessed on the following web site: http://www.epa.sa.gov.au

Yours faithfully

Courtney Stollznow
Delegate
ENVIRONMENT PROTECTION AUTHORITY

Government of South Australia
Department for Energy and Mining

Our Ref: MER F 2009/000399; 2019_086

15 July 2019

Development Assessment Commission
Submitted via the Electronic Land Division Lodgement Site (EDALA)

To Whom It May Concern,

Land Division Application: Development Numbers 960/D025/19 and 960/D026/19

I refer to the above land division applications (65313 and 65314) in the vicinity of Pipeline Licence (PL) 13, licensed to SEA Gas Pty Ltd for the Port Campbell to Adelaide gas pipeline (PCA) under the *Petroleum and Geothermal Energy Act 2000 (PGE Act)*.

The *PGE Act* requires all transmission pipelines to be designed, constructed, operated and maintained in accordance with Australian Standard (AS) 2885: *Pipelines – Gas and Liquid Petroleum* (Regulation 29). This standard exists to ensure protection of the pipeline, which in turn ensures the safety of the community, protection of the environment and security of (gas) supply to users.

AS 2885 requires that the pipeline be designed to ensure it will be compatible with the surrounding land use. Where there is a change in land use, it must be demonstrated that risks have been reduced to As Low as Reasonably Practicable (ALARP).

This land division application has been referred to the Department for Energy and Mining (DEM) as it is within the measurement length of the PCA.

The PCA has been designed to be compatible with Rural land use in this location, based on the information available regarding the existing and planned land use at the time of construction. The proposed development will result in a change to the existing Rural land use classification.

In 2017, as required by AS 2885, a Safety Management Study (SMS) was undertaken by SEA Gas, involving the Gawler Council, the developer and DEM as the technical regulator of the transmission pipeline, to identify the controls required to ensure that the risk of the pipeline operation remains ALARP throughout and following completion of the proposed development.

SEA Gas have advised that the information submitted by the developer and available on EDALA in support of this application does not provide assurance that the development incorporates the actions identified in the SMS study.

If this land division application is approved, DEM recommends a condition that the actions of the 2017 SMS are complied with. If there are any changes to the proposed land division or land use outside the scope of the 2017 SMS study, a new SMS for the development must be undertaken, and the proponent, licensee and relevant stakeholders must participate in a SMS validation workshop. The controls and actions identified in the SMS must then be implemented.

Direct contact with SEA Gas on this matter should be through Michael Jarosz on 0477 112 463 Michael.Jarosz@seagas.com.au.

ENERGY RESOURCES DIVISION
Level 7, 11 Waymouth Street, Adelaide SA 5000 | GPO Box 320 Adelaide SA 5001 | DX452
Tel (+61) 8 8429 2470 | ABN 83 768 683 934

If you have any queries in relation to this matter, please contact me on (08) 8429 2470 or Michael.Malavazos@sa.gov.au.

Yours sincerely,

Michael Malavazos
Director Engineering Operations
Energy Resources Division
Department for Energy and Mining

Government of South Australia

SA Housing Authority

Level 5
Riverside Building
North Terrace
Adelaide SA 5000

Tel: 131 299

GPO Box 1669 Adelaide SA 5001

State Commission Assessment Panel
Development Division
Level 5, 5 Flinders Street
ADELAIDE SA 5000

Dear State Commission Assessment Panel,

Referral Response to Application for Development Plan Consent

Application Number	490/D026/19 and 960/D025/19
Applicant	Arcadian Communities
Subject Land	Lots 2, 1, 9010, 9011 Balmoral Road, Gawler East and Kalbeeba
Proposal	Conventional Land Division

1. The subject land is located within areas of the Corporation of Town of Gawler and the Barossa Council so the development application has been lodged across two Local Government Areas.
2. The Corporation of Town of Gawler Development Plan (Consolidated – 20 February 2018) and the Barossa Council Development Plan (consolidated 1 November 2018) identify the location of the subject land as an affordable housing designated area.
3. Majority of the subject land is located within Residential (Gawler East) Zone, Objective 2 for which requires inclusion of a minimum of 15 percent affordable housing from total residential dwellings. Principle of Development Control 1 for the Zone defines affordable housing as envisaged land use. Principle of Development Control 7 for the Zone states that land division should facilitate the provision of a broad range of housing options, including affordable housing.
4. There is a Land Management Agreement (AG 11764743) in place over the subject land which requires the Applicant to deliver at least 15% of the residential dwellings as Affordable Housing outcomes. The Applicant has provided an Affordable Housing Plan which provides 15% affordable housing. The development should be assessed on the basis that it is providing affordable housing.
5. Should the Applicant have further questions on how to meet their obligation on delivering affordable housing outcomes as a part of their proposal, they are encouraged to contact Maria Klimenchuk at SA Housing Authority (tel. 8207 0625).

Yours sincerely,

Maria Klimenchuk
AFFORDABLE HOUSING OFFICER
HOMES AND PARTNERSHIPS
SA HOUSING AUTHORITY

20/ 06/ 2019

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12 December 2019

State Commission Assessment Panel
Level 5, 50 Flinders Street
GPO Box 1815
Adelaide SA 5001

Dear Hannah,

DEVELOPMENT NO:	490/D026/19
APPLICANT:	Springwood Communities
PROPOSAL:	Land Division – 490/D026/19
SUBJECT LAND:	Balmoral Road Gawler East

I write in relation to the documentation recently supplied to Council pertaining to Springwood Communities' response to SCAP's request for further information dated 22 November 2019.

As previously advised in an email to you dated 25 November 2019, the Town of Gawler would like to formally request the opportunity for representative/s of the Council to present to SCAP when the land division application 490/D026/19 is presented for consideration.

Whilst Council acknowledges SCAP has raised a number of concerns with the applicant following Council's submission dated 15 August 2019, which have been responded to by the applicant's representatives (being Ekistics and WGA), there are still a number of matters that remain outstanding from Council's perspective. These outstanding aspects are detailed below and further reiterated in our previous submission. Please refer to the Town of Gawler's previous submission dated 15 August 2019 for further guidance. Council considers that these matters should be resolved prior to any Development Authorisation being issued.

1. Public Notification/Categorisation

Council notes that the subject land division application has been deemed by SCAP to be a Category 1 form of development, in that the creation of the additional 1,201 allotments will not change the nature and function of the existing road network.

As stated in our previous submission, and based on the investigations undertaken by the applicant's traffic engineer, the proposal is anticipated to increase traffic volumes on Cheek Avenue from 2000 vehicles per day to 7500 vehicles per day. Such an increase will inevitably change the nature and function of Cheek Avenue from a Local Road to a Collector Road. This is evidenced within the proposed road hierarchy, which sees roads within the proposed estate categorised as collector roads based on traffic volumes of a lesser extent, being those ranging within 2900 to 6500 vehicles per day respectively.

The traffic report prepared also indicates that Sunnydale Avenue will accommodate a volume of 4500 vehicles per day. This volume is equivalent to a Collector Road standard and would require this road to be upgraded from a local road to a collector road as a result of the proposal.

As the proposal will change the nature and function of these existing roads, Council disagrees with SCAP's determination in this instance, in that the land division application should be considered as a Category 2 form of development in accordance with Schedule 9 Clause 21 of the *Development Regulations 2008*. Refer to **Attachment 1** for independent correspondence from Tonkin supporting this position.

2. Infrastructure Funding (Deed and Land Management Agreements)

On 25 May 2017, Council and the Minister for Transport and Infrastructure entered into a Deed setting out the Minister's commitment to fund and construct the Gawler East Link Road (GELR), as well as Council's obligations to repay a portion of this cost to the Minister on behalf of future developers – including Springwood.

Contemporaneously, and as required by Council in the GELR Deed with the Minister, Council entered into a GELR Deed with the Developer (Springwood) obligating them to pay to Council the cost of the GELR within their estate, as and when development occurs.

As part of the GELR Deed between Council and the Minister and that between Council and Springwood Communities Pty Ltd, all parties also reached an in-principle agreement on the cost and scope of other forms of critical infrastructure required to support development within the Gawler East Development Area, namely Traffic Interventions and Community Infrastructure.

It was also agreed that both the GELR Deed and subsequent Traffic Interventions and Community Infrastructure Deeds once executed, would be registered over the land via a Land Management Agreement.

To date the Deeds and associated Land Management Agreement, and thus agreement on the provision of critical infrastructure, remains outstanding. From Council's perspective, this Deed and associated Land Management Agreement should be executed and registered over the land prior to any Development Authorisation being granted.

The notion that this infrastructure has otherwise been secured via the application of the Gawler East Separate Rates is somewhat flawed, as these Separate Rates need to be applied annually and are subject to challenge. Likewise, simply executing the Deed in the absence of a Land Management Agreement tying the obligations to the land will still leave all parties, including the State Government, exposed.

3. Native Vegetation and Biodiversity Protection

The Council notes that the subject land contains a threatened ecological community and a threatened species of fauna listed under the Commonwealth *Environment, Protection and Biodiversity Conservation Act 1999* – being Iron-Grass Natural Temperate Grassland (listed as critically endangered) and the Flinders Ranges Worm-Lizard. This is evident by the enclosed Referral Decision from the then Department of Sustainability, Environment, Water, Population and Communities concerning a previous development proposal for the division of the subject land. Refer **Attachment 2**.

The latest response provided by Ekistics acknowledges the requirement to undertake both a *Native Vegetation Act 1991* and an *Environment, Protection, Biodiversity and Conservation Act 1999* referral. However, it appears that neither an informal or formal referral has occurred at this point.

As such, Council has reviewed the current allotment configuration overlaid with the previous *Environment, Protection, Biodiversity and Conservation Act 1999* referral advice and notes that the layout conflicts with the protected areas in a number of locations. It is Council's opinion that the proposed development application in the current configuration is in contravention of the previous *Environment, Protection, Biodiversity and Conservation Act 1999* referral advice.

Council is concerned that the proposed development may not be able to lawfully proceed under the *Environment, Protection, Biodiversity and Conservation Act 1999*. As the SCAP would, no doubt, be aware, Section 51 of the Australian Constitution operates such that the *Environment, Protection, Biodiversity and Conservation Act 1999* applies to the subject land over and above the *Development Act 1993* such that a Development Authorisation granted under the *Development Act 1993* cannot modify or exclude the operation of the *Environment, Protection, Biodiversity and Conservation Act 1999*.

In response to Ekistics correspondence, Council notes that no additional information has been provided to confirm that discussions have been had with the Native Vegetation Council, and whether or not the division has been undertaken in consultation with the Native Vegetation Council to limit impacts on endangered ecological communities.

Native Vegetation Council approval should also be sought for any proposed tree removal. It is noted that no arborist reports have been provided to support any tree removal. Removal of remnant trees within the subject site area requires a Native Vegetation Act 1991 approval. Additionally, where such trees are also a Regulated tree, a Development Authorisation is also required. As such, the removal of any regulated trees should be incorporated within the subject application.

To avoid unnecessary variations in the future, Council recommends SCAP request that the applicant seek consent under the *Environment, Protection, Biodiversity and Conservation Act 1999* and *Native Vegetation Act 1991*. This consent should be obtained, or at least advice sought, prior to any development authorisation being granted.

In addition, the Desired Character Statement for the Gawler East Residential Zone notes the importance of development respecting and enhancing the natural attributes of the Zone through the retention of native vegetation and areas of ecological significance. This is further reinforced within Gawler East Structure Plan GA/1 (overlay 1) enlargement G, and Conservation Council Wide Provisions.

The Ekistics report now shows a Bulk Earthworks Plan which incorporates batter slopes to reduce the extent of retaining walls proposed on public land, which is supported, but these need to be set back further and thus outside any protected areas. Council request the developer provide further documentation to demonstrate the roads can be at a level that does not impact on *Environment, Protection Biodiversity and Conservation Act 1999* protected areas.

4. Stormwater Management

In response to the WGA Memorandum dated 26 November 2019, Council advises there is no mention of the flora and fauna protected by federal legislation under the *Environment, Protection Biodiversity and Conservation Act 1999*. There is no mention of the proposed large dam structure west of the SA Water pipeline that is located in the protected area and there is no mention of the location of these protected areas.

Further to the above and as reiterated in our ongoing deliberations, the proposed stormwater management strategy for the development is at variance with the previous (31 May 2011) *Environment, Protection Biodiversity and Conservation Act 1999* referral advice.

These variances include:

- Stormwater detention ponds in the central tributary (below RL 70)
- The use of sections within the creek below RL 70
- Proposed water bodies to be created west of RL 70

- The clearing of Iron-grass natural temperate grassland

As mentioned the current stormwater management system, specifically the location of a stormwater detention basin within the creek is both below and west of the specified RL 70, is impacting on the Iron-grass natural temperate grassland, and is at variance with the above *Environment, Protection Biodiversity and Conservation Act 1999* referral advice.

The Ekistics report states in relation to stormwater management "Unfortunately, it is not possible to design and install an off-line arrangement due to site constraints". Council reiterates that a stormwater management plan prepared by WGA (formerly Wallbridge & Gilbert) was previously submitted to Council for the subject land in relation to a previous land division and demonstrates off-line stormwater detention is feasible.

There is no reference to the previous WGA stormwater management strategies provided to Council (for another land developer) that demonstrate offline detention is feasible outside of the spring fed creek. It should be noted that a recent example of offline detention has been achieved in a land division within the Gawler East development zone, in similar challenging topography.

Council's Stormwater Watercourse Management Policy seeks to promote the restoration, enhancement and maintenance of the natural environment whilst being compliant with legislative requirements for the management of watercourses. Council does not consider the WGA Stormwater Management Plan/Strategy to be consistent with the Town of Gawler Stormwater Watercourse Management Policy.

The report mentions that erosion risk will be addressed in Spring Creek by "Increase the vegetation density of the common reed species with the existing in-stream marsh along the bed of Spring Creek along the western half of the development". Council does not consider this vegetation should be proposed on land that is protected under the *Environment, Protection Biodiversity and Conservation Act 1999*. Likewise, no supporting documentation has been provided confirming Department of Environment and Water support the proposed stormwater management plan.

In addition, Council still has concerns with the location of infiltration wells in the rear of private allotments and how this will be managed into the future. It is unclear whether the applicant is proposing to provide these wells, or if that obligation will be passed onto future land owners. If this is the case it should be reflected within a Land Management Agreement and preferably the onus of providing such a system by the applicant prior to Section 51 Clearance.

5. Traffic Management

In Council's previous submission to SCAP it was stated that Council would support a 22m wide road reserve for the Collector Type 1 road. We advise that the road reserve for the Collector Type 1 road between the Link Road and Calton Road connecting to Cheek Avenue is less than 22m. However, Council consider the proposed road reserve is acceptable as infrastructure can be provided in the future Western Reserve area (outside of the Spring fed watercourse environment).

Council notes that the amended Plan of Division proposes road reserve widths that are acceptable to Council. However, Council does not support road carriageway widths less than 11.2 metres for collector roads. It is noted the GTA report previously proposed a carriageway width of 9 metres which is not supported by Council. The road carriageway width previously approved in Highfield Stage 2 was 11.2 metres in carriageway width in a 20 metre wide road reserve.

Council would like to draw your attention to correspondence provided to SCAP dated 26 July 2019, which remains unanswered (refer **Attachment 3**). Amongst a range of procedural concerns raised in this correspondence, Council still seeks clarification relative to the issuing of Land Division Consent. Given that Section 331(c) of the *Development Act 1993* requires Council to consent to the vesting of any land into its ownership. Noting to date this consent has not been granted, due to both uncertainty relative to process and outstanding issues.

In closing, whilst Council appreciates the response from Ekistics clarifies some concerns previously raised by Council and subsequently SCAP within the request for further information, a number of initial concerns raised by Council within the submission dated 15 August 2019 were not contained within SCAP's information request and thus remain outstanding. Council is looking forward to continuing to work with Springwood and SCAP to achieve a quality planning outcome for this master planned community.

Regards,

Ryan Viney

Manager Development, Environment and Regulatory Services
Town of Gawler

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15 August 2019

Ms Simone Fogerty
Presiding Member
State Commission Assessment Panel
C/- Department of Planning Transport and Infrastructure
PO Box 1815
ADELAIDE SA 5001

Dear Ms Fogerty,

Re: Springwood Land Division Applications
490/D025/19 (1 existing allotment into 22 allotments)
490/D026/19 (6 existing allotments into 1180 allotments)
490/D027/19 (1 existing allotment into 24 allotments)
490/D028/19 (3 Existing allotments into 188 allotments).

At its meeting on 14 August 2019 the Town of Gawler Council Assessment Panel (CAP) considered the above Springwood Land Division Applications as a referral agency for the purpose of providing comments to the State Commission Assessment Panel (SCAP) as the Relevant Authority.

As a result of CAP's deliberations, please see enclosed a Council Report regarding the four (4) Land Division Applications. However, and to avoid any doubt, it should be noted that, at this stage, Council does not support the issuing of either Development Plan Consent pursuant to Section 33(1)(a) or a Land Division Consent pursuant to Section 33(1)(c). Also, the Council does not agree with the proposed vesting of land and assets pursuant to Section 33(1)(c)(iva) of the *Development Act 1993*.

Given the level of information provided to support the proposed land division applications, a number of procedural concerns, uncertainty about the proposed vesting of land into Council's ownership and the fact that significant Infrastructure Deeds between Council and the Developer for the provision of critical infrastructure have not been executed, Council considers that it would be premature to issue any form of consent at this stage. It is therefore recommended that SCAP convene a process that Council, SCAP and the Developer can continue to work collaboratively over the coming months to reach a resolution on each of the issues and concerns raised in the Council Report.
In order to assist in this process Council offers some possible solutions and/or recommendations in order to achieve the best possible planning outcome for both the developer and the community.

In summary, and while support is not provided for the issuing of either Development Plan Consent pursuant to Section 33(1)(a) or to Land Division Consent pursuant to Section 33(1)(c), and that Council does not agree with the proposed vesting of land and assets pursuant to Section 33(1)(c)(iva) of the *Development Act 1993*, Council does look forward to working collaboratively with SCAP and the developer to resolve all outstanding issues as quickly as possible.

Should you require any further information do not hesitate to contact Ryan Viney, Manager Development, Environment and Regulatory Services on 8522 9228.

Yours sincerely,

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A REPORT

TO THE STATE COMMISSION ASSESSMENT PANEL

FROM THE

TOWN OF GAWLER

COUNCIL ASSESSMENT PANEL

Adopted by the Panel at its meeting held on Wednesday, 14 August 2019.

	PROCEDURAL CONCERNS AND CONSIDERATIONS
1.	**Infrastructure Funding**
	1.1. On 26 August 2010 the then Minister for planning rezoned approximately 400 hectares of land in Gawler East to increase the supply of residential land in northern Adelaide to meet expected demand. At the time this land was rezoned, it was acknowledged by the then Minister for Planning that additional road infrastructure would be required to support the intended use of the land. Most notably the need for a Gawler East Link Road and other associated external traffic interventions. 1.2. Rather than ensuring Infrastructure Agreements and other such legal mechanisms (Land Management Agreements) were in place with the beneficiaries of this rezoning to fund this critical infrastructure prior to the land being rezoned (which is now considered to be best practice), a 1000 allotment non-complying trigger was inserted into the Gawler Development Plan. 1.3. This non-complying trigger implied that once 1000 allotments were created in the Gawler East Development Area, the existing road network would be at capacity, and no further allotments should be created until the Gawler East Link Road had been constructed. This approach placed a significant constraint on the development of the land. It is noted that if these Development Applications are approved it will facilitate approximately 1,415 allotments being created within the Gawler East Development Area. 1.4. At the time of rezoning, the Town of Gawler, The Barossa Council, the State Government and the former developer Lendlease agreed in-principle to contribute financially towards a series of traffic interventions, including the construction of the Gawler East Link Road. This was documented in a draft Road Infrastructure and Delivery Deed based on a road classification and alignment designed by the Department of Planning Transport and Infrastructure (DPTI). 1.5. This draft Deed was never executed as there was significant disagreement between all parties on the roads classification (local verses arterial), ownership (State or Local Government), alignment and financial contributions to be made by each of the beneficiaries (land owners). Whilst there was originally a willingness from all parties to contribute towards infrastructure prior to the land being rezoned, once the land was rezoned this willingness diminished significantly, particularly from land owners who had already realised increased land values. 1.6. As a result of this disagreement the project stalled for five years. Then in 2015 the State Government committed $55 million in their 2016 budget for the construction of the Gawler East Link Road over land owned by the Commissioner

	of Highways. However, there was still no financial commitment from Lendlease for their section of the road to ensure a connection to Calton Road in the north and other traffic infrastructure directly related to the development of their land (subject land).
	1.7. Apart from the length of time between the preparation of the original draft infrastructure agreement, the disagreement on critical design elements for the road and concerns with the apportionment of costs, in January 2016 Lendlease sold their interest in Gawler East to Springwood Communities Pty Ltd (Developer). 1.8. Throughout 2016 Council in partnership with The Barossa Council, DPTI and the Developer worked collaboratively to reach agreement on the roads classification, its ownership and alignment and devised an equitable funding model for its delivery. This secured a significant State Government investment in critical infrastructure for the community, and facilitated the accelerated delivery of the GELR prior to the creation of 1000 allotments to provide confidence for developers/investors. 1.9. The funding model was based on the following key principles: a) The developer pays - passive land owners and future residents excluded b) An equitable distribution of costs between beneficiaries c) Establishing a clear nexus between infrastructure provision and the development of the land – infrastructure commensurate with the rate of development. d) Payback to the State Government (return on their investment) e) Commercially sustainable regime of developer contributions f) Facilitate a model that also provided financial contributions towards community development outcomes 1.10. The key to achieving this outcome was the development of a business case that ultimately persuaded the Minister for Transport and Infrastructure to deliver the total Gawler East Link Road alignment within the $55 million already allocated in the State Government budget. This included the road section within Developer's land and the section within the "Other Future Developers" land. In this model the State Government essentially agreed to "bank roll" the total upfront costs for the Gawler East Link Road. 1.11. To ensure the Gawler East Link Road alignment could be achieved within the $55 million budget, Council had to agree to "value engineer" the scope of the road, defer non-essential infrastructure and achieve significant efficiencies through a

collaborative approach to the roads procurement. This ultimately achieved significant upfront savings across the entire length of the road. It is noted that notwithstanding the cost savings sought to be achieved that more recently the overall cost of the project has increased, resulting in the State Government allocating an additional $5m into the project.

1.12. Under this funding model, and a key element to the Minister agreeing to bank roll the upfront expenditure, was the establishment of a mechanism to reimburse the State Government on a per hectare basis to deliver a net saving of $8.2 million. In essence a road that was originally anticipated to cost the State Government $55 million would now cost $46.8 million, through the collective and collaborative efforts of Council, DPTI and Developer. As noted above the road will now come at an upfront cost of $60 million to State Government.

1.13. Ultimately this reimbursement to the State Government is intended to come to fruition through a series of Infrastructure Agreements with developers, such as Springwood Communities Pty Ltd, in the Gawler East Development Area that requires a per allotment contribution (calculated on a per hectare rate on developable land) payable prior to Section 51 clearance (being creation offuture land titles). It is important to note that by applying this contribution before individual allotments are created, the cost is immediately attributed to the developer and not the eventual resident. Likewise, if the land is not subdivided, no such contribution would be required by the land owner. This is a true “developer pays principle”. This is also consistent with the new principles of the Planning, Development and Infrastructure Act 2016, with relation to imminent infrastructure schemes.

1.14. This model also requires the use of Land Management Agreements linking the Infrastructure Agreements to the Land. This ensures the future application and security of the Agreements in the event where the land is sold. These monies would then be collected by Council and passed onto the State Government over time when development occurs.

1.15. While the catalyst for developing the above funding model was driven by the need to find a more equitable approach to the distribution of costs for the Gawler East Link Road and ensure the accelerated delivery of critical road infrastructure, it was considered beneficial to apply the same methodology to other forms of critical infrastructure needed to support the intended future community. This included

	other local traffic interventions and community infrastructure that would not have otherwise been achievable. 1.16. On 25 May 2017, Council and the Minister for Transport and Infrastructure entered into a Deed setting out the Minister's commitment to fund and construct the Gawler East Link Road, as well as Council's obligations to repay a portion of this cost to the Minister on behalf of future developers – including Springwood. 1.17. The Gawler East Link Road Deed documented the parties' respective roles and responsibilities in relation to the delivery of the Gawler East Link Road, and established the obligation for Council to use reasonable endeavours to enter into further Infrastructure Deeds on similar terms with other future developers in the Gawler East Development Area. 1.18. Contemporaneously, and as required by Council in the Gawler East Link Road Deed with the Minister, Council entered into a Gawler East Link Road Deed with the Developer (Springwood) obligating them to pay to Council the cost of the GELR within their estate, as and when development occurs. 1.19. Based on Council's contribution to the Minister (on behalf of developers within the Gawler East Development Area) of $8.167 million, Developers (Springwoods) contribution represents approximately 60% ($4.9million) of Council's total contribution. The total value of all related infrastructure is estimated at $80 million. 1.20. As part of the Gawler East Link Road Deed between Council and the Minister and that between Council and Springwood Communities Pty Ltd, all parties also reached an in-principle agreement on the cost and scope of other forms of critical infrastructure required to support development within the Gawler East Development Area, namely Traffic Interventions and Community Infrastructure. 1.21. At this point, and in the context of these proposed land division applications, it is important to note that by agreeing to the Gawler East Link Road Deed, Springwood have a legal obligation to promptly enter into a further Traffic Intervention and Community Infrastructure Deed and associated Land Management Agreement with Council. The developer also has an obligation once the Traffic Intervention and Community Infrastructure Deed is signed not to divide, sell or otherwise dispose of their land prior to the Land Management Agreement being registered against the land. 1.22. A Deed, which is tied to the land via a Land Management Agreement, rather than

	just an individual/company, provides Council with the optimum level of protection for the community. This is due to the fact that the obligations of the Deed are attached to the land, and not an entity, as the entity is subject to change (i.e. if land on sold). 1.23. Following the execution of the Gawler East Link Road Deed between Council and Springwood Communities Pty Ltd, Council prepared the subsequent Traffic Intervention and Community Infrastructure Deed between Council and Developer (on similar terms to the above Deeds) requiring contributions from Springwood Communities Pty Ltd for traffic interventions and community infrastructure. 1.24. Council has continued to negotiate with Developer in good faith in order to execute the Traffic Intervention and Community Infrastructure Deed between Council and Springwood Communities Pty Ltd in a timely manner. 1.25. However, the developer recently raised concerns with the requirement in the Deed for the Land Management Agreement to be registered on their land prior to any sale or development. Whilst Springwood Communities Pty Ltd does not oppose the registration of an Land Management Agreement on their land, their issue is that the Deed is drafted such that Developer will be unable to deal with their land (sell or develop) until such time as the Land Management Agreement is registered on the Certificate of Titles. 1.26. This is due to the fact that all parties with an interest in the land, including Easement holders, have to consent to the terms of the Land Management Agreement. As a result, and until such time as all interested parties consent to the Land Management Agreement, it cannot be registered and Springwood Communities Pty Ltd cannot sell, divide, develop or otherwise dispose of their land. 1.27. As discussed, the intent of a Land Management Agreement is to tie the obligations of the Infrastructure Deeds to the land, rather than simply to a company or individual. This provides Council with the greatest level of protection, as the intent of the Deed directly relates to the development on the land. This is why the obligation of the Deed should be registered against the land prior to development occurring. 1.28. As you would appreciate the use of a Land Management Agreement in such a manner is considered to be standard practice across Local Government when

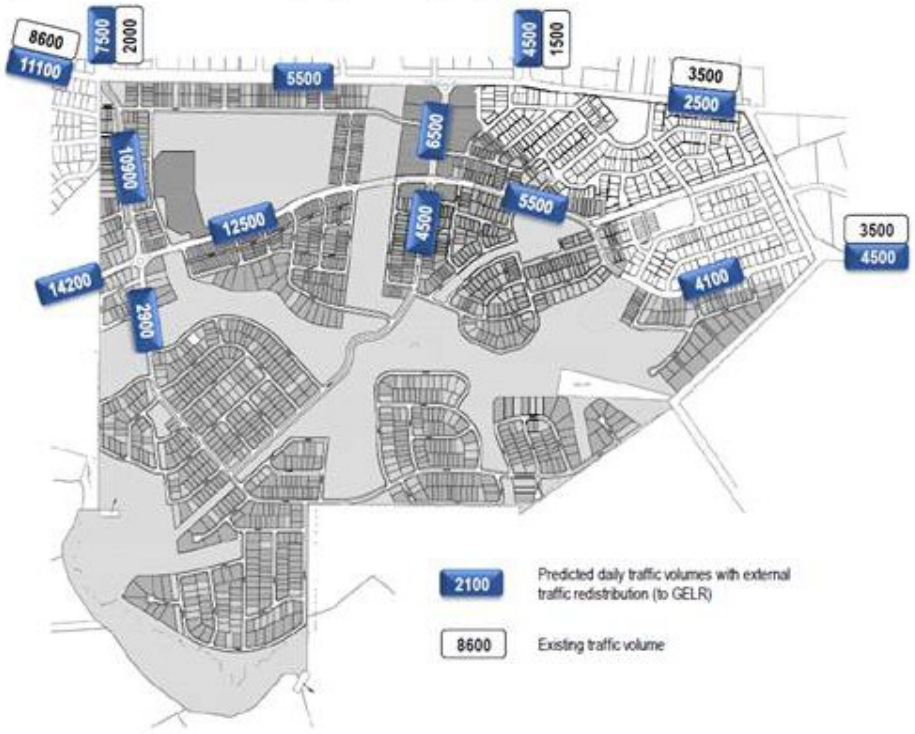
	dealing with such matters and this particular clause has not been raised as an issue in the past. This requirement is a fundamental component of the overall funding model created for the Gawler East Development Area, which was developed in partnership with the developer. 1.29. The GTA Report prepared by the developer states in conclusion that the anticipated traffic volumes will be managed by pre-planned external infrastructure upgrades at a number of intersections based on an agreement between the Springwood Communities Pty Ltd and Council. The Town of Gawler advises that the Gawler East Infrastructure Deed has not been agreed to and/or executed by relevant parties at the present time. 1.30. Council considers the external works outlined in the Traffic Interventions and Community Infrastructure Deed, are required to be agreed and the Deed executed by all parties prior to any consent being issued in order to facilitate orderly development, and minimise the impacts of the proposed development on the broader community. 1.31. If SCAP was to approve the proposed land division applications in the absence of signed Traffic Intervention and Community Infrastructure Deeds, and an associated Land Management Agreement being registered on the land, it would expose Council and the community to a greater level of financial risk in the provision of critical infrastructure directly related to the proposed development. 1.32. As such, Council cannot support the proposed land division applications until such time as the above mentioned Infrastructure Agreements and associated Land Management have been executed and registered over the land. 1.33. An Infrastructure Agreement for additional external works, not included in the Traffic Intervention or Community Infrastructure Deed, has also not been provided to the Town of Gawler to facilitate orderly development. There are infrastructure upgrades proposed for the road network including footpaths, cycle paths which should be designed and costed to confirm that they can be constructed and whether any land acquisitions is required or major service implications exist. Similarly off site stormwater infrastructure if required (including detention, water quality improvements, upgrades etc.) should be shown, scoped and a staging plan agreed to by the developer. The external infrastructure agreement should include an agreed staging based on allotments developed.

	RECOMMENDATION – It is recommended that:
	1.34. The Gawler East Traffic Interventions and Community Infrastructure Deed between Council and Springwood be executed prior to any Planning Consent being granted by SCAP.
2.	**Gawler East Separate Rates**
	2.1 From 1 July 2017 and in order to underpin the regime of infrastructure contributions required from developers to fund critical infrastructure within the Gawler East Development Area, Council declared three Separate Rates. 2.2 Once declared, payment of the separate rates is postponed unless the principal ratepayer of the land or any other person seeks to have a certificate under Section 51 of the *Development Act 1993* issued for any division of the land involving the creation of one or more allotments intended for residential or commercial use; or otherwise obtains development approval under the *Development Act, 1993* for construction of a residential development involving more than one dwelling, or a commercial development, on the land, and either: 2.2.1 payment has not already been made to the Council (or security provided to the Council's satisfaction) in accordance with another mechanism (including under a deed) for an amount equivalent to the amount of the separate rate declared and payable in respect of the land; or 2.2.2 in kind capital works have not been undertaken (or security provided to the Council's satisfaction) which the Council is satisfied in its absolute discretion are equivalent to the amount of the separate rate declared and payable in respect of the land, in which case the postponement is revoked and ceases to operate. 2.3 Whilst the Gawler East Separate Rates require infrastructure contributions to be paid by future developers prior to development approval (Section 51 Clearance), it was always intended that the payment would be facilitated via a series of Infrastructure Deeds between Council and developers as mentioned above. This would allow contributions to be made commensurate with the rate of development, prior to Section 51 Clearance for each respective stage. This model endeavoured to facilitate the "developer pays" principle for infrastructure contributions. 2.4 As a result, the Separate Rates act as a form of security for Council should a

	developer not enter into a Deed with an associated LMA. However, it should be noted that the Separate Rates need to be declared each year and thus potentially can be subject to challenge every 12 months. 2.5 In essence, the per allotment contribution payable under the Infrastructure Agreement will only occur if and when the land is subdivided. This principle was key to gaining the support for Gawler East Separate Rates in the community, particularly from passive land owners within the Gawler East Development Area. Likewise, the Separate Rates were not applied to land that had already received development consent for residential purposes approved. The total quantum of Separate Rates attributed to the subject land at 17 July 2019 is $13,881,945.77.
	RECOMMENDATION – It is recommended that:
	2.6 That any decision notification form should reference the need to pay the relevant separate rate applicable to the land.
3.	**Vesting of land and assets to Council**
	3.1 As was outlined in correspondence to the Department of Planning Transport and Infrastructure (DPTI) dated 4 February 2019 (Refer Attachment 1) Council has significant concerns with the process of SCAP potentially approving land and infrastructure assets which is proposed to be vested into Council ownership. These assets will be required to be managed and maintained in perpetuity by Council on behalf of the community, and if not adequately designed and constructed will impose a significant and ongoing financial burden on Council into the future. 3.2 As a result, and on behalf of the community, it is a requirement that Council approve all detailed design, a relevant construction methodology and the final state of any infrastructure being vested into Council ownership. To achieve this, and to ensure that Council ultimately agrees to the vesting of any land pursuant to Section 33(1)(c)(iva) of the Development Act 1993, Council will be need to provide its agreement upfront during the planning assessment stage of the land division applications and subsequently approve final designs (quality of design) prior to the granting of Section 51 Clearance. 3.3 Given the complexities outlined above, and to assist in defining the roles and responsibilities for both SCAP and Council in the administration of any consent

	over the next 10-15 years, it is requested that SCAP, as the relevant planning authority, splits the consent, with Development Plan Consent pursuant to Section 33(1)(a) being issued by SCAP and Land Division Consent pursuant to Section 331(c) to be either issued by the Council under delegated authority from the SCAP, or otherwise issued with conditions that are drafted to the Council's satisfaction. 3.4 Pursuant to Section 33(1)(c)(iva) of the Development Act 1993, where land and assets are proposed to be vested into Council ownership, the Council must consent to the vesting of such infrastructure and assets. Land to be vested to Council must be done so in a condition that is satisfactory to Council and will not result in a financial burden on the new or existing community. 3.5 At this stage and based on the level of information presented, Council does not support the proposed vesting of land and assets into Councils ownership.
	RECOMMENDATION – It is recommended that:
	3.6 SCAP, Council and the developer establish a collaborative process moving forward in which all parties seek to reach a suitable outcome relative to the amount, type and detail of land and assets proposed to be vested to Council's ownership to support the proposed development. 3.7 All land and infrastructure proposed to be vested to Council must be submitted to and approved to the reasonable satisfaction of Council.
4.	**Proposed Categorisation of Land Division Application 490/D026/19 as Category 1**
	4.1 The proposal incorporates retaining walls indicated within the 'bulk earth work' plans, with the indicative designs demonstrating that retaining walls up to 2 metres in height are required within the proposed road reserve to accommodate the construction of the road. 4.2 The height of these retaining walls represents development in their own right and as such, are subject to development approval. 4.3 Given the construction of the road would be dependent on the provision of the retaining walls, the appropriateness of the retaining walls should be considered holistically with the division of land. Similarly, the retaining walls are fundamental to the merits of the land division application to ensure the proposed allotments

	are suitable for their intended use given the topographical nature of the subject site. 4.4 As the retaining walls are indicated up to 2 metres in height, they are not considered to be of a minor nature for the purposes of Schedule 9 Clause 2(g)(17) of the Development Regulations 2008 and subsequently constitute a Category 3 form of development. 4.4 It is not considered that the relocation of retaining walls from within the public road reserve to within the proposed residential allotments would alter the consideration of the above.
	RECOMMENDATION – It is recommended that:
	4.6 Bulk earthworks should remain part of the subsequent application and the land division should be considered as a Category 3 development application.
5.	**Change in function and nature of existing roads**
	5.1 The proposed division seeks to create internal public roads, which will interface with the existing road network. Previous discussions with the developer relative to the Gawler East Link Road have resulted in the consideration and preparation of a draft deed for external works that would effectively down grade Calton Road from a Collector Road to a Local Road. Such works have not yet been agreed to by way of an executed deed and as such, should be considered as part of the subject land division application. 5.2 Irrespective of the above, based on the investigations undertaken by the applicant's traffic engineer, the proposal notes an anticipated increase in traffic volumes on Cheek Avenue from 2000 vehicles per day to 7500 vehicles per day. Such an increase would inevitably change the nature and function of Cheek Avenue from a Local Road to a Collector Road. This is evidenced within the proposed road hierarchy, which sees roads within the proposed estate categorised as collector roads based on traffic volumes of a lesser extent, being those ranging within 2900 to 6500 vehicles per day respectively.

	Figure 6.3: Predicted traffic volumes (completed development) 
	5.3 As the proposal would change the nature and function of an existing road, the division of land should be considered as a Category 2 form of development in accordance with Schedule 9 Clause 21 of the *Development Regulations 2008*.
	RECOMMENDATION – It is recommended that:
	5.4 Should the SCAP not concur with Council's consideration or the retaining walls affecting the categorisation of the application, or should the earthworks and retaining wall components be removed from the application, then the application should be processed as a Category 2 form of Development.
6.	**Sequencing and consideration of individual applications:** **1. 490/D025/19 (1 existing allotment into 22 allotments);** **2. 490/D026/19 (6 existing allotments into 1180 allotments);** **3. 490/D027/19 (1 existing allotment into 24 allotments);** **4. 490/D028/19 (3 Existing allotments into 188 allotments).**

	6.1. There are concerns with the manner and sequence in which the proposed land divisions may be considered. The primary concern relates to Land Division application 490/D026/19 that represents the main land division proposal, with the other three (3) divisions relating to 'super lots' created as a result of 490/D026/19 (should it be approved). 6.2. Council appreciates the rationale and desire for the applicant/developer to segregate these applications so that the consideration relative to the SEA Gas Main Line Valve (MLV) and soil remediation can be considered in isolation from the balance of the site. 6.3. The above approach is legally challenging, in the sense that the three (3) land division applications (being 490/D025/19, 490/D027/19 and 490/D028/19) seek to divide allotments that do not exist. The three (3) super lots within land division 490/D026/19 will not legally exist until such time that a Certificate of Title has been issued. This therefore requires that land division 490/D026/19 be approved and enacted in the first instance. 6.4. The above notion has been considered by the Environment, Resource and Development (ERD) Court in the matter between *Hagger v Development Assessment Commission* [2006] SAERDC56 in which the court held the following within paragraphs 34 and 35: *The decision the subject of this appeal is a nullity, because it was a decision in relation to the division of land which was not an allotment within the meaning of the Development Act 1993, because the land was held in a Crown Lease.* *Had the land been held in a certificate of title at the time of the application, the fact that the proposed plan of division related to portion of an allotment would have rendered the development application and the decision in relation to it a nullity.* 6.5. Whilst the subject applications do not represent a lease, the concept of the courts rationale remains the same, that the land proposed to be divided does not legally exist as it is not held within a Certificate of Title. 6.6. Further concerns are raised with the creation of super lots for the purposes of

	future division within 490/D025/19 and 490/D027/19 unless soil remediation is appropriately considered. 6.7. 490/D026/19 seeks to create two super lots for the purposes of the above application, with such development lots not being suitable for their intended residential use until such time that soil remediation has been considered/addressed.
	RECOMMENDATION – It is recommended that:
	6.8. Land division applications 490/D025/19, 490/D027/19 and 490/D028/19 should be either withdrawn or at very least put on hold until such time as the super lots have been approved within land division 490/D026/19.
	6.9. All land division applications should be merged into one (1) application and Council would encourage this approach. At the very least, the chronological numbering of the land division applications should be amended.
	6.10. Council would appreciate further clarification on the process SCAP intends to pursue in order to resolve the above issues.
7.	**Port Campbell to Adelaide High Pressure Gas pipeline Easement *(Easement Terms and Conditions)***
	7.1. Two existing easements in favour of SEA Gas as the licensee of the Port Campbell to Adelaide High-Pressure Gas Pipeline traverse through the subject land. These easements were created to coincide with the installation and operation of this gas pipeline. 7.2. At the time that these easements were established it was intended that the land would be held in private ownership, and that the use of the land would continue as primary production. The proposed development now seeks to change the use of land from primary production to residential, with the land containing the SEA Gas infrastructure proposed to be vested in Council ownership for public purposes. 7.3. Once vested into Council ownership as a reserve, particularly as a public road reserve, section 208(2) of the Local Government Act 1999 discharges of all easements over the land. Section 221(3)(a) of the Local Government Act 1999 then provides an exemption for these authorities in seeking authorisation from Council to undertake maintenance and repair works to their infrastructure which lay in situ. This generally satisfies the requirement for utility providers in maintaining a “secure form of tenure” to their infrastructure.

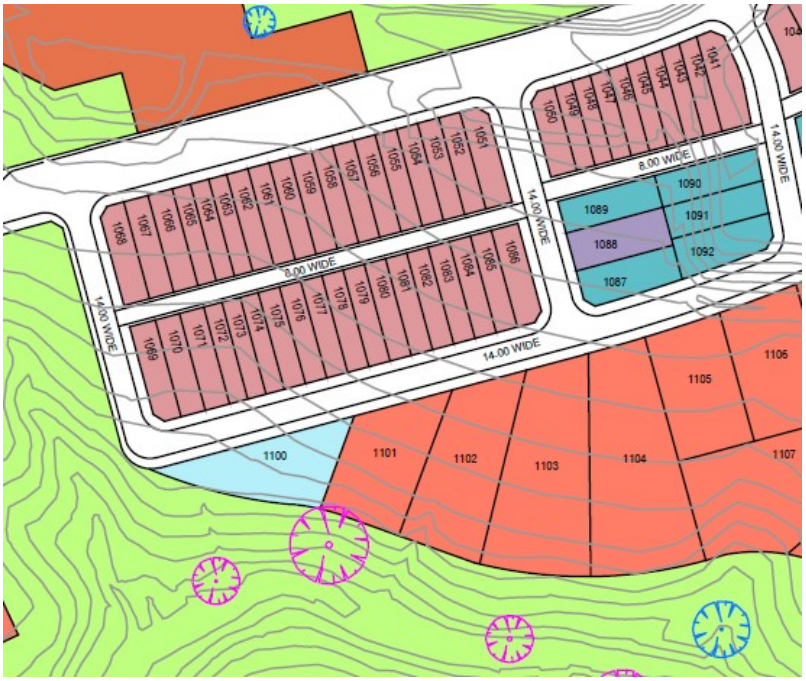
	7.4. However, SEA Gas is not licensed under the Gas Act and they have previously informed Council that they are not afforded the same exemptions under section 221(3)(a) of the Local Government Act 1999 that other authorities, such SA Water enjoy. As a result, and in order to maintain a "secure form of tenure", Council considers it necessary for the Port Campbell to Adelaide High-Pressure Gas Pipeline Easements (SEA Gas) to be preserved within Council land. 7.5. The preservation of easements within Council land is contemplated in section 208(3) of the Local Government Act 1999. However this requires a formal resolution of Council. Once the Council resolves these terms, the resolution must be published in the Government Gazette and the approved Plan of Division lodged with the Land Titles Office clearly showing the easement within the public road. 7.5. The easements terms and conditions were originally created at a time that the subject land was used for agricultural purposes and held in private ownership. Due to the change in land use and proposed ownership, it is now a requirement of Council that the existing easement terms and conditions be amended prior to Council accepting the vesting of this land.
	RECOMMENDATION – It is recommended that:
	7.6. The existing Port Campbell to Adelaide High-Pressure Gas Pipeline Easements will need to be extinguished and a new easements (terms and conditions) created contemporaneously over the land vesting in Council ownership. 7.7. Any new terms for the easement prior to the vesting of any land. An in principle agreement should be sought prior to the determination of the affected land division applications, with the new terms as resolved by the Council executed prior to the issuing of Section 51 Clearance in any circumstance.
8.	**SEA Gas and Safety Management Study (SMS) Workshop**
	8.1. On 23rd May 2017 a Australian Standard 2885 Safety Management Study (SMS) Workshop was undertaken based on the Springwood Master Plan, and in particular the section of the Port Campbell to Adelaide Pipeline that traverses the Springwood Estate at Gawler East (between Balmoral Road and the South Para River). 8.2. High pressure transmission pipelines are required to be licensed by the Commonwealth, State or Territory. In February 1994, The Council of Australian

	Government (CoAG) agreed to adopt the AS 2885 suite of standards to achieve uniform national pipeline construction standards. Accordingly, the Port Campbell to Adelaide Pipeline that passes through the Springwood development is licensed under the Petroleum and Geothermal Energy Act 2000 and must met the requirements of the AS 2885 suite of standards. 8.3. The AS 2885 suite of standards contain robust processes for assessing risks to public safety, the environment and security of supply. AS 2885 defines the pipeline Measurement Length as the 4.7kw/m2 radiation contour for an ignited rupture and provides the method for calculating the Measurement Length for a pipeline. The pipeline location class is determined based on the land use within the pipeline Measurement Length. Any change to the land use within the pipeline Measurement Length triggers a review of the pipeline Safety Management Study. 8.4. In 2017 and based on the previous Springwood Master Plan, for most threats it was found that provided that designs comply with AS 2885 and SEA Gas requirements, and that construction methods are approved by SEA Gas then threats to the Port Campbell to Adelaide Pipeline will be controlled in accordance with the requirements of AS 2885. 8.5. However, there were, two issues which were not able to be resolved by the workshop: 8.5.1 Locations where there is very little separation between the pipeline and the residential allotments (primarily along Balmoral Road and, to a lesser extent, a short section immediately east of MLV 8), which: a) Introduce the threat of soil collapse around the pipeline due to excavation activities on the adjacent properties; and, b) Increase the risk of pipeline maintenance dig-ups that may be required from time to time. 8.5.2 High noise levels associated with venting at MLV 8. 8.6. In relation to locations where there was reduced separation between the pipeline and the residential allotments, the Safety Management Study identified three options to control this threat:

	8.6.1 Provide additional space between the property boundary and the pipeline 8.6.2 Install an engineered barrier outside of the pipeline easement to provide protection against mechanical damage and soil collapse, and also allow for trench shoring equipment to be safely deployed during “High Risk Excavations”. 8.6.3 Relocate the pipeline within the easement. 8.7. As part of the assessment of previously approved land division 490/D009/17 the Developer agreed to move the residential properties away from the high pressure gas pipeline in order to provide a minimum 6 metre separation distance, effectively widening the existing easement. This was a commercial negotiation between the developer and SEA Gas, and similar agreements will be needed for the balance of the Springwood development. 8.8. In relation to the high noise levels associated with venting at MLV 8. The MLV 8 compound includes a vent, which was installed in case the pipeline inventory needs to be relieved (in an emergency situation). When MLV 8 was designed the land use was rural and there were no published plans to re-zone the land for residential development. 8.9. Venting operations will expose residents within close proximity to Extreme Noise Levels for periods of up to 1 hour. The current development application includes open space around the MLV 8 compound, which provides at least 45m separation from the vent stack to the nearest residence. 8.10. SEA Gas has previously sought to develop a solution for this problem with the Town of Gawler and the previous Developer. The solutions proposed were: 8.10.1. Relocate the vent; 8.10.2. Construct new vent line out the development area; 8.10.3. Build noise attenuation at the current MLV site – this will involve constructing a 15m high vent stack with external structure to allow access to the top. 8.11. Council understands that negations between Springwood Communities Pty Ltd and SEA Gas are progressing, in regards to a possible solution. However, it is recommended that land division applications should not be approved until such time as this matter has been resolved.

	8.12. As mentioned the 2010 Safety Management Study was based on the previous Springwood Master Plan, which was indicative at the time and there was limited detail on facilities that may fall under the definition of the AS 2885 Sensitive Use (S) location class (e.g. aged care facilities, schools and child care). As a general principal, these facilities should be located as far as possible from the pipeline, and preferably outside of the Measurement Length. 8.13. As a result, and given the 2010 Safety Management Study was based on the previous Springwood Estate Master Plan, it is recommended that a new Safety Management Study be conducted with SEA Gas prior to any approvals being granted, as the outcomes of the Safety Management Study should be used to inform any conditions of approval moving forward.
	RECOMMENDATION - It is recommended that:
	8.14. An updated SMS workshop should be conducted to review the latest land division plans lodged by all affected parties.
	8.15. The assessment of land division 490/D028/19 should not occur until such time as matters relating to the SEA Gas mainline valve are resolved.
9.	***Native Vegetation Act 1991* and *Environmental, Protection, Biodiversity Conservation Act 1999* consents.**
	9.1 The proposal seeks the removal and clearance of native vegetation, including critically endangered ecological communities at risk (Iron grass and Peppermint Box). Whilst portions of native vegetation are proposed to be cleared and potentially later reinstated, such an activity still constitutes the removal and clearance of vegetation and requires approval under the *Native Vegetation Act 1991*. Council also considers this may also trigger approval under the *Environmental, Protection, Biodiversity Conservation Act 1999*.
	RECOMMENDATION – It is recommended that:
	9.2 To ensure that the relative consents are obtained by the applicant, a native vegetation clearance approval under the *Environmental, Protection, Biodiversity Conservation Act 1999* should be sought prior to the assessment of the proposed land division applications.
	9.3 Further investigations and consents applicable under the *Native Vegetation Act*

	1991 and *Environmental, Protection, Biodiversity Conservation Act 1999* should be sought to ensure development is balanced against preserving the existing biodiversity value of the site.
	9.4 The comments and recommendations provided by external consultants Greening Australia and by Council's Landscape Coordinator should be noted.
10.	**Retaining walls and Building Rules Consent Requirement**
	10.1 It has been demonstrated within the applications documentation that future detailed design and subsequent construction of roads are likely to require the construction of retaining walls to ensure proposed roads achieve appropriate grades and allotments suitable for their intended use. 10.2 Retaining walls in excess of 1.0 metre or 2.1 metres where inclusive of an affixed fence, require Development Approval in the form of Development Plan Consent and Building Rules Consent.
	RECOMMENDATION – It is recommended that:
	10.3 To ensure the necessary approvals are obtained and so that the subject land division applications implementation is not contingent on separate development authorisations being obtained, land division 490/D026/19 and any other land division requiring retaining walls should incorporate such retaining walls as part of the application.
	10.4 Building rules consent be sought as part of the land division process should the applications be approved.
	10.5 Building Rules Consent be obtained prior to Full Development Approval of the subject land division applications.
	10.6 The issues pertaining to procedural matters as contained in Presiding Member's letter dated 26 July be addressed.

	PLANNING CONCERNS AND CONSIDERATIONS
11.	**Allotment Layout and Mix**
	(compact) allotments immediately abut very low density lots in particular lots labelled 1069 to 1086 immediately fronting lots 1100 to lot 1104.
	
	RECOMMENDATION – It is recommended that:
	11.2 A greater transition in allotments should be considered within the above area mentioned, i.e. with the introduction of more traditional sized lots.
	11.3 Greater consideration should be given to the interface between medium and low-density allotments.
12.	**Dense clusters of Medium density allotments and excessive stretches of lane ways**
	12.1 A dense cluster of medium density allotments along the Gawler East Link Road are proposed which further results in laneways in excess of 100 metres and a number of undesired “T” intersections.
	RECOMMENDATION – It is recommended that:
	12.2 To improve variation to future built form, improve road layout (reduce thoroughfares) and intersection safety, the use of long stretches of laneways within close proximity to the educational precinct should be either reduced or

	reconfigured.
	12.3 Such improvements may include the use of 'H" configured lane ways which reduce the need for multiple "T" intersections.
13.	**External Boundary treatments (interface)**
	13.1 Land Division 490/D026/19 seeks to provide allotments on Calton Road and Cheek Avenue that provide for secondary frontages and rear allotment interfaces with existing external roads. 13.2 There is a risk of undesirable lengths of solid boundary fencing that will provide for poor urban design and interface and potentially be detrimental to the existing character and amenity for the new and existing community. 13.3 It's noted within the applicant's planning report that fencing treatments are proposed to reflect past treatments utilised along Calton Road, however no associated agreement is proposed to secure the installation and retention of such treatments. 13.4 Within previous stages of the Springwood Estate, external fencing treatments and ongoing maintenance has been secured via a Land Management Agreement between the developer and the Council. This approach or an appropriate alternative method would be encouraged.
	RECOMMENDATION – It is recommended that:
	13.5 A form of boundary treatment is secured as part of the land division through a process such as a Land Management Agreement. 13.6 This process has previously been accepted by all relevant parties.
	13.7 The use of an encumbrance on the land is not a preferred method as the enforcement of such an agreement is generally only limited for the duration of the project.
14.	**Internal interface between proposed lots and areas of public open space.**
	14.1 Similar to the above, the proposal seeks to provide residential allotments with a side/rear boundary interface with areas of public open space. 14.2 In order to avoid undesirable solid boundary fencing, areas prone to vandalism and improve passive surveillance allotment boundary treatments should be considered.

	RECOMMENDATION – It is recommended that:
	14.3 A form of boundary treatment is secured as part of the land division through a secure process such as a Land Management Agreement.
	14.4 An encumbrance on the land is not a preferred method given the enforcement of such agreement is generally not be used as it only limited for the duration of the project.
15.	**Slope analysis**
	15.1. Whilst the majority of allotment sizes for the slope appear appropriate, additional consideration is strongly recommended to ensure allotments are suitable for their intended use without the need for excessive retaining which is contrary to the desired character. 15.2. Consideration should be given to whether the topography of the proposed allotments is sufficient to contain future dwellings that do not require unreasonable retaining. This notion is supported by the 'bulk earthworks plan' that demonstrates a significant extent of retaining may be required to accommodate the construction of roads. 15.3. Council Wide (CW) Principle of Development Control (PDC) 301, 302 and 328 seek for earthworks associated with development to reflect the natural topography of the land and where retaining is required, limited to a maximum of 2 metres for excavation and 1 metre for fill. This is also reinforced within Zone PDC 25, which only accommodates additional fill in relation to the remediation of the former quarry.
	RECOMMENDATION – It is recommended that:
	15.4. A detailed slope analysis should be undertaken to determine if the proposed design needs to be revised to reduce the extent of future retaining required. 15.5. Concerns could be resolved by providing larger "super conventional" allotments to the perimeter of roads to transition the topography to low lying areas of Public open space. This is contrary to the current design where public roads form the boundary and buffer to public open space (as per areas indicated requiring retaining walls within public road reserves).
16.	**Appropriateness of medium density allotments on topographically steep terrain.**

	16.1. Allotments 6-8, 129-137 and 1164-1157 (inclusive) appear to be topographically steep and may not be appropriate for medium density housing. The appropriateness of this slope to accommodate this type of future dwelling form needs to be considered and is at variance with the desired character, which notes the slope of the land will dictate the dwelling type provided. A reduction in yield and a detailed slope analysis is recommended to inform density.
	
	

	RECOMMENDATION – It is recommended that:
	16.2. The future development and usability of these allotments be further investigated and considered.
	16.3. The yield of these allotments be potentially reduced.
17.	**Easements within proposed allotments**
	17.1. Given the topographically steep layout of the subject land, there is a likelihood for the need for easements for the provision of services infrastructure and the management of stormwater on a large number of allotments. 17.2. Given the considerable number of medium density allotments proposed, there is a risk of potential building implications on these lots should easements be required to be provided at the civil design stage.
	RECOMMENDATION – It is recommended that:
	17.3. The location of anticipated easements should be investigated relative to medium density allotments and topographically steep allotments early to determine if a sufficient building envelope remains for the construction of future dwellings and any anticipated retaining walls. Similarly, easements should be indicated to inform Council's consideration of potential asset vesting associated with Land Division Consent.
18.	**Allotments within two Council boundaries**
	18.1. A number of proposed allotments to the southern portion of land division 490/D026/19 are indicated to be located within two Council areas (Town of Gawler and Barossa Council). 18.2. Being located within two council boundaries may impose further constraints on future land owners being mainly: 18.2.1 Paying a portion of their Council rates to both Councils 18.2.2 Requiring future development applications (i.e. dwelling) to be lodged with SCAP for assessment and determination.
	RECOMMENDATION – It is recommended that:
	18.3. All allotments should designed to be located completely within one Council area. 18.4. It is recommended that appropriate provisions and agreements be reached in relation to the provision of affordable housing within the estate.

19.	**Consideration of removal of Significant and Regulated Trees**
	19.1. The proposed division seeks for the removal of 47 regulated trees and 40 significant trees. Whilst it is generally acknowledged that a number of regulated and significant trees will be required to be removed in order to accommodate orderly development. 19.2. Given that both the *Development Act 1993* and *Native Vegetation Act 1991* are applicable within the Residential (Gawler East) Zone, approval from the native vegetation council may also be required.
	19.3. The applicant is seeking for replacement street trees in lieu of a financial payment into the Council's tree fund. Council does not support this proposal and would encourage the application of payment into the fund. 19.4. The Council is entitled under Section 33(1)(c)(iva) to apply discretion in the consent to the vesting of land. The vesting of a road and areas of open space are naturally anticipated to be provided with an extent of tree plantings and should not be used in lieu of payment. 19.5. Replanting activities to offset Regulated/ Significant removals are heavily constrained due to the available open space/ reserve areas outside of encumbered (easements) areas, as there are limiting factors to successful tree planting. These factors include steep slopes, overall area available for trees and where area is available the placement of trees is likely to impinge upon environmental protections on site. 19.6. The planting of trees into native grassland habitat, including the EPBC listed Iron Grass grasslands and Peppermint Box Grassy Woodland negatively affects these areas. This should not occur and would be at odds with *Native Vegetation Act 1991*.
	RECOMMENDATION – It is recommended that:
	19.7. Regulated and Significant trees be retained where possible.
	19.8 The applicants obligations under Section 42(6) of the *Development Act 1993* to provide 214 replacement trees should not be offset by the improvements required to roads and areas of open space. These plantings would be provided and required irrespective of whether Regulated Trees are to be removed.

	19.9 Where removal is required, Council strongly recommends the application of a condition in accordance with Section 42(6) of the *Development Act 1993*. Based on the number of trees indicated within the current proposal to be removed, a total payment of $20,116 into the Council's Tree Fund would be required.
	19.10 Native Vegetation Council approval should also be sought, as where applicable for some of the regulated trees indicated to be removed.
20.	**Limited emergency access (during bushfire event) and during maintenance or accident over pipe crossing.**
	20.1. Currently, the southern portion of the site can only be accessed via one roadway, with an emergency access track noted to be provided on adjoining land. 20.2. The proposed access track is proposed over private land and not within a secure public road reserve. 20.3. Being located within an area that traverses areas within the General, Medium and High Bushfire Risk, one access over the SEA Gas pipeline, in addition to an access track through an area of bushfire risk is not supported by Council and may be hazardous in a bushfire situation. 20.4. One access point over the SEA Gas pipeline should also not be relied on in the event of maintenance over the pipe crossing.
	RECOMMENDATION – It is recommended that:
	20.5. A second access point be provided to ensure adequate accessibility to the southern portion of the land division during times of limited access over the SA Water pipeline crossing or during times of an emergency.
	20.5. Should a secondary road not be provided, then the emergency access track should be secured prior to the issuing of any consents. As the land proposed to be utilised for the emergency access track is under private tenure and separate of that to the developer, adequate security should be provided to demonstrate that the construction of the emergency access track can occur. 20.6. An infrastructure agreement for the extent of off-site works required should also be executed with the applicant prior to the issuing of any consent.
21.	**Site Contamination**
	21.1. A preliminary site investigation has been undertaken on behalf of the applicant by

	LBW co to determine if any potentially site-contaminating activities have occurred on the land. 21.2. The assessment determined that further investigations are required in relation to Areas of Potential Environmental Interest identified as areas 6, 7, 10 and 11 to confirm the suitability of the land for the proposed sensitive land use – being residential. These areas of potential contamination are proposed to be considered as separate land division proposals to that of the balance of the estate within proposed applications 490/D025/19 and 490/D027/19. This approach is of concern to Council. 21.3. Whilst the intention of the applicant to handle contamination (if any exists) by remediation within the subsequent land division applications is acknowledged, this approach does not ensure that allotments 9000 and 9002 proposed as part of 490/D026/19 (being the primary division) are suitable for their future and end use. As such, Council does not believe it is appropriate for this consideration to be prolonged to subsequent applications.
	RECOMMENDATION – It is recommended that:
	21.4. Further investigations should be undertaken prior to the issuing of any consent to ensure that all proposed allotments (inclusive of super/development lots that will be divided further by way of separate applications – being 490/D025/19 and 490/D027/19) are suitable for their intended residential use.
	21.5. All proposed allotments should be suitable for their intended use, and the four respective land division applications be considered holistically as one land division application with the necessary soil investigations and assessment undertaken.
22.	**Provision of Open Space**
	22.1. Council Wide Objectives 65 through to 68 seek various requirements for the provision of public open space mainly within larger residential land divisions. Council wide PDC 184 in association with Section 50 of the Development Regulations 2008 reinforce the above objectives by seeking land divisions (20 allotments or more) to include public areas of open space and recreational areas (up to 12.5% statutory requirement). 22.2. As part of the four land division proposals, new public open spaces are proposed which satisfy the above mentioned legislative requirements.

	22.3. In total, 73.57 hectares or approximately 39.5% of the total development area of the four land divisions is proposed to consist of public open space. 22.4. This proposed open space area is well in excess of the required 12.5%, which will have financial implications on both the Council and community. It is therefore imperative that land vested to Council is done so to Councils satisfaction and standards. 22.5. In consideration of the total Springwood area (including land already developed/ approved with the proposed) totalling approximately 220ha and the existing public open space already provided or approved and proposed, a total of 77.42 ha of public open space will be provided within Springwood. 22.6. Once completed, the entire Springwood development will provide approximately 34.8% public open space, which is currently considered by Council as being excessive. 22.7. Typically, the development plan seeks to ensure that the extent of open space provided is usable and via Council Wide PDC 191 discounts an extent of public open space provided, if it forms part of the area utilised in stormwater management or comprises a steep gradient (exceeding 1:4). 22.8. However, the above does not apply if the proposed public open space forms part of a linear open space network. Due to the extent of easements situated on the land and the creek/riverine environments that restrict the development potential of the land, the extent of open space provided is considered to form a linear network.

	22.9. Consequentially, all the public open space provided can be admitted for the purposes of CW PDC 191. 22.10. Similarly, the provision of open space provided is consistent with structure plan provided within Map Ga/1 (Overlay 1) Enlargement G and subsequently Zone PDC 4. 22.11. The total amount of open space nominated within the application is considered to be an oversupply when having regard to the catchment of the proposed open space hierarchy. 22.12. In its current proposed form, the majority of public open space (approximately 61.34 ha which in itself is 27.88% of the total development area) being vested to Council is considered to be encumbered land that does not facilitate active useable open space, however the design proposal does activate these spaces in a feasible manner (through the use of walkways and passive open space opportunities). 22.13. The proposed division seeks to provide open space within the following hierarchy: 22.13.1. Proposed District level open space – 2 new area of open space; 22.13.2. Proposed Neighbour level open space – 2 new areas of open space; 22.13.3. Local level open space – not clearly defined however considered to comprise of 4 new areas of open space. 22.14. All categories of open space provided are considered to be an oversupply and rationale behind this is discussed further. 22.15. As per the planning report accompanying the land division applications, open space is proposed to be located generally 200 metres of all residents and centrally within neighbourhoods. 22.16. In accordance with PDC 190, local parks should be located centrally within 300metre of households that they serve. 22.17. Although it is noted that the application proposes an excess of open space as general supply; the spaces proposed do not meet the criterion of the draft deed and the Development Plan as detailed in the following points.

22.18. The application discusses the use of the separate rate mechanism to fund community infrastructure in some instances, however does not deliberate upon the opportunity for infrastructure deeds to be implemented to avoid the need for the separate rate to be called in. The Town of Gawler and Springwood have already invested significantly in preparing a number of draft deeds. However, there have been unsuccessful in their execution to date.

22.19. The Draft Traffic Interventions and Community Infrastructure Deed seeks the following provision of community infrastructure to service the impending Gawler East Development Area:

Gawler East Development Area – Community Infrastructure			
Infrastructure	**Category/Trigger**	**Specification**	**Quantity**
District Level Open Space	Non-Conventional 5000+ people	• Minimum of 3 hectares in size (As stated in the Development Plan) • District Level Open Space considers the wider community and areas that people deliberately visit for the purpose of a specific activity. They are generally used for multi-use activities and often contain sports fields, courts and other sports infrastructure (goals, nets, etc.) • Typically includes: Play equipment, seating, bins, shelters, irrigation, grassed areas, lighting, landscaping, shared paths, BBQ, car parking, toilets. • Specialised Infrastructure: • Skate Park, BMX Track	1

			○ Community Garden ○ Nature Play Areas	
	General Activity Green Space	Non-Conventional 10,000+ people	15,000sqm general play fields, top soil, sandy loam, turf, irrigation and sports equipment/infrastructure.	1
	Multi Use Courts	Non-Conventional 10,000+ people	Netball/Basketball/Tennis courts with associated infrastructure to be located within the district play space.	2
	Community Hub/Centre	Non-Conventional 10,000+ people	1000sqm multipurpose community centre facility/meeting facilities. A single facility or group of facilities co- located together. A community hub provides a broad range of services to the community based on three main functions: • Provide key services to meet local needs. Program activity responds to the needs of the local community and involves providers of social, health, employment and/or business services. • Provide accessible community space. The space is open to the public and common areas are available for both formal and unstructured programming. • Build networks through the co-location of different service providers. The scale and	1

			focus of services creates a critical mass that improves overall accessibility for clients and creates synergies for co-locating tenants. Informal networks among.	

22.20. The above infrastructure is deemed as appropriate and sought via the draft deed was informed by the 'Gawler Open Space Sport and Recreation Plan' and the 'Gawler East Precinct Plan Social and Recreational Infrastructure Requirements Report'.

22.21. The Springwood application proposes to deliver the following provision of community infrastructure:

22.21.1. Proposed District Level Open Space x5

22.21.2. Springwood Village Centre Park & Springwood Playing Fields

22.21.3. General Activity Green Space x2 (considered as Neighbourhood under the Development Plan)

22.21.4. Highfield Reserve & a similar reserve on the western side of Springwood

22.21.5. Multi Use Courts N/A

22.21.6. Community Hub/Centre N/A

22.21.7. An analysis of the proposed community infrastructure is provided below:

District Level Open Space - Springwood Village Centre Park (approx. 2.2ha)

The overall size of the Springwood Village Centre Park is approximately 2.2 hectares, this falls short of the 3 hectare minimum which is sought in the Development Plan and the draft deed.

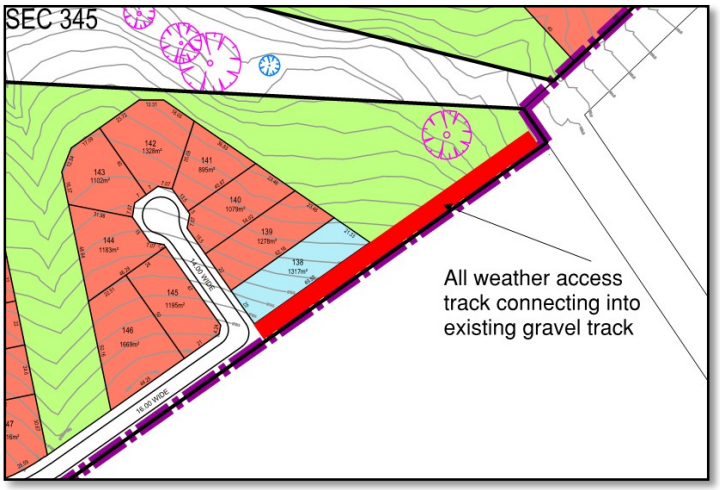
22.22. In addition the SEAGAS mainline valve is located in this proposed district level park. There are concerns pertaining to general activity occurring in the vicinity of this location, people coming into contact with the valve or maintenance issues from the regulator's perspective this precinct is unlikely to be suitable.

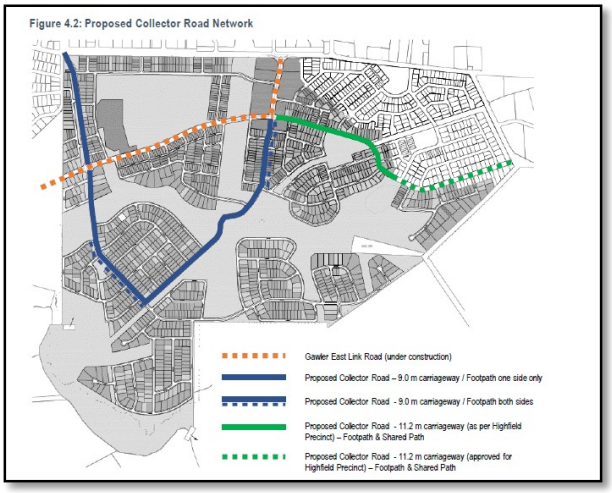
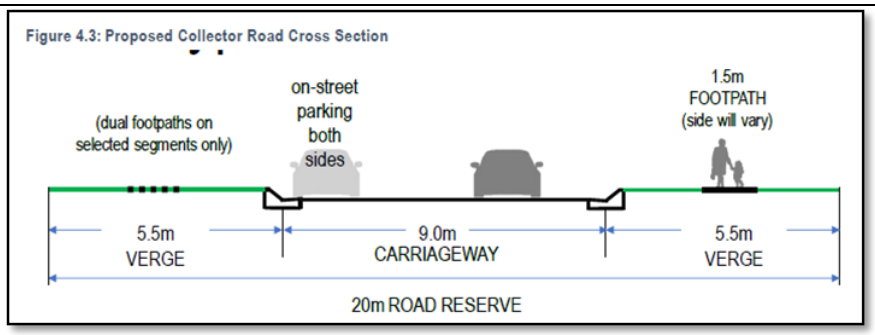
22.23. From an urban design perspective the location of the SA Water pipeline running through the centre of the space creates a poor outcome, it divides and separates

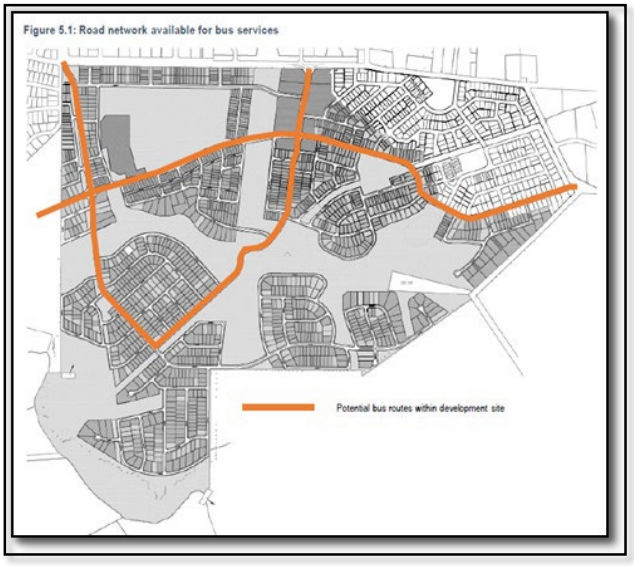
	the park and its facilities whilst reducing public surveillance. 22.24. The practicality of the amenities/facilities being proposed is questionable and does not mitigate the proposed park's short falls and due to this should not be considered a District level park. 22.25. Springwood Playing Fields – not applicable 22.26. Refer to comments under Multi Use Courts and Community Hub Centre – not applicable. 22.27. General Activity Green Space - Highfield Reserve (approx. 0.75ha) , a similar reserve on the western side of Springwood (approx. 0.38ha) 22.28. Previous work identifies that a single General Activity Green Space of 1.5 hectares with irrigated turf and general play fields (help in keeping clearly separate from "Springwood Playing Fields" is required in this area. The proposed areas identified for 'General Activity Green Spaces' in the Springwood application fall significantly short in terms of size. The small sizes of these spaces will likely limit what sport and active recreation activities can be played as well as their general availability. 22.29. Furthermore these spaces are also proposed to be utilised for stormwater treatment at a scale of which is unknown, which also has the potential to further restrict usability and availability to the community. 22.30. Springwood Playing Fields, Multi Use Courts & Community Hub/Centre. 22.31. It is anticipated that the principal sporting and community hub in Springwood is to be located in the former quarry along with a future education facility. However the Springwood application states the following under Springwood Playing Fields: *"The exact quantum of organised sporting facilities will be considered in the detailed design phase when more is known about the requirements of the future education facilities and in collaboration with Council to ensure the facilities support the region wide sporting strategy".* 22.32. It should be noted that the overall dimensions of the subject site can only accommodate the 'Springwood Playing Fields, Multi Use Courts and a

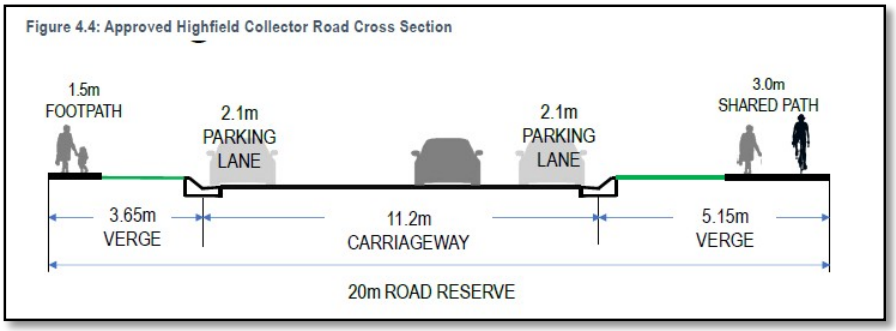
	Community Hub' once appropriate earthworks have been carried out. 22.34. Council is unable to provide support for the proposal in its current format due to a general lack of detail, no commitment from an education provider or community/sport club and furthermore no mention of multi-use courts or a community centre. 22.35. Market demand for a school in this location is uncertain and in the event a school cannot be secured in this area, it will put the majority of the significant community infrastructure in jeopardy. Council is aware that the Department for Education has commenced planning for a B-12 super school in Munno Para and has recently provided $10 million towards facility upgrades at Gawler & District B-12 College, to help service the growing catchment in Northern Adelaide (including Gawler). 22.36. Furthermore, the Gawler region is relatively well serviced by private school providers and in addition a new $30 million Trinity College campus has been proposed by Trinity College in the St Yves Estate in Roseworthy. 22.37. Council has invested significant time and resources into determining what community infrastructure is required to appropriately support the expected community. The vesting of appropriate community infrastructure and land is in the best interests of both Council and the developer and would be best resolved via the implementation of a deed.
	RECOMMENDATION – It is recommended that:
	22.38. Where appropriate, the total area of open space should be rationalized and decreased, as the proposal provides in excess of the minimum 12.5% of Public Open Space to be vested to Council in accordance with Section 50 of the Development Act 1993. Whilst Council acknowledges that a large portion of this land is best served under Council's ownership due to the encumbered nature of the land (being that it contains essential easements, gully environments and creeks). Further detailed is provided below in this regard.
	22.39. The above could be achieved by consolidating into adjoining residential allotments unusable and irregular portions of open space serving no functional or recreational purpose nor benefit.

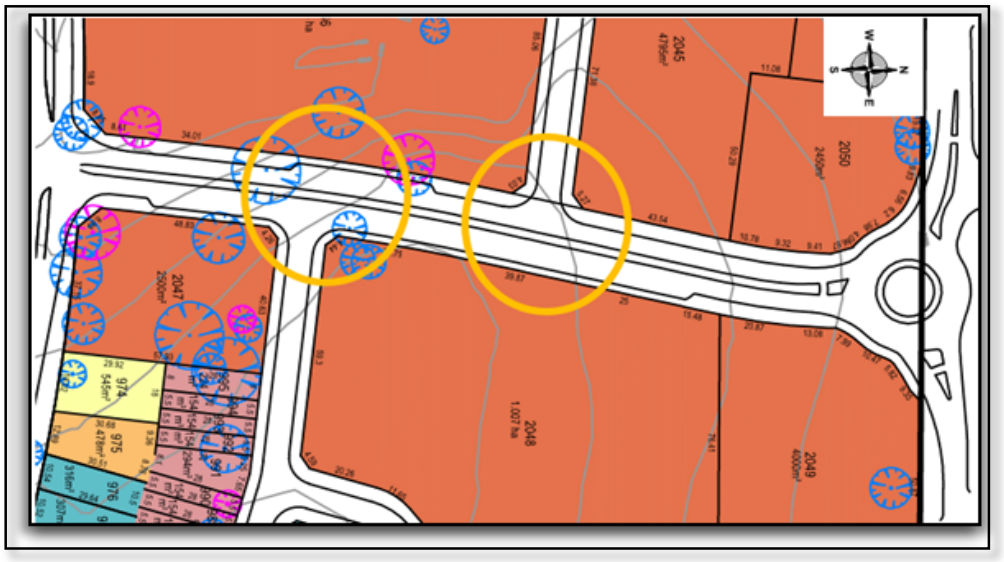
	22.40. Similarly, some stormwater reserves located amongst residential allotments should be investigated for potential removal and converted into residential allotments to aid in reducing the total extent of open space provided. Furthermore, SCAP, Council and the developer should hold discussions pertaining to the further location of the community Centre, such that this can be reflected relative to open space discussion and ultimately identified on the Plan of Division.
23.	**Secondary access to the Gawler East Link Road**
	23.1. Whilst Council's engineering departments have considered traffic and access, the restriction of secondary vehicle access points to external roads and the Gawler East Link Road is an area of concern for Council.
	RECOMMENDATION – It is recommended that:
	23.2. To ensure secondary road access is restricted in undesirable locations (i.e. side and rear boundaries to external roadways), a 100mm reserve strip to Cheek Avenue, Calton Road and the Gawler East Link Road should be provided alongside and rear boundaries of allotments.
24.	**Proposed Emergency Fire Access Road**
	24.1. The GTA Report "Transport Impact Assessment Issue A" Figure 4.1 proposes emergency access on both private land and a public road reserve to the south of the development site however the extent of external works and Infrastructure Agreements have not been provided to Council executed by all parties. 24.2. Council considers the external works proposed for emergency access on private land and road reserve under the care and control of the Barossa Council are required to be agreed and executed by all parties prior to development plan consent to facilitate orderly development.
	RECOMMENDATION – It is recommended that:
	24.3. Infrastructure Agreements be entered into between private property owners, the Barossa Council and Springwood Communities prior to the granting of Development Plan Consent. 24.4. An all-weather track be provided between the development boundary and allotment 138 (south-eastern section) up to Balmoral road.

	
25.	**Staging Plan for External Works**
	25.1. The Staging Plan referred to as Appendix 2 has not been provided to the Town of Gawler for assessment (i.e. what external works are proposed to occur and the timing of these external works relative to stages for reference in an Infrastructure Agreement as triggers for works).
	RECOMMENDATION – It is recommended that:
	25.2. A detailed staging plan showing development and infrastructure staging should be provided prior to the granting of Development Plan Consent to facilitate the orderly provision of infrastructure and development externally to the site and to ensure all external works are outlined in an Infrastructure Agreement and executed between the Springwood Communities, the Town of Gawler and The Barossa Council.
26.	**Internal Traffic volumes. Road between Cheek Avenue/ Calton intersection to Gawler East Link road**
	26.1 The Traffic Assessment indicates a 9.0m carriageway with a footpath one side only for the section of traffic between Cheek Ave and Gawler East Link road intersection. The anticipated volume of traffic on this section of road is 10,900 which is only 1600 lower than the Gawler East Link road, therefore it should have similar characteristic. The report identified these roads as collector roads, with a 9.0m carriageway as per Figure 4.2 of the GTA report.

	
	26.4 The cross section proposed for the "proposed collector road" as per the Figure 4.2, identifies a 20m road reserve, with a 9.0m carriageway. This cross section indicates on-street parking on both sides of the road, which then allows only for a two-way driveable area of 4.8m. The lane width is then 2.4m in each direction.
	
	26.4 The GTA report further recommends that these roads become the proposed bus routes, as per Figure 5.1 of the report. Council's standard lane width for collector and even residential streets is 3.7m, which is as per the minimum standard given by Austroads, which states a minimum of 3.5m excluding the transitional area between two types of transport modes or the gutter on the side of the road.

	
	RECOMMENDATION – It is recommended that:
	26.4 This road be regarded as a "Collector 1" road based on the predicted traffic flow of more than 8,000 vehicles per day. Council's standard for a 25m road reserve with a 15m shared roadway, but due to the approval of Highfield 20m road reserve where a 3m shared footpath is applied, Council would support a 22m road reserve for the "Collector 1" road, similar to the Gawler East Link road cross section profile.
27.	**Internal Traffic volumes Collector roads between 3,000 and 8,000 vehicles per day**
	27.1. The GTA report indicates traffic volumes of less than 8000 vehicles per day on the remainder of collector roads. The report recommends these collector roads excluding the Highfields collector road, should be a 9.0m carriage way road which include 2.1m on-site parking on both sides of the road and the 4.8m driveable road width, same as the previous cross section in Figure 4.3. Again the report identified these collector roads as "possible bus routes". As per the previous comment, this is not complying with the minimum council standards.
	RECOMMENDATION – It is recommended that:
	27.2. As the traffic volumes suggested in the report, triggers the "Type 2 Collector" classification. This should be 22m instead of the proposed 20m. Previously, a 20m road reserve was approved for the Highfields collector road from the Gawler East Link road towards Balmoral road, whereby a shared path of 3m is allowed on the one side of the verge. This approved cross section allowed for an 11.2m carriageway with 2.1m parking lane on both sides. Therefore allowing for a minimum of 3.5m lane width, which complies with the minimum

	Austroads standard of 3.5m lane width for heavy vehicles.
	27.3. A minimum standard for "Type 2 Collector" roads should be as per the Highfield Collector road cross section, shown in figure 4.4, p14.
	
28.	**Left in and out on Gawler East Link road between the Gawler East Link road roundabout and 4-way intersection**
	28.1. The layout indicated a left in and out on both these intersections, due to a median island on the Gawler East Link road. It is assumed this is incorrect and these intersections should be T-intersections. 28.2. There is concern with the stagging and transition distance between four intersections on Mullamar Way. The GTA report did not address any internal concerns or configurations between intersections on collector roads, although the report determined 6500 vehicles would travel on Mullamar Way per day. 28.3. Currently the intersections are configured with 70-75m of spacing between intersections. This distance is not sufficient for back-to-back right turning movements on a divided road. 28.4. Given the high volume of traffic volumes between Mullamar Way and Schomburgh Drive intersection, a right turning lane into Schomburgk Drive from Mullamar Way might be warranted. If a dedicated right turning lane is required, at least 60m is required for the turning movement.



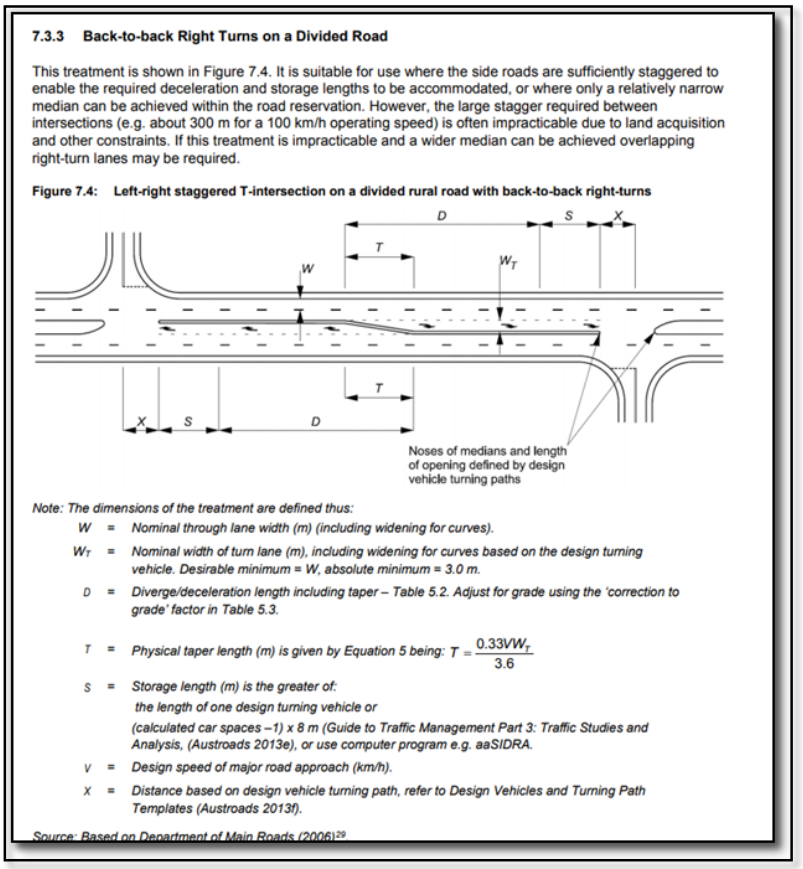
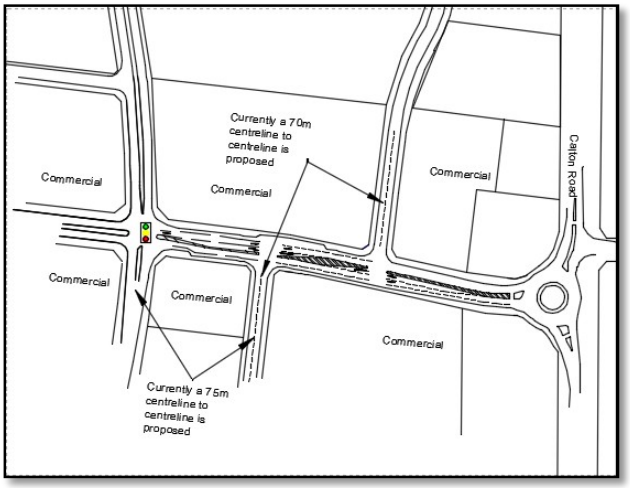
RECOMMENDATION – It is recommended that:

28.5. Clarification should be obtained as to whether these intersections are “left in and out” or should be T- intersections.

28.6. An intersection capacity analysis is required, to determine the right turning movement and staging distances between the three intersections if these two northern intersections are intended to be T-intersections. This should be in accordance with Austroads standards for stacking distances. Refer to 7.3.3 Back to Back Right Turning on divided roads, volume Guide to road designs, Part 4A, unsignalised and signalised intersections.

28.7. It be noted that a 70m intersection to intersection spacing is currently proposed between the two residential roads but this is not sufficient for back-to-back right turn movements. A minimum diverge and storage length of 40m is required on both sides. A distances within each intersection is also required for the turning path. As a guideline, a spacing of 90m between the two intersections is the minimum, therefore the intersection spacing is not acceptable to Council between the two intersections.

28.8. A capacity analysis should be done on the Schomburgk Drive and Mullamar

	Way, to determine the stagging distance requirements for a dedicated right turning lane from Mullamar Way. This analysis may also indicate other upgrades and are required on the intersection. The analysis should take into consideration the peak hour trip distribution from the residential units, by-pass trips especially due to the commercial component around this area.
	
	

7.3.3 Back-to-back Right Turns on a Divided Road

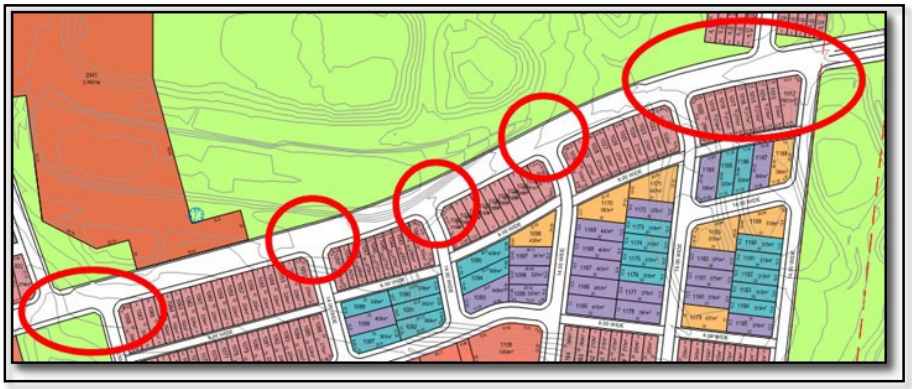
This treatment is shown in Figure 7.4. It is suitable for use where the side roads are sufficiently staggered to enable the required deceleration and storage lengths to be accommodated, or where only a relatively narrow median can be achieved within the road reservation. However, the large stagger required between intersections (e.g. about 300 m for a 100 km/h operating speed) is often impracticable due to land acquisition and other constraints. If this treatment is impracticable and a wider median can be achieved overlapping right-turn lanes may be required.

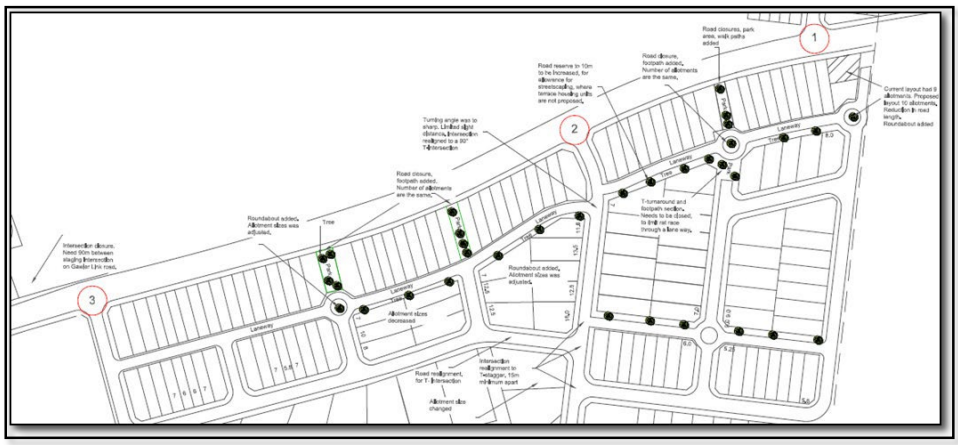
Figure 7.4: Left-right staggered T-intersection on a divided rural road with back-to-back right-turns

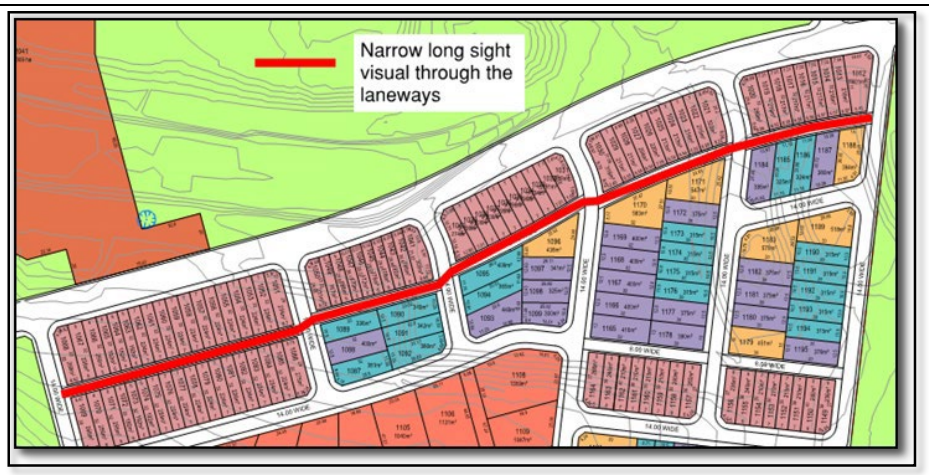
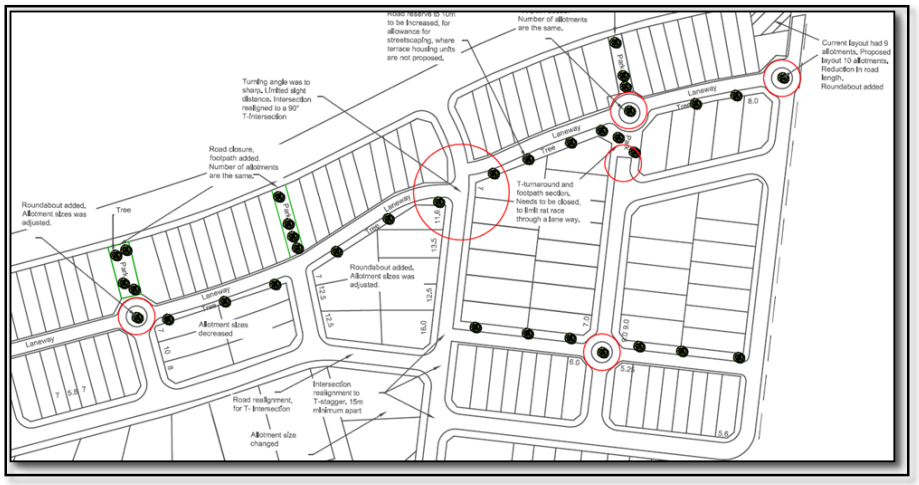
Note: The dimensions of the treatment are defined thus:

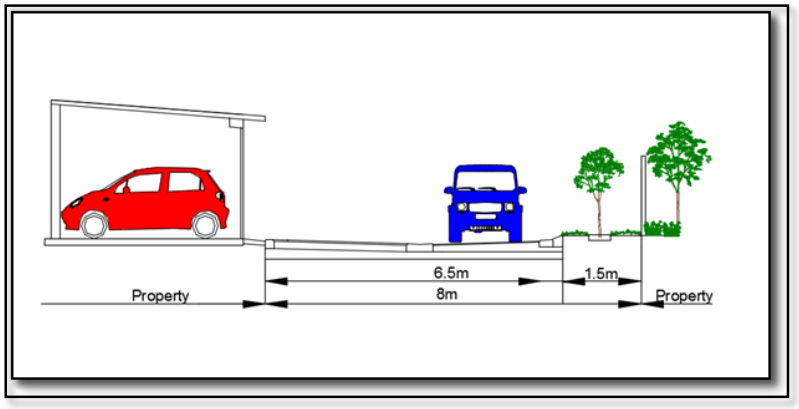
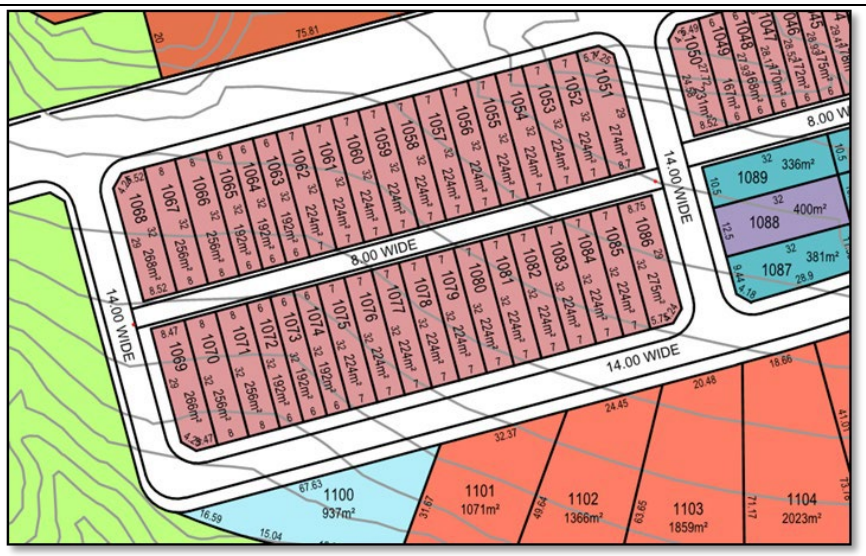
- W = *Nominal through lane width (m) (including widening for curves).*
- W_T = *Nominal width of turn lane (m), including widening for curves based on the design turning vehicle. Desirable minimum = W, absolute minimum = 3.0 m.*
- D = *Diverge/deceleration length including taper – Table 5.2. Adjust for grade using the 'correction to grade' factor in Table 5.3.*
- T = *Physical taper length (m) is given by Equation 5 being:* $T = \frac{0.33VW_T}{3.6}$
- S = *Storage length (m) is the greater of:*
  the length of one design turning vehicle or
  (calculated car spaces –1) x 8 m (Guide to Traffic Management Part 3: Traffic Studies and Analysis, (Austroads 2013e), or use computer program e.g. aaSIDRA.
- V = *Design speed of major road approach (km/h).*
- X = *Distance based on design vehicle turning path, refer to Design Vehicles and Turning Path Templates (Austroads 2013f).*

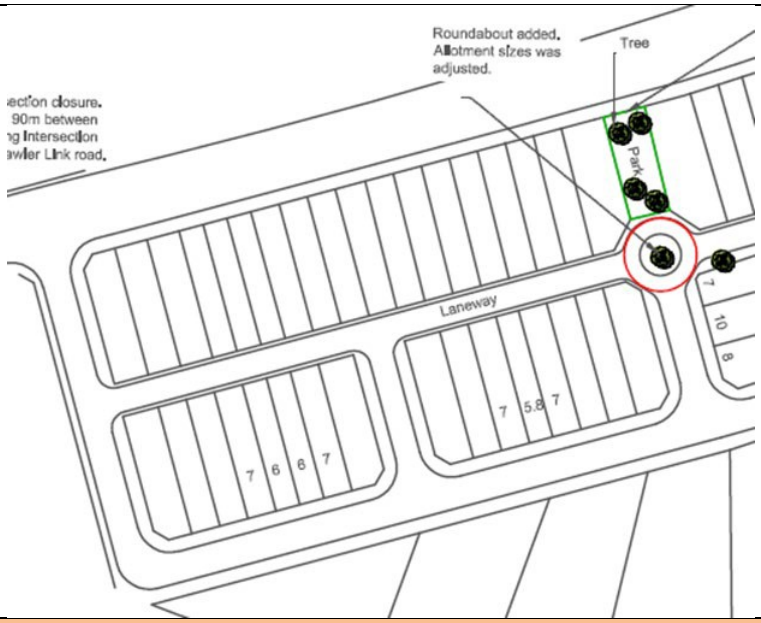
Source: Based on Department of Main Roads (2006)[29]

29.	**Excessive access points from the Gawler East Link road into the southern section of north mid- development area.**
	29.1 This section of the development caters for the higher density topologies along the Gawler East Link road. 29.2 The Gawler East Link road's intended purpose is for mobility to the wider Gawler East area and Springwood, especially the shopping centre. The studies indicate high volumes of traffic on this connector road, and therefore will require dedicated right turning movements into each residential road. These turning movements require a minimum of between 90-100m distances between intersections. 29.3 The current layout plan indicates 8 intersections over a distance of 530m. It is anticipated that the distance between the intersections is not suited for the geometric requirements for right turning movements on the Gawler East Link road.
	
	RECOMMENDATION – It is recommended that:
	29.4. Intersections need to be reduced based on right turning distance requirements on the Gawler East Link road. It is suggested that a maximum of 3 intersections with turning movements should be sufficient to service the allotments on both sides of the Gawler East Link road. Refer to circles numbered 1-3. Theomitted intersections can potentially be converted into open space areas with footpaths linking the Gawler East road with this portion of the development. This concept was successfully implemented in earlier phases of Springwood.

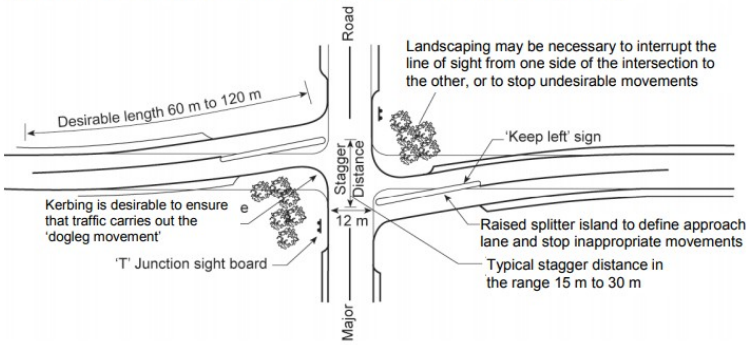
	
	
30.	**Sight length of narrow laneways in the east west direction.**
	30.1. There is a concern with the long sight length of narrow laneways in an east west direction. The laneways can successfully introduced into larger mix-topology developments, if they are clustered together in smaller groups, and spread out within the development. This configuration of terrace units will give the impression of long narrow alley ways, especially because the placement of lighting, services and planting becomes limited.

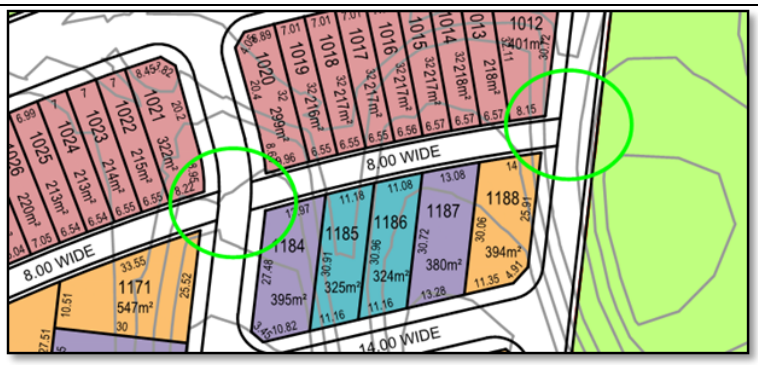
	
	RECOMMENDATION – It is recommended that:
	30.2. These areas be broken up with small roundabouts with greenery within the turning circles and additional greenery on the laneways. This will also introduce traffic calming measurements in this portion of the development, by ensuring the laneways will not be used as “rat race” paths through the laneways. A possible configuration is indicated in the figure below.
	
	30.3. It be noted that Council supports a lane width of 8m for a road width of 6.5m and 1.5m space for landscaping and lighting. This should allow for street lighting and street trees as it will assist with giving these areas a more urban feel, rather than an alley presentation as indicated below.

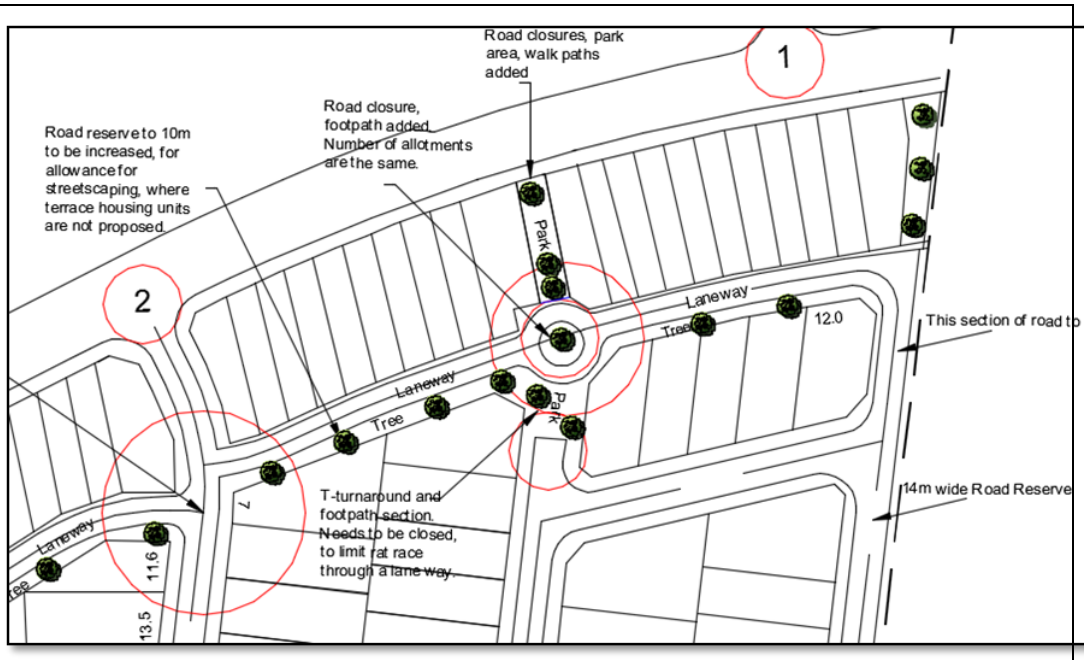
	
31.	**Laneways with 36 units. (Lots 1051-1086)**
	31.1. This portion of the laneway will carry 36 units of traffic, which is 288 vehicles per day. The general number of vpd is < 100. Council's development plan also states, laneways should not be longer than 100m.
	
	RECOMMENDATION – It is recommended that:
	31.2. A further traffic analysis be provided of the laneways proposed based on the amount of traffic expected to be generated from the adjacent allotments. 31.3. A possible configuration is to introduce an additional laneway between the southern 14.0m wide road and the mid laneway, which will then comply with the Council's requirements. The limit of a maximum length of 100m laneway ensures vehicle movements are transferred quicker to residential roads, which are more suitable for movability within the development.

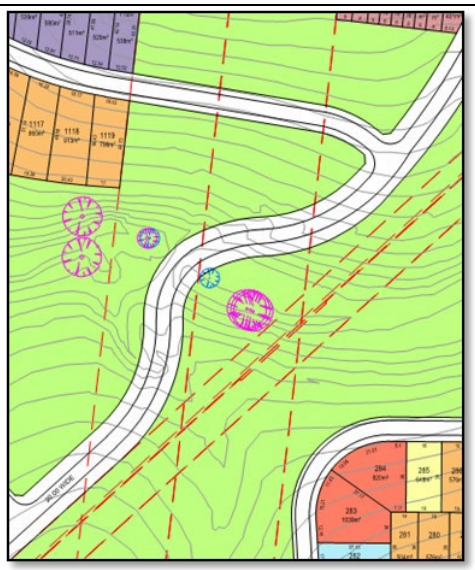


32.	**Intersection with laneways - Allotments 1164 and 1149**
	32.1. The subject roads need to become staggered intersections to assist with the natural traffic calming measures within the development. The major concern is the intersection with the 14m wide road on the western side. Residents, will use these laneways as through roads and not as the intended use to give direct access to properties.
	
	RECOMMENDATION – It is recommended that:
	32.2. A layout realignment with a configuration including staging distances between

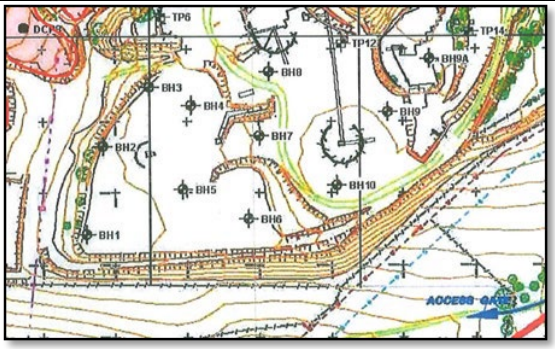
	the laneway and 14m road should be implemented. The suggested staging distance between intersections is between 15-30m, as per the Austroads, Guide to Road Design, Part 4A. Council would accept the minimum staging distance of 15m between intersections.
	Basic two-lane two-way road This layout (Figure 7.1) should be designed to ensure that: • the stagger distance between the minor legs is large enough to discourage drivers from 'taking a short-cut on the wrong side of the traffic islands (e.g. at least 15 m to 30 m depending on the site characteristics) • the island treatments in the minor roads are long enough to also discourage wrong way movements • sufficient width is provided on the major road within the intersection to enable through vehicles to pass slowly to the left of vehicles waiting to turn right (e.g. 12 m), a similar principle to the BAR treatment. **Figure 7.1: Right-left staggered T-intersection on a two-lane rural road (low turning volume)**  *Source: Based on Department of Main Roads (2006)[26].*
	32.3. A possible configuration with a T-staggering between the northern laneway and the southern 14m road is possible by realigning the western 14m road by introducing a larger horizontal bend. This will reduce the size of the larger southern allotments, but increase the northern allotments with an approximate 2m frontage width. These allotments will have a straighter allotment line, which is preferable for house footprint optimisation.
	

33.	**Intersection between lots 1021, 1020 and next to 1012.**
	33.1. The 4-way intersection between the two laneways and 14m north south street, can give motorists the opportunity to use the laneways as vehicle short cuts, and not realising they are crossing a 14m road, due to a tunnel vision in the laneways. A staggered approach or a road intervention is required. 33.2. This concern is linked to the comment above previous in regards to reducing the number of intersections on the Gawler East Link Road. If the previous concern is implemented, this intersection between lots 1020 and 1021, will be closed, and this laneway will increase in length.
	
	RECOMMENDATION – It is recommended that:
	33.3. A roundabout between the two terrace blocks is a possible option to implement traffic calming measures and to comply with the maximum length of a laneways. 33.4. Roundabouts between the two terrace blocks should be considered as this would assist with the closure of the intersection on the Gawler East Link road, and “rat racing” through the neighbourhood.

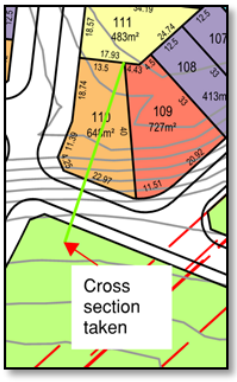


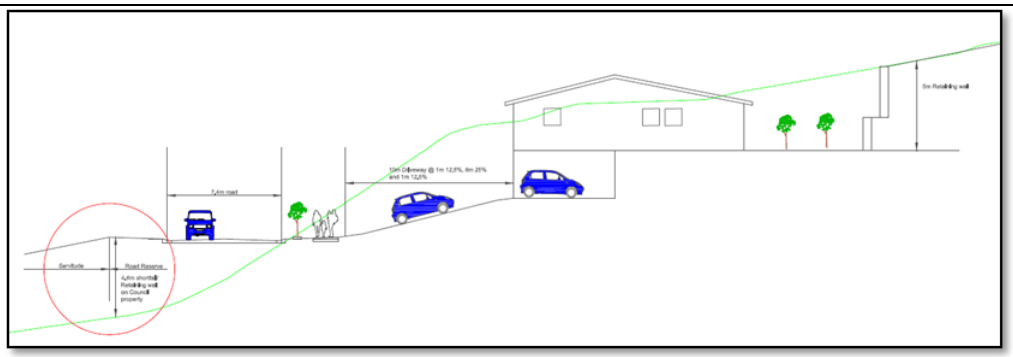
34.	**Main access over the South Para Creek**
	34.1. The road is required to be designed above the 1%AEP level. It is a major access link between north and south of the development, and there are various stormwater intervention structures proposed for this area. In the event that a major storm event occurs, this road should still be accessible for residents living in the southern part of the development.
	
	RECOMMENDATION – It is recommended that:
	34.2. The road be designed to have a freeboard of at least 300mm above 1%AEP level.

35.	**Steep slope on roads - Lots 6-16**
	35.1. A *WGA* Roads and Earthworks Report, refers to this area as the sedimentation pond area with excavations up to 4m deep. It is unclear on how this area will be rehabilitated to achieve the required gradient for road and allotment benching.
	
	RECOMMENDATION – It is recommended that:
	35.2. Clarification be obtained on the method of engineering fill in this entire area. It would be advisable to provide a contour plan which will reflect the final fill levels in order to determine if proposed road grades and benching level are acceptable.
36.	**Steep slopes on verge of the embankment. Road next to SA Water easement**
	36.1. This section of road is on the boundary of the former quarry. As per the contour layout, this section forms a soil embankment from the SAwater/SEAgas easement up towards the north, as per the geological study. It is unclear from the WGA Roads and earthworks Report, whether this section would be shaped with a gradual slope back towards the north.



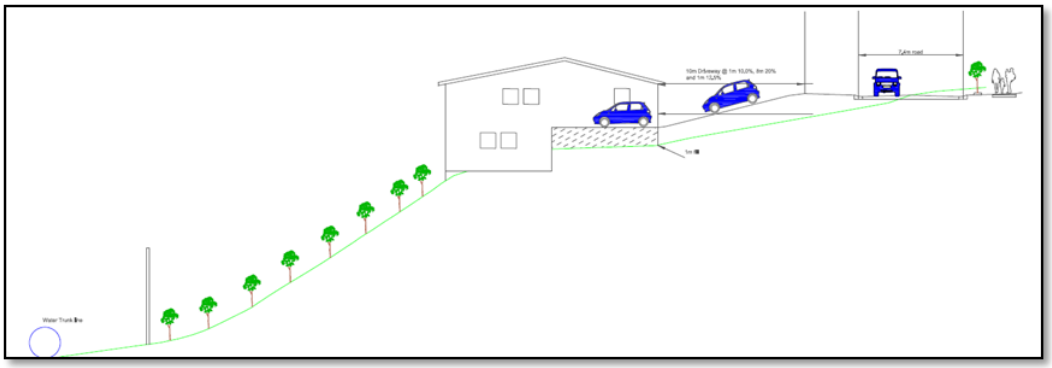
36.2. The concern is if the ridge section will be kept and a gradual sloping topology will be adopted towards Calton road from the top of the ridge, there is almost a 10m height difference within the road reserve. The earthworks design of keeping the ridge and sloping back to Calton road would likely be the preferred solution, due the high cost of cutting and filling the sedimentation pond area. Then the risk of the current position of the road becomes a concern. A cross section was taken to illustrate the concern of the current road position in terms of the existing contours and embankment ridge. This figure illustrates even with a rear retaining wall of 5m, a maximum driveway slope of 25% and a split level house, the road will still be constructed on a 4.8m high retaining wall. This retaining wall would then become the asset of council.

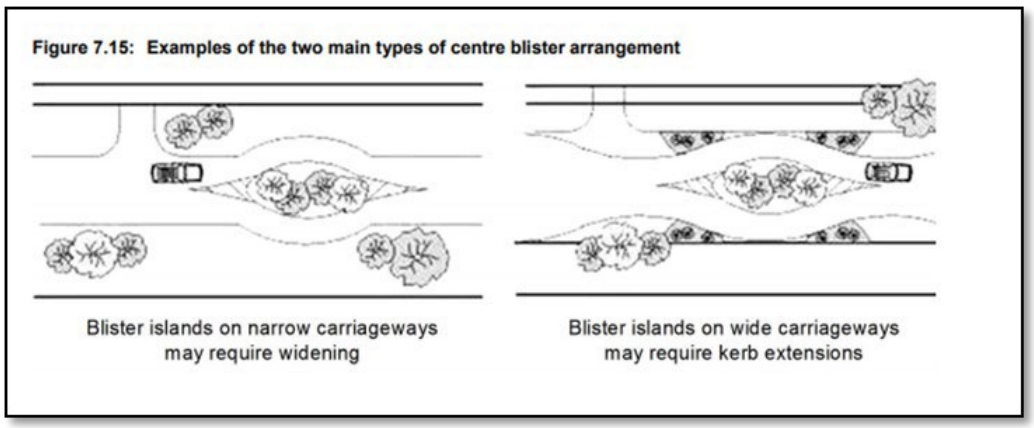


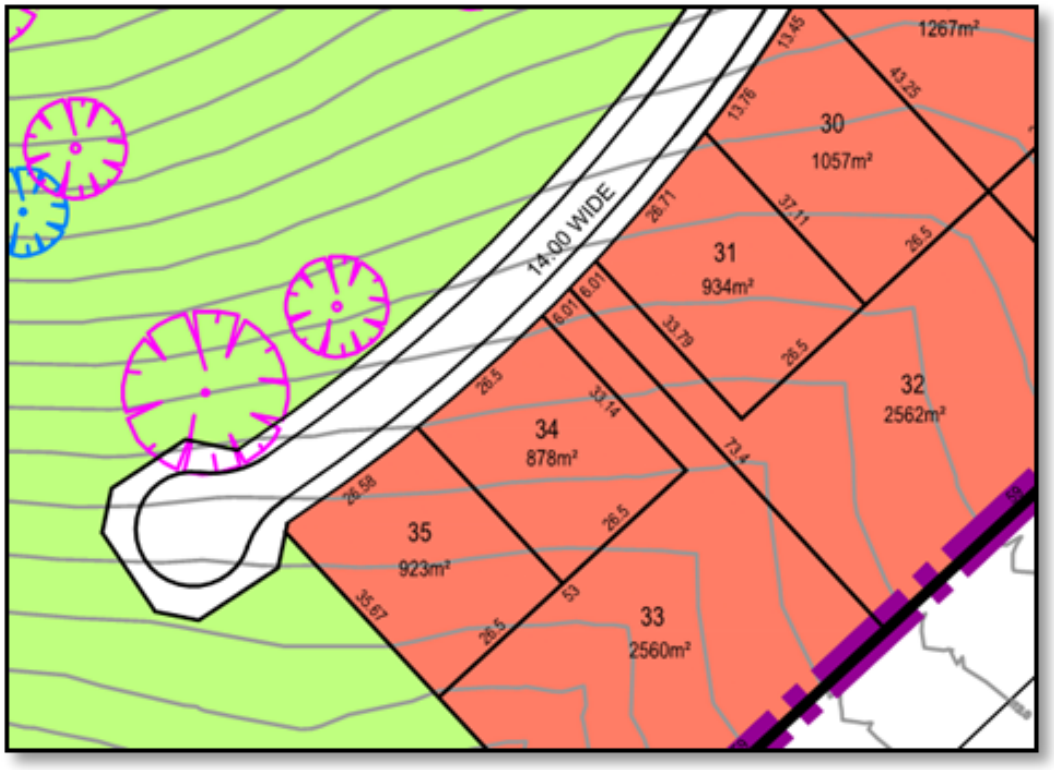
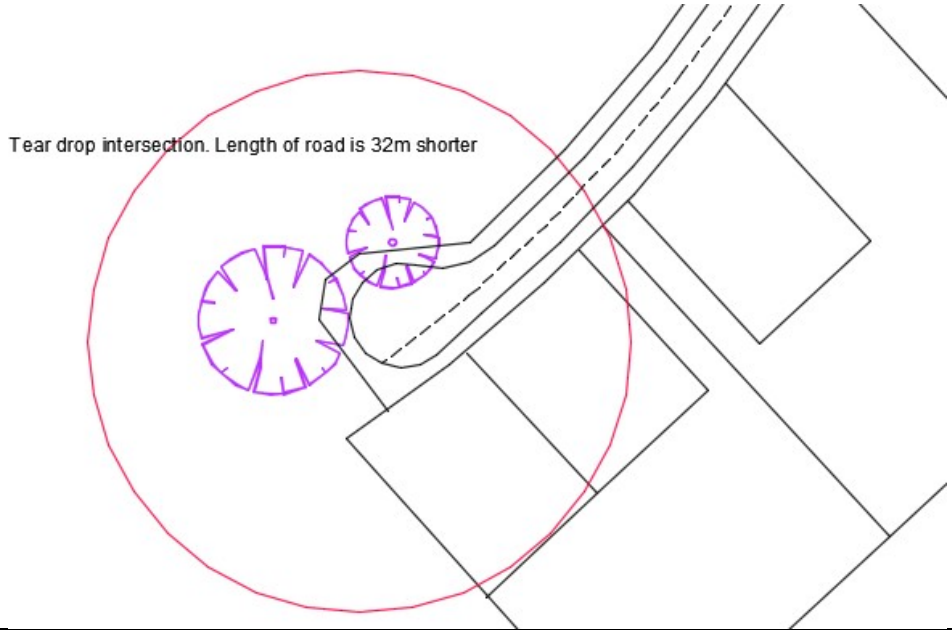


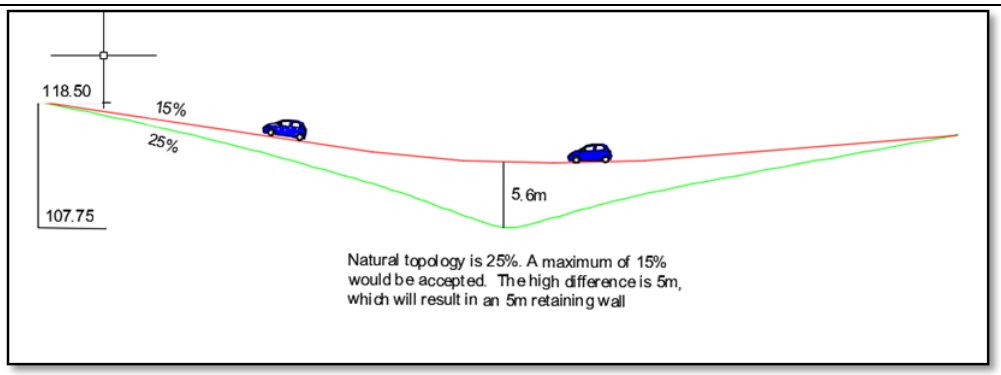
RECOMMENDATION – It is recommended that:

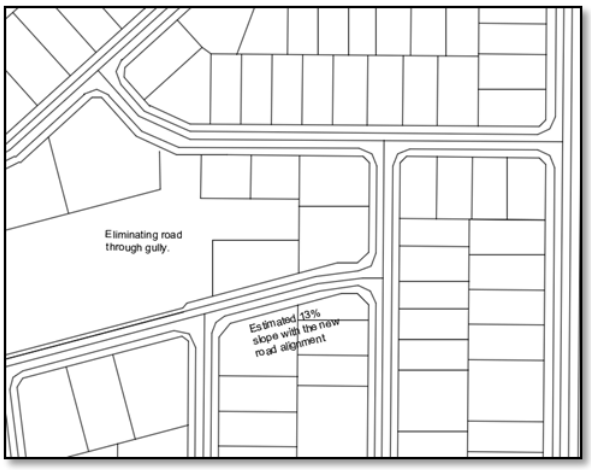
36.3. This section of road should be realigned towards the north to allow for allotments to terminate against the easement. If the ridge is to be kept, the allotments should be realigned in such a way that there is ample space at the top of the embankment to construct a house, with a sloping natural garden towards the easement. The figure indicates that it is possible to realign the road to be on top of the ridge, with partial flat allotments at the top of the ridge.

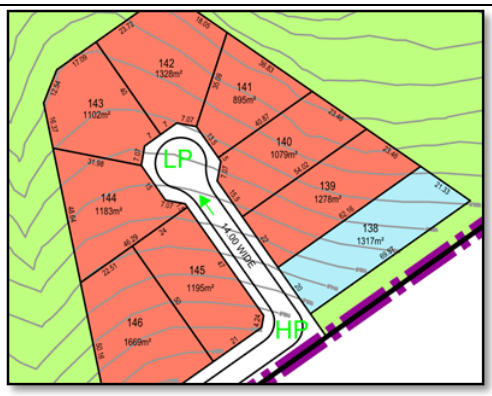
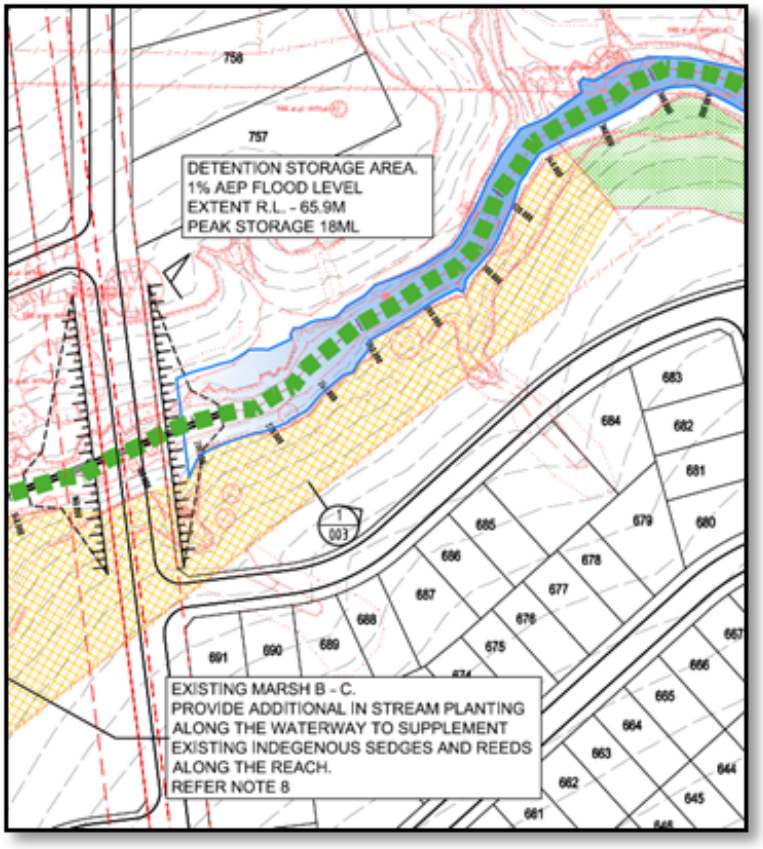


37.	**Long straight section of road** - **Lot 1131 -1120 (>250m)** - **Lot 593 573 (>350m)**
	37.1. The roads identified, generally give motorists the opportunity to speed if the road is over 250m, especially with a steeper gradient. Roads that provide less than 250 meters of straight sections of road are considered too short for excessive vehicle speeds to occur and act as a natural speed control measure.
	RECOMMENDATION – It is recommended that:
	37.2. Traffic management strategies to achieve a safe, low speed environment within the local street network be implemented. Although the report only makes reference to roundabouts and realigned T-junctions, it does not consider traffic calming measurements on long stretches of road. 37.3. Consideration be given to centre blisters on these sections of road. Refer to *Austroads, Guide to Traffic Management Part 8* Local Area Traffic Management for acceptable measurements.
	 **Figure 7.15: Examples of the two main types of centre blister arrangement** Blister islands on narrow carriageways may require widening Blister islands on wide carriageways may require kerb extensions

38.	**Reduce the length of road and change the turning circle to a teardrop turning circle/ or off centre turning circle.**
	38.1. The turning circle does not give access to any properties. It does not serve the intended purpose of giving access.
	
	RECOMMENDATIONS
	38.2. The road length be reduced with a teardrop turning circle, which would result in a 32m road length reduction.
	

39.	**Retaining walls in road verges**
	39.1. Various outer roads around allotment packages are proposed in the layout plan. The use of outer roads on steep slopes can result in retaining walls being required to keep up the road and ensuring there is access into allotments. This outer road alignment normally also results in longer lengths of road required within a development, which will results in higher construction costs for the developer and ongoing maintenance cost for council.
	RECOMMENDATION – It is recommended that:
	39.2. The outer roads around allotment groupings are supported, on the condition that there are no retaining walls imposed within the road reserve. Retailing walls within the road reserve, particular to the extent proposed are not supported. Council would not agree to the vesting of such infrastructure. If road construction is not achievable without retaining walls, it is suggested that the roads and allotments be realigned in order for the allotments to accommodate retaining walls.
40.	**Steep road sections (Barossa Council)**
	40.1. The natural slope on this section of road is around 25%. Even with a 15% slope on the road, it will result in a 5m retaining wall on the road reserve verge.
	
	RECOMMENDATION – It is recommended that:
	40.2. This section of layout be revised to eliminate the possibility of using retaining walls to retain the road. A possible solution is to extend the 14m west-east road to the middle north south road, as shown below.

	
41.	**Access tracks for maintenance and bushfire access**
	41.1. The layout plans or the supporting documentations submitted, does not make any reference to access tracks around allotments, which border open space areas. This area falls under a general bushfire area and will require access into open space areas.
	RECOMMENDATION – It is recommended that:
	41.2. Open space access tracks should be incorporated into the road layout plans prior to land development approval.
42.	**Rear of Allotment Stormwater Management**
	42.1. There are no rear of allotment stormwater drainage infrastructure or drainage easements proposed. The only rear allotment stormwater drainage infrastructure proposed is for rear allotment infiltration wells.
	RECOMMENDATION – It is recommended that:
	42.2. Rear of allotment stormwater drainage infrastructure be provided in accordance with Council's Standards and Requirements for Land Development / Land Division Guideline as the private property infiltration system as proposed is not supported.
43.	**Major storm overland flow path**
	43.1. The proposed allotment layout plan and WGA's stormwater management strategy does not allow for major storm overland flow path to dispose of stormwater in a safe and efficient way form the proposed road reserves. There is several restricted low points in road reserves, which will cause severe flood of properties. An example is given below.

	
	RECOMMENDATION – It is recommended that:
	43.2. A revised Plan of Division be provided showing the extent of major storm overland flow path reserves with a revised Stormwater Management Strategy to demonstrate how major storm overland flow paths will be achieved.
44.	**Stormwater Intervention structures within the creek**
	44.1. A vast amount of stormwater infrastructures such as wetlands and macrophyte ponds are proposed in-line within the creek. The Springwood Flora and Fauna Assessment report identified, native vegetation within these areas. The stormwater management has not considered how these intervention structures will impact the native vegetation areas.
	

	RECOMMENDATION – It is recommended that:
	44.2. The stormwater management plan should consider the recommendations of the Flora and Fauna Assessment report in determining suitable areas for intervention structures. The preliminary indications shows most of the intervention structures should be placed off-line and out of the 1%AEP flood line, to limit the impact on native vegetation.
45.	**Regional Flood Detention Storage**
	45.1. A regional flood detention storage is proposed for the pre- and post-development flows for the entire urban development catchments. Almost three quarters of the catchment area is upstream of this development. The proposed regional stormwater detention design, is only based on the runoff from the development, and does not take into account the pre development runoff from upstream areas. 45.2. In a 1%AEP event, the maximum flood line level at the road dam wall is 6.5m, with a storage of 15ML. This detention creates a substantial dam structure within the creek.
	RECOMMENDATION – It is recommended that:
	45.3. Smaller detention structures should be created within each stage of the development which are off-line to the creek.
46.	**Gawler East Traffic Intervention and Community Infrastructure Deed**
	46.1. The GTA Report “Transport Impact Assessment Issue A” states in conclusion that the anticipated traffic volumes will be managed by pre-planned external infrastructure upgrades at a number of intersections based on an agreement between the development, Council and DPTI. Council advises that the Gawler East Traffic Interventions and Community Infrastructure Deeds have not been agreed to and executed by all parties including the developer, Springwood Communities, at the present time. 46.2. Council considers the external works outlined in the Gawler East Traffic Interventions and Community Infrastructure Deeds, are required to be agreed and the Deed executed by all parties prior to Development Plan Consent to facilitate orderly development and minimise impacts of the Springwood development to the broader community.

	RECOMMENDATION – It is recommended that:
	46.3. The Gawler East Traffic Interventions and Community Infrastructure Deeds be agreed and executed by all parties prior to the granting of Development Plan Consent.
47.	**Infrastructure Agreement for Additional External Works**
	47.1. An Infrastructure Agreement for additional external works not included in the Gawler East Infrastructure Deed has not been provided to the Council to facilitate orderly development. 47.2. There are infrastructure upgrades proposed for the road network including footpaths, cycle paths which should be preliminary designed and costed to confirm that they can be constructed and whether any land acquisitions are required or major service implications. Similarly off site stormwater infrastructure if required (including detention, water quality improvements, upgrades etc.) should be shown and scope of work and staging agreed to by the developer. The external infrastructure agreement should include an agreed staging based on allotments developed.
	RECOMMENDATION – It is recommended that:
	47.3. An infrastructure agreement be prepared and agreed between the parties for proposed works in the Town of Gawler and The Barossa Council prior to the granting of Development Plan Consent.
48.	**Gawler East Link Road proposed road reserve width**
	48.1. The Springwood Development application proposes a road reserve width for the Gawler East Link Road. 48.2. The Springwood Development Application proposes a road reserve width for the Gawler East Link Road (now called Schomburgk Drive and Mullamar Way). However, the road reserve width is yet to be confirmed as part of the Gawler East Link Road Project between DPTI, Town of Gawler and Springwood Communities. This will have a significant impact on the Plan of Division and should be resolved as soon as possible.
	RECOMMENDATION – It is recommended that:

	48.3. The road reserve width of the Gawler East Link Road be confirmed and agreed between DPTI, the Town of Gawler and Springwood Communities prior to the granting of Development Plan Consent.
49.	**Gawler East Link Road proposed road reserve width**
	49.1. A Staging Plan for External Works has not been provided for the Springwood development. 49.2. The Staging Plan referred to as Appendix 2 has not been provided to Council for assessment (i.e. what external works are proposed to occur and the timing of these external works relative to stages for reference in an Infrastructure Agreement as triggers for works).
	RECOMMENDATION – It is recommended that:
	49.3. A detailed staging plan showing development and infrastructure staging be provided prior to the granting of Development Plan Consent to facilitate the orderly provision of infrastructure and development externally to the site and to ensure all external works are outlined in an Infrastructure Agreement and executed between the Springwood Communities, the Town of Gawler and The Barossa Council.
50.	**Proposed local street connections to Calton Road**
	50.1. The GTA Report "Transport Impact Assessment Issue A" Figure 4.1 proposes two local street junctions on Calton Road between Cheek Avenue and Phillips Street. 50.2. Council does not consider these intersections are required to facilitate safe and convenient movement of vehicles given there are other collector roads internal to the development to direct traffic to Calton Road.
	RECOMMENDATION – It is recommended that:
	50.3. The two road reserves referred to as 5a and 5b as well as the third local road access in the GTA Report "Transport Impact Assessment Issue A" be amended to have a T-turn around at the northern ends to prevent vehicle access to Calton Road in accordance with the Ministers Code for Development in Bushfire Protection Areas prior to the granting of Development Plan Consent.

51.	**Proposed local road connection to Cheek Avenue**
	51.1. The GTA Report "Transport Impact Assessment Issue A" Figure 4.1 proposes a local street access to Cheek Avenue south of Calton Road labelled '6', however no information on the extent of external works on Cheek Avenue has been provided and no Infrastructure Agreement has been executed between the Town of Gawler and Springwood Communities to facilitate the proposed local road connection.
	51.2. No information has been provided from Springwood Communities on the extent of external works proposed and traffic analysis to support the proposed location of the road reserve given the proximity to existing local roads connecting to Cheek Avenue (i.e. staggered T-intersection treatment).
	RECOMMENDATION – It is recommended that:
	51.3. Further information be provided to Council by Springwood Communities on the extent of external works proposed and traffic analysis, with reference to Austroads and Australian Standards, to support the proposed location of the road reserve given the proximity to existing local roads connecting to Cheek Avenue and proposed staggered T-intersection treatment.
52.	**Intersection of Cheek Avenue and Calton Road**
	52.1. The GTA Report "Transport Impact Assessment Issue A" Figure 4.1 proposes a new Collector road connection at the intersection of Cheek Avenue and Calton Road and this intersection is listed as a traffic intervention in the Gawler East Infrastructure Deed however the Deed has not been executed by all parties at the present time to facilitate orderly development. 52.2. A roundabout is required to be delivered at the intersection of Cheek Avenue and Calton Road, however no information has been provided to Council to demonstrate orderly development will be achieved by the proposed Collector road connection through the Springwood development and whether or not the proposed stagger with Cheek Avenue and the proposed Collector Road can be facilitated to meet Austroads requirements and the Australian Standards. No information has been provided to the Council to assess how the existing Cheek Avenue south of Calton Road integrates with the proposed Collector Road and intersection design.

	RECOMMENDATION – It is recommended that:
	52.3. The Gawler East Traffic Interventions and Community Infrastructure Deeds be agreed and executed by all parties prior to the granting of Development Plan Consent and further analysis (i.e. SIDRA or similar) be provided by Springwood Communities that demonstrates a roundabout can be facilitated within the proposed Collector Road road reserve and existing road reserves at the intersection of Cheek Avenue and Calton Road.
	52.4 A concept geometric layout of the intersection to demonstrate the intersection be provided the will meet Australian Standards and Ausroads Guideline requirements including any required alterations to existing Council road reserves (i.e. Cheek Avenue and Calton Road).
53.	**Intersection of Balmoral Road and Springwood Development and Intersection of Balmoral Road and Calton Road**
	53.1. The GTA Report "Transport Impact Assessment Issue A" Figure 4.6 proposes a major roundabout at the intersection of Balmoral Road and the Collector Road (Extension of the Gawler East Link Road) into the Springwood Development as well as the Calton Road Balmoral Road Junction. These intersections are listed as a traffic interventions in the Gawler East Traffic Interventions and Community Infrastructure Deed, however the Deed has not been executed by all parties at the present time to facilitate orderly development. 53.2. A roundabout is required to be delivered at the intersection of Balmoral Road and the Collector Road into the Springwood development and a junction upgrade to the intersection of Balmoral Road and Calton Road, however the Gawler East Traffic Interventions and Community Infrastructure Deed has not been executed by all parties at the present time to facilitate orderly development.
	RECOMMENDATION – It is recommended that:
	53.3. The Gawler East Traffic Interventions and Community Infrastructure Deed be agreed and executed by all parties prior to the granting of Development Plan Consent.

54.	**Traffic Modelling**
	54.1. The GTA Report "Transport Impact Assessment Issue A" Figure 6.3 outlines the traffic volumes predicted internally and externally from the Springwood development site. However, Council advises this traffic modelling is at variance with the existing traffic modelling underpinning the Gawler East Traffic Interventions and Community Infrastructure Deed and associated traffic interventions. 54.2. The traffic volumes presented in Figure 6.3 are not considered accurate to reflect the existing traffic generation modelled as part of the Tonkin Report Gawler East Traffic Interventions Assessment Report (June 2018) referred to in Section 6.4 of the "Transport Impact Assessment Issue A". Therefore an accurate assessment of the changes to the nature and function of external roads specifically as a result of the Springwood development has not been provided to Council by Springwood Communities. In particular the traffic modelling underpinning the Gawler East Traffic Interventions Assessment Report (June 2018) has apportioned financial contributions from all parties to the Deed based on the impact of traffic generated by the Springwood development on the external roads to the development site. In particular, the following impacts to the external road network have previously been identified that are directly a result of the Springwood development; 54.2.1 Cheek Avenue Upgrade (Intervention 1B) 54.2.2 Barossa Valley Way / Cheek Avenue Intersection – Interim (Intervention 1D) 54.2.3 Calton Road Upgrade – Cheek to Project entrance (Intervention 1E) 54.2.4 Calton Road / Link Road Intersection at Hamilton Reserve (Part of DPTI 54.2.5 Delivered Gawler East Link Rd Project (Intervention 1I) 54.2.6 Calton Road / Link Road Intersection at Cheek Avenue (Intervention 1J)

	54.2.7 Calton Road Upgrade – Project entrance to Balmoral Road (Part of Gawler 54.2.8 East Link Road Project) (Intervention 1L) 54.2.9 Link Road / Balmoral Road Intersection (Intervention 1M) 54.2.10 Kalbeeba Road / Barossa Valley Way Intersection (Intervention 1O) 54.2.11 Calton Road / Balmoral Road Junction (Intervention 1Q) 54.2.12 First Street Intersection, Fifth Street / Hill Street Intersection (Seventh 54.2.13 Street) (Intervention 2F) 54.2.14 Gawler One-Tree Hill Road (Deadmans Pass/Town Entry) Gawler Terrace to Eckerman Avenue (Intervention 2H) 55.2.13 It is noted the GTA Report "Transport Impact Assessment Issue A" Table 6.2 therefore does not list all the external impacts to the road networks under the care and control of the Town of Gawler and The Barossa Council as a direct result of the Springwood development.
	RECOMMENDATION – It is recommended that:
	54.4. A review of the traffic modelling be undertaken by Springwood Communities to take into consideration the existing traffic modelling undertaken as part of the Gawler East Traffic Interventions Assessment Report (June 2018). This will ensure an accurate assessment of the changes to the nature and function of external roads can be carried out prior to the granting of development plan consent.
55.	**Traffic Modelling Change to the Nature and Function of External Roads**
	55.1. The GTA Report "Transport Impact Assessment Issue A" Figure 6.3 provides predicted traffic volumes on the surrounding road network outside of the site that are not consistent with the traffic modelling previously undertaken to underpin the traffic interventions of the Gawler East Infrastructure Deed.

	55.2. This assessment completed in June 2018 identified traffic increases external to the Springwood Development as a result of the Springwood Development and the Gawler East Link Road. The report also provided guidance on other traffic volume changes as part of other developments in the area. Based on the Tonkin 2018 report, as a result of the ultimate Springwood Development, the traffic volume on adjoining roads (excluding Gawler East Link Road) including Cheek Avenue and Calton Road will have significant increases which will change the current nature and function of the road. Both these roads will form collector roads. Accordingly these roads will need to be upgraded to safely accommodate the additional traffic volumes. The Tonkin 2018 report did not include Sunnydale Road as this road was not considered appropriate to have increased traffic although this has been included in the GTA report with a significant traffic volume increase. If this road is to have the proposed increase in traffic volume proposed, it also will need to be upgraded to safely accommodate the additional traffic volumes and be designated a collector road. It is likely that Barossa Valley Way and Kalbeeba Road and Balmoral Road will all have an increased traffic and some works on these roads will be required to accommodate the additional traffic.
	RECOMMENDATION – It is recommended that:
	55.3. A review of the traffic modelling be undertaken by Springwood Communities to take into consideration the existing traffic modelling carried out as part of the Gawler East Traffic Interventions Assessment Report (June 2018) 55.4. It be noted that Council does not consider Sunnydale Avenue is required to be upgraded based on previous traffic modelling for the Gawler East Traffic Interventions and Community Infrastructure Deed but advises there will be a change in the nature and function of Calton Road and Cheek Avenue which will have a significant increase in traffic volume and require an upgrade to Collector Road standard to safely accommodate these traffic volumes as a direct result of traffic generated from the Springwood development.

56.	**Collector Road Cross Section Profile**
	56.1. The GTA Report "Transport Impact Assessment Issue A" outlines a proposed Collector Road cross-section that is not consistent with the requirements of the Council's Standards and Requirements for Land Development / Land Division Guideline. 56.2. The Collector Road cross-section proposed does not facilitate Council's standard level of service provided to the community for the provision of road infrastructure.
	RECOMMENDATION – It is recommended that:
	56.3. All Collector Roads be required to be delivered external to the Springwood development site to facilitate orderly development and are to be in accordance with the Council's Standards and Requirements for Land Development / Land Division Guideline and as outlined in the Council's Statement of Requirements.
57.	**Stormwater Management Detention Storage**
	57.1. The WGA Report "Springwood Urban Development" Stormwater Management Strategy proposes detention in the natural watercourse environment. Whilst detention is supported, it is not supported in the natural watercourse environment which was also raised by the Town of Gawler at a pre-lodgement SCAP meeting. 57.2. The WGA Report "Springwood Urban Development" Stormwater Management Strategy proposes detention in the natural watercourse environment, which has vegetation, including critically endangered vegetation that is protected under EPBC Act and Native Vegetation Act legislation. Detention is also not provided for all storm events up to the 1% AEP event for the development and the impacts of flooding to the South Para River and private properties immediately downstream have not been analysed. 57.3. The regional scale detention basin proposed in the natural watercourse environment has not been modelled taking into account the upstream rural catchment, so the Town of Gawler request a review of post development flows from the site.

	RECOMMENDATION – It is recommended that:
	57.4. It be noted that Council does not support the WGA Report "Springwood Urban Development" Stormwater Management Strategy. A revised Stormwater Management Strategy should be requested. Such revised report to addresses the following prior to Development Plan Consent: 57.4.1. Detention storage be provided to limit post development flows to predevelopment flows for all storm events up to and including the 1% AEP event outside of the watercourse environments of the South Para River
	and 'Spring Creek' as defined in the WGA Report "Springwood Urban Development" Stormwater Management Strategy. 57.4.2. All water quality treatment devices are provided outside of the watercourse environments of the South Para River and 'Spring Creek' as defined in the WGA Report "Springwood Urban Development" Stormwater Management Strategy to meet the Pollutant reduction targets outlined in the Town of Gawler Standards and Requirements for Land Development / Land Division Guideline. 57.4.3. Further information be provided on how flow velocities will be managed to protect the watercourse environments from erosion on the Springwood development site and immediately downstream on Private Properties. 57.4.4. Further stormwater infrastructure and water quality treatment devices (i.e. linking stages of the development) consolidated to rationalise the number of detention storages and water quality treatment devices.
58.	**Stormwater Erosion Impacts to Downstream Private Property**
	58.1. The WGA Report "Springwood Urban Development" Stormwater Management Strategy does not provide sufficient analysis of potential erosion impacts in the natural gullies both within the Springwood development site and off site immediately downstream on private properties. 58.2. Flows from the Springwood development site will have increased frequency and volume irrespective of detention requirements as a result of development, and there is a high risk of erosion to private properties immediately downstream of the development site that has previously been identified as 'high risk' in the draft Gawler and Surrounds Stormwater Management Plan as well as within the natural gullies of the Springwood development site.

	RECOMMENDATION – It is recommended that:
	58.3. A further stormwater analysis be undertaken by Springwood Communities to demonstrate that the impacts of erosion in the natural gullies both within the Springwood development site and immediately downstream on private properties have been assessed and works proposed (if required) to manage these impacts. 58.4. It be noted that an agreement with the downstream private property owners would be required if off site works are proposed on private properties and requests an executed copy of such an agreement be provided to the Town of Gawler prior to Development Plan Consent.
59.	**Stormwater Management Plan Calton Road External Stormwater Works**
	59.1. The WGA Report "Springwood Urban Development" Stormwater Management Strategy proposes the catchment in the most North West corner of the Springwood development discharge stormwater to the natural gully to the south. Council is concerned due to the topography that this discharge location is not possible and discharge to Calton Road may be required and earthworks information has not been provided to demonstrate discharge of this catchment to the south into the natural gully and location of stormwater detention infrastructure is achievable. 59.2. If stormwater discharge to Calton Road is required then Council will require detention storage to limit the post development flow to the pre development flow for all storm durations and water quality requirements to be met. In addition, there is currently no location for detention storage or water quality treatment for this catchment proposed prior to discharge off site and this has potential to impact on the Plan of Division proposed.

	RECOMMENDATION – It is recommended that:
	59.3. A further analysis of the catchment in the North West corner of the Springwood development be provided to demonstrate whether it is possible to discharge stormwater to the natural gully to the south and whether an external works Infrastructure Agreement is required for orderly development to facilitate these works on Calton Road between the Council and Springwood Communities.
60.	**Stormwater Overland Flow Paths internal the development**
	60.1. There are several low points within the development site in proposed road reserves that do not have major storm overland flow paths.
	60.2. Overland flow paths should be provided at 'trapped' low points in proposed road reserves including provision of 3 metre width reserve strips at the downstream end of cul-de-sac's / T-turn arounds to ensure major storm overland flow paths are provided.
	RECOMMENDATION – It is recommended that:
	60.3. It be noted that Council does not support the proposed allotment layout and WGA stormwater management strategy and requests a major storm overland flow paths be provided for the safe and efficient disposal of stormwater from the development from proposed road reserves. A revised Plan of Division be provided showing the extent of major storm overland flow path reserves with a revised Stormwater Management Strategy demonstrating how major storm overland flow paths will be achieved.
61.	**Steep slope on roads** - **Lots 103-110 Road next to park areas** - **Roads around allotment block 6-16**
	61.1. There would be an 8m fall over 20m. It's anticipated that a retaining wall structure would be constructed on the verge of the road but it might only be a quarry embankment.
	RECOMMENDATION – It is recommended that:

	61.2. This section of development should be cut/filled, but no retaining walls should be permited next to the SEAgas easement.
62.	**Long straight section of road** - **Lot 1131 -1120 (>250m)** - **Lot 593 573 (>350m)**
	62.1. These roads generally give motorists the opportunity to speed if it's over 250m, especially with a steeper gradient. Roads that provide less than 250 metres of
	straight sections of road are considered too short for excessive vehicle speeds to occur and act as a natural speed control measure.
	RECOMMENDATION – It is recommended that:
	62.2. Traffic management strategies to achieve a safe, low speed environment within the local street network be implemented by using roundabouts, realigned T-junctions and other traffic calming measurements on long stretches of road. 62.3. Consideration be given to centre blisters on these sections of road with reference to Austroads Guide to Traffic Management Part 8 Local Area Traffic Management for acceptable measurements.
63.	**Excessive Open Space areas vested to Council**
	63.1. The total amount of open space proposed is majorly provided through encumbered land (refer comments in item 20) which does not facilitate active useable open space (i.e. community public realm infrastructure such as shelters, picnic tables, sporting goals, bbq's etc.), the design proposal does however propose to activate a portion of this space in a feasible manner.

	63.2. 'Approximately 61.344ha of land (**Attachment 1**) is nominated within the application as "Gullies and Steep Creeks" and "Pedestrian and cycle corridors". These areas are considered as undevelopable within Council's Development Plan, due to their location being within infrastructure easements. The application does nominate that these areas will be activated through the placement of walking/ cycling trails and other community infrastructure at nodes. This inclusion is welcomed to activate the areas. This level of activation lifts these areas from being considered "undevelopable" into the category of "Ancillary Open Space", which is defined within the Barossa, Light and Lower North Region -Open Space, Recreation and Public Realm Strategy under 7.2.5 pg29 as "... area's primary role is not necessarily open space. These areas complement and can serve as an addition to primary open space areas. This includes school reserves, cemeteries, road verges, creek lines, storm water channels as well as minor road networks that provide scope to incorporate open space features such as linear trails, revegetation opportunities and dedicated walking/cycling links. These areas are significant and serve as supplementary green links between existing parks and reserves and are important in suburbs deficient in open space." 63.3. The application nominates that 73.57ha of land will be vested as Open Space. With 1414 lots being proposed this equates to an estimated population of 6363 people for the development (based upon 2011 Census data of 4.5 people per household) thus equating to a need for 57.267ha of Open Space to meet with the Barossa, Light and Lower North Region -Open Space, Recreation and Public Realm target. The strategic direction from the Gawler Open Space, Sport and Recreation Plan 2025 does however provide direction for an additional 25-30ha of sporting open space, which the application does facilitate part thereof.

	63.4. Village Centre Park presented Concept Plan includes community infrastructure that is considered unsuitable within the SEA Gas MLV 45m buffer zone, which is listed on page 58 of the Planning Statement as a "hazardous area exclusion zone." 63.5. Mapping of Open Space areas shows that they are clustered in the central/ eastern portion of the development. When mapping the Council Development Plan catchments for Open Space areas an oversupply becomes evident for this area. This oversupply takes into account the presence of the Springwood Creek and Gawler East Link Road as creating a physical barrier to resident's use of Local Open Space). Thus placing extra burden upon Council and the community in future years in relation to the servicing and maintenance of a high number of community infrastructure elements.
	RECOMMENDATION – It is recommended that:
	63.6. The amount of open space (except for the sporting oval reserve) be rationalised to reduce the overall amount of Open Space to be vested to Council specifically in oversupplied areas for each category of reserve. 63.7. It be noted that Council has identified a number of locations where open space can be reconfigured to private allotments to reduce the provision of small unwarranted open space areas. 63.8. The community infrastructure/ activities facilitated at Springwood Village Centre Park be relocated to the Springwood Playing Fields. 63.9. It be noted that Council does not support the concept plan of the Springwood Village Centre Park due to the over servicing of community infrastructure proposed by Springwood Communities and requests a more suitable use of the space as a rehabilitated/ revegetated natural open space area with walking trails. 63.10. A new SEA Gas Safety Management Study be completed and provided to Council prior to the granting of Development Plan Consent.

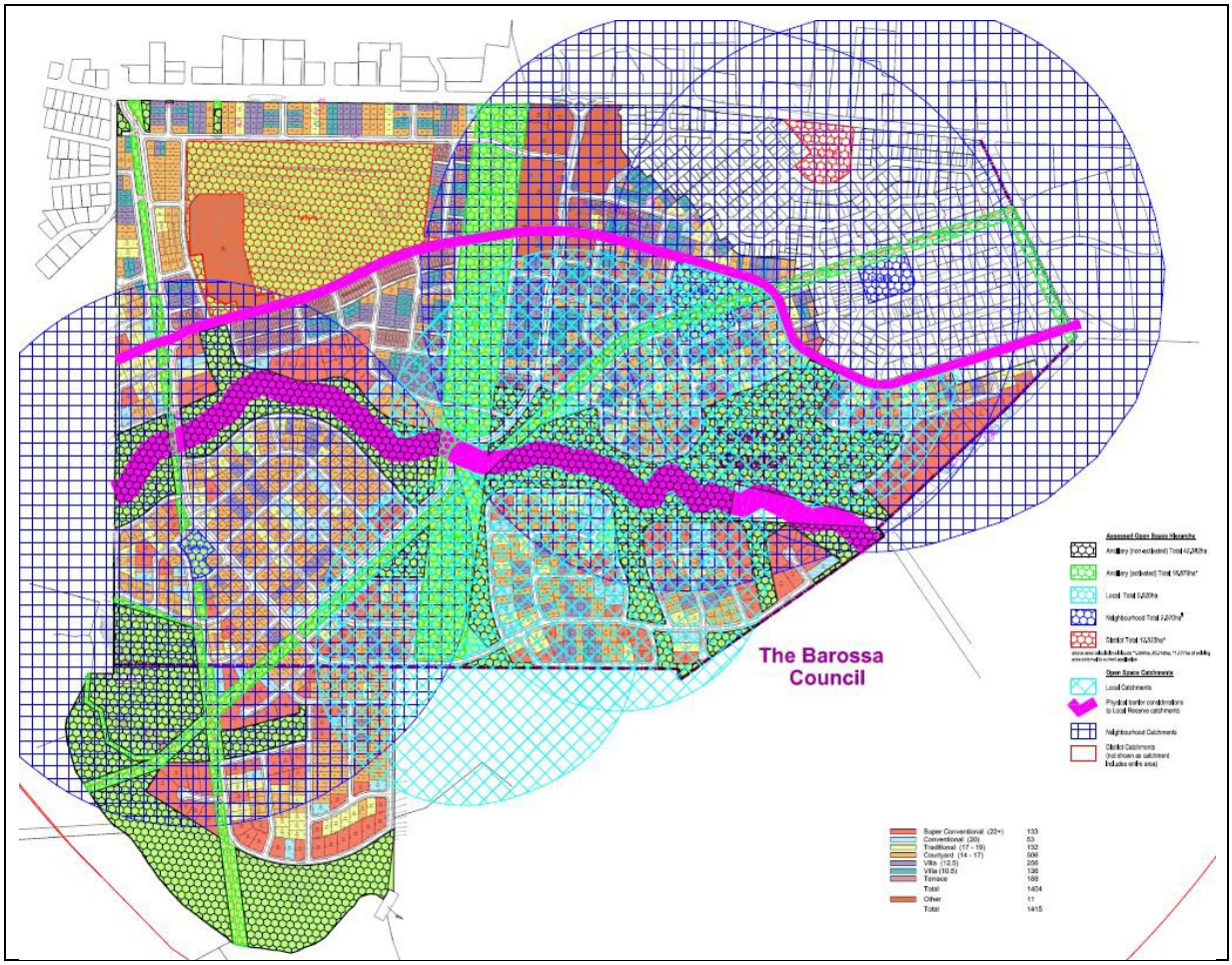
64.	**ElectraNet Easement**
	64.1. No consideration for screen planting between high voltage electrical supply lines/ towers and residential allotments is evident. 64.2. Residential allotments are located hard up against easement corridors. High voltage electrical easements do not allow tree planting within the corridor. 64.3. Landscaping treatments alluded to within supplied Concept Plans show total disregard for easement conditions. 64.4. The existing high voltage electrical easement north of Calton Road through Gawler East, provides an example of development/ urban design considering configurations to provide buffer planting between housing and high voltage electrical supply lines/ towers.
	RECOMMENDATION – It is recommended that:
	64.5. It be noted that Council does not support the proposed tree planting within the electrical easements in favour of ElectraNet and requests that written consent from ElectraNet be provided to Council for the proposed landscape works in the easements in favour of ElectraNet prior to the granting of Development Plan Consent.
65.	**Environmental impacts from tracks (walking and cycling trails & fire tracks)**
	65.1. The areas within the 'Springwood Creek' reserve contain steep slopes, in many locations greater than what can be safely traversed by maintenance vehicles. 65.2. Redesign of the maintenance tracks, walking and cycling trails and fire tracks to address issues of disturbance and degradation for the noted flora and fauna. 65.3. The construction of accessible tracks for maintenance access is likely to cause greater undue harm to the Iron grass Natural Temperate Grassland and Peppermint Box (Eucalyptus odorata) Grassy Woodland. 65.4. These tracks may be best located to areas outside of flora associations, such as top of banks along rear of property boundaries. Redesign of the tracks and trails is required prior to planning consent.

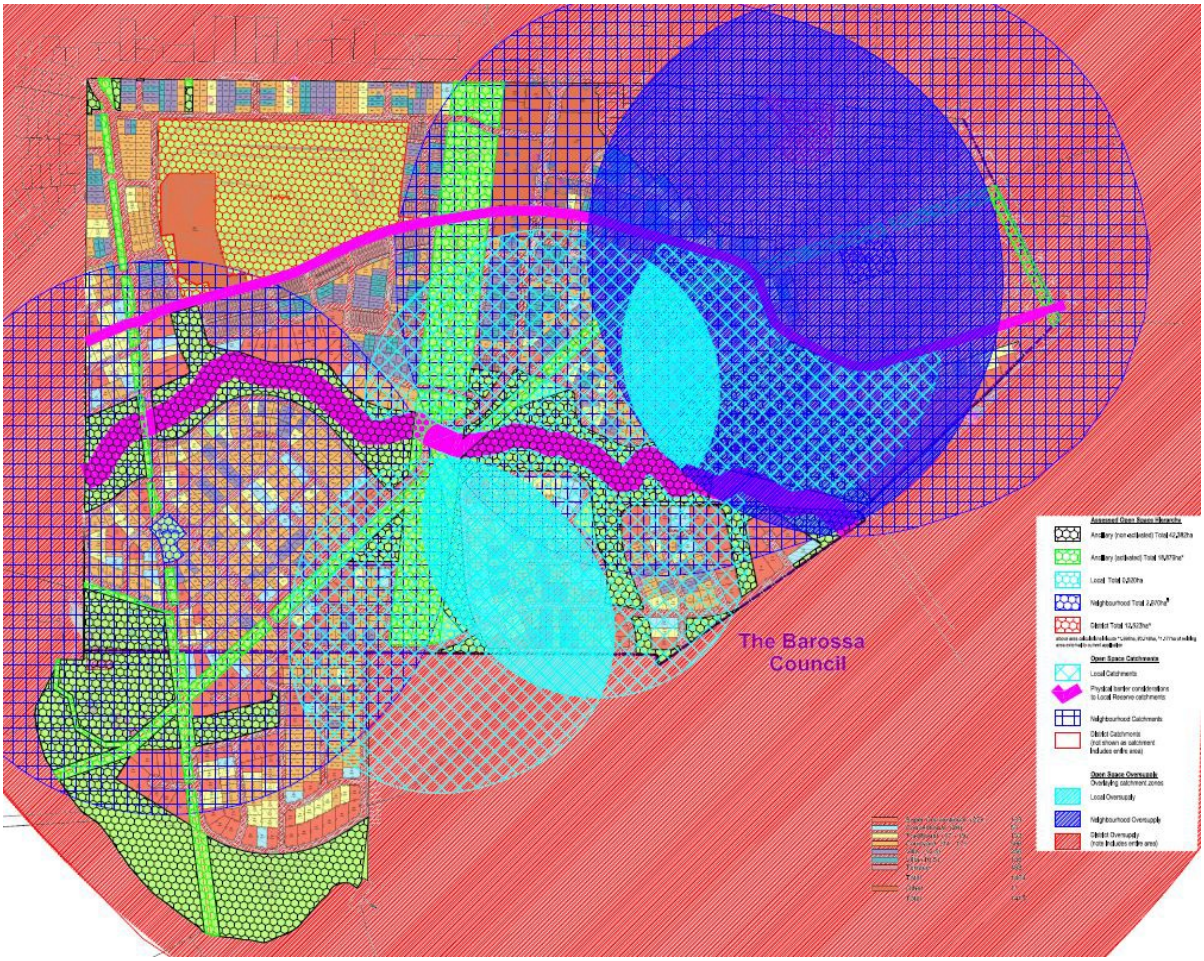
	RECOMMENDATION – It is recommended that:
	65.5. It be noted that Council does not support the proposed placement of trails on vegetation protected under the *Environment Protection and Biodiversity Conservation Act 1999* and *Native Vegetation Act 1991*. 65.6. A copy of all relevant approvals be provided to the Council under the *Environment Protection and Biodiversity Conservation Act 1999* and *Native Vegetation Act 1991* prior to the granting of Development Plan Consent
	65.7. Reference be made to **Attachment 3** for further information pertaining to traffic management and stormwater management.

	Landscaping & Environmental
66.	**Springwood Creek - Detailed revegetation/ rehabilitation plan**
	66.1. The existing width allowed for at Springwood Creek is at the narrowest point nominally 65m between residential property and roadway (Lot #1103 rear boundary and road due south). Existing Concept Plans for the Springwood Creek do not have consideration to existing environments. Detailed revegetation/ rehabilitation plan is required to inform open space treatments of areas.
	RECOMMENDATION – It is recommended that:
	66.2. Greater corridor width is required to provide a sufficient habitat corridor with a 100 metre wide corridor being achieved at the narrowest point. 66.3. Grasslands and Open Woodland/Grassland association require buffering with suitable revegetation/ rehabilitation works.
67.	**Verge widths**
	67.1. Verge widths are to be of a size suitable to accommodate minimum offset requirements for the provision of street trees.

	RECOMMENDATION – It is recommended that:
	67.2. Minimum Distance offsets for trees be: 67.2.1. 1m behind Kerb 67.2.2. 0.6m from footpath 67.2.3. 6m from street lights 67.2.4. 2m from Side Entry Pits, Grated Inlet Pits, Junction Boxes etc.
67.	**Local Open Space areas**
	67.1. Approximately 61.344ha of land is nominated within the application as "Gullies and Steep Creeks" and "Pedestrian and cycle corridors". This land categorically falls under areas that are considered as undevelopable within Council's Development Plan, due to its location being within infrastructure easements. The application does nominate that these areas will be activated through the placement of walking/ cycling trails and other community infrastructure at nodes. This inclusion is welcomed to activate the areas. This level of activation lifts these areas from being considered "undevelopable" into the category of "Ancillary Open Space". 67.2. "Ancillary Open Space" is defined within the Barossa, Light and Lower North Region -Open Space, Recreation and Public Realm Strategy under 7.2.5 pg29 as "... area's primary role is not necessarily open space. These areas complement and can serve as an addition to primary open space areas. This includes school reserves, cemeteries, road verges, creek lines, storm water channels as well as minor road networks that provide scope to incorporate open space features such as linear trails, revegetation opportunities and dedicated walking/cycling links. These areas are significant and serve as supplementary green links between existing parks and reserves and are important in suburbs deficient in open space."

	67.3. Community infrastructure at nodes noted from above have been considered as proposed to be developed to a higher level than that of the surrounding "Ancillary Open Space" Council considers it warranted to assess these nodes as "Local Open Space" areas. 67.4. Mapping of these Local Open Space areas shows that they are clustered in the central/ eastern portion of the development (refer figure 8). When mapping the Council development plan catchment for Local Open Space areas of 300m (refer figure 9), an oversupply becomes evident for this area (refer figure 10). This oversupply does take into account the presence of the Springwood Creek and central roadway as such creating a physical barrier to residents wishing to use Local Open Space.


The Barossa Council



	RECOMMENDATION – It is recommended that:
	68.5. Council requests that the Local Open Space areas be reconsidered or consolidated to reduce the assessed oversupply.
69.	**Springwood Village Centre Park Open Space Hierarchy**
	69.1. The application inconsistently nominates the Springwood Village Centre Park Open Space Hierarchy. The ekistics 'Springwood' Planning Statement pg26, 27 & 32; Figure 4.10 pg. 33 lists the Village Centre Park as District, the Tract Masterplan on page 33/59 nominates it as Neighbourhood and then on page 38/59 Village Centre Park is listed as District. Council's own mapping of the reserve (figures 8, 9 & 10) identifies that as a District OR Neighbourhood reserve results in an oversupply of either of the reserve types within the development, and thus placing extra burden upon Council and the community in future years in relation to the servicing and maintenance of a high number of community infrastructure elements.

	69.2. Village Centre Park presented Concept Plan includes community infrastructure that is considered unsuitable within the SEA Gas MLV 45m buffer zone, which is listed on page 58 of the Planning Statement as a "hazardous area exclusion zone."
	RECOMMENDATION – It is recommended that:
	69.3. The community infrastructure/ activities facilitated at Springwood Village Centre Park be relocated to the Springwood Playing Fields. 69.4. A preferable use of the area be as a rehabilitated/revegetated Natural Open Space area with walking trails as the best form of community interaction with the space. 69.5. A new Safety Management Study be conducted prior to any Planning Consent being granted as the outcomes of the Safety Management Study should be used to inform any conditions of approval.
70.	**The topography of open space areas includes steep slopes including proposed trails.**
	70.1. As witnessed recently at the Springwood Highfield site small rain events are likely to cause considerable damage to unsealed pavement materials.
	RECOMMENDATION – It is recommended that:
	70.2. Trails/ footpaths of secondary use are to be of asphaltic concrete construction, with erosion control measures in place adjacent. Trails of tertiary use on slopes greater than 2% are to be of cement treated rubble material as a minimum standard.
71.	**Unauthorised Vehicle access controls to be included to roadways adjacent open space areas.**
	RECOMMENDATION – It is recommended that:
	71.1. Roadways adjacent open space areas are to have upright kerbing to the reserve frontage to reduce unauthorised vehicle access. 71.2. Ends of walkways/ trails are to have Post & Rail barriers installed to prevent unauthorised vehicle movements either side of footpaths should use Council standard posts (Advanced Plastic Recycling WPC Bollard 135x85x1500 peaked top with 63mm bore, Rail: 50mm Galv CHS with end caps). 71.3. Removable Bollards be installed central to pathways to prevent unauthorised

	vehicle movements - Council standard Post: Advanced Plastic Recycling WPC Bollard 135x85x1500 peaked top.
72.	**Placement of Pumping stations, stormwater GPT are proposed within a number of open space locations.**
	RECOMMENDATION – It is recommended that:
	72.1. Maintenance access is to be maintained through suitable placement and orientation of infrastructure, complimentary of maintenance activities. 72.2. Where screening is provided, maintenance access must be retained. 72.3. Consideration of landscaping treatments around Pump stations is to be complementary to adjacent natural environs.
73.	**Street Trees Species selections**
	73.1. Request that use of Ulmus parvifolia 'Chinese Elm' is NOT selected for use, due to the presence of Elm Leaf Beetle throughout Adelaide region. 73.2. Proposed Residential Street Trees -request the inclusion of some native tree species to this list. Suggest Eucalyptus leucoxylon 'Euky Dwarf', Eucalyptus torquata 'Coral gum', Callistemon species etc. 73.3. Proposed Residential Street Trees -request that streets that are of a north-south orientation. Suggest Eucalyptus leucoxylon 'Euky Dwarf', Eucalyptus torquata 'Coral gum', Callistemon species etc. 73.4. Proposed Residential Street Trees -request that streets that traverse the bounding edge to natural areas include native tree species. Particularly suggest Eucalyptus porosa 'Mallee Box' to the reserve side of the street. If variety/ separation is desired from streetscape design perspective Eucalyptus leucoxylon 'Euky Dwarf', Eucalyptus torquata 'Coral gum', Callistemon species etc. species to opposing sides of street.

	73.5. The urban design of the narrow lanes between Terrace lots is questioned in relation to the availability of space to provide desirable urban environments in particular landscaping (PDC10(e)). It is questioned how street trees area able to be facilitated amongst all the competing demands on these laneways. Pedestrian safety within these laneways is also questioned. 73.6. The north-South road connecting to Cheek Avenue/ Calton Road includes a strip of approximately 800 lineal metres where the electrical easement severely restricts placement of street trees. In the least street tree species will be limited to little more than shrubs, which is an undesirable outcome taking into consideration traffic sightlines and pedestrian safety.
	RECOMMENDATION – It is recommended that:
	73.7. All Tree plantings are to be in accordance with Council's Street Tree Planting for New Land Divisions Policy and Tree Planting Standard.
74.	**Open Space Designs**
	74.1. Open Space Designs illustrated through Concepts plans provided do not communicate an understanding for the requirements relating to clearance and offsets under the Native Vegetation Act. Heavily tree planted areas within the Tract masterplan are likely to impinge upon the Iron grass Natural Temperate Grassland and Peppermint Box (Eucalyptus odorata) Grassy Woodland. 74.2. Open Space Designs illustrate significant density of "Park Trees" and "Boulevard Trees" in native grassland habitat, including the EPBC listed Iron Grass grasslands. This should not occur and would be at odds with Native Vegetation Act. 74.3. Pg. 67 (Pg. 51 of Ekistics, 2019) "Supplementary vegetation planting within the existing marsh… " to "...improve the health of the marsh." is unnecessary and risks disturbing the remnant vegetation, possibly breaching the native vegetation act. [This is on the assumption that the marshes referred to are the extant sedgelands]. This vegetation is diverse and in good condition (Pg. 40, Greening Australia). Non-marshy areas where extant native vegetation is less abundant may benefit from revegetation or restoration.

	74.4. Pg. 77 & 78 (Pg. 61 & 62 of Ekistics, 2019) "Parkland trees within the river reserves that will assist to restore the ecology of the remnant dominant plant associations including the Mallee Box Woodland and Eucalyptus camaldulensis Open Woodland." As stated above, trees planted into this area will not necessarily "restore the ecology", and are more likely to degrade grasslands.
	RECOMMENDATION – It is recommended that:
	74.5 NVA & EPBC approvals be required prior to planning consent. 74.6 Grasslands and Open Woodland/Grassland will require buffering with suitable revegetation/ rehabilitation works.
76.	**'Springwood Creek'**
	76.1. The areas within the 'Springwood Creek' reserve contain steep slopes, in many locations greater than what can be safely traversed by maintenance vehicles. The construction of accessible tracks for maintenance access is likely to cause greater undue harm to the Iron grass Natural Temperate Grassland and Peppermint Box (Eucalyptus odorata) Grassy Woodland. 76.2. Proposed alignment of the "Share path trails-on and off road" along the northern edge of 'springwood creek' and "Key pedestrian trails - on and off road" along the eastern edge of the South Para River will significantly impact remnant vegetation, including some local species, and encroach heavily into the corridor. 76.3. This is at variance to the *Native Vegetation Act 1991*. It appears to go through at least one "Significant tree", and significant trees not even mapped along the South Para near the proposed trail. Paths/ trails should be on the outer edge of corridors, nearer roads or housing. 'Significant' and 'regulated' trees are not categories supported by the *Native Vegetation Act 1991* in Gawler East, instead native vegetation in the broader sense is protected in Gawler East. The actual number of trees to be cleared, which would all be accounted for in the *Native Vegetation Act*'s scattered tree assessment may be significantly different, although this act only protects native species. A proper assessment of the native vegetation which might be subject to the native vegetation act appears

	to be lacking here. 76.4. Unsealed adventure trails closer to the creek and into gullies where grade permits" would be at odds with Native Vegetation Act. Increasing the penetration of trails closer to the creek and into the gullies would result in fragmentation and disturbance to the corridor.
	RECOMMENDATION – It is recommended that:
	76.4. A redesign of the tracks and trails be required prior to planning consent and NVA & EPBC approvals be required prior to planning consent. 76.5. Further information is required prior to approval. 76.6. Maintenance tracks, walking and cycling trails and fire tracks be redesigned to address issues of disturbance and degradation for the noted flora and fauna. These tracks are best located to areas outside of critically endangered flora associations, such as top of banks along rear of property boundaries.
77.	**Steep slopes to existing quarry batter**
	77.1. Steep slopes to existing quarry batter within 'Springwood Playing Fields' are to be vegetated in a low maintenance manner. Previous Masterplan documents have made reference to potential 1/3 slope, access for maintenance activities will need to be considered.
	RECOMMENDATION – It is recommended that:
	77.2. The vegetation of slopes must consider access for maintenance activities, and further information is required prior to approval.
78.	**Cultural consideration**
	78.1. A significant rock outcrop is present within the Mallee Box Woodland which is proposed to be cleared. 78.2. This may be a significant feature for the Kaurna people and removal would be at odds with the Gawler Development Plan.

	RECOMMENDATION – It is recommended that:
	78.3. Kaurna Cultural investigations are warranted and should be undertaken. 78.4. Contact should be made with Kaurna Nation Cultural Heritage Association - Uncle Jeffrey Newchurch and Aunty Lynette Crocker.
	Further Information
79.	**Environmental and Open Space Concerns**
	79.1. Council requests that SCAP give consideration to all information provided in Attachments 2 and 3. 79.2. Council requests that SCAP give consideration to the Statement of Requirements provided in Attachment 5.
	RECOMMENDATION – It is recommended that:
	79.3. SCAP take into account all the issues raised in Attachments 2, 3 and 4 of this report.

Town of Gawler Administration Centre
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ATTACHMENTS FOR REPORT

TO THE STATE COMMISSION ASSESSMENT PANEL

FROM THE
TOWN OF GAWLER
COUNCIL ASSESSMENT PANEL

Gawler

Contact: Henry Inat

Ref: RV:rv

Town of Gawler
43 High Street
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4 February 2019

Ms Sally Smith
Department of Planning, Transport and Infrastructure
GPO Box 1533
ADELAIDE SA 5001

ATTENTION: Mr Jason Cattonar and Mr Jeremy Wood

Dear Ms Smith

Re: Springwood Communities Development - Land Division Application

In light of the decision by the State Coordinator General to assign the Springwood Communities Development to be 'called in' and assessed by the State Commission Assessment Panel (SCAP), I write to you to express Council's ongoing commitment to working collaboratively with both SCAP and the developer (applicant), Springwood Communities in order to achieve a quality planning outcome for the new and existing community.

The Springwood development, if approved as one large land division, will deliver in excess of 30 kilometres of new roads, 48 hectares of road reserve and landscaping, 4 kilometres of shared paths and 75 hectares of public open space, of which 15 hectares will be for active sports and passive recreation. The completion of this division will need to be facilitated in stages, as it is projected to be delivered over the next 10-15 years, accommodating a community of approximately 6000 people.

As you would appreciate, a consent spanning such a considerable period of time will present a number of legislative and administrative challenges for the developer, SCAP and Council to manage. It is therefore critical that the roles and responsibilities of both SCAP and Council are clearly defined.

Of particular concern to Council is the fact that all infrastructure including but not limited to roadways, pedestrian linkages, stormwater management and public open space, if agreed to be vested to Council in accordance with Section 33(1)(c)(iva) of the *Development Act 1993* (the Act) will become Council assets. These assets will be required to be managed and maintained in perpetuity on behalf of the community and, if not adequately designed and constructed, will

impose a significant and ongoing financial burden on the community into the future.

As a result, and on behalf of the community, it is considered necessary for Council to have a process that enables it to approve detailed designs, construction methodologies and thus the final state of any asset being ultimately vested into Council ownership.

To achieve this, and to ensure that Council ultimately agrees to the vesting of any land pursuant to Section 33(1)(c)(iva) of the Act, and approves various infrastructure requirements imposed pursuant to Section 33(1)(c)(v) of the Act, Council will be required to agree to the vesting of land (i.e. road reserves and public open space) during the planning assessment stage of the land division application and subsequently approve final designs (quality of design) prior to the granting of Section 51 Clearance.

Given the complexities outlined above, and to assist in defining the roles and responsibilities for both SCAP and Council in the administration of any consent over the next 10-15 years, it is requested that SCAP, as the relevant planning authority, splits the consent, with Development Plan Consent pursuant to Section 33(1)(a) be issued by SCAP and Land Division Consent pursuant to Section 331(c) be either issued by the Council under delegation or authorisation from the SCAP or otherwise issued with conditions that are drafted with Council input and which are to the Council's satisfaction whenever a particular stage of the land division occurs.

This proposal is intended to provide certainty to the developer, while ensuring Council maintains sufficient input and oversight of future assets proposed to be vested into its ownership.

This proposal will enable a more flexible approach to both the design and construction of any proposed infrastructure for both Council and the developer, particularly given the lifespan of this particular development and ensures that Council consents to the vesting of any asset pursuant to Section 33(1)(c)(iva) of the Act. It is Council's objective to work collaboratively with the SCAP and the developer to ensure that Springwood is a success.

Yours faithfully

Henry Inat
Chief Executive Officer

Direct line: (08) 8522 9221
Email: henry.inat@gawler.sa.gov.au

Town of Gawler - Review of Springwood Development Application Discussion Register					Date: Revision:	###### A	
Item	**Category**	**Issue**	**Reason for Concern**	**Recommendation/Condition**	**Responsibility**	**Status**	**Priority**
1	Stormwater	Unclear as to how sub-area 22 will drain.	Currently natural fall is towards Calton Street. If runoff is directed to Calton Street it would overload downstream drainage system	Either provide detention storage within area 22 or demonstrate how it will drain back towards Spring Creek	Springwood Estate	Open	High
2	Stormwater	Appendix 10, Section 4.2. Detention storage within Spring Creek to reduce post development peak to pre-development peak. Calculations have not included the upstream catchment	Calculations excluding large upstream catchment does not represent real-life stormwater conditions.	Include the catchment in the hydrolgical modelling	Springwood Estate	Open	High
3	Stormwater	Appendix 10, Section 4.2. Road embankment to act as a detention basin.	No mention of how the potential for spill passing over the road will be managed.	Commentary to be provided as to how overtopping of the road will be managed	Springwood Estate	Open	Medium
4	Stormwater	A number of downhill facing cul-de-sacs are included in the design.	These will require a stormwater drainage system to a 1% AEP standard. A drainage easement for either drains or an overland flood flow path would be required at the downstream end of the cul-de-sacs.	Require a reserve for overland flow path.	Springwood Estate	Open	High
5	Stormwater	Numerous allotments grade towards the back of the block.	Numerous areas will required rear of allotment drainage systems (likely to be needed for sewer as well). These will require stormwater easements.	Rear of allotment drainage in easements to be provided	Springwood Estate	Open	Medium
6	Stormwater	2% of EIA used for preliminary sizing of surface area for stormwater quality systems.	This may required significantly more land than this given the steep nature of the site and may require steep batters.	Level design at some "worst case" locations to be developed further to assess if the layout will need to change to accommodate the proposed water quality measures	Springwood Estate	Open	Medium

7	Stormwater	Appendix 10, Section 4.2. Stormwater detention is relatively minor (~50% reduction in peak flows).	Therefore for longer duration events and for smaller events there may be little detention. While on-site detention is unlikely to make downstream flooding worse (due to overlapping peaks) the change in flows off the site are not likely to make downstream flooding worse.	Pre and post flows to be prepared for a range of AEP events. Basis for providing on-site detention for large events to be justified beyong having post development meet pre-development flows as an increase in short duration flows are unlikely to increase flooding risk in the South Para River where peaks typically take more than 10 hours to arrive.	Springwood Estate	Open	Medium
8	Stormwater	Detention is proposed near the downstream end of the catchment. Increases in flow volumes, flow rates and velocity will need to be addressed in the upstream parts of the catchment	The creek system including natural soils and vegetation is unlikely to be able to accommodate increased flows without engineering works	The creek system is engineered and landscaped to accomomodate the increased flows	Springwood Estate	Open	Medium
9	Stormwater	Appendix 10, Figure 7.1. Numerous stormwater management devices are proposed	These will require significant maintenance to ensure they continue to operate effectively.	Potential long term maintenance costs to be estimated. Can the number of proposed devices be rationalised? Maintenance access to and from each device will need to be provided. A maintenance plan for each device (or type of device) should be provided.	Springwood Estate	Open	High
10	Stormwater	Appendix 10, Figure 7.1. A number of structures, particularly at the bottom of Spring Creek are at the bottom of steep areas (close to 1 in 2 grade at some locations).	Providing safe access to allow maintenance will be challenging.	An assessment of how safe access can be provided to be assessed.	Springwood Estate	Open	Medium
11	Stormwater	Appendix 10, Figure 7.1. No information has been provided about how the eastern roadway across Spring Creek will be managed.	It is an important secondary access point to the southern part of the development.	Proposed details of drainage under the road crossing to be provided.	Springwood Estate	Open	Medium
12	Stormwater	Appendix 10, Figure 7.1 Numerous properties relying on rear of allotment infiltration wells.	These will require significant maintenance to ensure they continue to operate effectively, some land owners may not maintain.	Highlight how these will be maintained in the future	Springwood Estate	Open	Medium
13	Stormwater	Appendix 10, Appendix A. A number of sub areas drain to the top of steep batters, many metres (~30m) above the invert of the South Para River.	There is no information on how these flows will be managed between the outlet of the treatment device and the invert of the river.	Provide discussion or details as to how these flows will be managed between the outlet of the treatment device and the invert of the river	Springwood Estate	Open	Low
14	Stormwater	Appendix 10, Section 5.4 Significant reliance on infiltration systems to manage low flows and meet water quality targets.	If the systems have low infiltration rates they will be ineffective.	Provide evidence to demonstate that infiltration systems will have a suitably high infiltration rate to be effective.	Springwood Estate	Open	Low
15	Stormwater	Appendix 10, Figure 7.1. No discussion as to why some of the area (sub area 30) is untreated.	Water quality in the area will be impacted.	Discussion to be provided as to why the area is untreated for water quality.	Springwood Estate	Open	Medium
16	Stormwater	Staging of works	Works are proposed to be staged. During construction additional silt management will be required.	The applicant should maintain water quality devices until site is stabilised,			Medium
17	Stormwater	Appendix 10, Section 7. Rainwater tanks	Report appears to be silent on the benefial impact of incorporating domestic rainwater tanks and how these will reduce flow volumes.	Discussion to be provided.	Springwood Estate	Open	Medium

18	Environmental	The PSI report compiled by LBW Co has indicated that potentially contaminating activities - as listed within the Environment Protection Act (1993) exist within a small portion of the site (denoted in report as areas of potential environmental interest (APEI) 6, 7, 10 and 11). It is evisaged that a Site Contamination Auditor will be required to determine the suitability of these areas for the proposed sensative land uses. The instigation of the Audit will likely warrant additional soil and potential groundwater investigation works.	As there are identified contaminating activities identified that are listed in the EP Act and the desired development of this portion of land is for sensitive landuse, an Audit would be required to satisfy EP Act and confirm suitability. No development works could be undertaken in this portion of the site prior to completion of the Audit.	That Council impose a condition that for DA's DA490/D025/19 & DA490/D027/19 a `Site Contamination Audit Report' (SCAR) is provided by a suitably qualified and registered Site Contamination Auditor confirming that the land is suitable for its intended use prior to Section 51 clearance to the reasonable satisfaction of Council	Springwood Estate	Open	Low
19	Environmental	The geotechnical report indicated that the abandoned sand mine includes a pit (up to about 25 m deep), with various spoil piles of overburden material (up to approximately 10m high) and several slimes pits (unconsolidated and saturated fines from sand washing activities) up to 6m deep.	This material (slime and fill) does not appear to have been tested to confirm suitabilty to remain onsite.	Clarification if the material has been adequately assessed in accordance with the ASC NEPM	Springwood Estate	Open	Medium
20	Environmental	Backfilling of existing pits and voids.	Potential importation of contaminated soil onsite, or the use of existing stockpiled spoil onsite that is chemically not suitable for re-use onsite.	Ensure that all soils imported to site meet the Waste Fill requirements as specified within the SA EPA (2010) Standard for the Production and Usage of Waste Derived Fill Guidelines.	Springwood Estate	Open	High
21	General	Bushfire Protection road layout	Springwood is classified as 'general bushfire'. As per The Ministers Code (revised 2012), public roads in land divisions shall provide a continuous road network that eliminates the use of cul-de-sac or dead end roads. The whole southern part of the Springwood development is a dead end road with cul-de-sacs and only one point of entry/exit.	The road design must meet the requirements for bushfire protection, including as details in The Ministers Code.	Springwood Estate	Open	High
22	General	Bushfire Protection access track	Proposed bush fire track is shown outside of the project boundary in neighbouring land	All provisions for bushfire protection must be contained within the development site.	Springwood Estate	Open	Medium
23	General	Allotments facing on to Calton Road	Entry and exit to houses during busy traffic times could present risk of vehicle accidents.	Allotments should have sufficient size and dimensions so that vehicles enter and exit the allotment in a forward direction	Springwood Estate	Open	Medium
24	Traffic/Transport	Collector road with 9m carriageway has no provision for cyclists	Collector road with 9m carriageway shows on-street parking on both sides with a 1.5m footpath with no provision for cyclists	All collector roads are to include a dedicated cycle lane or shared path as per Councils traffic Management Plan	Springwood Estate	Open	High
25	General	Allotments abutting water/gas easement with no road reserve between	SA Water and SEAGas have minimum offset requirements for allotments adjacent services and easements	The development's lot layout must accommodate required minimum offsets from services and easements as required by SA Water, SEAGas and other serivce providers.	Springwood Estate	Open	Medium

26	Traffic/Transport	Road grades	Road grades exceed the maximum allowable (10%) outlined in the Town of Gawler 'Standards and Requirements for Land Development/Land Division'. Maximum achieved longitudinal grade = 12.5% from WGA assessment. This also presents a risk for on-street parking with respect to sight distances and vehicle control.	Condition - A maximum longitudinal road grade of 12.5% shall be provided unless approved on a case by case bases by Council	Springwood Estate	Open	Medium
27	General	Allotment grading, differential lot height	Worst-case height differential between two lots within the assessed area was determined by WGA to be 7.5m. There could potentially be larger difference in other areas of the development. A 2 metre retaining wall on the boundary is proposed (not sure if this is by the Developer) and then the balance of the slope taken up within the allotments (possibly more retaining walls)	TBC	Springwood Estate	Open	Medium
28	General	Quarry area redevelopment	Details of earthworks and construction works in the quarry is not clear. The grading plan in the Coffey report does not include areas for the oval, tennis courts, facilities etc. A more detailed plan showing extent of works should be provided to confirm adequate area for an AFL oval, tennis courts, facilities (ie club rooms, change rooms, toilets), car parking, access arrangements, quality of works etc are provided considering bank stabilisation works and treatment of the slime pits and compaction of the uncontrolled fill.	A plan showing the redevelopment of the quarry area should be provided including works to be included, stormwater drainage, bank stabilitation, erosion manaagement etc	Springwood Estate	Open	Medium
29	General	Earthworks	The WGA report describes significant earthworks within the site including upto 6 metres of cut to create road and allotments in the test area on the southern boundary. There is also a sitgnificant amount of earthworks arounf the quarry site to reshape the site, create an oval and tennis court area (and car parking) and filling the slime pits. There are minimal details provided on the expected cut-to-fill balance for the site. It is likely that material will need to be moved within the site and a strategy to manage this without affecting roads and creating nuisance to residents should be considered. There is no plan for excess spoil or deficient fill material.	An earthworks strategy be developed to the reasonable standard of Council to minimise the impact on future residents and future Council infrastructure	Springwood Estate	Open	High
30	Traffic/Transport	Traffic Modelling Cheek Avenue	The traffic distribution in Figure 6.1 indicates a value of 10% for Cheek Avenue. We believe this is too low and does not take into consideration that there is no right turn access from Calton Road onto Murray Street.	Review traffic modelling to take into consideration that access to Murray Street is restricted.	Springwood Estate	Open	High

31	Traffic/Transport	Traffic modelling in general	The GTA report provides an indication that additional traffic will be attracted to the Link Road but does not explain that some traffic from existing residential areas will also be attracted to the link Road	Have GTA explain how additional traffic derived	Springwood Estate	Open	Medium
32	Traffic/Transport	Traffic Modelling Sunnydale Avenue	The existing Barossa Valley Way / Sunnydale junction is of a very poor standard and not conjusive to catering for the significant increase in traffic. We believe that GTA has overestimated this traffic and there may be other routes (eg Balmoral Road) that could be used for eastbound traffic.	Have GTA review the modelling	Springwood Estate	Open	Medium
33	Traffic/Transport	Impact of development on Sunnydale Avenue	GTA report Figure 6.3 indicates Sunnydale Ave with a volume of 4,500vpd. This equivalent to a collector Road standard and would require this road to be be upgraded. However no discussion of this in the GTA report. This is also not consistent with the outcomes of the Interventions Study agreed with developer to limit impact on Sunnydale Avenue.	Have GTA review the modelling and report to determine requirements for the upgrade of Sunnydale Avenue	Springwood Estate	Open	Medium
34	Traffic/Transport	Bus Routes	The proposed collector roads are assumed to cater for buses as per Figure 5.1. However collector road width of 9.0m and allowing for on-street parking would restrict the width of the clear travel lanes to 4.8m. This is considered to be insufficient to provide for safe two-way movement for commercial vehicles (buses).	Consideration should be given to provision of indented parking on the collector roads to provide for two-way bus movements	Springwood Estate	Open	Medium
35	Traffic/Transport	Access to fire track on south eastern end of development	There are a number of properties that back onto the access track to the natural area south of the development. This track is essentially a fire access track and not a public road.	Developer to provide abuffer reserve to prevent legal access to the fire track	Springwood Estate	Open	High
36	Traffic/Transport	Impact on Barossa Valley Way	The traffic report indicates an increase in traffic on Cheek and Sunnydale Avenues. There is no discussion on impact on Barossa Valley Way, particularly at the junctions.	Provide a description of the impacts as required	Springwood Estate	Open	High
37	Traffic/Transport	Roundabout at Cheek Ave and Calton Road intersection	The proposed Cheek Avenue / Calton road Roundabout is highlighted for provision as part of the external works for the development. However there is no discussion or development of a concept on what happens with the existing Cheek connection to the south of Calton Road. It appears from the plan there is a separate connection to the extension of Cheek Avenue but if this is the case, the stagger should be reveiwed .	Develop a concept for the location highlighting how connection to existing Cheek Ave south of Calton Rd is maintained.	Springwood Estate	Open	Medium
38	Traffic/Transport	Cross-sections show indented parking	The text / report highlights that indented parking can be provided if required. However no cross section is provided indicating how this can be provided within the road reserve and impact on other infrastructure.	Provide a cross section indicating how indented parking can be provided	Springwood Estate	Open	Medium

39	Traffic/Transport	Footpaths on collector roads	Footpaths are proposed on one side of collector roads	All collector roads shall have a path on both sides	Springwood Estate	Open	Medium
40	Traffic/Transport	Emergency Access	The (approximately 400) allotments south east of the SEAGas / SA Water easement along the southern boundary only have a single public road access. In the event of an emergency this may increase risk. The Ekestics report suggests an emergency access road along the southern boundary in private property connectiong to the public road (Balmoral Track?)	That a preliminary design and necessary land access is confirmed and this be submissted to Council for review. The road should be all weather two way and fully maintainable.	Springwood Estate	Open	Medium
41	General	Infrastructure Upgrades	There are infrastructure upgrades proposed for the road network including footpaths, cycle paths which should be preliminary designed and costed to confirm that they can be constructed and whether any land acquisitions are required or major service implications. Similarly off site stormwater infrastructure if required (including detention, water quality improvements, upgrades etc) should be shown and scope of work and staging agreed to by the developer. The external infrastructure agreement should include an agreed staging based on allotments developed.	An infrastructure agreement shall be prepared and agreed between the parties prior to S 51 cleararnce of the first stage of the development	Council	Open	Medium
42	Traffic/Transport	Off street parking	Off street parking has not been addressed in the report	Off street parking adjacent the school and oval should be addressed and the commercial area to ensure that adequate parking is available	Springwood Estate	Open	Low
43	Traffic/Transport	Internal road layout	The internal road layout shows a number of 4 way uncontrolled intersections, stagger intersections and lanes without turning areas	Council should consider these ares in more detail	Council	Open	High
44	General	Staging Plan	Staging plan referred to as Appendix 2 does not appera to be provided	A detailed staging plan showing development and infrastucture should be provided	Springwood Estate	Open	High
45	Environmental	Directly comparing the Proposed Plan of Division within the Development Plan against the assessment area within the PSI report, it appears as though there is a portion of the land that has not been assessed, namely the northeast portion of the site, between APEI 14 and the existing development. This area will need to be assessed in accordance with the requirements of the ASC NEPM	Unknown risks for the proposed development	Assessment in accordance with the ASC NEPM (1999), including a preliminary site investigation.	Springwood Estate	Open	Medium

46	Stormwater	Springwood creek discharges onto private property on the western side of the site	Details of works in the creek in private property is not described. There will be an increase in flow rate, flow velocity, frequency of flows, summer flows and flow volume. This is likely to lead to creek erosion and potential impacts on flora and fauna. Detention limits 100 year event and there will be significant increases in flow in smaller events.	Recommend a condition - 'Unless demonstrated otherwise, alternative arrangements agreed or engineering treatments implemented, the developer shall detain flows from the site for all events to pre-development flow rates upto a 1%AEP event. The developer shall ensure that flows leaving the site do not increase flood risk, or increase erosion or reduce safety as a result of increased flow rates, increased frequency, increased summer flows or duration of flows and increased flow volumes.	Springwood Estate	Open	High
47	Stormwater	The southern creek (in Barossa Council) serving sub areas 31-47 discharges direct to the South Para River (assuming the boundary is centre of creek)	High potential for erosion and difficulty for maintenance. No detention is required as area would discharge direct to the South Para River	Recommend a condition -The developer shall provide a drainage solution to the reasonable satisfaction of Council that does not increase erosion or detrimentally affect the land and provides a solution that can be maintained although requires minimal maintenance	Springwood Estate	Open	Medium

Environmental Assessment

Item No.	Reference	Category	Comment	Rating	RFI/ Condition
1	pg 40 (Pg 24 of Ekistics, 2019)	At variance with draft plan	proposed alignment of the "Share path trails-on and off road" along the northern edge of 'springwood creek' and "Key pedestrian trails - on and off road" along the eastern edge of the South Para River will significantly impact remnant vegetation, including some locally important species, and encraoch heavily into the corridor. This is at variance with recommendations 19, 20 and potentiall 21 (depending on design), and possibly the Native Vegetation Act*. It appears to go though at least one "Significant tree" (as mapped page 6), and significant trees not even mapped along the South Para near the proposed trail. As per recommendation 20 paths should be on the outer edge of corridors, nearer roads or housing. 'Significant' and 'regulated' trees are not categories supported by the Native Vegtation Act in Gawler East, instead native vegetation in the broader sense is protected in Gawler East. The actual number of trees to be cleared, which would all be accounted for in the Native Vegetation Act's scattered tree assessment may be significantly different, although this act only protects native species. A proper assessment of the native vegetation which might be subject to the native vegetation act appears to be lacking here.	Serious Concern	Walking trails in current configuration is not supported, until further environmental and civil analysis (slope) is provided. These tracks may be best located to areas outside of flora associations, such as top of banks along rear of property boundaries. **Redesign of the tracks and trails is required prior to planning consent.**
5	pg 43 (pg 27 of Ekistics, 2019)	At variance with draft plan	"Unsealed adventure trails closer to the creek and into gullies where grade permits" would be at odds with recommendations 20 and 21. Increasing the pentration of trails closer to the creek and into the gullies would result in fragmentation and disturbance to the corridor.	Serious Concern	see item 1
7	pg 43 (pg 28 of Ekistics, 2019)	At variance with draft plan	Figure 4.6 shows significnat density of "Park Trees" and "Boulevand Trees" in native grassland habitat, including the EPBC listed Iron Grass grasslands. This should not occur and would be at odds with previous statements in items 3 above, about "minor" tree planting, and would be at variance with recommendation 23, and possibly the Native Vegetation Act	Serious Concern	Request for Concept Plans and masterplan to make concerted reference to Native Vegetation Act requirements for revegetation/ rehabilitation or provide SEB offset payment are required prior to planning consent.
10	pg 45 (pg 29 of Ekistics, 2019)	At variance with draft plan	Figure 4.7 shows significant density of "Park Trees" in native grassland habitat. This appears to be at odds with previous statements in item 8 above, about "minor" tree planting, and would be at variance with recommendation 23, and possibly the Native Vegetation Act*. It also shows an unlikely scenario of "Park trees" being planted into the South Para watercourse which would be undesirable as this watercourse contains very high floral and faunal diversity which significant planting would disturb. It would be at variance with recommendation 19, and possible the Native Vegetation Act* and EPBC Act.	Serious Concern	see item 7
11	pg 45 (pg 29 of Ekistics, 2019)	At variance with draft plan	figure 4.7 shows trails running directly alongside the South Para river which would impact native vegetation and disturb fauna, making it odds with recommendations 19 and 20	Serious Concern	see item 1
13	pg 46 (pg 30 of Ekistics, 2019)	At variance with draft plan	"Limited tree planting will be achieved within the easements due to utility easement restrictions, however existing trees will be retained and supplemented with dense tree planting to verges adjacent the easement corridors." The first part is in line with the plan as per item 12 above. The second part regarding dense tree planting may be at variance with recommendation 23 depending on the location of the verges. This may also be at variance with recommendation 10, if local native grasses are impacted by tree planting.	Serious Concern	All development applications submitted to councils must include a signed Electricity Act Declaration Form (201.0 KB PDF) acknowledging that the development plan complies with prescribed clearance requirements. Screening of infrastructure is requested, maintenance access must be retained, diverse native grass revegetation suggested within easement corridors and allotment layout requires redesign.
22	Pg 63 (Pg 47 of Ekistics, 2019)	At variance with draft plan	"...the subject land has an overall low ecological value..." is not a conclusion supported by the draft plan or KBR reports. Map 13 shows it contains a very high number of remnant species relative to other parts of Gawler, although it does only have moderate levels of native flora species relative to other parts of Gawler (map 14). Whilst the draft reports field surveys detected low levels of bird diversity (map 15), when including historical records, it is one of the more diverse areas in Gawler (map 16) and holds a similar relative level for 'total biodiversity' (map 18). As a result this area was identified as a "Priority area for biodiversity conservation" (map 19) which also highlights its importance as a corridor. The conclusion of "overall low ecological value" must be taken in the correct context, that the pastured areas are low ecological value, but the uncultivated areas are of high ecological value.	Serious Concern	Planning statement misrepresents ground truthing.
24	Pg 64 (Pg 48 of Ekistics, 2019)	other (internally inconsistent)	"Importantly the proposed plan of division avoids the area and will not impact directly on this Threatened Ecological Community." The EPBC act does not discriminate between direct and indirect impacts on an EPBC listed Threatened Ecological Community, only whether or not it has a significant impact. Indirect impacts may still be significant. Notably, this sentence is at odds with the EBS conclusion (pg 16, EBS, 2019) that "There is every likelihood that this project will lead to a slow long term decrease in the population due to the impacts listed above" and numerous other negative consequences on pg 17 (EBS, 2019). Ekistics appear to either misunderstand the EBS report, or misquote it, or both.	Serious Concern	**Areas of native vegetation in the development are shown for removal including areas that are Listed as Critically Endangered ecological communities of National Significance under the EPBC Act List of Threatened Ecological Communities (Iron grass Natural Temperate Grassland of South Australia https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=37&status=Critically+Endangered and Peppermint Box (Eucalyptus odorata) Grassy Woodland of South Australia https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=36&status=Critically+Endangered). The location and Layout of development requires redesign to protect and provide a buffer zone to these areas from disturbance. Native Vegetation Act 1991, and Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) approvals are required prior to planning Consent.**
25	Pg 64 (Pg 48 of Ekistics, 2019)	other (internally inconsistent)	"This plan, reproduced in Figure 4.22 below, demonstrates that the iron-grass community (shown orange) will not be impacted by proposed stormwater infrastructure". This figure (in full on pg 261) actually shows the detention basin created by the road considered to be stormwater infrastucture - it is labelled as "detention storage" and clearly impacts the Iron grass community (see also Pg 68 - Pg 52 Ekistics, 2019)	Serious Concern	**see item 24**
27	Pg 64 (Pg 48 of Ekistics, 2019)	Other	The construction of tracks in the creek line would likely be under Regulation 12(36) – Recreation track of the Native Vegetation Act, not 12(35) - Residential Subdivision as these tracks are probably not infrastructure associated with subdivision.	Serious Concern	see item 11

31	Pg 65 (Pg 49 of Ekistics, 2019)	other (internally inconsistent)	"The Proposed Plan of Division has avoided the creation of allotments in all areas mapped as high habitat value within the 2010 KBR report." No "high" value category is mapped. The "fair to good" category which is presumably what this refers to is actually overlapped by development (as per pg 6 and others) along the northern bank by super conventional, conventional and terrace allotments, making this statement blatantly untrue. The draft plan makes no specific recommendation regarding FWL habitat, but is covered in the principles relating the recommendations 20 and 21 as cited in other items above. Although not directly related to this statement, this habitat would also be impacted by proposed roads, and proposed tree planting.	Serious Concern	see item 24
34	Pg 67 (Pg 51 of Ekistics, 2019)	At variance with draft plan	"Supplementary vegetation planting within the existing marsh… " to "...improve the health of the marsh." is unnecessary and risks disturbing the remnant vegetation, possibly breaching the native vegetation act. [This is on the assumption that the marshes referred to are the extant sedgelands]. This vegetation is diverse and in good condition (Pg 40, Greening Australia). Non-marshy areas where extant native vegetation is less abundant may benefit from revegetation or restoration as per recommendation 19.	Serious Concern	Areas of native vegetation in the development are nominated for removal as part of stormwater management including areas that are Listed as Critically Endangered ecological communities of National Significance under the EPBC Act List of Threatened Ecological Communities (Iron grass Natural Temperate Grassland of South Australia https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=37&status=Critically+Endangered and Peppermint Box (Eucalyptus odorata) Grassy Woodland of South Australia https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=36&status=Critically+Endangered). Thus causing disturbance and degradation for the noted flora and fauna. The presented final form of the stormwater management systems within these areas is vastly different to the noted habitats that are present. The location and layout of stormwater management requires redesign to protect and provide a buffer zone to these areas from disturbance. Native Vegetation Act 1991, and Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) approvals are required prior to planning Consent.
37	Pg 68(Pg 52 of Ekistics, 2019)	other (internally inconsistent)	"Storage is achieved within Spring Creek without the requirement to excavate or disturb the existing profile and vegetation..." does this consider acheiveing access to the creek bed to construct and revegetate this area? Also, the mapping shows a rock weir and a road weir clearly impacting native vegetation.	Serious Concern	see item34
38	Pg 68(Pg 52 of Ekistics, 2019)	other	"The culvert crossing would be designed using environmental principles and incorporate fish passage through the design of a partially submerged culvert" is in line with recommendation 21. Although it should be noted that fish have not been recorded in this creek. Water Rats, snakes and frogs are the vertebrate fauna more likely to utilise the culvert in typical flows, and these species would likely cross the road anyway, although a changed hydrological regime may allow fish to recruit and persist in the creek line making this a valuable design feature. This is also supported by the statement "Culverts associated with these structures are not expected to provide significant habitat fragmentation or restriction of biodiversity corridor values...". The installation of a single culvert at or below water level would not facilitate the movement of important mammals including Possums, Kangaroos and Echidnas as well as a large number of reptiles including the endangered Flinders Worm Lizard. As per recommentation 21, movement of these animals should be facilitated to not only prevent a barrier, but prevent vehicle/animal interactions.	Serious Concern	Creek crossing designs require reconsideration to reduce overall impacts upon Iron Grass Natural Temperate Grassland (Critically Endangered ecological community of National Significance). Native Vegetation Act 1991, and Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) approvals are required prior to planning Consent
43	Pg 77 (Pg 62 of Ekistics, 2019)	other	"A total of 47 Regulated Trees and 40 Significant Trees are proposed to be removed..." only the the development act. The Native Vegetation Act also governs all native trees on the site. The area of the Act which is relevant is cited at the bottom of page 78 (Pg 62 of Ekistics, 2019) but no supporting information for native vegetation impact is presented.	Serious Concern	Request for Arborists report for each of the requested tree removals, including reference to EPBC Act and Native Vegetation Act requirements. Regulated and Significant Tree removal approvals are required prior to planning consent.
44	Pg 77 & 78 (Pg 61 & 62 of Ekistics, 2019)	At variance with draft plan	"Parkland trees within the river reserves that will assist to restore the ecology of the remnant dominant plant associations including the Mallee Box Woodland and Eucalyptus Camaldulensis Open Woodland." As stated above, trees planted into this area will not necessarily "restore the ecology", and are more likely to degrade grasslands.	Serious Concern	Native Vegetation Act 1991, and Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) approvals are required prior to planning Consent
45	Pg 92 (Pg 76 of Ekistics, 2019)	other	"Land should not be divided...where existing significant trees or remnant vegetation will be removed or compromised." Both are present in the proposed subdivision.	Serious Concern	see item 43
46	Pg 93 (Pg 77 of Ekistics, 2019)	other	"Land division design should...protect significant vegetation". To a large exent this is true or the division sensuo strico, although a large portion of Mallee Box woodland is proposed to be subdivided.	Serious Concern	see item 44
49	Pg 107 & 108 (Pg 91 & 92 of Ekistics, 2019)	At variance with draft plan	"public open space reserves have been designed to...create strong connections between open space and key destinations i.e.... Springwood Creek" and "Recognise Springwood Creek as a key open space destination". Encouraging people to access Spring Creek is at variance with the Habitat and Condition principles (pg 115, V0.6, Greening Australia) and associated recommendation 20.	Serious Concern	see item 44
52	Pg 108 (Pg 92 of Ekistics, 2019)	At variance with draft plan	"Supplementary vegetation planting within the existing marsh…" risks disturbing the remnant vegetation as per item 34 above.	Serious Concern	see item 44
55	Pg 109 (Pg 93 of Ekistics, 2019)	other (internally inconsistent)	"...the Stormwater Management Plan prepared by WGA... demonstrates that the iron-grass community will not be impacted by proposed stormwater infrastructure. It also demonstrates how the proposed stormwater infrastructure supports regeneration of this vegetation community via nomination of a potential future iron-grass colonisation area". see comments in item 25. Also the proposed Iron-grass colonisation area is mapped as being planted with trees on Pg 44. Exactly how this recolonisation will be facilitated is not documented anywhere.	Serious Concern	see item 34

57	Pg 109 (Pg 93 of Ekistics, 2019)	At variance with draft plan	"Restoring the traditional tree layer along the creek corridor will have a positive effect on restoring the ecology of the post productive landscape and strengthening the overall health of the regional river and creek system." As per the principles on page 115 and associated recommendation 23, this statement falls for the fallacy that more trees are better for the environment. There is no evidence to suggest the tree canopy has reduced, I suspect it has probably increased since settlement.	Serious Concern	see item 44
58	Pg 109 (Pg 93 of Ekistics, 2019)	At variance with draft plan	"Trees of historical or local significance and single trees or groups of trees of particular visual significance should be preserved..." Locally significant trees will be cleared as a result of the proposed subdivision. As per the principles on page 115 and associated recommendation 20 this is at variance with the draft plan.	Serious Concern	see item 43
59	Pg 109 (Pg 93 of Ekistics, 2019)	At variance with draft plan	"Native vegetation and roadside vegetation should be preserved and replanted with local indigenous species where practical and should not be cleared if it...(a) provides important habitat for wildlife; (b) has a high plant species diversity or has rare or endangered plant species and plant associations;...(e) has high value as a remnant of vegetation associations characteristic of a district or region prior to extensive clearance for agriculture;...(g) is growing in, or is characteristically associated with, a wetland environment." The proposed subdivision and road alignment would result in the clearance of vegetation which meets each of these categories as documented in the draft plan in various sections.	Serious Concern	see item 44
62	Pg 110 (Pg 94 of Ekistics, 2019)	other	"Where a significant tree: (a) makes an important contribution to the character or amenity of the local area; or (b) is indigenous to the local area and/or a species is listed under the National Parks and Wildlife Act 1972 as a rare or endangered native species; or (c) represents an important habitat for native fauna; or (d) is part of a wildlife corridor of a remnant area of native vegetation; or (e) is important to the maintenance of biodiversity in the local environment; or (f) forms a notable visual element to the landscape of the local area; development should preserve these attributes." The proposed subdivision plan will remove significant trees which display some or all of these features, except part b.	Serious Concern	see item 43
63	Pg 111 (Pg 94 of Ekistics, 2019)	other	"Significant trees should be preserved and tree-damaging activity should not be undertaken unless:...(a) in the case of tree removal;...(1) (i) the tree is diseased and its life expectancy is short;" this is not the case for most, if not all, mallee box trees. "or...(2) it is demonstrated that all reasonable alternative development options and design solutions have been considered to prevent substantial tree-damaging activity occurring." Development could avoid the area of mallee box woodland, it is presumably only a commercial imperative to include this woodland in the development footprint.	Serious Concern	see item 44
64	Pg 111 (Pg 95 of Ekistics, 2019)	other	"Land should not be divided or developed where the division or development would be likely to result in a substantial tree-damaging activity occurring to a significant tree." this development will clearly damage a number of significant trees.	Serious Concern	see item 43
65	Pg 112 (Pg 95 of Ekistics, 2019)	other	"The conservation of regulated trees that provide important aesthetic and/or environmental benefit." not all regulated trees with be conserved under this development proposal	Serious Concern	see item 43
69	Pg 116 (Pg 100 of Ekistics, 2019)	other	"Native flora, fauna and ecosystems protected, retained, conserved and restored." Not all of the above are protected and retained. Some are, some are destroyed.	Serious Concern	see item 44
70	Pg 116 (Pg 100 of Ekistics, 2019)	other	"Restoration, expansion and linking of existing native vegetation to facilitate habitat corridors for ease of movement of fauna." This proposal restricts the corridor by encroaching development and fragmenting the corridor with roads and culverts, and destorying known habitat for EPBC listed fauna.	Serious Concern	see item 44
71	Pg 116 (Pg 100 of Ekistics, 2019)	other	"Development should be undertaken with minimum impact on the natural environment, including air and water quality, land, soil, biodiversity, and scenically attractive areas." Imapct to biodiversity will occur, some aspects are being minimised, some are not.	Serious Concern	see item 44
72	Pg 116 (Pg 100 of Ekistics, 2019)	other	"Development should ensure that South Australia's natural assets, such as biodiversity, water and soil, are protected and enhanced." Biodiversity in some areas of the proposed development is not protected from negative impacts.	Serious Concern	see item 44
73	Pg 116 (Pg 100 of Ekistics, 2019)	other	"Development should not significantly obstruct or adversely affect sensitive ecological areas such as creeks and wetlands." Several roads will dissect the creek line with some adverse effects for wetlands.	Serious Concern	see item 38
75	Pg 116 (Pg 100 of Ekistics, 2019)	other (internally inconsistent)	"[The stormwater management plan and strategy] includes... Preservation of the Nationally Threatened iron-grass community and ensuring that the stormwater strategy does not encroach on this area and supports planning for regeneration of this area;" This is inconsistent with map on page 261 which shows the detention basin created by the road considered to be stormwater infrastucture - it is labelled as "detention storage" and clearly impacts the Iron grass community (see also Pg 68 - Pg 52 Ekistics, 2019). Also there is no actual planning for the regeneration of the area, and the recolonisation area (pg 261) is partially mapped as existing Irongrass grassland by KBR.	Serious Concern	see item 44
77	Pg 125 (Pg 109 of Ekistics, 2019)	other (internally inconsistent)	"Preserves a Nationally Threatened iron-grass community and ensuring that the stormwater strategy does not encroach on this area and supports planning for regeneration of this area;" as per several items above, there is a clear impact planned to the Lomandra grassland and no detailed planning for regeneration or recolonisation is presented.	Serious Concern	see item 44
79	Pg 211 (Pg i of WGA, 2019)	At variance with draft plan	"Supplementary vegetation planting within the existing marsh (zone B-C) using indigenous species (remnant species) to improve environmental value, mitigate flow velocity and improve the health of the marsh." is unnecessary and risks disturbing the remnant vegetation. [This is on the assumption that the marshes referred to are the extant sedgelands, zones B and C do not appear to be explicitly mapped aywhere]. This vegetation is diverse and in good condition (Pg 40, Greening Australia). Non-marshy areas where extant native vegetation is less abundant may benefit from revegetation or restoration as per recommendation 19.	Serious Concern	see item 44
82	Pg 212 (Pg ii of WGA, 2019)	other (internally inconsistent)	"Preservation of the Nationally Threatened iron-grass community and ensuring that the stormwater strategy does not encroach on this area through infrastructure that supports regeneration of this area." As per several items above, the road which dissects the Irongrass grassland is part of the stormwater system and therefore it does encroach on the community. Nowhere is there infastructure which supports regeneration.	Serious Concern	see item 44

87	Pg 212 (Pg ii of WGA, 2019)	other (internally inconsistent)	"Storage is achieved within Spring Creek without the requirement to excavate or disturb the existing profile and vegetation. Noting that the disturbance is confined to the footprint of the new road crossing only" So it does disturb it, but only in that location? The placement of a rock weir immediately upstream from the road crossing would also impact vegetation, as would the inevitqable access to the creek for the installation of the infrastructure. see comments in item 37	Serious Concern	see item 44
88	Pg 212 (Pg ii of WGA, 2019)	other	"The culvert crossing would be designed using environmental principles and incorporate fish passage through the design of a partially submerged culvert." Doesn't accommodate passage of other animal species. See item 38.	Serious Concern	Consideration should be given to facilitate fauna other than fish movements along the creek corridor
92	Pg 227 (Pg 13 of WGA, 2019)	other (internally inconsistent)	"Retain all in stream and riparian native vegetation, including trees and understorey plants and ground covers." is untrue as clearance is proposed as per item 25.	Serious Concern	see item 44
95	Pg 227 (Pg 13 of WGA, 2019)	other (internally inconsistent)	"Areas of high biological value have been extensively mapped and subsequent field inspections. These areas have been set aside to be protected and or enhanced by incorporating supplementary revegetation to enhance the protection zones." Not all areas have been protected.	Serious Concern	see item 44
96	Pg 227 (Pg 13 of WGA, 2019)	other (internally inconsistent)	"The extent of iron grass community has been surveyed and mapped. Plotted onto the plan showing the detention storage extents. Refer to stormwater management strategy (plan). Areas containing exposed rock and cracks / fissures which are most likely to be habitat for the worm lizard are protected. No works occur near these valuable habitats." The mapping appears accurate, however works clearly go through the community.	Serious Concern	see item 44
99	Pg 252 (Pg 38 of WGA, 2019)	At variance with draft plan	2 wetlands ponds in the south east of the area appear to be placed directly in remnant Mallee Box Woodland	Serious Concern	see item 44
102	Pg 261 (Pg ?? of WGA, 2019)	other (internally inconsistent)	rock weir B appers to be placed in native vegetation	Serious Concern	see item 44
104	Pg 298 (Pg 17 of Tract, 2019)	other (internally inconsistent)	Shows a "wetland/retarding" in the Lomandra Grassland. Also does not show wetlands in south West of site where it has previously been mapped (as per Pg 252). Does not show wetlands in Spring Creek	Serious Concern	see item 44
106	Pg 302 (Pg 21 of Tract, 2019)	At variance with draft plan	"Create strong connections between open space and key destinations i.e. schools, the village centre, open space reserves, Springwood Creek etc. Recognise Springwood Creek as a key open space destination." is at variance with the draft plan. See item 49.	Serious Concern	see item 44
111	Pg 314 (Pg 33 of Tract, 2019)	At variance with draft plan	Map shows significnat density of "Park Trees" and "Boulevand Trees" in native grassland habitat, including the EPBC listed Iron Grass grasslands. This appears to be at odds with previous statements in items 3 above, about "minor" tree planting, and would be at variance with recommendation 23, and possibly the Native Vegetation Act and EPBC Act. It also shows an unlikely scenario of "Park trees" being planted into the South Para watercourse which would be undesirable as this watercourse contains very high floral and faunal diversity which significant planting would disturb. It would be at variance with recommendation 19, and possible the Native Vegetation Act	Serious Concern	see item 44
113	Pg 315 (Pg 34 of Tract, 2019)	At variance with draft plan	"Unsealed adventure trails closer to the creek and into gullies where grade permits" would be at odds with recommendations 20 and 21. Increasing the pentration of trails closer to the creek and into the gullies would result in fragmentation and disturbance to the corridor.	Serious Concern	see item 44
116	Pg 316 (Pg 35 of Tract, 2019)	In line with draft plan	"Unsealed adventure trails closer to the creek and into gullies where grade permits" would be at odds with recommendations 20 and 21. Increasing the pentration of trails closer to the creek and into the gullies would result in fragmentation and disturbance to the corridor.	Serious Concern	see item 44
128	Pg 348 (Pg 3 of EBS, 2019)	other	"This project is considered to be relevant under exemption Regulation 12(35) – Residential subdivision to allow clearance of vegetation in connection with residential subdivision, associated house sites, roads and other associated infrastructure." Whilst this is correct, the construction of tracks in the creek line would likely be under Regulation 12(36) – Recreation track of the Native Vegetation Act, not 12(35) - Residential Subdivision as these tracks are probably not infrastructure associated with subdivision. see item 27	Serious Concern	see item 44
131	Pg 359 (Pg 14 of EBS, 2019)	other	Conducting a flora survey in March is never likely to properly detect the full suite of species, regardless of season. This is compounded by the poor season as noted by EBS. One wonders why this was left until then to be conducted when the requirement for such a survey must have been known for a significant period of time, and is far from best practice.	Serious Concern	see item 7
132	Pg 359 (Pg 14 of EBS, 2019)	other	Section "5.3 Specific species and community issues" only includes a subset of all communities present on site. No justification is given for not including Red Gum Woodlands, Mallee Box Woodlands, Grasslands, Sedgelands, etc. thus this is a very incomplete assessment.	Serious Concern	see item 131
133	Pg 359 (Pg 14 of EBS, 2019)	other	Section "5.3.1 Eucalyptus porosa scattered trees" implies that these trees would be assesed under the native vegetation act as "scattered trees". Whilst some might, many would not. Instead they would be subject to a 'patch' assessment as they are part of a vegetation association with native understorey. Notwithstanding the above, these trees would also be subject to scattered tree assessment as per the development act.	Serious Concern	see item 44
134		other	"It was not possible to make an accurate assessment as the herbaceous species diversity during the March visit due to appalling conditions from a seasonal perspective." not best practice. See item 131 above	Serious Concern	see item 131
135		other (internally inconsistent)	"The masterplan avoids the area mapped as the Threatened Ecological Community". Blatantly untrue. Map on page 347 (pg 2 EBS), clearly shows a road going straight through this community.	Serious Concern	see item 38
137	Pg 360 (Pg 15 of EBS, 2019)	other (internally inconsistent)	"The Springwood Masterplan has avoided all areas mapped as high habitat value within the 2010 KBR report." No "high" value category is mapped. The "fair to good" category which is presumably what this refers to is actually overlapped by development along the northern bank, making this statement blatantly untrue. see also item 31	Serious Concern	see item 24

138	Pg 361 (Pg 16 of EBS, 2019)	other (internally inconsistent)	"The Springwood Development will not impact directly on the TEC based on the Masterplan design." Blatantly untrue. Map on page 347 (pg 2 EBS), clearly shows a road going straight through this community. All subsequent aspects of self assessment are therefore irrelevant or also incorrect. The conclusion that "a referral for this area is conducted." is supported, but the predicted potential outcome of such a referral is necessarily wrong by virtue of the impact above. Notwithstanding that "buffer zones from the Iron-grass community and a conservation management plan to ensure the longevity and sustainability of the community." is supported by the draft plan recommendations 19, 20 and 21.	Serious Concern	see item 24
140	Pg 363 (Pg 18 of EBS, 2019)	other (internally inconsistent)	"Springwood has avoided the areas of highest vegetation cover where practical..." The masterplan proposes clearance of a large section of Mallee Box Woodland, as well as other areas of significant native vegetation.	Serious Concern	see item 24
143	Pg 364 (Pg 19 of EBS, 2019)	other	"Scattered Tree Assessment clearance application provided to the Native Vegetation Council for the removal of up to 70 individual Eucalyptus porosa (Mallee Box) trees with measures utilising the mitigation hierarchy undertaken." Unfortunetly for Springwood, this advice is incorrect. Scattered tree and patch assessments are required under the native vegetation act for all native vegetation clearance. The 70 trees figure is likely to be incorrect.	Serious Concern	see item 44
144	Pg 365 (Pg 20 of EBS, 2019)	At variance with draft plan	"This Springwood Development area has an overall low ecological value..."is not a conclusion supported by the draft plan. Map 13 shows it contains a very high number of remnant species relative to other parts of Gawler, although it does only have moderate levels of native flora species relative to other parts of Gawler (map 14). Whilst the draft report's field surveys detected low levels of bird diversity (map 15), when including historical records, it is one of the more diverse areas in Gawler (map 16) and holds a similar relative level for 'total biodiversity' (map 18). As a result this area was identified as a "Priority area for biodiversity conservation" (map 19) which also highlights its importance as a corridor. The conclusion of "overall low ecological value" must be taken in the correct context, that the pastured areas are low ecological value.	Serious Concern	see item 22
148	Pg 365 (Pg 20 of EBS, 2019)	other (internally inconsistent)	"Culverts associated with these structures are not expected to provide significant habitat fragmentation or restriction of biodiversity corridor values provided by Springwood Creek based on the likely fauna community structure expected within an urban area." The installation of a single culvert at or below water level would not facilitate the movement of important mammals including Possums, Kangaroos and Echidnas as well as a large number of reptiles including the endangered Flinders Worm Lizard. As per recommentation 21, movement of these animals should be facilitated to not only prevent a barrier, but prevent vehicle/animal interactions.	Serious Concern	see item 88
149	Items not mentioned	other	There is a Significant rock outcrop within the Mallee Box Woodland which is proposed to be cleared. This may be a significant feature for the Kaurna and removal would be at ods with Gawler Development Plan	Serious Concern	Kaurna Cultural investigations are warranted. Contact with Kaurna Nation Cultural Heritage Association - Uncle Jeffrey Newchurch and Aunty Lynette Crocker is requested.
150	Items not mentioned	At variance with draft plan	no mention of Kaurna heritage assessment or engagement. This is not in line with the principles outlined in the "Areas and issues of possible Cultural Heritage Significance in the context of Biodiversity Conservation" in the draft plan (pg 123, Greening Australia).	Serious Concern	see item 149
151	Items not mentioned	At variance with draft plan	no measurable condition improvement measures anywhere except ratio of significant/regulated tree replacement. Setting benchmarks is a key principle of recommendation 19	Serious Concern	see item 43
152	Items not mentioned	other	no weed or pest control strategy mentioned in any detail. Recommendations 12 and 17 would be applicable to Springwood area.	Serious Concern	Environmental Management Plan is required
153	Items not mentioned	other	corridor vastly less than 200m in several locations	Serious Concern	
154	Items not mentioned	other	The EPBC submission by Delfin included a proposal for a management plan for the irongrass area. This has not been cited by EBS, nor included in the overall submission, and might improve the abiliyt to assess the proposed management of this commuity	Serious Concern	see item 44
19	Pg 53 (Pg 37 of Ekistics, 2019)	At variance with draft plan	Iron Bark (Eucalyptus sideroxylon var. sideroxylon) is one of the flowering gum species referred to in recommendation 9	Minor Concern	
20	Pg 54 (Pg 38 of Ekistics, 2019)	At variance with draft plan	"Within the river reserves the opportunity to restore the ecology of the remnant dominant plant associations, the Mallee Box Woodland and Eucalyptus Camaldulensis Open Woodland". Whilst the aspiration is admirable and in line with the draft plan, as per recommendation 19 this is best achieved through understorey management not more trees. Whilst there are minor opportunities to improve these communities with "trees", in many areas increasing the "trees" will have a negative impact on the understorey through increased moisture stress and shade. see also recommendation 23, recognise the value of grasslands.	Minor Concern	see item 7
26	Pg 64 (Pg 48 of Ekistics, 2019)	Other	As per item 1 above, all native vegetation is protected by the Native Vegetation Act, not just Eucalyptus porosa scattered trees. This would include grasses, herbs and shrubs.	Minor Concern	see item 44
28	Pg 64 (Pg 48 of Ekistics, 2019)	At variance with draft plan	section 4.5.1 Flora communities does not include any information about red gum woodlands, grasslands or reed and sedge wetland communities. No justification given for ignoring these. (NB it is a direct quote from EBS, 2019, but this is not cited, and EBS, 2019, does not justify why other vegetation is not discussed).	Minor Concern	see item 44
29	Pg 65 (Pg 49 of Ekistics, 2019)	At variance with draft plan Other internally inconsistent	"Retain post-industrial quarry landforms" (pg 46 - pg 30 of Ekistics, 2019) is inconsistent with "Rehabilitation and major earthworks are a necessity". This activity having an impact on fauna is at variance with the principles in Habitat Features (pg 64, V0.6, Greening Australia)and Habitat and Condition (pg 115, V0.6, Greening Australia). Just becuase a feature is man made does not mean it is necessarily "temporary habitat", there is no evidence to support this conclusion, and is only temporary if the developers seek to change the status quo. The "..differing opportunities to relocate..." is ambiguous as to whether all species have opportunities to relocate or some will not, i.e. the adjoining habitat has all suitable habitat niches already filled.	Minor Concern	see item 44

39	Pg 68(Pg 52 of Ekistics, 2019)	other	"...EBS Ecology confirmed that any efforts to increase the extent and frequency of ephemeral or semi -riparian zones is welcomed from an ecological perspective." This is not supported by facts presented in the report. See item 147 below.	Minor Concern	see item 7
54	Pg 108 & 109 (Pg 92 & 93 of Ekistics, 2019)	other	"the Proposed Plans of division have been designed to provide significant areas of dedicated open space... specifically designed and configured to preserve ... important vegetation communities including Iron-grass Temperate Grassland and Scattered Eucalyptus porosa (Mallee Box) trees." This stement is slightly misleading in that although it does preserve some of these communities in open space, it also results in the destruction of some of these communities.	Minor Concern	see item 7
74	Pg 116 & 117 (Pg 100 & 101 of Ekistics, 2019)	other	"Development should be sited and designed to: ... (h) maintain natural hydrological systems and not adversely affect: (i) the quantity and quality of groundwater; (ii) the depth and directional flow of groundwater; (iii) the quality and function of natural springs." This aspect has clearly been considered in the WSUD aspects of the development plan, but difficult to detemine the extent to which natural hydrological systems (particularly groundwater) will be maintined with the given information.	Minor Concern	see item 44
91	Pg 227 (Pg 13 of WGA, 2019)	other	"These systems encourage natural predation of mosquitos and therefore it is not expected to pose a problem." This is not founded on any evidence. The main predator for mosquitos would be fish, which have not been recorded in spring creek due to its previously ephemeral surface water. Whilst frogs do eat some mosquitos and small birds and other invertabrates would too that may not constitute adequate control. Do they propose to release fish into these ponds?	Minor Concern	
94	Pg 227 (Pg 13 of WGA, 2019)	In line with draft plan	"Watercourse works strategy is based on protecting native vegetation and only targets sections that are highly degraded, void of vegetation or that are weed infested." This aspiration is in line with recommendations 19, 20 and 21. Some planned implementation appears likely to impact this vegetation.	Minor Concern	see item 44
114	Pg 316 (Pg 35 of Tract, 2019)	At variance with draft plan	The location of this "Node Park" differs from the location given in the prior maps, and places it directly in a remnant patch of Mallee Box Woodland. Planting of turf and establishing a shelter and BBQ setting in this community would be undesirable, and at odds with recommendation 19, and possibly the Native Vegetation Act. Placement of some infrastructure may be done without significant impact as the floral diversity is low in this patch, but would require specific ground truthing.	Minor Concern	
118	Pg 325 (Pg 44 of Tract, 2019)		Heavy emphasis on deciduous trees will increase material and nutrient load in stormwater.	Minor Concern	see item 7
119	Pg 327 (Pg 46 of Tract, 2019)	At variance with draft plan	Iron Bark (Eucalyptus sideroxylon var. sideroxylon) Spotted Gum (Corymbia maculata) and Lemon Scented Gum (Corymbia citriodora)are some of the flowering gum species referred to in recommendation 9	Minor Concern	
120	Pg 328 (Pg 47 of Tract, 2019)	At variance with draft plan	Chines Elm, English Oak and Japanese Pagoda should not be planted into areas of remnant vegetation.	Minor Concern	
124	Pg 333 (Pg 52 of Tract, 2019)	At variance with draft plan	Grevillea rosmarinafolia is an environemtnal weed and known to hybridise with native species. Lavandula is an environemtnal weed. There is no need for cultivars of local native species, and for some propose species there are local native alternatives. This is at avariance with recommendation 1	Minor Concern	see item 44
125	Pg 335 (Pg 54 of Tract, 2019)	At variance with draft plan	Grevillea rosmarinafolia is an environemtnal weed and known to hybridise with native species. Callistemon spp. can be environemtnal weeds around wetlands. There is no need for cultivars of local native species, and for some propose species there are local native alternatives. This is at variance with recommendation 1.	Minor Concern	see item 44
126	Pg 337 (Pg 56 of Tract, 2019)	At variance with draft plan	Samphire, Rhagodia candiolleana, Muehlenbecki gunnii, Nitraria bullardierei, Adriana klotzschii, Xanthorrhoea semiplana are innapripriate species in this location. They are unlikely to persist and would need to be replaced, potentially increasing maintenance burden for council.	Minor Concern	
127	Pg 337 (Pg 56 of Tract, 2019)	other	Casuarina cunninghamiana is an odd choice. It is not native to South Australia. Drooping sheoak (included) is more environmentally appropriate	Minor Concern	
129	Pg 348 (Pg 3 of EBS, 2019)	other	"Applications for clearance approval and development approval are encouraged to be made at the same time." Is there evidence of submitting this, or even preparing this? It is not documented anywhere in this submission	Minor Concern	see item 44
130	Pg 357 (Pg 12 of EBS, 2019)	other (internally inconsistent)	Table 5. Lathams Snipe is listed as "unlikely" within the devlopment area based on "lack of habitat" (pg 358) but adequate habitat does occur along the South Para on Springwood land. EPBC Referral may be warranted if tracks were to be installed as planned along the South Para.	Minor Concern	see item 44
141	Pg 363 (Pg 18 of EBS, 2019)	other	"Reserves have been incorporated into the strategic design where remnant trees are present where possible in a bid to reduce SEB requirements..." Whilst this statement may be true, SEB requirements would also be based on all forms of native vegetation.	Minor Concern	see item 44
142	Pg 363 (Pg 18 of EBS, 2019)	other	"outline measures taken to rehabilitate ecosystems that have been degraded, and to restore ecosystems that have been degraded, or destroyed..." the proposed wetland systems in the eastern section of Spingwood creek are new vegetation types for the creek line, not rehabilitated ones. If anything this work is more in line with an offset. There is no statement about rehabilitation or restoration of the Mallee Box or Lomandra grasslands which are heavily impacted by the proposed development.	Minor Concern	see item 7 & 44
145	Pg 365 (Pg 20 of EBS, 2019)	other	"Impacts on fauna will be mostly associated with rehabilitation of the quarry and the consequent impacts on avifauna". This should read "impacts on vertebrate fauna". Invertebrates are likely to be impacted across all areas of development (although they mostly have no protected status). Impacts to vertebrates are also likely to be felt along the entire length of the Springwood Creek corridor with a significant narrowing of that corridor and changes to hydrology. Proposed tracks (apparently not covered by this report) are also likely to impact vertebrate species along the South Para River.	Minor Concern	see item 7 & 44
146	Pg 365 (Pg 20 of EBS, 2019)	other	"Given the man-made nature of the quarry, this feature has been a temporary habitat structure and it is expected that species will adapt to changes again with each of these species having differing opportunities to re-locate in the region." Just becuase a feature is man made does not mean it is necessarily "temporary habitat", there is no evidence to support this conclusion, and is only temporary if the developers seek to change the status quo. The "..differing opportunities to relocate..." is ambiguous as to whether all species have opportunities to relocate or some will not, i.e. the adjoining habitat has all suitable habitat niches already filled. see also item 29	Minor Concern	

147	Pg 365 (Pg 20 of EBS, 2019)	other	"...any efforts to increase the extent and frequency of ephemeral or semi -riparian zones is welcomed from an ecological perspective" is not supported by the facts presented in the report. Such systems are well represented locally as per pg 63 of the draft plan permanent pools, Red Gum Woodlands and other sedgelands are all rated as "very good" for their total area. The argument put forward by EBS atually supports an increase in grasslands or native pine woodland on the springwood site as these have the lowest total area relative to previous extent, or Mallee Box woodland as it is the association being proposed for most clearance on the site. This is not an argument against the wetlands, but there is no significant ecological basis of the argument for the wetlands.	Minor Concern	see item 7 & 44
154	pg 23 (Pg 7 of Ekistics, 2019)	other	10 years to complete? Restoration planning and implementation will need to start as soon as possible to be established in this time frame. If a detailed retoration plan was included in this submission, a range of other aspects mentioned here could be far better evaluated.	Minor Concern	see item 7 & 44
2	all maps of Ekistics, 2019	Other	Southern tip of "site boundary" is cut off. Assume nothing except track in that area?. Also, a small parcel F163062 A94, CT/5697/87 is consistently misplaced in all maps.	Negligible	
6	pg 43 (pg 27 of Ekistics, 2019)	other	The type and extent of the "...amenity planting and re-vegetation to road interfaces and rear lot fencing" may be either in line with, or at variance with recommendation 19 depending on the nature of the planting and revegetation. Depending on planted species, it may be at vaiarinace with Recommendation 1 if innappropriate species, e.g. with weed potential, were to be planted.	Negligible	
8	pg 44 (pg 28 of Ekistics, 2019)	In line with draft plan	"Minor re-vegetation and tree planting to reinforce remnant vegetation associations;" is in line with recommendation 19 (Improving condition of suburban corridors), provided that an over emphasis is not placed on the "tree planting" as this would then be at odds with recommendation 23, and may compromise the understorey condition and habitat value.	Negligible	see item 7 & 44
9	pg 45 (pg 29 of Ekistics, 2019)	At variance with draft plan	The location of this "Node Park" differs from the location given in the prior maps, and places it directly in a remnant patch of Mallee Box Woodland. Planting of turf and establishing a shelter and BBQ setting in this community would be undesirable, and at odds with recommendation 19, and possibly the Native Vegetation Act. Placement of some infrastructure may be done without significant impact as the floral diversity is low in this patch, but would require specific ground truthing.	Negligible	
18	Pg 53 (Pg 37 of Ekistics, 2019)	Other	Japanese Elm (Zelkova serrata 'Green Vase') and perhaps Chinese Elm (Ulmus parvifolia) are vulnerable to Elm Leaf Beetle, which is spreading through Adelaide. I wouldn't recommend investing in these as they will be a maintenance liability re pest control. But technically not at variance with the plan (ELBs are a biological control)	Negligible	
21	Pg 58 (Pg 42 of Ekistics, 2019)	Other	Proposed collector roads dissection creek line should be in line with recommendation 21. variance or otherwise cannot be established with provided level of detail.	Negligible	
36	Pg 68(Pg 52 of Ekistics, 2019)	other	Iron-grass communities "Duration of inundation is estimated at less than 2 hours for the 1% AEP post development..." is likely to be in the tolerance levels for this community.	Negligible	
48	Pg 107 (Pg 91 of Ekistics, 2019)	other	"Public open space has also been designed to enhancing Spring Creek, and embrace the natural landscape of the site." Enhanced for what, human utility or conservation outcomes?	Negligible	see item 7 & 44
56	Pg 109 (Pg 93 of Ekistics, 2019)	other	"The river reserves provide the opportunity to restore the ecology of the remnant dominant plant associations including the Mallee Box Woodland and Eucalyptus Camaldulensis Open Woodland." Eucalyptus camaldulensis woodlands do not need their ecology restored. very minor weed control may be warranted	Negligible	
61	Pg 110 (Pg 94 of Ekistics, 2019)	other	"Local indigenous plant species should be considered for landscaping, screening buffer planting and revegetation activities." The planting palette from page 325 to 337 has clearly 'considered' local indigenous plants, but also includes a range of species which are not local and for which local native substitutes would be more appropriate.	Negligible	see item 7
66	Pg 113 (Pg 96 of Ekistics, 2019)	other	"The proposed removal of Regulated and Significant Trees should be assessed in the context that 73.57 hectares of land (or 39.5% of the site) is proposed to be divested as open space reserve with significant areas allocated for the preservation of Mallee Box Woodland and Iron-Grass (Lomandra) Temperate Grassland." why should it? Many significant and regulated trees (as mapped) are proposed to be cleared, mostly at variance with the Gawler Development Plan as cited. There is no credible evidence for a net increase in native vegetation in the presented submission	Negligible	see item 7, 43 & 44
67	Pg 115 (Pg 99 of Ekistics, 2019)	other	"Urban development should... be based on principles of ecologically sustainable development (ESD) that includes...biodiversity protection and enhancement, natural resource protection..." This development proposal includes aspects of biodiversity protection, whilst also incorporating elements of biodiversity impact.	Negligible	
68	Pg 116 (Pg 100 of Ekistics, 2019)	other	"Development sited and designed to: (a) protect natural ecological systems;..." This development proposal includes aspects ofecological protection as well as destruction.	Negligible	
76	Pg 124 (Pg 108 of Ekistics, 2019)	other	"Remediates Spring Creek along the degraded sections to improve the ecology & biodiversity and control in stream velocities post development..." The proposed stormwater management strategy would likely increase biodiversity. Claims of "improving the ecology" are moot as it appears likely to substitue one system for another.	Negligible	
83	Pg 212 (Pg ii of WGA, 2019)	other	"Preservation of remnant vegetation areas and faunal group habitats through additional planting with indigenous species of local provenance to enhance degraded areas." Some areas of remnant vegetation and some faunal group habitats will not be preserved. The aspiration is in line with recommendation 19 and 24, but other submitted details suggest it may not be implemented	Negligible	
84	Pg 212 (Pg ii of WGA, 2019)	In line with draft plan	"Protection of areas of high biological value, including the retention of trees and planting for appropriate regeneration, particularly as part of the waterway remediation and stormwater treatment elements." This aspiration is in line with the draft plan recommendations 19, 20, 21 and 24, but other submitted details suggest it may not be implemented	Negligible	
85	Pg 212 (Pg ii of WGA, 2019)	other	"The extent of inundation of the iron-grass community varies and is dependent upon where it occurs over the lower extents of its existing covered area" suggests they don't have good location data to refer to, or is a confused dot point (i.e. by definition it occurs across all its covered extent)?	Negligible	
86	Pg 212 (Pg ii of WGA, 2019)	other	"Duration of inundation is estimated at less than 2 hours for the 1% AEP post development storm event." is likely to be in the tolerance levels for this community as per item 36)	Negligible	

103	Pg 279 & 280 (App E of WGA, 2019)	In line with draft plan	photos and location and condition concur with sureys and mapping in draft plan	Negligible	
105	Pg 301 (Pg 20 of Tract, 2019)	At variance with draft plan	trail alignments in variance with draft plan. See item 1	Negligible	
108	Pg 313 (Pg 32 of Tract, 2019)		Typo 'Eucapyts' should be Eucalypts or Eucalyptus	Negligible	
117	Pg 325 (Pg 44 of Tract, 2019)		Japanese Elm (Zelkova serrata 'Green Vase') and perhaps Chinese Elm (Ulmus parvifolia) are vulnerable to Elm Leaf Beetle, which is spreading through Adelaide. I wouldn't recommend investing in these as they will be a maintenance liability re pest control. But technically not at variance with the plan (ELBs are a biological control)	Negligible	
123	Pg 332 (Pg 51 of Tract, 2019)	other (internally inconsistent)	Acacia spp. pictured, but not included in list on previous page. Are they to be used?	Negligible	
3	pg 43 (pg 27 of Ekistics, 2019)	In line with draft plan	"minor revegetation and tree planting to reinforce mallee Box Woodland and River Red Gum Woodlands" is in line with recommendation 19 (Improving condition of suburban corridors), provided that an over emphasis is not placed on the "tree planting" as this would then be at odds with recommendation 23, and may compromise the understorey condition and habitat value.	Acceptable	
4	pg 43 (pg 27 of Ekistics, 2019)	In line with draft plan	"Walking trail along the upper perimeter of reserve to allow for a loop course;" is in line with recommendation 20, bearing in mind comments from item 1 above, "upper" should be "upper most".	Acceptable	
14	pg 46 (pg 30 of Ekistics, 2019)	In line with draft plan	"Retain post-industrial quarry landforms and self seeded tree copses and emerging vegetation and highlight with interpretive signage" stromgly aligns with the principles in Habitat Features (pg 64, V0.6, Greening Australia) where cliffs are recognised for their habitat value. It also strongly aligns with the principles in Habitat and Condition (pg 115, V0.6, Greening Australia)	Acceptable	
15	Pg 49 (Pg 33 of Ekistics, 2019)	In line with draft plan	Figure 4.10 "Nature play & reveg plantings" is in line with recommendation 3 to improve diversity of parks.	Acceptable	
16	Pg 49 (Pg 33 of Ekistics, 2019)	In line with draft plan	Figure 4.10 "Stormwater capture/WSUD" is in line with recommendation 24.	Acceptable	
17	Pg 52 (Pg 36 of Ekistics, 2019)	In line with draft plan	"The residential street tree planting palette provides a diversity of species..." is in line with recommendation 9	Acceptable	
23	Pg 64 (Pg 48 of Ekistics, 2019)	In line with draft plan	Iron -grass Temperate Grassland meeting EPBC Act criteria correctly identified on site as per the principles in "Habitat and Condition" section of draft plan (pg 115, V0.6, Greening Australia).	Acceptable	
33	Pg 66 (Pg 50 of Ekistics, 2019)	In line with draft plan	"Remediation of Spring Creek along the degraded sections to improve the ecology & biodiversity..." is in line with recommendations 19 and 21.	Acceptable	
47	Pg 94 (Pg 78 of Ekistics, 2019)	In line with draft plan	"Spring Creek proposed to be remediated to improve ecology and biodiversity..." is in line with recommendation 19	Acceptable	
60	Pg 110 (Pg 94 of Ekistics, 2019)	In line with draft plan	"When clearance is proposed, consideration should be given to: (a) retention of native vegetation for, or as: (i) corridors or wildlife refuges; (ii) amenity purposes;... or (iv) protection from erosion along watercourses and the filtering of suspended solids and nutrients from run-off;" The proposed subdivision open space plan and storm water management plan does consider these aspects of the proposed retained open space, and which is broadly in line with recommendations 19, 20, 21 and 24 of the draft plan.	Acceptable	see item 34
100	Pg 253 (Pg 39 of WGA, 2019)	In line with draft plan	"The vegetation of WSUD systems as well as the proposed remediation of the Spring Creek corridor with its pool and riffle sequences, and online stormwater ponds proposed within Spring Creek system are intended to provide a vegetation community of native vegetation that aims to remediate pre- European ecosystems and biodiversity." This aspiration is in line with recommendations 19, 20, 21 and 24. Although it should be noted that the wetlands systems being constructed are not necessarily in line with pre-European vegetation communities.	Acceptable	see item 34
101	Pg 253 (Pg 39 of WGA, 2019)	In line with draft plan	"The revegetation design documentation will set out the vegetation communities for each zone associated with the stormwater strategy. These zones will correspond to the water appropriate and expected regimes, aspect and location within the open spaces of the development." This is in line with recommendations 19, 20, 21 and 24. It would be easier to evaluate if the revegetation design was provided.	Acceptable	
107	Pg 302 (Pg 21 of Tract, 2019)	In line with draft plan	"Provide landscape treatments that recognise the significant amount of open space provided and ensure that these can be sustainably maintained by Council in the long term." is in line with recommendation 19	Acceptable	
109	Pg 313 (Pg 32 of Tract, 2019)	In line with draft plan	The underlying goal of this masterplan is to leave a legacy of green, interlinked spaces with a generous capacity to balance both the needs of a growing and thriving community whilst also providing opportunities for increased biodiversity." is in line with recommendations 1, 3, 9, 19, 20 and 24	Acceptable	
110	Pg 313 (Pg 32 of Tract, 2019)	In line with draft plan	"Improve environmental values through targeted weed removal and re-vegetation initiatives that reinforce remnant species" is in line with recommendations 19, 20 and 24. And possibly 17 and 18 depending on the nature of the weed control. Although, as with other items, it is difficult to evaluate the validity of this claim without a revegetation or weed control plan.	Acceptable	
112	Pg 315 (Pg 34 of Tract, 2019)	In line with draft plan	"Minor revegetation and tree planting to reinforce remnant Mallee Box Woodland and River Red Gum Woodlands" is in line with recommendation 19 and 20. But a cautionary note on too much emphasis on tree planting might see this at variance with recommendation 23.	Acceptable	see item 43 & 44
115	Pg 316 (Pg 35 of Tract, 2019)	In line with draft plan	"Minor revegetation and tree planting to reinforce remnant Mallee Box Woodland and River Red Gum Woodlands" is in line with recommendation 19 and 20. But a cautionary note on too much emphasis on tree planting might see this at variance with recommendation 23.	Acceptable	see item 43 & 44
122	Pg 331 (Pg 50 of Tract, 2019)	In line with draft plan	Species selection is broadly in line with the draft plan. Care should be taken in planting too many trees and shrub species. The palette could be broadened as per appendix 3 of draft plan (pg 181, Greening Australia)	Acceptable	see item 7
12	pg 45 (pg 29 of Ekistics, 2019)	In line with draft plan	"The environmental and community value of these easement spaces will be maximised...Low maintenance planting through the strategic placement of a mix of native species and direct/hydroseeding will create a pleasant reserve which is capable of hosting leisure activities, enriching biodiversity..." and "Planting selections which promote biodiversity..." is in line with Recommendation 5 regarding the use of easments in Gawler East.	Strongly Supported	
30	Pg 65 (Pg 49 of Ekistics, 2019)	In line with draft plan	The Flinders Worm Lizard "...are widespread and any retention of habitat is of high conservation value. The Proposed Plan of Division has avoided the creation of allotments in all areas mapped as high habitat value within the 2010 KBR report." is in line with the principles in Habitat Features (pg 64, V0.6, Greening Australia)and Habitat and Condition (pg 115, V0.6, Greening Australia). However, this statement is incorrect as per item 31 below	Strongly Supported	

32	Pg 66 (Pg 50 of Ekistics, 2019)	In line with draft plan	"The adopted stormwater strategy applies environmental stormwater management practices in the form of Water Sensitive Urban Design (WSUD) to manage stormwater..." is in line with recommendation 24	Strongly Supported	
35	Pg 67 (Pg 51 of Ekistics, 2019)	In line with draft plan	"Infiltration wells for rear of allotments..." is in line with recommendation 24 and the associated principles.	Strongly Supported	
40	Pg 69(Pg 53 of Ekistics, 2019)	In line with draft plan	Figure 4.23. The use of a broad range of storm water infiltration systems through a large portion of the developed catchment is in line with recommendation 24.	Strongly Supported	
41	Pg 69(Pg 53 of Ekistics, 2019)	other	"Installation of a sedimentation basin (Basin A) within Spring Creek (located upstream of the marsh zone)..." is desirable as this zone contains the most intact vegetation association and is likely to be most vulnerable to sedimentation.	Strongly Supported	
42	Pg 74(Pg 58 of Ekistics, 2019)	In line with draft plan	"No development has been proposed over the easement, with the exception of road crossings. It has been advised that open space is a permissible land usage..." is in line with recommendation 5	Strongly Supported	
50	Pg 108 (Pg 92 of Ekistics, 2019)	In line with draft plan	"Give consideration to sustainability for future Council maintenance." This is in line with recommendation 19, and depending on the implementation of this aspiration could also be in line with recommendation 9, 12, 17 and 18	Strongly Supported	
51	Pg 108 (Pg 92 of Ekistics, 2019)	In line with draft plan	"Revegetation to facilitate filtering, sediment deposition, nutrient uptake, erosion control, while also providing opportunities for increasing biodiversity and habitat value..." is in line with recommendation 19	Strongly Supported	
53	Pg 108 (Pg 92 of Ekistics, 2019)	In line with draft plan	"The natural character of the South Para River and Spring Creek will therefore be preserved and restored and these corridors will act as a distinctive green spine to the interlinked open space network." is in line with recommendations 19, 20 and 21.	Strongly Supported	
78	Pg 211 (Pg i of WGA, 2019)	In line with draft plan	"Revegetation at proposed wetland pools to facilitate filtering, sediment deposition, nutrient uptake, erosion control, while also providing opportunities for increasing biodiversity and habitat value, and visual amenity". Although the increased habitat value statement is moot, the revegetaiton of the creek line is broadly in line with recommendation 19 and in line with recommendation 24.	Strongly Supported	see item 34
80	Pg 212 (Pg ii of WGA, 2019)	In line with draft plan	"-Wetland ponds, wetland systems, biofiltration basin, rain gardens and ecological sponge systems. -Infiltration wells for rear of allotments (where these back onto gullies and Spring Creek). Infiltration wells are designed to cater for roof runoff only and incorporate trickle flow outlets to ensure storages are available to mitigate frequent rain events. -Linear wetland pools and reed beds (macrophyte zones) integrated into the base of Spring creek." are in line with recommendation 24. The implementation of wetlands in Spring Creek may or may not be in line with recommendation 21 (see item 81 below)	Strongly Supported	see item 34
81	Pg 212 (Pg ii of WGA, 2019)	In line with draft plan	"Each stormwater management system is designed to incorporate frequent flow management into their extended detention zone. This approach aims to release trickle flow over a 2 to 3-day period to reduce the responsiveness of the urban catchment to Spring Creek." is in line with recommendation 24.	Strongly Supported	
89	Pg 212 (Pg ii of WGA, 2019)	In line with draft plan	"Installation of a sedimentation basin (Basin A) within Spring Creek (located upstream of the marsh zone) which would intercept sediments during construction stages. This basin is provided as a last interception point." see item 41	Strongly Supported	see item 34 & 44
90	Pg 227 (Pg 13 of WGA, 2019)	In line with draft plan	"Incorporate naturalistic design principles in waterway design to establish natural function, habitats and ecological values.' Is in line with recommendations 19, 21 and 24	Strongly Supported	
93	Pg 227 (Pg 13 of WGA, 2019)	In line with draft plan	"Enhance existing vegetation by planting additional to complement, protect and restore existing degraded areas." Is in line with recoemmndation 19, if done in appropriate locations as per item 79.	Strongly Supported	
97	Pg 227 (Pg 13 of WGA, 2019)	In line with draft plan	"The application of WSUD principles through the urban development will reduce the hydrological responsiveness of the catchment to the watercourse. The use of wetland ponds and systems and biofiltration basins will be designed to manage pre and post flow rates for the 90% AEP event. This ensures that all the frequent events are controlled within the catchment to limit the rate of flow through the watercourse. The watercourse will be remediated as part of the strategy to incorporate pool and riffle sequences and extensive revegetation to create a robust and environmentally sustainable environment. The design approach is sensitive to protecting existing environmental values, while using measures and techniques to rehabilitate existing areas that are eroded and void of vegetation." Is in line with recommendaitons 19, 21 and 24	Strongly Supported	
98	Pg 231 (Pg 17 of WGA, 2019)	In line with draft plan	"Principles within the WSUD framework are proposed for...Managing the volume of runoff for < 90% AEP events where feasible through infiltration systems;Protection of existing downstream areas designated as high biological significance by creating opportunities for these values within the development's green corridors as well as using WSUD within the open spaces to extend exiting vegetation groups;Enhancement in amenity, environmental values, habitat and biodiversity;Protect Spring Creek from the high risk of erosion that will be a result of urbanisation by integrating rock riffle and pool sequences to control bed gradient and stream power; Avoid works in areas identified as high environmental value and protection areas; and Adopt a sequence of wetland ponds within Spring Creek to manage velocities, provide additional treatment, and to provide opportunities for off-set planting." is in line with recommendations 19, 20, 21 and 24.	Strongly Supported	
121	Pg 329 (Pg 48 of Tract, 2019)	In line with draft plan	Species list is generally in line with draft plan, although some species are innaprioriate for this specific location and hydrology.	Strongly Supported	
136	Pg 360 (Pg 15 of EBS, 2019)	other	Regarding Flinders Worm Lizard, "any retention of habitat is of high conservation value." is in line with recommendation 20 and 21	Strongly Supported	
139	Pg 363 (Pg 18 of EBS, 2019)	In line with draft plan	"Areas of the highest density trees are of particularly high value with many having large hollows and provide other habitat values such as food and roosting resources. " is supported by the principles in Habitat Features (pg 64, V0.6, Greening Australia)	Strongly Supported	

OPEN SPACE COMMENTS

Springwood Planning Statement

CONSULTANT / DEVELOPER AGENT /REP.

Springwood Development Nominees Pty Ltd

Legend:	ISSUE	CONCERN	SERIOUS CONCERN	UNACCEPTABLE
Ref.	Item	Plan #	Priority Council Comment - July 2019 (Received Plans 18 June 2019)	
1	1.0	Ecological	Areas of native vegetation in the development are nominated for removal including areas that are Listed as Critically Endangered ecological communities of National Significance under the EPBC Act List of Threatened Ecological Communities (Iron grass Natural Temperate Grassland of South Australia https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=37&status=Critically+Endangered and Peppermint Box (Eucalyptus odorata) Grassy Woodland of South Australia https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=36&status=Critically+Endangered). **NVA & EPBC approvals required prior to planning consent**	UNACCEPTABLE
	1.1	Ecological	Areas of native vegetation in the development are nominated for removal as part of stormwater management including areas that are Listed as Critically Endangered ecological communities of National Significance under the EPBC Act List of Threatened Ecological Communities (Iron grass Natural Temperate Grassland of South Australia https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=37&status=Critically+Endangered and Peppermint Box (Eucalyptus odorata) Grassy Woodland of South Australia https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=36&status=Critically+Endangered). Thus causing disturbance and degradation for the noted flora and fauna. The presented final form of the stormwater management systems within these areas is vastly different to the noted habitats that are present. **NVA & EPBC approvals required prior to planning consent**	UNACCEPTABLE

	1.2		**The vegetation areas noted above meet ALL (excluding 1 (m))criteria for retention under Principles of Clearance of Native Vegetation, Native Vegetation Council Information Sheet No.10 Updated March 2013** (https://www.environment.sa.gov.au/files/sharedassets/public/native_veg/con-nv-clearanceprinciples.pdf) SCHEDULE 1 – PRINCIPLES OF CLEARANCE OF NATIVE VEGETATION 1. Principles of clearance of native vegetation Native vegetation should not be cleared if, in the opinion of the Council – (a) it comprises a high level of diversity of plant species; or (b) it has significance as a habitat for wildlife; or (c) it includes plants of a rare, vulnerable or endangered species; or (d) the vegetation comprises the whole, or a part, of a plant community that is rare, vulnerable or endangered; or (e) it is significant as a remnant of vegetation in an area which has been extensively cleared; or (f) it is growing in, or in association with, a wetland environment; or (g) it contributes significantly to the amenity of the area in which it is growing or is situated; or (h) the clearance of the vegetation is likely to contribute to soil erosion or salinity in an area in which appreciable erosion or salinisation has already occurred or, where such erosion or salinisation has not yet occurred, the clearance of the vegetation is likely to cause appreciable soil erosion or salinity; or (i) the clearance of the vegetation is likely to cause deterioration in the quality of surface or underground water; or (j) the clearance of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding; or (k) – (i) after clearance the land will be used for a particular purpose; and (ii) the regional NRM board for the NRM region where the land is situated has, as part of its NRM plan under the Natural Resources Management Act 2004 assessed	UNACCEPTABLE

			Significant alteration to habitat zones of the Vulnerable Aprasia pseudopulchella — Flinders Ranges Worm-lizard is noted within the proposed development. The following is listed under Threat Abatement and Recovery for the species; "The Conservation Advice (TSSC 2008dj) identifies following priority recovery and threat abatement actions for the Flinders Ranges Worm-lizard: Identify populations of high conservation priority. Manage threats to areas of vegetation that contain populations/occurrences of the Flinders Ranges Worm-lizard. Ensure chemicals or other mechanisms used to eradicate weeds do not have a significant adverse impact on the Flinders Ranges Worm-lizard. Ensure development activities in areas the Flinders Ranges Worm-lizard occurs do not adversely impact on known populations. Manage any changes to hydrology which may result in changes to the water table levels, increased run-off, sedimentation or pollution. Investigate formal conservation arrangements such as the use of covenants, conservation agreements or inclusion in reserve tenure. ... Raise awareness of the Flinders Ranges Worm-lizard within the local community. Develop and promote guidelines for landowners and users to reduce the impact of current land use practices on the species outside reserve areas. Investigate options for linking, enhancing or establishing additional populations". **It is recommended that the Springwood Creek is nominated for Conservation listing with the National Parks.**	UNACCEPTABLE
			Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and Native Vegetation Act 1991 approvals are required prior to development approval being granted	UNACCEPTABLE

	1.4	Environmental	Locations including occurrences of species protected under the federal Environmental Protection and Biodiversity Conservation Act (1999) are shown to be affected by the proposed development. The Springwood Creek area is at risk of fragmentation, encroachment and degradation due to proposed the road crossings through construction activities and the type of culvert crossing proposed. Town of Gawler draft Biodiversity Management Plan includes references to prevent fragmentation, encroachment and degradation of areas, with recommendations 19, 20, 21, 22 & 23. **Creek crossing designs may require reconsideration to reduce overall impacts upon Iron Grass Natural Temperate Grassland (Critically Endangered ecological community of National Significance). NVA & EPBC approvals required prior to planning consent.**	UNACCEPTABLE
			Native Vegetation Act 1991, and Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) approvals are required prior to planning Consent	UNACCEPTABLE
2	2.0	Open Space	The total amount of open space proposed is majorly provided through encumbered land which does not facilitate active useable open space, the design proposal does activate these spaces in a feasible manner. **Council has identified a number of locations where excessive open space can be returned to private allotments to reduce the provision of small unwarranted open space areas. Refer Attachment 5**	CONCERN
4	4.1	Springwood Village Centre Park	Village Centre Park presented Concept Plan includes community infrastructure that is considered unsuitable within the SEA Gas MLV 45m buffer zone, which is listed on page 58 of the Planning Statement as a "hazardous area exclusion zone." **Request relocation of community infrastructure/ activities facilitated at Springwood Village Centre Park to the Springwood Playing Fields. In place Council nominates that a preferable use of the area as a rehabilitated/ revegetated Natural Open Space area with walking trails as the upper most form of community interaction with the space. As a result, and given the 2010 Safety Management Study mentioned was based on the previous Springwood Estate Master Plan, it is recommended that a new Safety Management Study be conducted prior to any Planning Consent being granted as the outcomes of the Safety Management Study should be used to inform any conditions of approval.**	UNACCEPTABLE
5	5.0	Retaining Walls	The indicative placement of retaining walls to property boundaries and roadways adjoining the natural creek corridor is of concern in relation to intrusive construction activities and the protection of these retaining walls and footings from erosion. **Allotments may require reconfiguration to better suit topographic nature of site, thus reducing the need for retaining walls.**	CONCERN

8	8.0	Screening	No consideration for screen planting between high voltage electrical supply lines/ towers and residential allotments is evident. Residential allotments are located hard up against easement corridors. High voltage electrical easements do not allow tree planting within the corridor. Landscaping treatments alluded to within supplied Concept Plans show total disregard for easement conditions. The existing high voltage electrical easement north of Calton Road through Gawler East, is an example of development/ urban design considering configurations to offset provide buffer planting between housing and high voltage electrical supply lines/ towers. **All development applications submitted to councils must include a signed Electricity Act Declaration Form (201.0 KB PDF) acknowledging that the development plan complies with prescribed clearance requirements. Screening of infrastructure is requested, maintenance access must be retained, diverse native grass revegetation suggested within easement corridors and allotment layout requires redesign.**	SERIOUS CONCERN
9	9.0	Regulated/ Significant Trees	An arborist's report is not supplied to support the removal of the 47 Regulated and 40 Significant Trees. **Request for Arborists report for each of the requested tree removals, including reference to EPBC Act and Native Vegetation Act requirements. Regulated and Significant Tree removal approvals are required prior to planning consent.**	UNACCEPTABLE
	9.3	Regulated/ Significant Trees	The required replanting activities to offset Regulated/ Significant removals are heavily constrained due to the available open space/ reserve areas outside of encumbered (easements) areas, as there are limiting factors to successful tree planting. These factors include steep slopes, overall available area available for trees and where area is available the placement of trees is likely to impinge upon the environmental protections on site. **Request for detailed revegetation/ rehabilitation planting report, including reference to EPBC Act and Native Vegetation Act requirements for revegetation/ rehabilitation or provided SEB offset payment are required prior to planning consent.**	UNACCEPTABLE
12	12.0		All Open Space Designs illustrated through Concepts plans provided do not communicate an understanding for the requirements relating to clearance and offsets under the Native Vegetation Act. Heavily tree planted areas within the Tract masterplan are likely to impinge upon the Iron grass Natural Temperate Grassland and Peppermint Box (Eucalyptus odorata) Grassy Woodland. **NVA & EPBC approvals required prior to planning consent.**	SERIOUS CONCERN

	12.1	Steep Slopes	The areas within the 'Springwood Creek' reserve contain steep slopes, in many locations greater than what can be safely traversed by maintenance vehicles. The construction of accessible tracks for maintenance access is likely to cause greater undue harm to the Iron grass Natural Temperate Grassland and Peppermint Box (Eucalyptus odorata) Grassy Woodland. Redesign of the maintenance tracks, walking and cycling trails and fire tracks to address issues of disturbance and degradation for the noted flora and fauna. These tracks may be best located to areas outside of flora associations, such as top of banks along rear of property boundaries. **Redesign of the tracks and trails is required prior to planning consent. NVA & EPBC approvals required prior to planning consent.**	SERIOUS CONCERN

Ref.	Item	Plan #	Detailed Council Comment - June 2019 (Received Plans 18 June 2019)	
			General	
1	1.0	Ecological	Areas of native vegetation in the development are nominated for removal including areas that are Listed as Critically Endangered ecological communities of National Significance under the EPBC Act List of Threatened Ecological Communities (Iron grass Natural Temperate Grassland of South Australia https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=37&status=Critically+Endangered and Peppermint Box (Eucalyptus odorata) Grassy Woodland of South Australia https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=36&status=Critically+Endangered). **NVA & EPBC approvals required prior to planning consent.**	UNACCEPTABLE
	1.1	Ecological	Areas of native vegetation in the development are nominated for removal as part of stormwater management including areas that are Listed as Critically Endangered ecological communities of National Significance under the EPBC Act List of Threatened Ecological Communities (Iron grass Natural Temperate Grassland of South Australia https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=37&status=Critically+Endangered and Peppermint Box (Eucalyptus odorata) Grassy Woodland of South Australia https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=36&status=Critically+Endangered). Thus causing disturbance and degradation for the noted flora and fauna. The presented final form of the stormwater management systems within these areas is vastly different to the noted habitats that are present. **NVA & EPBC approvals required prior to planning consent.**	UNACCEPTABLE

	1.2		**The vegetation areas noted above meet ALL (excluding 1 (m))criteria for retention under Principles of Clearance of Native Vegetation, Native Vegetation Council Information Sheet No.10 Updated March 2013** (https://www.environment.sa.gov.au/files/sharedassets/public/native_veg/con-nv-clearanceprinciples.pdf) SCHEDULE 1 – PRINCIPLES OF CLEARANCE OF NATIVE VEGETATION 1. Principles of clearance of native vegetation Native vegetation should not be cleared if, in the opinion of the Council – (a) it comprises a high level of diversity of plant species; or (b) it has significance as a habitat for wildlife; or (c) it includes plants of a rare, vulnerable or endangered species; or (d) the vegetation comprises the whole, or a part, of a plant community that is rare, vulnerable or endangered; or (e) it is significant as a remnant of vegetation in an area which has been extensively cleared; or (f) it is growing in, or in association with, a wetland environment; or (g) it contributes significantly to the amenity of the area in which it is growing or is situated; or (h) the clearance of the vegetation is likely to contribute to soil erosion or salinity in an area in which appreciable erosion or salinisation has already occurred or, where such erosion or salinisation has not yet occurred, the clearance of the vegetation is likely to cause appreciable soil erosion or salinity; or (i) the clearance of the vegetation is likely to cause deterioration in the quality of surface or underground water; or (j) the clearance of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding; or (k) – (i) after clearance the land will be used for a particular purpose; and (ii) the regional NRM board for the NRM region where the land is situated has, as part of its NRM plan under the Natural Resources Management Act 2004 assessed	UNACCEPTABLE

	1.3		**Significant alteration to habitat zones of the Vulnerable Aprasia pseudopulchella — Flinders Ranges Worm-lizard is noted within the proposed development.** The following is listed under Threat Abatement and Recovery for the species; "The Conservation Advice (TSSC 2008dj) identifies following priority recovery and threat abatement actions for the Flinders Ranges Worm-lizard: Identify populations of high conservation priority. Manage threats to areas of vegetation that contain populations/occurrences of the Flinders Ranges Worm-lizard. Ensure chemicals or other mechanisms used to eradicate weeds do not have a significant adverse impact on the Flinders Ranges Worm-lizard. Ensure development activities in areas the Flinders Ranges Worm-lizard occurs do not adversely impact on known populations. Manage any changes to hydrology which may result in changes to the water table levels, increased run-off, sedimentation or pollution. Investigate formal conservation arrangements such as the use of covenants, conservation agreements or inclusion in reserve tenure. ... Raise awareness of the Flinders Ranges Worm-lizard within the local community. Develop and promote guidelines for landowners and users to reduce the impact of current land use practices on the species outside reserve areas. Investigate options for linking, enhancing or establishing additional populations". **It is recommended that the Springwood Creek is nominated for Conservation listing with the National Parks.**	UNACCEPTABLE
	1.4	Environmental	Locations including occurrences of species protected under the federal Environmental Protection and Biodiversity Conservation Act (1999) are shown to be affected by the proposed development. The Springwood Creek area is at risk of fragmentation, encroachment and degradation due to proposed the road crossings through construction activities and the type of culvert crossing proposed. Town of Gawler draft Biodiversity Management Plan includes references to prevent fragmentation, encroachment and degradation of areas, with recommendations 19, 20, 21, 22 & 23. **Creek crossing designs may require reconsideration to reduce overall impacts upon Iron Grass Natural Temperate Grassland (Critically Endangered ecological community of National Significance). NVA & EPBC approvals required prior to planning consent.**	UNACCEPTABLE

1.4.1		**Recommendation 19** ***Improving condition of suburban corridors*** "works within these corridors are conducted to maintain and improve the function of these corridors and reduce Council's and resident's liability for significant ongoing maintenance and fire hazards." Prior to the vesting of land to Council, Council may request the land be vested to an acceptable standard which meets one objective; the site achieves a desirable level of native biodiversity that is self-sustainable, or sustainable with the least possible human intervention. To measure the site's progress against this objective the following criteria are proposed: Eradicate noted pest species; Control -tolerate noted weed species to total of less than 15% cover; Restore -establish a representative number of native species proportionate to the size of the site.	CONCERN
1.4.2		**Recommendation 20** ***Minimise encroachment and edge effects*** "aim of corridors is to improve terrestrial biodiversity. To achieve this a corridor width of 200m is desirable. Larger buffers are better where this can be achieved. Compromises will obviously need to be made in some areas for narrower buffers, where 200m cannot be achieved. Negotiations to achieve higher quality corridors may help to mitigate the reduced width. In addition to these buffers of native vegetation, development on the outer edge of these buffers should, where possible, be tapered in order of the development's potential to contribute to the severest edge effects, from least impacting to more impacting features. For example: BUFFER →open space →paths → roads → housing. This step back would also align with CFS bushfire buffer zone management practice (CFS, 2016)." **The existing width allowed for at Springwood Creek is at the narrowest point nominally 65m between residential property and roadway (Lot #1103 rear boundary and road due south). Existing Concept Plans to Springwood Creek does not show consideration to existing environments. Detailed revegetation/ rehabilitation plan is required to inform open space treatments of areas.**	CONCERN

	1.4.3		**Recommendation 21 *Mitigate fragmentation and blockages*** "a) Ensure that some formal crossing points, with appropriate design, are installed in these watercourses to discourage the establishment and proliferation of informal alternative crossing points. b) The design of a road barrier should incorporate underpass and overpass features which allow terrestrial animals to easily move from one side to the other without the risk of being exposed to traffic. • Underpass features should ensure that the size is large enough allow a kangaroo to move through and ensure that light can penetrate throughout. • Ideally an underpass would retain or re-establish vegetation similar to the adjacent remnant, but this is not always feasible from an infrastructure maintenance point of view. • Overpasses should install climbing features to cater for highly mobile animals such as Possums and Koalas which may find themselves trapped on or outside a road. c) Infrastructure should be designed such that low flows are maintained as seasonally appropriate."	CONCERN
	1.4.4		**Recommendation 22. *Foster community value of open space*** **and Recommendation 23 *Formal recognition of the value of grasslands*** refer to revegetating the areas within the easement corridors with native grasslands. **Existing Concept Plans to easement corridors does not show consideration to existing environments. Detailed revegetation/ rehabilitation plan is required to inform open space treatments of areas.**	CONCERN
	1.5	Environmental	Consideration should be given to facilitate fauna other than fish movements along the creek corridor	ISSUE
	1.6	Environmental	Council suggest the inclusion of habitat boxes amongst reserve spaces to improve the total amount of nesting environments available for fauna. The Gawler NRM and Gawler Environment Centre are able to provide further information on providing nesting boxes for a variety of different native fauna.	ISSUE
2	2.0	Open Space	The total amount of open space proposed is majorly provided through encumbered land which does not facilitate active useable open space, the design proposal does activate these spaces in a feasible manner. **Council has identified a number of locations where excessive open space can be returned to private allotments to reduce the provision of small unwarranted open space areas. Refer Attachment 5**	CONCERN

	2.1	Open Space	The application nominates that 73.57ha of land will be vested as Open Space. With 1414 lots being proposed this equates to an estimated population of 6363 people for the development (based upon 2011 Census data of 4.5 people per household) thus equating to a need for 57.267ha of Open Space to meet with the Barossa, Light and Lower North Region -Open Space, Recreation and Public Realm target. The strategic direction from the Gawler Open Space, Sport and Recreation Plan 2025 does however provide direction for an additional 25-30ha of sporting open space, which the application does facilitate part there of. Therefore Council requests that the amount of open space (except for the sporting oval reserve) be rationalised to reduce the overall amount of Open Space to be vested to Council. Excess areas of open Space be reconfigured to provide a greater number of allotments.	CONCERN
	2.2	GOSSRP	Supportive of Springwood Oval for structured play activities	ISSUE
	2.3	Open Space	The total amount of land to be divested as open space reserve is challenged by Council. A detailed slope analysis of the entire site is requested to fully assess the useability of the is area. Council's own preliminary assessment is articulated in the following points	CONCERN
	2.4	Open Space	Approximately 61.344ha of land is nominated within the application as "Gullies and Steep Creeks" and "Pedestrian and cycle corridors" categorically falls under areas that are considered as undevelopable within Council's Development Plan, due to it's location being within infrastructure easements. The application does nominate that these areas will be activated through the placement of walking/ cycling trails and other community infrastructure at nodes. This inclusion is welcomed to activate the areas. This level of activation lifts these areas from being considered "undevelopable" into the category of "Ancillary Open Space". Which is defined within the Barossa, Light and Lower North Region -Open Space, Recreation and Public Realm Strategy under 7.2.5 pg29 as "... area's primary role is not necessarily open space. These areas complement and can serve as an addition to primary open space areas. This includes school reserves, cemeteries, road verges, creek lines, storm water channels as well as minor road networks that provide scope to incorporate open space features such as linear trails, revegetation opportunities and dedicated walking/cycling links. These areas are significant and serve as supplementary green links between existing parks and reserves and are important in suburbs deficient in open space."	ISSUE
3	3.0	Local Open Space	Community infrastructure at nodes noted from above have been considered as proposed to be developed to a higher level than that of the surrounding "Ancillary Open Space" Council considers it warranted to assess these nodes as "Local Open Space" areas.	ISSUE

	3.1		Mapping of these Local Open Space areas shows that they are clustered in the central/ eastern portion of the development (**Attachment 1**). When mapping the Council development plan catchment for Local Open Space areas of 300m (**Attachment 2**), an oversupply becomes evident for this area (**Attachment 3**). This oversupply does take into account the presence of the Springwood Creek and central roadway as such creating a physical barrier to residents wishing to use Local Open Space.	CONCERN
	3.2		Council requests that the Local Open Space areas be reconsidered or consolidated to reduce the assessed oversupply	CONCERN
4	4.0	Springwood Village Centre Park	The application inconsistently nominates the Springwood Village Centre Park Open Space Hierarchy. The ekistics 'Springwood' Planning Statement pg26, 27 & 32; Figure 4.10 pg. 33 lists the Village Centre Park as District, the Tract Masterplan on page 33/59 nominates it as Neighbourhood and then on page 38/59 Village Centre Park is listed as District. Council's own mapping of the reserve (see item above) notes that as a District OR Neighbourhood reserve results in an oversupply of either of the reserve types within the development, and thus placing extra burden upon Council and the community in future years in relation to the servicing and maintenance of a high number of community infrastructure elements.	CONCERN
	4.1	Springwood Village Centre Park	Village Centre Park presented Concept Plan includes community infrastructure that is considered unsuitable within the SEA Gas MLV 45m buffer zone, which is listed on page 58 of the Planning Statement as a "hazardous area exclusion zone." **Request for relocation of community infrastructure/ activities facilitated at Springwood Village Centre Park to the Springwood Playing Fields. In place Council nominates that a preferable use of the area as a rehabilitated/ revegetated Natural Open Space area with walking trails as the upper most form of community interaction with the space. As a result, and given the 2010 Safety Management Study mentioned was based on the previous Springwood Estate Master Plan, it is recommended that a new Safety Management Study be conducted prior to any Planning Consent being granted as the outcomes of the Safety Management Study should be used to inform any conditions of approval.**	UNACCEPTABLE
	4.2	Neighbourhood Open Space	Mapping of Neighbourhood Open Space areas (**Attachment 1**) which includes the recently developed Highfield and; proposed Springwood Village Centre Park and Springwood West Reserve presents that the location of the Village Centre Park is considered unsuitable due to an oversupply (**Attachment 3**). Council development plan catchment for Neighbourhood Open Space areas is 500m. Neighbourhood Open Space areas are generally of a nature that people are attracted to them from further away than Local Open Space areas; and as such physical barriers to residents wishing to use Neighbourhood Open Space are not considered relevant.	ISSUE

	4.3	Springwood Village Centre Park	In line with the above 2 points **Council requests relocating the activities facilitated at Springwood Village Centre Park to the Springwood Playing Fields. In place Council nominates that a preferable use of the area as a rehabilitated/ revegetated Natural Open Space area with walking trails as the upper most form of community interaction with the space.**	SERIOUS CONCERN
5	5.0	Retaining Walls	The indicative placement of retaining walls to property boundaries and roadways adjoining the natural creek corridor is of concern in relation to intrusive construction activities and the protection of these retaining walls and footings from erosion. **Allotments may require reconfiguration to better suit topographic nature of site, thus reducing the need for retaining walls.**	CONCERN
6	6.0	Entry Walls	Low Entry Walls' present an ongoing concern in relation to vandalism for Council maintenance crews, it is preferred that 'Entry Statement' marketing be provided via removable signage. Refer Policy 8.19 Land Development Promotional and Directional Signs on Council Property	ISSUE
7	7.0	General note	Footpaths to Town of Gawler Standard -Land Division Operating Manual Town of Gawler 3.3.4 Footpaths	ISSUE
	7.1	Trails	Trails of secondary or tertiary use on slopes greater than 2% are to be constructed using cement treated rubble material as a minimum standard. As witnessed recently at the Springwood Highfield site that small rain events are likely to cause considerable damage to unsealed pavement materials.	CONCERN
	7.2	Vehicle restrictions	Ends of walkways/ trails to have Post & Rail barriers installed to prevent vehicle movements either side of footpaths -Council standard Post: Advanced Plastic Recycling WPC Bollard 135x85x1500 peaked top with 63mm bore, Rail: 50mm Galv CHS with end caps	ISSUE
	7.3	Vehicle restrictions	Removable Bollard installed central to pathway to prevent vehicle movements -Council standard Post: Advanced Plastic Recycling WPC Bollard 135x85x1500 peaked top	ISSUE
	7.4	Vehicle restrictions	Roads adjacent reserve/ open space areas are to have upright kerb to the reserve frontage to reduce unauthorised vehicle access	ISSUE

8	8.0	Screening	No consideration for screen planting between high voltage electrical supply lines/ towers and residential allotments is evident. Residential allotments are located hard up against easement corridors. High voltage electrical easements do not allow tree planting within the corridor. Landscaping treatments alluded to within supplied Concept Plans show total disregard for easement conditions. The existing high voltage electrical easement north of Calton Road through Gawler East, is an example of development/ urban design considering configurations to offset provide buffer planting between housing and high voltage electrical supply lines/ towers. **All development applications submitted to councils must include a signed Electricity Act Declaration Form (201.0 KB PDF) acknowledging that the development plan complies with prescribed clearance requirements. Screening of infrastructure is requested, maintenance access must be retained, diverse native grass revegetation suggested within easement corridors and allotment layout requires redesign.**	SERIOUS CONCERN
	8.1	Pump Stations	Consideration for landscaping treatments around Pump stations to be complimentary to adjacent natural environs. Screening of infrastructure requested, maintenance access must be retained.	
Softscape				
9	9.0	Regulated/ Significant Trees	An arborist's report is not supplied to support the removal of the 47 Regulated and 40 Significant Trees. **Request for Arborists report for each of the requested tree removals, including reference to EPBC Act and Native Vegetation Act requirements. Regulated and Significant Tree removal approvals are required prior to planning consent.**	UNACCEPTABLE
	9.1	Regulated/ Significant Trees	It is noted that 32 of the Significant Tree's are outside of the uncontrolled fill zone	ISSUE
	9.2	Regulated/ Significant Trees	It is noted that 17 of the Regulated Tree's are outside of the uncontrolled fill zone	ISSUE
	9.3	Regulated/ Significant Trees	The required replanting activities to offset Regulated/ Significant removals are heavily constrained due to the available open space/ reserve areas outside of encumbered (easements) areas, as there are limiting factors to successful tree planting. These factors include steep slopes, overall available area available for trees and where area is available the placement of trees is likely to impinge upon the environmental protections on site. **Request for detailed revegetation/ rehabilitation planting report, including reference to EPBC Act and Native Vegetation Act requirements for revegetation/ rehabilitation or provided SEB offset payment are required prior to planning consent.**	UNACCEPTABLE

	9.4	Regulated/ Significant Trees	Street Tree planting is not be counted as replacement planting for Significant/ Regulated Tree Removals. Replacement Tree planting should only be counted within reserve/ open space areas to provide legacy plantings.	ISSUE
10	10.0	General note	All Tree plantings are to be in accordance with Council's Street Tree Planting for New Land Divisions Policy and Tree Planting Standard	ISSUE
	10.1	General note	Open Space/ Reserve areas tree plantings are to be located offset from fence lines to allow for minimal overhang of private property at maturity	ISSUE
	10.2	General note	Individual placement of shrub/ grass and groundcover species is to consider the mature spread of the plant adjacent footpaths and property boundaries. Thus eliminating maintenance pruning activities to provide clear passage along all footpaths	ISSUE
	10.3	General note	Planting areas adjacent footpaths, heights to allow for clear sight lines through reserve, observing CPTED principles.	ISSUE
	10.4	General note	All Garden Planting areas, species selection will be drought tolerant, hardy, long lived and suitable to the existing soil conditions on site. Native species are preferred. Irrigation should be considered for establishment purposes only.	ISSUE
	10.5	General note	All street trees to be minimum 6m offset from street lighting	ISSUE
11	11.0	Street Trees	Species selections	ISSUE
			Request that use of Ulmus parvifolia 'Chinese Elm' is NOT selected for use, due to the presence of Elm Leaf Beetle throughout Adelaide region.	ISSUE
	11.1		Proposed Residential Street Trees -request the inclusion of some native tree species to this list. Suggest Eucalyptus leucoxylon 'Euky Dwarf', Eucalyptus torquata 'Coral gum', Callistemon species etc.	ISSUE
	11.2		Proposed Residential Street Trees -request that streets that are of a north-south orientation. Suggest Eucalyptus leucoxylon 'Euky Dwarf', Eucalyptus torquata 'Coral gum', Callistemon species etc.	ISSUE
	11.3		Proposed Residential Street Trees -request that streets that traverse the bounding edge to natural areas include native tree species. Particularly suggest Eucalyptus porosa 'Mallee Box' to the reserve side of the street. If variety/ separation is desired from streetscape design perspective Eucalyptus leucoxylon 'Euky Dwarf', Eucalyptus torquata 'Coral gum', Callistemon species etc species to opposing sides of street.	ISSUE

	11.4		The urban design of the narrow lanes between Terrace lots is questioned in relation to the availability of space to provide desirable urban environments in particular landscaping (PDC10(e)). It is questioned how street trees area able to be facilitated amongst all the competing demands on these laneways. Pedestrian safety within these laneways is also questioned.	CONCERN
	11.5		The north-South road connecting to Cheek Avenue/ Calton Road includes an strip of approximately 800lm where the overhead electrical easement will severely restrict placement of street trees. In the least street tree species will be limited to little more than shrubs, which is an undesirable outcome taking into consideration traffic sightlines.	CONCERN
	11.6		Tract 16.3 Road Corridor and Gateways Plant list includes Tulbaghia, Cotyledon and Lavandula species, these have potential to be weeds. This of concern as it is likely to impact adjacent Iron Grass grasslands and Mallee Box open woodland/ grassland association. **Remove Tulbaghia, Cotyledon & Lavandula species from plant lists**	CONCERN
	11.7		Tract 16 Plant Species Strategy Species list are composed of species that are included within draft Biodiversity Management Plan Revegetation Plant List, the plant list supplied Tract 16.1 is a good example of diversity; however the supplied lists 16.2, 16.3, 16.4 and 16.5 are overwhelmingly proportioned towards shrubs species. **In keeping with rehabilitating/ revegetating grasslands, grass, herb and groundcover species should make up greater than 60% of diversity.**	
12	12.0		All Open Space Designs illustrated through Concepts plans provided do not communicate an understanding for the requirements relating to clearance and offsets under the Native Vegetation Act. Heavily tree planted areas within the Tract masterplan are likely to impinge upon the Iron grass Natural Temperate Grassland and Peppermint Box (Eucalyptus odorata) Grassy Woodland. **NVA & EPBC approvals required prior to planning consent.**	SERIOUS CONCERN
	12.1	Steep Slopes	The areas within the 'Springwood Creek' reserve contain steep slopes, in many locations greater than what can be safely traversed by maintenance vehicles. The construction of accessible tracks for maintenance access is likely to cause greater undue harm to the Iron grass Natural Temperate Grassland and Peppermint Box (Eucalyptus odorata) Grassy Woodland. Redesign of the maintenance tracks, walking and cycling trails and fire tracks to address issues of disturbance and degradation for the noted flora and fauna. These tracks may be best located to areas outside of flora associations, such as top of banks along rear of property boundaries. **Redesign of the tracks and trails is required prior to planning consent. NVA & EPBC approvals required prior to planning consent.**	SERIOUS CONCERN

	12.2	Fire Breaks	Fire breaks to rear of property boundaries may be possible in some locations, through the provision of access tracks. **Where suitable grade match in is attainable such tracks are to double as walking/ cycling routes.**	CONCERN
	12.3	Public Safety	Where walking/ cycling routes adjoin steep drop offs, or cliffs protections are to be in place for public safety	CONCERN
	12.4	Springwood Village Centre Park	Concept Plan shows configuration of park inconsistently to Stormwater management plan.	ISSUE
	12.5	Springwood Playing Fields	Steep slopes to existing quarry batter are to be vegetated in a low maintenance manner. Previous Masterplan documents have made reference to potential 1/3 slope, access for maintenance activities will need to be considered.	ISSUE
	12.6	Springwood West Reserve	Large parcentage of area covered by electrical easement and the Stormwater mangement plan idenitifies 2 wetlands for this site, Council is concerned for amount of useable area available for community activation of the space.	ISSUE
	12.7	Quarry Park	Concern that the development of a Community Garden within the electrical easement will be within Electrical Act requirements. All development applications submitted to councils must include a signed Electricity Act Declaration Form (201.0 KB PDF) acknowledging that the development plan complies with prescribed clearance requirements.	ISSUE
	12.8	Quarry Park	Activation of the space is supported. Activities facilitated will require approval under Electrical Act. All development applications submitted to councils must include a signed Electricity Act Declaration Form (201.0 KB PDF) acknowledging that the development plan complies with prescribed clearance requirements.	ISSUE
Irrigation				
13	13.0	General comment	Irrigation to be designed and installed to Council Irrigation specification standards	ISSUE
	13.1	General note	All Garden Planting areas should be considered as irrigation for establishment purposes only.	ISSUE
Play Element				
14	14.0		The diversity of play experiences for cross generational structured and unstructured play proposed is supported	ISSUE
Drainage / Swale / Wetland				
15	15.0	General note	Footpath finish surface level to be proud of adjacent garden finish mulch level	ISSUE
Verges in local road reserves (excluding park)				

16	16.0	General note	Residents are to be provided with Council Policy 7.7 available from Councils website, and an application form to alter or occupy a road (Section 221 application form) also available from Councils website. Residents are to be provided this information when they purchase allotments. Verges not directly adjacent properties are not to be irrigated or grassed unless a property owner is willing to maintain this service level via above process with Council.	ISSUE
	16.1	General note	At the time of land division, verges are to be backfilled with compacted material. This material type is to be confirmed with Council during the assessment of detailed landscape design.	ISSUE

Springwood Statement of Requirements

Development Plan Consent Advisory Notes

1. Advisory Notes

1.1 The applicant is reminded of its general environmental duty, as required by Section 25 of the Environment Protection Act, to take all reasonable and practical measures to ensure that the activities on the whole site, including during construction, do not pollute the environment in a way which causes or may cause environmental harm.

1.2 Approvals from all service authorities to modify services infrastructure are required to be obtained prior to commencement of construction and a copy of the approvals provided to the Town of Gawler.

1.3 Noise levels must comply with the Environment Protection (Noise) Policy 2007.

1.4 The developer shall be responsible for liaison with SA Power Networks in respect to both public lighting and for the provision of an underground electricity service to all new allotments in the development.

1.5 The appropriate Council Officer(s) shall be notified prior to commencing the various stages of infrastructure installation in order to inspect installation and traffic management.

1.6 No retaining walls are approved as part of this land division application. Any retaining wall exceeding one (1) metre in height or combination of retaining wall and fence exceeding the height of 2.1 metres or any addition to an existing retaining wall and/or fence exceeding the afore mentioned heights shall require Development Approval.

1.7 No blasting shall occur on the subject land in accordance with AS 2885.

1.8 Future land owners are advised that landscaping of road verges in front of private properties requires Council approval in accordance with Section 221 of the Local Government.

Land Division Consent Requirements

1. Road Layout & Design

1.1 The Gawler East Infrastructure Deed should be executed by all parties including the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that external works associated with the land division are adequately delivered

1.2 Where works are proposed on existing road reserves in the Town of Gawler, an Infrastructure Agreement is required to be prepared and executed between the Town of Gawler and the applicant / developer prior to the issue of Section 51 Clearance.

REASON: To ensure that external works associated with the land division are adequately delivered

1.3 Prior to Section 51 Clearance, all deeds and relevant documents pertaining extinguishing and registering easements and associated terms to the gas (infrastructure) easement licensed to SEA Gas (and/or associated parties) shall be executed to the satisfaction of the Town of Gawler.

REASON: To ensure that the easement terms adequately address the use of the land

1.4 The Applicant/Developer must prior to the issue of clearance for the purposes of a section 51 certificate (or at such other time as may be agreed in writing by the Town of Gawler), pay to the Town of Gawler:

a. The amount of the separate rates applying to the land and relating to the Gawler East link road, traffic interventions and community infrastructure; or

b. An infrastructure contribution on account of the Applicant/Developer's contribution to the Gawler East link road, traffic interventions and community infrastructure as agreed between the Developer and the Town of Gawler in any separate infrastructure agreement or agreements entered between them.

REASON: To ensure that adequate infrastructure that serves the Gawler East Community is delivered

1.5 A Traffic and Transport Management Study shall be provided detailing the traffic generation, bus routes, proposed road hierarchy and key pedestrian and cycling routes within the development and connecting to existing surrounding external roads and reserve areas to the satisfaction of Council prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.6 A road hierarchy plan must be developed to the satisfaction of Council in accordance with 'Council's Standards and Requirements for Land Development / Land Division Guideline' to show the alignment, classification and typical cross-section of each proposed road based on expected traffic volumes prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.7 In accordance with the Development Regulations 2008 all roads must be formed to a width specified by the Council, and in a manner satisfactory to the Council in accordance with Council's Standards and Requirements for Land Development / Land Division Guideline.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.8 Full detailed designs and specifications pertaining to roads, drainage, streetscape shall be provided to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.9 All roads shall be designed to accommodate a 12.5m long Medium Rigid Vehicle with a check vehicle of a 19-metre semitrailer in accordance with Australian Standard AS2890 and Austroads Guidelines.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.10 All roads shall be designed in accordance with the Ministers Code for Undertaking Development in Bushfire Protection Areas for safe and convenient movement of vehicles and have a sealed surface.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.11 All Cul-de-sacs shall be designed in accordance with the requirements of the Development Regulations 2008 with mountable kerb and gutter in accordance with 'Council Standard Detail SK-304' and in accordance with the Ministers Code for Development in Bushfire Protection Areas.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.12 All laneways providing secondary access to properties shall be continuous straight linkages between local residential roads, have a road reserve width of 7 metres and facilitate crime prevention through environmental design principles to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.13 All local Residential Roads for traffic volumes up to 3,000 vehicles per day shall have a 14 metre wide road reserve with a 7.4 metre wide road carriageway and include a 1.5m wide concrete footpath constructed on one side of the roadway in accordance with 'Council Standard Detail SK-200' with mountable kerb and gutter in accordance with 'Council Standard Detail SK-304' to the satisfaction of the Town of Gawler prior to Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.14 All Collector Roads Type 1 for traffic volumes between 8,000 vehicles per day and 15,000 vehicles per day shall have a road reserve width of 22 metres and include 1.5 metre wide bike lanes, 3.5 metre wide traffic lanes, a 3 metre wide central median and 2.1 metre wide on-street parking to both sides of the roadway with 1.5 metre wide concrete footpath to both sides of the roadway in accordance with 'Council Standard Detail SK-200' and barrier kerb and gutter to 'Council Standard Detail SK-305' to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.15 All Collector Roads Type 2 for traffic volumes between 3,000 vehicles per day and 8,000 vehicles per day shall have a road reserve width of 20 metres and include 2.1 metre wide on-street parking to both sides of the roadway and 3.5 metre wide traffic lanes and a 1.5 metre wide concrete footpath to one side of the roadway in accordance with 'Council Standard Detail SK-200', a 3.0 metre wide shared path to one side of the roadway in accordance with 'Council Standard Detail SK-203', with barrier kerb and gutter to 'Council Standard Detail SK-305' to the satisfaction of the Town of Gawler prior to Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.16 All shared paths are to be 3m in width and constructed in accordance with Council 'Council Standard Detail SK-203' prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.17 All roads shall be designed to facilitate safe and convenient movement of vehicles by achieving a sign posted speed environment of 50 kilometres per hour unless specified otherwise by the Town of Gawler.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.18 Access roads within high pedestrian volume areas including town centre area shall be designed as shared streetscapes and create pedestrian friendly environments designed generally in accordance with the most recent 'Streets for People: Compendium for South Australian Practice' and to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.19 All footpaths in the Town Centre area shall be designed to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.20 All roads shall be designed and constructed in accordance with the Town of Gawler Standards and Requirements for Land Development / Land Division Guideline to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.21 All roadways shall be designed and constructed in a manner, which allows safe and convenient property access to proposed allotment driveways in accordance with Australian Standard AS2890 and Austroads Guidelines.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.22 Detailed civil engineering design plans and specifications prepared by a suitably qualified professional engineer shall be provided to the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.23 Residential allotments on roads with projected traffic volumes exceeding 6000 vehicles per day should have sufficient size and dimensions so that vehicles enter and exit the allotment in a forward direction or are accessed from roads located at the rear of the property for safe and convenient movement of vehicles.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.24 All traffic control devices and roadway intersections shall be designed to relevant current Australian Standards, Austroads Guidelines, the Manual of Legal Responsibilities and Technical Requirements for Traffic Control Devices and to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.25 Street name signs shall be erected at the applicant's expense to the satisfaction of the Town of Gawler in accordance with Councils Standard drawing SK-604 prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.26 The road layout should be designed with the natural topography to minimise extensive cut and fill earthworks within proposed residential allotments to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.27 The design traffic for the formed surface of roads shall be based on Chapter 12 of the Austroads Guide to Pavement Technology, Part 2: Pavement Structural Design.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.28 Road pavement design and construction shall have a design life of 30-years, including allowance for predicted road traffic, future road construction traffic, residential construction traffic, future potential bus routes and the construction of future stages of the land division to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.29 All bridge structures shall be designed by a suitably qualified professional engineer in accordance with Australian Standard AS5100 and to the satisfaction of the Town of prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.30 Construction works associated with bridge structures shall be inspected and certified that it has been constructed in accordance with the approved plans and specifications by a suitably qualified and experienced structural engineer to the reasonable satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.31 Construction of all road, stormwater and footpath infrastructure is to be in accordance with the following construction hold points with a minimum of 48 hours' notice given to Council to attend site:

a. Stormwater Hold Points – Excavation; pit and pipe installation; and backfill material

b. Road Hold Points – Subgrade inspection, Subbase inspection, Basecourse inspection; and asphalt installation

c. Footpath Hold Points – Formwork prior to concrete pour

REASON: To ensure that infrastructure is provided in accordance with Council requirements

1.32 Prior to the commencement of construction, an appropriate Construction Management Plan shall be submitted to and approved by Council which mitigates or minimises potential impacts during the construction phase including but not limited to noise, dust and safety.

REASON: To ensure the amenity of the locality is not impacted upon during construction.

2 Carparking

2.2 Sufficient off-street, on-street and disabled parking to be provided and designed to the Australian Standard AS2890 and Austroads Guidelines and to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

2.3 Car parking areas are to be designed with landscaping and have public lighting, traffic controls and signage in accordance with Australian Standard AS2890 and Austroads Guidelines to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

2.4 Roads surrounding schools, active open space areas, commercial areas or public transport hubs should have on street parking to sufficiently cater for the anticipated parking demand to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

3 Stormwater Management

3.2 A Stormwater Management Plan prepared by a suitably qualified hydrological engineer shall be provided to the satisfaction of the Town of Gawler prior to the issue of Section 51 clearance that addresses the following:

- The overall peak discharge rate from the land post-development shall be limited to the pre-development flow rate for all storm events up to and including the 1 in 100-year ARI storm event with detention storage provided outside of watercourse environments.

- The design provides for a fully developed upstream catchment. This includes the proposed development and areas outside the proposed development that contains a drainage catchment affecting the development.

- Detail the arrangements for the management of stormwater once the site is fully developed.

- The design shall be accordance with the procedures in the current edition of 'Australia Rainfall and Runoff (IEA)' publication.

- An underground stormwater drainage system shall be designed in accordance with the Town of Gawler Standards and Requirements for Land Development / Land Division Guideline.

- All allotments shall be protected from a 100-year ARI flood and all dwellings shall be capable of having a final floor level a minimum of 300mm above the 1:100-year ARI flood level.

- The road carriageways shall be designed to accommodate the 100-year ARI flood, inclusive of an allowance of 25% blockage of the underground drainage network and/or collection system.

- Rear of allotment drainage pipework infrastructure shall be provided for all allotments that do not freely drain to public roads, with a minimum pipe size of 225mm in accordance to accommodate no less than the likely storm flows generated by a 1 in 20 year ARI storm event with the Town of Gawler Standards and Requirements for Land Development / Land Division Guideline with allotment connections in accordance with Council Standard Detail SK-102.

- Silt, debris and pollution shall be prevented from entering the watercourses. Water quality devices shall be installed to achieve water quality requirements outlined in the Town of Gawler Standards and Requirements for Land Development / Land Division Guideline and be located outside of the watercourse environment.

- Incorporate Water Sensitive Urban Design (WSUD) features and:

a. indicate the measures incorporated to ensure that stormwater leaving the site would achieve the following performance objectives:

i. Stormwater discharged from the site in any storm event up to a 100 year ARI must be limited to the 5-year predevelopment flow unless otherwise approved by Council.

ii. Quality targets of:

1. Suspended Solids (SS) - 80% reduction of the typical urban average annual load with no treatment;

2. Total Phosphorus (TP) - 45% reduction of the typical urban average annual load with no treatment; and

3. Total Nitrogen (TN) - 45% reduction of the typical. Urban average annual load with no treatment

b. Detailed design or the design criteria (including expected quality improvements) WSUD components.

REASON: To ensure impact on the environment is minimised as a result of development

3.3 All existing watercourses and new watercourses shall be designed to prevent scour and erosion as a result of increased flow rates for all storm events up to and including the 100-year ARI storm event, increased flow volumes and increased frequency of flow to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure impact on the environment is minimised as a result of development

3.4 Stormwater detention and water sensitive urban design systems shall be integrated within public open space areas and be designed to consider function, amenity, safety, future maintenance and be rationalised where possible to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure impact on the environment is minimised as a result of development

3.5 A Soil Erosion and Drainage Management Plan (SEDMP) hall be provided to and approved by Council prior to construction commencing. The SEDMP must be implemented in accordance with the 'Stormwater Pollution Prevention Code of Practice' to prevent soil sediment and pollutants leaving the site or entering watercourses during development of the site.

REASON: To ensure impact on the environment is minimised during construction

3.6 All stormwater pipe and pit infrastructure is to be reinforced concrete type in accordance with the Town of Gawler Standards and Requirements for Land Development / Land Division Guideline.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

3.7 Closed circuit television video footage providing internal inspection of all stormwater pipe networks in DVD format must be provided to Council prior to date of Practical Completion.

REASON: To ensure Council has adequate documentation assets vested to Council

4 Environmental, ecological areas and vegetation habitats

4.2 Provide a Biodiversity Management Plan prepared by a suitably qualified and experienced professional for the preservation, restoration and enhancement of existing natural assets on the land to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance that addresses the following:

- An assessment of remnant vegetation and habitat within the riparian land.

- Proof of compliance and approvals required in accordance with the Native Vegetation Act 1991 and Environment Protection and Biodiversity Conservation Act 1999 for all vegetation clearance works proposed.

- Existing and potential soil erosion considerations have been evaluated and management and / or rehabilitation measures have been included.

- Maintain existing fauna movements throughout the development site.

- Restoration of existing watercourse environments throughout the development site.

REASON: To ensure impact on the environment is minimised as a result of development

4.3 Environmentally significant areas of native vegetation shall be retained, including retaining the natural vegetation of the South Para River and existing watercourse environments to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure impact on the environment is minimised as a result of development

4.4 Provide an Arborist Report for the development site identifying all regulated and significant trees and any proposed regulated and significant trees proposed to be removed to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

4.5 Provide detailed land landscape design drawings and specifications for all proposed landscape works in proposed road reserves and open space areas prepared by a suitably qualified landscape architect to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

5 Existing easements & exclusion zones

5.2 Any active or passive open space provisions proposed within easements or utility exclusion zones require approval from the relevant easement authority and a copy of written approval and easement authority requirements shall be provided to the Town of prior to the issue of Section 51 Clearance.

REASON: To ensure compliance with easement authority requirements

5.3 All allotments should be set back an appropriate distance that complies with the relevant easement authority requirements to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure compliance with easement authority requirements

5.4 All stormwater drains and associated stormwater drainage works serving more than one allotment and not wholly located within roads or reserves vesting in Council pursuant to Section 223 LG (2) of the Real Property Act 1886 shall be contained within an easement for drainage purposes and provide on the relevant final plan. Such easements shall be a minimum width of 3.0 metres and delineated to the reasonable satisfaction of the Council.

REASON: To ensure that the adequate provision of infrastructure is provided

5.5 A SeaGas Safety Management Study is requested to be provided to the satisfaction of the Town of Gawler for works proposed within the SeaGas easement prior to the issue of Section 51 Clearance.

REASON: To ensure compliance with AS2885

5.6 Prior to Section 51 Clearance, it must be confirmed by survey that there is a minimum of 6 metres of separation between the centreline of the Port Campbell to Adelaide High Pressure

Gas Pipeline and any boundary of any proposed residential allotment included within the Final Plan of Division, unless otherwise approved by Council.

REASON: To ensure compliance with AS2885

Prior to Section 51 Clearance, plans depicting the design of the road and reserves must be approved by the Council. These plans must, to the satisfaction of Council:

a. Satisfy requirements of the Safety Management Study report issued by SEA Gas;

i. ensure that the road crossing design satisfactorily address stresses associated with soil loading and road traffic;

b. Include either one of the following protection measures for that portion of the Adelaide High Pressure Gas Pipeline which is located down Balmoral Road and through the approved development:

i. A bituminised bike/pedestrian path with buried marker strip installed below it and aluminium marker plates within the path to clearly note the presence of the pipeline;

ii. Reinforced concrete slabbing to a design approved by the Town of Gawler.

c. Show the location and design of light poles and signage, which shall not be located within 6 metres of the Port Campbell to Adelaide High Pressure Gas Pipeline;

d. Include an inspection and test plan for construction of the protection slab in accordance with SEA Gas requirements;

e. Include a detailed landscaping plan.

REASON: To ensure compliance with AS2885

5.7 Light poles and signage or other infrastructure shall not be located within 6 metres of the Port Campbell to Adelaide High Pressure Gas Pipeline unless otherwise approved by the Town of Gawler.

REASON: To ensure compliance with AS2885

5.8 The bituminised bike/pedestrian path or alternate concrete slab protection must be installed prior to any excavation works on the Port Campbell to Adelaide High Pressure Gas Pipeline easement, unless access to the pipeline easement has been prevented by temporary fencing to the satisfaction of the Town of Gawler.

REASON: To ensure compliance with AS2885

5.9 All works proposed for the construction of proposed public roads and the proposed reserves must be completed or otherwise appropriately bonded, to the satisfaction of the Town of Gawler, prior to Section 51 Clearance.

REASON: To ensure compliance with AS2885

5.10 No excavation, civil or construction work associated with the construction of the hereby approved land division shall occur within 20 metres of the Port Campbell to Adelaide High Pressure Gas Pipeline without a Construction Methodology Statement (CMS) first being provided, to the satisfaction of the Town of Gawler.

REASON: To ensure compliance with AS2885

5.11 Prior to the commencement of construction works within 20 metres (either side of the Port Campbell to Adelaide High Pressure Gas Pipeline easement), and to the satisfaction of the Town of Gawler, a construction review of the Safety Management Study report issued by SEA

Gas will be undertaken by relevant stakeholders and including the construction contractor. The purpose of this review is to ensure that the construction contractor fully understands the requirements of the Safety Management Study and to determine if there have been any material changes in the proposed works since the original Safety Management Study.

REASON: To ensure compliance with AS2885

Prior to any construction works associated with the hereby approved land division occurring within 20 metres of the Port Campbell to Adelaide High Pressure Gas Pipeline, the developer shall ensure that all contractors working within 20 metres of the Port Campbell to Adelaide High Pressure Gas Pipeline undertake pipeline awareness training to the satisfaction of the Town of Gawler.

REASON: To ensure compliance with AS2885

A construction traffic management plan for the construction site shall be provided to Council for approval prior to any construction for traffic, plant or equipment operating within 20 metres of the Adelaide High Pressure Gas Pipeline.

REASON: To ensure compliance with AS2885

No vibrating rollers are to be used within 15 metres of the existing high pressure gas pipeline. A vibration management plan shall be provided to and approved by Council that limits peak particle velocity at the pipeline to less than 50 mm/s for vibration caused by other equipment prior to Section 51 Clearance.

REASON: To ensure compliance with AS2885

Reserve strips of 100mm in width are to be shown on the final Plan of Division at the boundary of allotments to prevent vehicle access across the existing easement in favour of SEA Gas to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

Pipeline Marker Signs shall be installed at intervals required by AS 2885 warning of the location of the Port Campbell to Adelaide High Pressure Gas Pipeline prior to construction within 20 metres of the Port Campbell to Adelaide High Pressure Gas Pipeline.

REASON: To ensure compliance with AS2885

Bollards or locked gates to the satisfaction of Council shall be installed prior to Section 51 Clearance to limit entry of large equipment into linear park areas at vehicle points, once bulk earthworks are completed. However, sufficient access must be provided for SEA Gas and Council equipment to access and excavate the Port Campbell to Adelaide High Pressure Gas Pipeline, if required.

REASON: To ensure compliance with AS2885

Prior to Section 51 Clearance or an agreed time with Council, the developer shall provide Council all 'As built' drawings for all construction works over the Port Campbell to Adelaide High Pressure Gas Pipeline easement.

REASON: To ensure compliance with AS2885

6 Fire Protection

6.2 All fire tracks shall be designed to allow safe and convenient access for fire vehicles to adequately access dwellings for the purpose of fire protection and allow safe evacuation of the community in the event of a fire in accordance with the Ministers Code for Undertaking

Development in Bushfire Protection Areas and to the satisfaction of the Town of prior to the issue of Section 51 Clearance.

REASON: To ensure the roadways within the development are appropriately

7 Public Lighting

7.2 Public street lighting and public area lighting shall comply in all respects with the Australian Standard AS1158 and the style and type of lighting shall be selected and constructed to the reasonable satisfaction of Council and SA Power Networks.

REASON: To ensure the roadways within the development are appropriately lit.

7.3 Light Emitting Diode (LED) Lighting shall be provided to all public roads, laneways, cyclist paths and open spaces as well as around public facilities such as toilets, bus stops, seating, bins, and carparks to the to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure the roadways within the development are appropriately lit.

8 Remediation of existing waterways

8.2 A reserve width of at least 30 metres, when measured from the top of the bank, shall be provided along the South Para River to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure adequate width is provided in accordance with the Town of Gawler Development Plan.

9 Open Space & Landscaping

9.2 Detailed street landscaping and Public Open Space plans shall be provided including but not limited to details of trees, groundcovers and furniture to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

9.3 All open space areas shall be designed in accordance with the Town of Gawler Open Space Guidelines to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that public open space is provided in accordance with Council requirements

9.4 A Landscape Masterplan is to be prepared for the entire development to provide an integrated, sustainable and quality environment for the future community to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance that addresses the following:

- District level parks should be at least 3 hectares in size and provide for all dwellings within a 2km radius.
- Neighbourhood parks should be at least 0.5ha and generally closer to 1 ha in size and be provided for all dwellings within a radius of 500m.
- Local parks should be a minimum of 0.2ha in size and centrally located within a residential area, generally within a 300m radius of dwellings.
- No more than 20% of land allocated as public space should have a slope in excess of 1:4 and/or comprise creeks or other drainage areas.

REASON: To ensure that public open space is provided in accordance with Council requirements

9.5 A Maintenance and Management Plan shall be prepared for any areas of open space that are proposed to be vested in the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

9.6 Maintenance access tracks shall be provided along the top of embankments to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance in accordance with the following:

- Access tracks shall be 3 metres in width and if forming part of a cycling connection shall be of asphalt type in accordance with Town of Gawler Standard Detail SK-203.
- Access tracks shall be 3 metres in width and if not forming part of a cycling connection shall be of cement stabilised crushed rock type in accordance with Town of Gawler Standard Detail SK-203.
- Include appropriate drainage systems, retaining structures and scour control measures to the satisfaction of the Town of Gawler.
- Provide safe and convenient access to stormwater basins, stormwater water quality devices and any other public infrastructure in accordance with Australian Standard AS2890, Austroads Guidelines and ARRB Group 'Unsealed Roads Manual: Guidelines for Good Practice.'

REASON: To ensure that infrastructure is provided in accordance with Council requirements

9.7 Landscaping within a public utility easement must be designed considering the relevant authority requirements (including SA Power Networks, ElectraNet, SA Water and SEA Gas) and be functional, sustainable and appropriate for local climate conditions to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that public open space is provided in accordance with Council requirements

9.8 Street trees shall be planted in accordance with Council Policy 7.12 (Street Tree Planting for New Land Divisions). The species and location of trees shall be to the satisfaction of Council and shall consider the common service trench location, street light location and setback from the kerb.

REASON: To ensure that public open space is provided in accordance with Council requirements

9.9 Irrigated areas shall be designed in accordance with the Town of Gawler Open Space Guideline and considering the sustainable use of water to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that public open space is provided in accordance with Council requirements

9.10 Design should be developed considering Crime Protection Through Environmental Design (CPTED) principles and a safety in design assessment provided to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that public open space is provided in accordance with Council requirements

9.11 All land proposed to be vested in the Town of Gawler shall be suitable for the intended use and remediated to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that public open space is provided in accordance with Council requirements

10 NBN

10.2 Installation of NBN telecommunications fibre optic cable is required to all proposed roads in accordance with the NBN requirements.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

11 General

11.2 Provide a Staging Plan prepared by a suitably qualified surveyor to the satisfaction of the Town of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

11.3 The existing quarry area is to be stabilised to provide safe and stable embankments. The design and construction must be certified by a suitably qualified an experienced geotechnical engineer to the satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure the subject land is suitable for its intended use.

11.4 All civil construction shall be inspected and certified that it has been constructed in accordance with the approved plans and specifications by a suitably qualified and experienced civil engineer to the reasonable satisfaction of the Town of Gawler prior to the issue of Section 51 Clearance.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

11.5 An allotment plan shall be provided to and approved by Council showing the extent and the depth of filling on the allotments approved as part of this division. A compaction and clean fill certificate issued by a suitably qualified engineer shall be provided to the reasonable satisfaction of Council, indicating that the compacted fill is suitable to support standard footings for residential development prior to the issue of Section 51 Clearance.

REASON: To ensure the subject land is suitable for its intended use.

11.6 “As constructed” drawings shall be provided to the Town of Gawler prior to the date of Practical Completion in respect of all infrastructure constructed as part of the development. The drawings shall be provided in hard copy format and electronic “DWG” or “DXF” and “PDF” format.

REASON: To ensure Council has adequate documentation assets vested to Council

11.7 Temporary turnaround areas and appropriate road and allotment drainage shall be provided to the reasonable satisfaction of the Town of Gawler to facilitate proposed staging or works.

REASON: To ensure that infrastructure is provided in accordance with Council requirements

11.8 All physical infrastructure services, including electricity and telecommunication services are to be provided underground.

REASON: To improve the character and amenity of the locality.

11.9 All costs for the design and construction of all infrastructure shall be borne by the owner/applicant. Following a certificate of practical completion from Council the owner/applicant shall be responsible for all maintenance for a period to be agreed with the Town of Gawler (defects liability period).

REASON: To ensure adequate infrastructure development by the developer

11.10 During construction, precautions shall be taken to prevent the pollution of stormwater by mud, silt, dust or other debris from the site in accordance with EPA Code of Practice for the Building and Construction Industry.

REASON: To ensure the amenity of the locality is not impacted upon during construction.

11.11 During construction, precautions shall be taken to prevent the pollution of stormwater by mud, silt, dust or other debris from the site in accordance with EPA Code of Practice for the Building and Construction Industry.

REASON: To ensure the amenity of the locality is not impacted upon during construction.

10-Sep-2019

Chair
State Planning Commission
GPO Box 1815
ADELAIDE SA 5001

scapadmin@sa.gov.au

Dear Sir/Madam

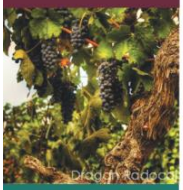
DEVELOPMENT NO:	960/D025/19 [Council Ref: 960/346/2019]
APPLICANT:	Alexander Symonds
NATURE OF THE DEVELOPMENT:	Torrens Title Land Division - creation of 1174 additional allotments (139 of which are in The Barossa Council) SCAP Unique ID 65314)
SUBJECT LAND:	Allot 1 Government Road, KALBEEBA

Thank you for the invitation to comment on the above application for which the State Planning Commission is the relevant authority. The following report pursuant to Regulation 38(2) of the *Development Regulations 2008* is presented to assist the Commission in reaching its decision.

Council staff have reviewed the various documents accompanying the application and commend the applicant on the thorough research and investigation undertaken in order to address the challenges presented by the overall site's topography, previous land use, and presence of major infrastructure facilities.

The applicant and its consultants have clearly acknowledged the challenges which significantly limit development potential with its response being the creation of discrete 'neighbourhoods' separated by infrastructure and open space corridors. While these neighbourhood units located within less topographically challenged areas, Council staff have identified a number of issues with the adopted land division and infrastructure approach.

Staff have attempted to limit comments to that portion of the land division within our Council however as this area is not independent in that it accessed via the Town of Gawler, and with the land division design invariably influenced by the approach adopted within the portion of the site in that council area, a number of comments have been provided about aspects of the development within Gawler's area.

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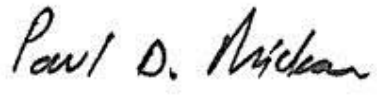
Please contact the undersigned if you require further assistance.

Yours sincerely



Paul Mickan
PRINCIPAL PLANNER

DEVELOPMENT NO: 960/D025/19 – COMMENTS FROM THE BAROSSA COUNCIL

DEVELOPMENT PLAN POLICY	COMMENT
Design and layout	
Residential (Gawler East) Zone **Form and Character** PDC 4 Development should occur in accordance with the *Concept Plan Map Baro/15 - Gawler East*. **Residential (Gawler East) Zone** **Land Division** PDC 24 Land division should accommodate open space and movement networks that provide for strong connections and safe and convenient access to public facilities, public transport and potential future development of adjoining sites.	The land division is generally in accordance with *Concept Plan Map Baro/15 - Gawler East* with the exception of access. Whereas the concept plan indicates two access points into the area only one is proposed. Inclusion of an additional access point would assist in/out movement to the neighbourhood. Provision of another access point may also assist to meet bushfire protection outcomes and provide an alternative to the proposed 'emergency fire access' concept which is not supported (see comments below).
Open space	
Residential (Gawler East) Zone **Built Form/Setbacks** PDC 8 Where allotments have direct frontage to an open space reserve, housing should address the reserve. **General Section: Crime Prevention** Objective 1 A safe, secure, crime resistant environment where land uses are integrated and designed to facilitate community surveillance. PDC 1 Development should be designed to maximise surveillance of public spaces through the incorporation of clear lines of sight, appropriate lighting and the use of visible permeable barriers wherever practicable. **General Section: Open Space and Recreation** Objective 2 Pleasant, functional and accessible open spaces providing a range of physical environments. PDC 3 Open space should be designed to incorporate:	<u>Allotments with direct frontage to reserves</u> The division provides for a number of allotments to back on to open space reserves (e.g. lots 373-377 and 489-496). Although Zone PDC 8 provides for housing to address the reserve there is no policy relating to the style of boundary fencing. The style of fencing can impact on the amenity and character of the reserves and it is suggested that only rural style fencing (e.g. post and wire) is installed in preference to standard suburban style fencing (e.g. 2.1 m steel cladding). The amenity and character can also be impacted if excessively high retaining walls are installed on the reserve boundaries. It is suggested that a Land Management Agreement or similar mechanise be used to restrict the style of fencing and height of retaining walls on boundaries with reserves to ensure only rural style fencing and low retaining walls are installed. <u>Retaining walls</u> Our interpretation of plans suggests retaining walls up to 5 m might be required on the low side of roads adjacent to areas of proposed open space. This will severely restrict public access from adjoining roads into the open spaces.

DEVELOPMENT PLAN POLICY	COMMENT
(d) easily identified access points (e) frontage to abutting public roads to optimise pedestrian access and visibility	Likewise, visibility from road and footpaths into those parts of open space reserves at the base of high retaining walls would be limited. Long term asset sustainability and robust engineering effectiveness are concerns regarding the above. <u>Open space standards</u> Significant areas of open space will be vested with Council in the future together with associated management obligations which in turn will require appropriate resourcing. While the *Landscape and Urban Design Masterplan* sets out high level proposals it is not possible to set specific service levels at this point in time. Obviously the associated level of resources required to maintain reserves will correlate with the service level set for each open space reserve. Council should have direct input into setting these standards and accordingly it is recommended that a condition be included requiring some form of endorsement/agreement with council prior to formal approval to commence construction and development of the respective reserves.
Land division	
General Section: Land Division Objective 2 Land division that creates allotments appropriate for the intended use. Objective 3 Land division that is integrated with site features, including landscape and environmental features, adjacent land uses, the existing transport network and the availability of infrastructure. PDC 2 Land should not be divided if any of the following apply: (c) the intended use of the land is likely to require excessive cut and/or fill **General Section: Land Division** **Design and Layout** PDC 8 Allotments should have an orientation, size and configuration to	Significant land forming will be required to ensure allotments are suitable for their intended use. This land forming will entail the use of retaining walls and filling. The application documentation suggests this land forming will be done through the land division construction stage. This approach is supported in that if retaining walls and filling are installed by future owners there is a high potential for inconsistency in design, height and engineering (potentially a complete lack of adequate retention at all), leading to potential significant future costs to Council due to compliance action and/or civil action due to perceived inconsistencies.

DEVELOPMENT PLAN POLICY	COMMENT
encourage development that: (a) minimises the need for earthworks and retaining walls	
Hazards	
General Section: Hazards Objective 5 Development located to minimise the threat and impact of bushfires on life and property. **Bushfire** PDC 8 Development in a Bushfire Protection Area should be in accordance with those provisions of the *Minister's Code: Undertaking development in Bushfire Protection Areas* that are designated as mandatory for Development Plan Consent purposes. PDC 15 Vehicle access and driveways to properties and public roads created by land division should be designed and constructed to: (a) facilitate safe and effective operational use for fire-fighting and other emergency vehicles and residents (b) provide for two-way vehicular access between areas of fire risk and the nearest public road.	The proposed emergency fire access to link the south and south-east neighbourhoods of the site to Balmoral Road is not supported. This would make use of 'Balmoral Track' but also require access over adjoining in separate ownership (Para Woodlands Nature Reserve managed by Nature Foundation SA and Department for Environment and Water). Presumably this is in response to the mandatory provisions of the *Minister's Code: Undertaking development in Bushfire Protection Areas* to *"provide for a mainly continuous street pattern serving new allotments that eliminates the use of cul-de-sac or dead end roads. Where this is not practicable such roads should not exceed 200m in length …"*. In effect the entire portion of the Springwood area within The Barossa Council is a cul-de-sac in that all the allotments are accessible from what is effectively a single access point comprising two roads separated by approx. 300 m. The concept of an emergency fire access across land owned by others raises a number of questions which suggests the proposed approach is not desirable: • what form will the access be? • will it provide all-weather access? • will it be obvious what it is ? • who will manage it - e.g. who maintains it to ensure an acceptable width access is maintained at all times? • who will control/operate it - i.e. who opens it in the case of need? • does the adjacent owner(s) consent to this? • are any formal agreements required with adjacent owner(s) to ensure long term arrangements? • what impact will the access track have on the integrity of the adjoining nature reserve?

DEVELOPMENT PLAN POLICY	COMMENT
	It is considered that alternative emergency fire access/egress approach is required, perhaps by creating additional road links from the southern neighbourhoods to collector and main roads to the north.
Sloping land, landscaping, fences and walls	
General Section: Landscaping, Fences and Walls Objective 2 Functional fences and walls that enhance the attractiveness of development. PDC 4 Fences and walls, including retaining walls, should: (f) be sited and limited in height, to ensure adequate sight lines for motorists and pedestrians especially on corner sites **General Section: Siting and Visibility** PDC 1 Development should be sited and designed to minimise its visual impact on: (c) views from public reserves … and walking trails. **General Section: Transportation and Access** **Movement Systems** PDC 4 Roads should be sited and designed to blend with the landscape and be in sympathy with the terrain. **General Section: Natural Resources** Objective 10 Minimal disturbance and modification of the natural landform. **General Section: Natural Resources** **Soil Conservation** 39 Development should take place in a manner that will minimise alteration to the existing landform.	As indicated above, our interpretation of plans suggests retaining walls up to 5 m might be required on the low side of roads adjacent to areas of proposed open space. This will result in unpleasant outlooks from within the open space. The WGA report Section 3.3 (p.7) indicates that driveways would generally be proposed on the downstream side of each allotment; how would this be ensured once an allotment is sold and a rollover kerb in place? With there be an encumbrance or requirement for the developer to pre-approve designs or access points be achieved through strategic placement of street trees and road infrastructure? In respect to lots on the high side of a road, will these be graded towards the road, and is it likely high retaining walls will be constructed at the street frontage if people choose a traditional (non-split level) house design?
Stormwater management	
General Section: Natural Resources Objective 1 Retention, protection and restoration of the natural resources and	The WGA Report under Section 4 – Catchment Hydrology – 4.3 Stormwater Network Design – indicates a proposed strategy for minor underground pipe

DEVELOPMENT PLAN POLICY	COMMENT
environment. Objective 5 Development consistent with the principles of water sensitive design. Objective 6 Development sited and designed to: (d) reduce runoff and peak flows and prevent the risk of downstream flooding Objective 7 Storage and use of stormwater which avoids adverse impact on public health and safety. Objective 12 Protection of areas prone to erosion or other land degradation processes from inappropriate development. **General Section: Natural Resources** **Water Sensitive Design** PDC 7 Development should be sited and designed to: (a) capture and re-use stormwater, where practical (b) minimise surface water runoff (c) prevent soil erosion and water pollution (d) protect and enhance natural water flows PDC 8 Water discharged from a development site should: (b) not exceed the rate of discharge from the site as it existed in pre-development conditions. PDC 9 Development should include stormwater management systems to protect it from damage during a minimum of a 1-in-100 year average return interval flood. PDC 10 Development should have adequate provision to control any	system design of 18% AEP as per the Town of Gawler requirements. The Barossa Council requirement however is 10% AEP. It is noted that there are no formal watercourses for stormwater drainage outfall in The Barossa Council area of land division. The stormwater drainage flow paths connect indirectly to the South Para River. The proposal to provide major storm peak flow detention, 1.0% AEP post to 1.0% AEP pre, is considered reasonable due to the undeveloped nature of the downstream environment with few physical impediments for major flows in this outfall; however a significant issue with the both outfalls is that while the proposed detention manages increases in major storm flows, it does not manage the impact of increased frequency of flows. A characteristic of the natural catchments is the high rainfall interception (30 – 50mm initial loss) before runoff occurs, The consequence is that small rainfall events (say less than about 1 year ARI) do not produce significant, if any, runoff. In the post development state the impervious areas produce runoff from most rainfall events. This increase in flow frequency cases constant wetting in rain seasons and risks causing instability in the channel with high risk of scouring and degradation of the drainage flow path environment downstream. The northern Springwood outfall through Kalbeeba demonstrates the negative effects of continuously wetted drainage flowpaths and increased (albeit capped) regular flow volumes over longer periods of time. The WGA Report under Section 5 - Stormwater Treatment Systems – 5.4 Frequent Flow Management – Addresses Spring Creek with a raft of ‘soft’ engineering such as WSUD and environmental techniques to encourage infiltration and trickle flows over a wider area. It may be unrealistic to assume that soft engineering will be the sole solution in terms of long term asset sustainability and robust engineering effectiveness, especially in the secondary drainage flow paths in the Barossa Council area with very steep grades. ‘Hard’ engineering (such as piped sytems) are expected to still be required to fully address the frequent low flow arrangements

DEVELOPMENT PLAN POLICY	COMMENT
stormwater over-flow runoff from the site and should be sited and designed to improve the quality of stormwater and minimise pollutant transfer to receiving waters. PDC 11 Development should include stormwater management systems to mitigate peak flows and manage the rate and duration of stormwater discharges from the site to ensure the carrying capacities of downstream systems are not overloaded. PDC 13 Stormwater management systems should preserve natural drainage systems, including the associated environmental flows. PDC 14 Stormwater management systems should: (b) utilise, but not be limited to, one or more of the following harvesting methods: (ii) the discharge to open space, landscaping or garden areas, including strips adjacent to car parks (iii) the incorporation of detention and retention facilities (iv) aquifer recharge. PDC 15 Where it is not practicable to detain or dispose of stormwater on site, only clean stormwater runoff should enter the public stormwater drainage system. PDC 16 Artificial wetland systems, including detention and retention basins, should be sited and designed to: (a) ensure public health and safety is protected (b) minimise potential public health risks arising from the breeding of mosquitoes.	Practical access for maintenance of a 'soft' engineered solution is also a concern. The proposed dense residential development in a steep terrain precinct requires extra detail to mitigate the induced extra risks beyond normal, also including revetment / retaining walls.
Transportation and Access	

DEVELOPMENT PLAN POLICY	COMMENT
Residential (Gawler East) Zone **Form and Character** PDC 5 Road reserves should be of a width, design and alignment that can: (a) provide for safe and convenient movement and parking of vehicles and other users according to projected vehicle volumes, speeds and the character of the road **General Section: Land Division** **Design and Layout** PDC 4 The design of a land division should incorporate: (a) roads, thoroughfares and open space that result in safe and convenient linkages with the surrounding environment, including public and community transport facilities, and which, where necessary, facilitate the satisfactory future division of land and the inter-communication with neighbouring localities PDC 17 The layout of land divisions should incorporate street patterns designed to enhance the efficient movement of traffic and minimise trip lengths. **General Section: Transportation and Access** Objective 2 Development that: (a) provides safe and efficient movement for all motorised and non-motorised transport modes	The area within The Barossa Council is 'isolated' in a sense, being located at the southern end of the development with limited access. Although a permeable road layout is proposed within the actual neighbourhood, access to the neighbourhood itself is not direct with up to seven turns required to access some allotments from Calton Road or Balmoral Road. In this regard the proposed movement system does not enhance the efficient movement of traffic nor minimise trip lengths and therefore does not demonstrate a convenient movement system. It is suggested that inclusion of an additional access, in line with the concept plan, would assist in/out movement to the neighbourhood and as previously indicated assist to meet bushfire protection outcomes.

General comments
Interface with character preservation district The "*Addendum to two volumes of the South Australian Planning Strategy: The 30-Year Plan for Greater Adelaide and Murray and Mallee Region Plan*" (the planning strategy addendum) includes the following policy: "Preserve the district as a separate entity from suburban Adelaide and promote a clear transition between village style townships and the rural landscape." It does not indicate what constitutes a 'clear transition' - e.g. does it mean a 'hard' or distinct edge - however the reference to "village style townships" suggests that where new development areas abut rural areas that traditional residential subdivision approaches should not be implemented. In particular, it is common where

residential subdivisions abut main roads to orient the allotments 'inward' with solid rear fencing facing the main road. Applying this approach to the Springwood development would create an inappropriate urban/character preservation district interface. The Barossa Council has applied an alternative approach in the Menge Road Policy Area at Tanunda which seeks a specific residential/rural interface to require orientation of lots outwards rather than rear fences along the Menge Road interface. A similar approach was applied to Gods Hill Road development area in Lyndoch.

The proposed land division in The Barossa Council portion of the development site provides a road between the character preservation district and housing; Although this is preferable to rear fencing facing the rural area, it appears the road will directly abut the rural area whereas perhaps provision for some landscaping could be provided.

This approach is proposed for the majority of the development area in the Town of Gawler where it abuts the character preservation district with the exception of the north-east corner where the rear of nine allotments will abut the Balmoral 'Track'. As per the comments in relation to allotments which abut open space, while owners might orientate their dwellings towards the rural land, should there be an LMA to restrict the style of fencing on the boundary to ensure only rural style fencing is installed?

Allotments split by municipal boundary

A number of allotments will lay partly within two council areas. Although discussions regarding a potential boundary adjustment may have taken place which would place the entire Springwood development within the Town of Gawler, that outcome might not eventuate. While not a valid planning matter, is it a logical or practical situation for future owners?

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RESIDENTIAL (GAWLER EAST) ZONE

Introduction

The Objectives and Principles of Development Control that follow apply in the Residential (Gawler East) Zone shown on Gawler Maps Ga/5, 6, 9 and 20 and Policy Areas Map Ga/15 and 18. They are additional to those expressed for the whole of the Council area.

OBJECTIVES

Objective 1: A predominately residential area comprising a range of low and medium-density dwellings, with associated infrastructure, retail, commercial, recreational, educational and community development in master-planned locations in accordance with Structure Plan Map Ga/1 (Overlay 1) Enlargement G.

Objective 2: A residential zone comprising a range of dwellings types, including a minimum of 15 percent affordable housing.

Objective 3: Increased dwelling densities in close proximity to centres, future public transport routes and public open spaces.

Objective 4: Open space systems designed to provide multiple use reserve areas that promote water management, habitat retention and enhancement, and recreational linkages.

Objective 5: Development that contributes to the desired character of the zone.

DESIRED CHARACTER

The Residential (Gawler East) Zone is located within both the Town of Gawler and The Barossa Council. The Gawler East area encompasses broad hectare land which is expected to support a population of approximately 10 000 persons.

The zone will develop in accordance with Structure Plan Map Ga/1 (Overlay 1) Enlargement G and be undertaken in an orderly manner that achieves the most efficient use of land, the extension or expansion of infrastructure services and the timely provision of community facilities. No more than 1000 allotments should be created within the area defined by Gawler East Development Constraints Concept Plan Figure CoP/5 until such time as the collector road is complete.

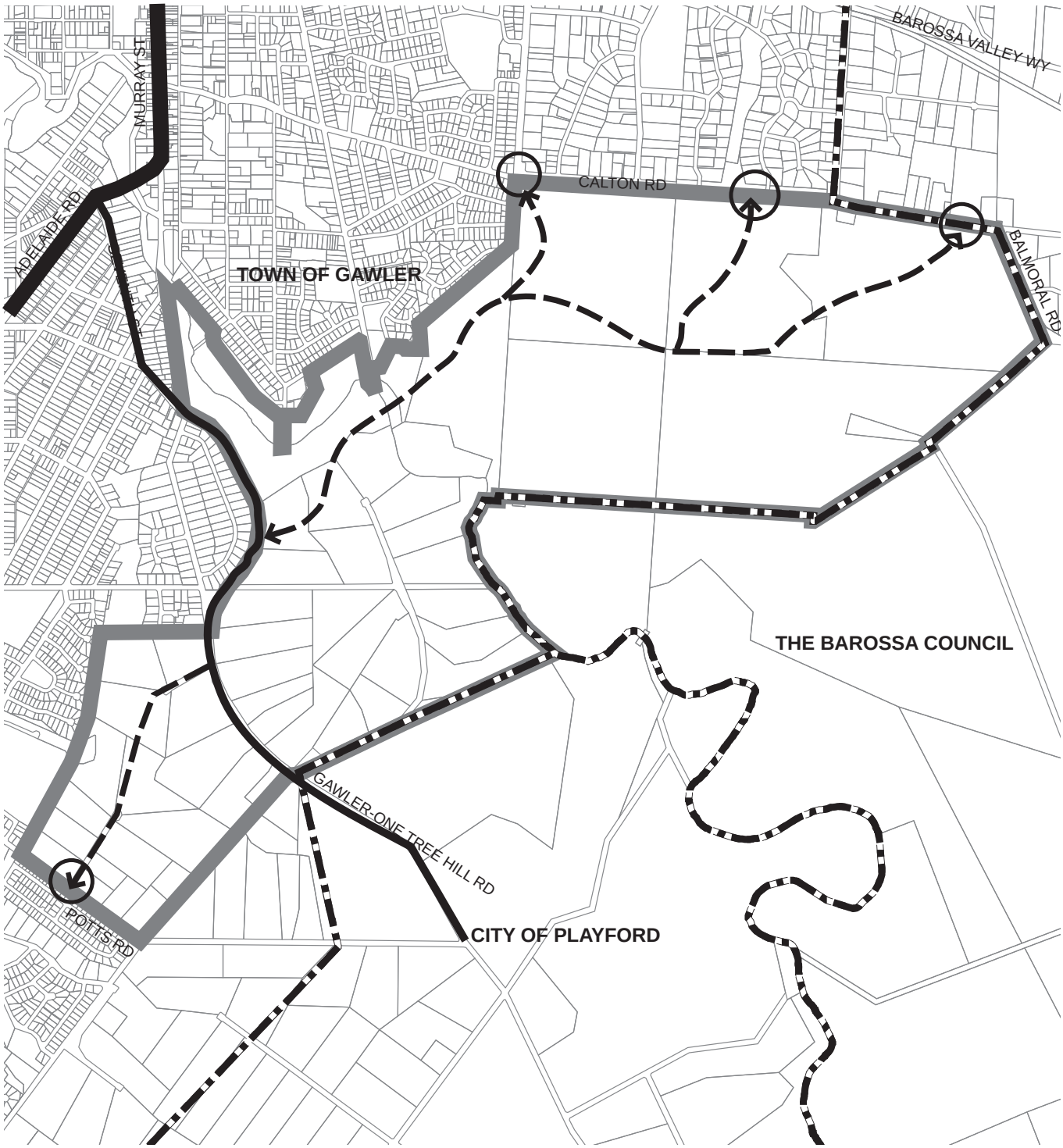
The zone will accommodate a diversity of housing forms. The Mixed Use Centre Policy Area 3 will comprise a mix of residential development and a range of commercial, retail, educational, recreational and community facilities. A smaller range of retail facilities, together with compact housing are anticipated within the Local Centre Policy Area 19.

It is essential that development respects and enhances the natural attributes of the zone through the retention of significant views, creek lines, native vegetation and locations of ecological significance. Innovative and best practice solutions in respect to water reuse, grey water supply and stormwater management will be implemented.

Dwellings will range between 1 and 3 storeys in height; however buildings at the interface with adjoining zones other than the Open Space Zone will not exceed 2 storeys.

Buildings of between 3 and 5 storeys, such as apartment buildings, will be located in the Mixed Use Centre Policy Area 3, the former quarry area, adjacent to open space, and where necessary to frame the end of important or significant vistas. It is important that development achieve a clear transition in building height for a cohesive streetscape.

Housing forms will be simple and incorporate a high degree of articulation to the street façade while delivering a mix of housing types and forms to provide interesting streetscapes and promote social interaction. This will include the provision of recessed vehicle garaging and the inclusion of front verandas/porticos and appropriate landscaping.



Concept Plan Boundary

Arterial Road

Collector Road

Proposed Collector Road

Traffic Management

Proposed Vehicle access

Development Plan Boundary

N

1:20,000

0 250 500 750 1000 1250 metres

GAWLER (CT)
GAWLER EAST
DEVELOPMENT CONSTRAINTS
CONCEPT PLAN FIGURE CoP/5

Consolidated - 20 February 2018

The delivery of housing diversity will require innovative solutions for front or rear access and parking. Rear access will be provided in the form of 'service lanes', which support vehicular access requirements at reduced speeds providing a safe pedestrian environment.

Allotment configuration is envisaged to be compact particularly within the Mixed Use Centre Policy Area 3, with building setbacks minimised to assist in facilitating an enclosed and active street. This will incorporate opportunities for multi-storey apartments, terrace and rear lane mews housing that will achieve a range of housing types within a single street.

The slope of the land will dictate the location of particular dwelling types, with some more compact dwelling types located on relatively flat sites, whilst more traditional dwelling types will be located on those portions of the site with moderate to high slope. Greater setbacks are envisaged on topographically steep sites in order to satisfactorily deal with earthworks and driveway gradients.

The form and distribution of major open space will be influenced by the need for stormwater detention, treatment and re-use given limitations on the potable water supply for the area. It will also be influenced by the location of drainage corridors, and the need to integrate with existing corridors, including the eastern escarpment at Evanston Park. Public open space areas will need to accommodate both active and passive recreation opportunities and the retention of identified habitat areas of significance.

A network of linear parks including cohesive pedestrian and bicycle movement corridors and visual links will be established between the new development and adjoining natural creek lines, public recreation areas, local shopping and community services and surrounding road networks.

Portion of the southern boundary of the zone is located adjacent to the Para Woodland Reserve. It is essential that development form an appropriate interface with the Para Woodland Reserve. The interface will act as a buffer between the residential area and the Reserve, balancing access, management of bushfire risk, management of potential invasion by pest plants, minimising the impact of domestic pets on native wildlife and as a provision of open space. The interface will vary in width as appropriate to meet the above criteria and will comprise of a combination of roads, paths, public open space and, where appropriate, areas of natural character for stormwater management. Where housing is included in the interface area it is expected that houses will address the Reserve. The interface area will be planted with locally indigenous species (mainly groundcovers and low shrubs) selected to minimise the bushfire risk by providing an area of reduced fuel hazard.

The north-eastern, eastern and southern boundary of the zone adjoins agricultural, rural and rural living land. It is essential that development provide an appropriate buffer between dwellings and land used for agriculture. Larger allotments together with open space and road networks and increased dwelling setbacks will be established at the peripheries of the zone boundary in order to provide an appropriate low density transition and interface with adjacent rural and rural living land.

The collector road shown on Structure Plan Map Ga/1 (Overlay 1) Enlargement G is intended to have a boulevard character comprising wide footpaths and cycle paths on both sides and substantive street tree plantings. Dwellings will front and address the road with setbacks to contribute to the boulevard character.

A high pressure gas transmission pipeline traverses the zone as shown on Map Ga/1 (Overlay 1) Enlargement G. It is required that development within the zone comply with *AS2885 (Pipeline Gas and Liquid Petroleum)* to ensure minimum pipeline safety requirements have been met.

The Infrastructure Corridor has been created in response to the presence of key public infrastructure, namely 132 kV and 275 kV transmission lines. This infrastructure comprises a significant component of the State's high voltage power transmission network. The zone provisions are aimed at protecting this significant public infrastructure from encroachment by incompatible land uses and protecting the infrastructure corridor from being fragmented by land division and therefore ensuring on-going access for maintenance is available and that the security and reliability of the power network is not compromised. No residential allotments should infringe on the corridor or existing easement. This corridor provides the opportunity for co-locating compatible land use activities such as other appropriate infrastructure, at-grade car parking and roads, a linear park or a cycling/walking trail.

PRINCIPLES OF DEVELOPMENT CONTROL

Land Use

1 The following forms of development are envisaged in the zone:

Affordable housing
Community facilities
Domestic outbuilding in association with a dwelling
Domestic structure
Dwelling
Dwelling addition
Dwelling with associated home based business uses
Non-residential use that serves the local community, for example:
- child care facility
- health and welfare service
- open space
- primary and secondary school
- recreation area
- shop, office or consulting room

Supported accommodation

2 Development listed as non-complying is generally inappropriate.

Form and Character

3 Development should not be undertaken unless it is consistent with the desired character for the zone.

4 Development should occur in accordance with Structure Plan Map Ga/1 (Overlay 1) Enlargement G.

5 Road reserves should be of a width, design and alignment that can:

(a) provide for safe and convenient movement and parking of vehicles and other users according to projected vehicle volumes, speeds and the character of the road;

(b) accommodate bus routes where required;

(c) provide for shared, on-street parking bays for nearby residents and visitors wherever practical to achieve unrestricted movement along collector roads;

(d) allow vehicles to enter or reverse from an allotment or garage in a single movement, allowing for cars parked on the opposite side of the road (where applicable) or fixed infrastructure on the street;

(e) allow for the efficient movement of service and emergency vehicles; and

(f) accommodate street planting, landscaping, street furniture and utilities infrastructure.

6 The use and placement of outbuildings should be ancillary to and in association with a dwelling or dwellings.

Land Division

7 Land division should facilitate the provision of a broad range of housing options, including affordable housing.

8 Land division should accommodate open space and movement networks that provide for strong connections and safe and convenient access to public facilities, public transport and potential future development of adjoining sites.

9 Land division:

(a) should not exceed 1000 allotments until at least the following infrastructure indicated by Structure Plan Map Ga/1 (Overlay 1) Enlargement G has been constructed:

(i) a collector road between Calton Road and One Tree Hill Road; and

(ii) a collector road between One Tree Hill Road and Potts Road; and

(iii) an upgrade of Potts Road and its intersection with Main North Road to accommodate the traffic flows associated with further continued development.

(b) should not prejudice the construction of the collector road indicated by Structure Plan Map Ga/1 (Overlay 1) Enlargement G.

10 Rear lanes should:

(a) have a minimum reserve width of 6.5 metres;

(b) be limited in length to a maximum of 100 metres;

(c) have a minimum carriageway width of 5.5 metres;

(d) include protuberances to accommodate landscaping and lighting should not exceed 1.0 metre;

(e) landscaping should be in the form of tall vertical trees in preference to low level shrubs;

(f) be designed to accommodate garbage trucks and emergency service vehicles.

11 Public lighting should be provided to all public roads, laneways, paths and open spaces.

12 Development with frontage to the eastern side of the Gawler – One Tree Hill scenic road should be established on allotments of no less than 1000 square metres in area and incorporate screen planting between buildings and the road in order to provide a distinctive landscape character along this corridor.

13 Land located west of the South Para River should not be divided for the purpose of creating additional allotments unless forming part of an integrated development scheme where all infrastructure is delivered to service the land in an orderly and economic manner including potable water supply, grey water supply, waste water disposal, formed all-weather public roads and access, and stormwater disposal.

14 Detention and/or retention basins should incorporate good design techniques that:

(a) allow sediments to settle so as to treat stormwater prior to discharge into watercourses or the marine environment;

(b) ensure human health and safety, particular with respect to high velocity drainage points;

(c) ensures the control of mosquitoes and nuisance insects (eg midges); and

(d) where wetlands are used for the cleaning of stormwater it is advisable that the storage is able to retain the 25 year, 24 hour rainfall event.

15 Transmission lines should be protected from encroachment through the provision of:

(a) a 30 metre wide corridor (15 metres each side from the centreline) for the 132kV line;

(b) a 50 metre wide corridor (25 metres each side from the centreline) for the 275kV line.

16 Residential allotments should not be created within the Major Transmission Infrastructure Corridors shown on Structure Plan Map Ga/1 (Overlay 1) Enlargement G, or within the existing easements for the 132kV and 275kV transmission lines.

Land Use and Density

17 Housing with an average site area for dwellings less than 250 square metre should be located within the Mixed Use Centre Policy Area and Local Centre Policy Area or within walking distance of public open space, local shops and public facilities.

Built Form/Setbacks

18 Buildings should not exceed the following heights:

(a) two storey development for properties adjacent to the boundary of adjoining zones other than the Open Space Zone;

(b) three storeys for the balance of the zone, other than apartment/mixed use buildings within the Mixed Use Centre Policy Area where a 5 storey limit applies.

19 Where allotments have direct frontage to an open space reserve, housing should address the reserve.

20 Where an allotment immediately adjoins public open space, clear, safe and convenient pedestrian access should be provided to the dwelling.

21 Residential building setbacks should satisfy the minimum dimensions outlined in Table 1 except where a proposed plan of division is accompanied by a building envelope plan that demonstrates that lesser building setbacks will contribute to the achievement of the desired character for the zone:

Table 1

Parameter	Value
Primary Street Frontage (excluding arterial or collector roads forming the zone boundary and the One Tree Hill Scenic Road shown on Map Ga/1 (Overlay 1) Enlargements Part A and Part B	3.0 metres to front facade 1.5 metres for dwellings where vehicle access obtained from the rear or side 1.5 metres to veranda/balcony elements 0.5 metres to entry porch and portico
Secondary Street Frontage (Corner Lots)	1.5 metres to facade 0.6 metres for dwellings on allotments with a frontage equal to or less than 9.0 metres 0.5 metres for veranda/balcony elements 0 metres for entry porch/portico
Side Boundary (excluding road frontage)	0.0 metres for dwellings on allotments with a road frontage equal to or less than 9.0 metres; 0.9 metres for dwellings on allotments with a frontage greater than 9.0 metres, other than a garage wall with a maximum length of 6.0 metres
Rear Boundary (other than rear lane)	0.9 metres
Open Space Reserve Frontage	1.5 metres where dwellings front the reserve 0.5 metres to entry porch and portico, veranda and balcony elements.

Parameter	Value
Single Carport/Garage	5.0 metres from primary street frontage 0.5 metres for laneway frontage
Double Carport/Garage	5.0 metres from primary street frontage 0.5 metres for laneway frontage
Arterial or Collector Roads	6.0 metres to front façade 5.5 metres to carport/garage 4.0 metres to veranda/balcony
One Tree Hill Scenic Road shown on Map Ga/1 (Overlay 1) Enlargements Part A and Part B	15.0 metres to all buildings (excluding minor protrusions such as porches, porticos, eaves, verandas, balconies or similar)
Rear Lane (upper level dwelling)	0.5 metres for laneway frontage

Private Open Space

22 Dwellings should include private open space which conforms to the requirements of Table 2:

Table 2

Site area of dwelling	Minimum area of private open space	Provisions
Greater than 250 square metres	60 square metres (minimum dimension of 2.5m)	(a) Balconies, roof patios, decks and the like, can comprise part of this area provided the area of each is 8 square metres or greater and has a minimum dimension of 2.0m. (b) One part of the space should be directly accessible from a living room and have an area of 25 square metres with a minimum dimension of 4 metres and a maximum gradient of 1-in-10.
250 square metres and less	35 square metres (minimum dimension of 2.5m)	(a) Balconies, roof patios and the like can comprise part of this area provided the area of each is 8 square metres or greater and has a minimum dimension of 2.0m. (b) One part of the space is directly accessible from a living room and has an area of 16m² with a minimum dimension of 4 metres and a maximum gradient of 1-in-10.
	25 square metres (minimum dimension of 2.5m) where:	(a) The dwelling has no more than two bedrooms (or rooms that could reasonably be used as bedrooms) and a total floor area of not more than 110m² (b) Separate areas are provided for the provision of a rainwater tank and the storage of refuse and recycling bins.
Upper level dwellings	Minimum area of private open space	(a) 8 square metres and accessible from a living room.

Amenity and Public Spaces

23 Residential development should have regard to existing and possible future noise sources with respect to site layout, orientation, design and construction to ensure a safe and comfortable residential environment and to minimise conflict with existing non-residential activities.

24 Front fencing should balance the desire for an open streetscape and passive surveillance with the need for functional privacy. Clear delineation should be provided between public and private spaces, which may incorporate fencing, landscaping or a combination of these elements.

25 Filling of land exceeding 1.0 metre in height is appropriate where both of the following can be achieved:

(a) it is associated with the remediation and development of the former quarry site;

(b) consequential retaining is not directly visible from a public road.

26 Residential development should provide an area for the storage of waste receptacles that is screened from primary and secondary street frontages.

Bushfire Protection

27 To protect against bushfire, dwellings should not be sited within 40 metres of a slope greater than 20 degrees, where the length of the slope is greater than 10 metres and covered by unmanaged vegetation.

Separation of Use

28 Development should be designed and sited to minimise negative impact on existing and potential future land uses considered appropriate in the locality.

29 Residential development adjacent to non-residential zones and land uses should be located, designed and/or sited to protect residents from potential adverse impacts from non-residential activities.

Car Parking

30 For each dwelling, the maximum width (including the width of any support structure) of any garage or carport opening that faces a street, should be no greater than six metres or 50 percent of the frontage width, whichever is the lesser, except where a site has a frontage of less than 12 metres and the dwelling is:

(a) two or more storeys; and

(b) incorporates protrusions such as verandas, projecting windows, porches, balconies etc which provide articulation in the building as it presents to the street, in which case garages or carports should have a maximum width of 6 metres or 80 percent of the width of the site, whichever is the lesser.

31 No maximum width applies to garage or carport openings where a site has rear vehicular access and from which vehicular access is obtained.

32 Development within Mixed Use Centre Policy Area 3 and Local Centre Policy Area 19 should provide off-street visitor car parking in accordance with the following table based on calculations relating to net-leaseable floor areas:

Form of Development	**No. of required car spaces**
Apartment	1 space for every unit plus 1 additional space for every 5 2-bedroom units plus 1 additional space for every 3 bedroom unit with a visitor park of 1 space for every 5 units
Bank	5.5 spaces per 100 square metres
Office	4 spaces per 100 square metres
Post Office	5.5 spaces per 100 square metres

Form of Development	No. of required car spaces
Shop	5.5 spaces per 100 square metres
Video Store	5.5 spaces per 100 square metres

Affordable Housing

33 Development should include a minimum 15 percent of residential dwellings for affordable housing.

34 Affordable housing should be distributed throughout the zone to avoid over-concentration of similar types of housing in a particular area.

35 Dwellings constituting affordable housing should be designed within the parameters shown in Table 3.

Table 3

Parameter	Detached Dwelling	Semi-Detached Dwelling	Group Dwelling	Residential Flat Building	Row Dwelling
Minimum area of private open space for ground level dwellings	20 square metres	20 square metres	20 square metres	20 square metres	20 square metres
Minimum area of private open space in the form of a balcony for dwellings above ground level	8 square metres	8 square metres	8 square metres	8 square metres	8 square metres
Minimum open space dimension	3.0m for ground level private open space and 2.0m for balconies	3.0m for ground level private open space and 2.0m for balconies	3.0m for ground level private open space and 2.0m for balconies	3.0m for ground level private open space and 2.0m for balconies	3.0m for ground level private open space and 2.0m for balconies
Minimum number of on site car parking spaces	1	1	1	1	1

PROCEDURAL MATTERS

Complying Development

36 Complying developments are prescribed in Schedule 4 of the *Development Regulations 2008*.

Non-complying Development

37 Development (including building work, a change in the use of land, or division of an allotment) for the following is non-complying:

Crematorium

Development in the form of land division in the area defined by the Gawler East Development Constraints Concept Plan Figure CoP/5 is non-complying if:

(a) there exist 1000 allotments within the area defined by the Gawler East Development Constraints Concept Plan Figure CoP/5; and

(b) the following infrastructure has not been completed in full:

(i) a collector road between Calton Road and One Tree Hill Road;

(ii) a collector road between One Tree Hill Road and Potts Road;

(iii) an upgrade of Potts Road and its intersection with Main North Road to accommodate the traffic flows associated with further continued development.

Fuel Depot
Horticulture
Hospital except where located within Mixed Use Policy Area 3
Industry
Intensive animal keeping
Junk Yard
Major public service depot
Office greater than 150 square metres, except where located within Mixed Use Centre Policy Area 3 and/or Local Centre Policy Area 19
Prescribed mining operations
Refuse destructor
Shop or group of shops with a gross leaseable floor area exceeding 250 square metres, except where located within Mixed Use Centre Policy Area 3 and/or Local Centre Policy Area 19
Telecommunications Facility above 30 metres in height
Warehouse
Waste reception, storage, treatment or disposal, except a sewerage treatment plant.

Public Notification

38 Categories of public notification are prescribed in Schedule 9 of the *Development Regulations 2008*. Further, all development listed within Principle of Development Control 1 of the Residential (Gawler East) Zone, Mixed Use Policy Area 3 and/or Local Centre Policy Area 19 are designated category 2 (except where the development is classified as Category 1 or non-complying).

Mixed Use Centre Policy Area 3

Introduction

The Objectives and Principles of Development Control that follow apply in the Mixed Use Centre Policy Area 3 of the Residential (Gawler East) Zone shown on Policy Areas Map Ga/15. They are additional to those expressed for the whole of the Council area.

OBJECTIVES

Objective 1: A functional and diverse zone accommodating a mix of commercial, retail, recreation, community, residential, office, consulting rooms and educational uses.

Objective 2: Development that minimises any adverse impacts upon the amenity of the locality within the policy area.

Objective 3: Development that contributes to the desired character of the policy area.

DESIRED CHARACTER

Mixed Use Centre Policy Area 3 will accommodate retail, commercial, community, education and formal recreation facilities and clubrooms to service the local community. It is envisaged that a full range of residential development will form an integral component of this policy area to activate it outside of commercial and retail business hours. Housing forms will include, but not be limited to, mixed use development within a single building where dwellings will typically be established above non-residential land uses.

Low impact, commercial business activities that provide employment opportunities for the local population are envisaged. Such development will need to have particular regard to ensuring that minimal off-site impacts occur with respect to noise, air, water and waste emissions, commercial traffic generation and movement.

A retail facility, not exceeding 10 000 square metres in floor area, will comprise a supermarket and a range of specialty shops to serve the weekly shopping needs of the community. Restaurants, cafes, hotels (incorporating dining) and take away outlets are envisaged and will develop the centre as a destination point and provide uses that extend the hours of the centres operation to promote surveillance and safety of the adjacent recreation and education facilities.

It is envisaged that community facilities and additional educational establishments will be established to complement the existing role of the Gawler township. Future educational establishments will be located in accordance with the Structure Plan Map Ga/1 (Overlay 1). Schools are expected to form a focal point for the new community providing opportunities for the establishment of significant buildings and shared open space.

In terms of urban design and built form, a 'main street' environment will be created, where buildings address the street and car parks are primarily located to the rear. In order to minimise the overall extent of off street parking shared car parking is encouraged, and the convenience, availability and function of on street parking in mixed use environments will be recognised.

Gathering points for formal and informal community events will be established, either by means of a central pedestrian plaza, a village green or series of nodes.

Commercial and mixed use buildings will be established close to the street frontage and incorporate verandas and other protruding elements in order to create a pedestrian-friendly environment and outdoor dining opportunities. These areas will be enhanced by large street trees, high quality paving, lighting and street furniture. Building facades will be designed in a manner to create diversity of interest through the appearance of an aggregation of smaller buildings.

PRINCIPLES OF DEVELOPMENT CONTROL

Land Use

1 The following forms of development are envisaged in the policy area:

Advertisement
Bank
Child care centre
Community facility
Consulting room
Detached dwelling
Educational establishment
Group dwelling
Health centre
Home activity
Hospital
Hotel
Indoor recreation centre
Library
Motel
Nursing home
Office
Office and dwelling
Personal service establishment
Petrol filling station
Place of worship
Pre-school
Recreation area
Residential flat building
Restaurant
Retail showroom
Row dwelling
Semi-detached dwelling
Serviced accommodation
Shop

Shop and dwelling
Supermarket.

2 Development listed as non-complying is generally inappropriate.

Form and Character

3 Development should be designed to ensure that:

(a) buildings are designed to address the street frontage with servicing areas located internal to the centre and appropriately screened from public view;

(b) the establishment of shared car parking areas to the rear of buildings and on-street.

4 Public space established should be activated by uses around its edges.

5 Buildings should have a maximum of 5 storeys in height.

6 Development should not be undertaken unless it is consistent with the desired character for the policy area.

Local Centre Policy Area 19

Introduction

The Objectives and Principles of Development Control that follow apply in the Local Centre Policy Area 19 of the Residential (Gawler East) Zone shown on Policy Area Map Ga/17. They are additional to those expressed for the whole of the Council area.

OBJECTIVES

Objective 1: A policy area accommodating small-scale convenience shopping, office, medical and community facilities to serve the day-to-day needs of the local community.

Objective 2: A policy area characterised by a traditional corner store or small groups of shops located within easy walking distance of the population they serve.

Objective 3: A policy area accommodating residential development in conjunction with non-residential development.

Objective 4: Development that contributes to the desired character of the policy area.

DESIRED CHARACTER

The Local Centre Policy Area 19 will be developed as a mixed use centre providing daily purchase opportunities for the population at the southern end of the zone. A supermarket of 1000 – 1500 square metres is anticipated.

A diversity of housing forms will also be established in the zone, taking advantage of the relatively flat land and access to retail services.

Buildings will be designed to encourage active street frontages and minimise the visibility of car parking from the public realm.

OPEN SPACE ZONE

Introduction

The Objectives and Principles of Development Control that follow apply in the Open Space Zone shown on Gawler Map Ga/5, 6, 8, 9, 12 and 20. They are additional to those expressed for the whole of the Council area.

OBJECTIVES

Objective 1: A zone:

(a) in which the open space character is preserved to provide a visual contrast to the surrounding urban area

(b) comprising open space that accommodates a range of public and private activities in an open space and natural setting, including:

(i) passive and active recreation land uses;

(ii) habitat conservation and restoration.

Objective 2: Private land within the Metropolitan Open Space System (MOSS) contributing to regional open space networks and providing an open, natural and rural character accommodating low-scale uses such as non-intensive agriculture.

Objective 3: Public land within the MOSS that provides for recreation areas and facilities, sporting facilities and conservation of the open, natural character.

Objective 4: A linear park that:

(a) provides an open space corridor across Regional South Australia

(b) promotes the use, awareness and preservation of the Riverine environment and enhancement of natural or semi natural habitats for the movement of wildlife and conservation of biodiversity.

Objective 5: A river system which provides for the maintenance of stormwater capacity and flood mitigation measures for adjoining areas.

Objective 6: Development that contributes to the desired character of the zone.

DESIRED CHARACTER

South Para River

The Open Space Zone recognises the special qualities of the South Para River and environs, and it is intended that the zone will manage the river and its interface.

The zone already has natural character and function based on the existing South Para River, topographically steep contours, floodplains and remnant vegetation. This character and function will be maintained and enhanced through appropriate vegetation.

Areas within the zone contain significant flora and fauna, wetlands and permanent waterholes and river corridors and adjoin grassy woodland habitats.

The aesthetic and natural landscape, together with biodiversity value of the zone will be maintained and enhanced in a manner which encourages appropriate human enjoyment and interaction. Whilst the primary intent of the zone is to enhance the natural character of the area, carefully managed development which has a demonstrated benefit to the community is envisaged.

Facilities will include but are not limited to walking and cycling trails, interpretive and recreational activities, formalised open space and car parking. It is envisaged that roads will be developed in the zone to enable movement between areas as shown on Map Ga/1 (Overlay 1) Enlargement G.

A high pressure gas transmission pipeline traverses the zone as shown on Map Ga/1 (Overlay 1) Enlargement G. It is required that development within the zone comply with AS2885 (Pipeline Gas and Liquid Petroleum) to ensure minimum pipeline safety requirements have been met.

Main North Road

A country experience south of Gawler will be provided by creating expansive views over the landscape to cropped and open paddocks and the Adelaide hills face through the removal of existing boundary tree plantations and restrictions on buildings and structures close to Main North Road. Occasional groups of new feature tree plantings will frame views to the hills and farmland towards Gawler River and the Adelaide Plains. All other plantings, earthworks, buildings and structures will use minimal vertical elements so to promote both an alternative distinctive urban character and reinforce the surrounding landscape and distant views. Fencing will be low and open in style.

The zone will provide for recreation activities within a specific and structured landscape framework.

On the western side of Main North Road will be broad areas of natural grasslands, path networks and new native tree and shrub planting, allowing this passive recreational landscape to be sensitively integrated with the new urban environment adjoining while applying a design that draws on the area's original open landscape structure and agricultural land use. Native grasslands and bands of trees will be planted in an arrangement that loosely interprets the grid pattern of 'field cropping'. A seasonal creek will provide a watercourse linear trail that links the open space with the existing path network running west into Evanston Gardens and east towards Trinity College.

The eastern side of Main North Road provides a more structured recreational landscape. Active open space facilities are proposed to strengthen the existing recreational hub around Trinity College. A detention basin and wetland will provide contrasting landscape elements. Opportunities exist for smaller pocket parks for playspace, picnicking opportunities and shared paths for walking and cycling. A mixture of both native and exotic tree plantings will create a more formal, ordered landscape.

Artwork will complement the landscape concept either as a stand alone signature piece or to influence and modify either the entry statements or proposed structural planting of feature trees.

Celebration of the 'journey' and 'arrival/departure' at the township will be announced at the southern bypass underpass where images can be mounted to existing underpass walls.

PRINCIPLES OF DEVELOPMENT CONTROL

Land Use

1 The following forms of development are envisaged in the zone:

Conservation work
Farming
Outbuilding associated with open space maintenance
Lighting
Playground
Recreation area
Sporting club facility
Structure associated with a public facility such as car parking, picnic / barbeque area, shelter and toilet
Toilet block and barbeque facility.

2 Development listed as non-complying is generally inappropriate.

3 Publicly owned land within the MOSS should be used for any of the following:

(a) to provide natural or landscaped open space using locally indigenous plant species;

(b) to accommodate a range of public recreation, sporting and institutional facilities and uses;

(c) to accommodate stormwater recreation and management;

(d) to conserve and restore areas of remnant native vegetation and wildlife habitats and corridors;

(e) to conserve sites of scientific, cultural or heritage interest;

(f) for revegetation purposes using locally indigenous plant species;

(g) to provide a buffer to adjoining areas of conservation significance.

4 Privately owned land within the MOSS should be used for any of the following:

(a) rural activities and agriculture (but not intensive animal keeping);

(b) low-impact sporting facilities;

(c) conservation purposes.

5 Development should allow for unstructured passive and active recreation.

Form and Character

6 Development should not be undertaken unless it is consistent with the desired character for the zone.

7 Development should only occur where it is integral to the aesthetic, drainage or recreation function of the zone.

8 Buildings should be:

(a) restricted in size and number;

(b) sited so as to not detract from the open natural character of the policy area;

(c) constructed of materials which blend with the Riverine landscape.

9 Development should ensure coordinated design with an emphasis on the creation of pedestrian areas.

10 Landscaped buffers should be provided around the perimeter of recreation or sporting facilities.

11 Landscaping should comprise locally indigenous species and incorporate existing remnant vegetation.

12 Development should ensure that public access to the Linear Park is retained and enhanced for cyclists and pedestrians.

13 Development, landscaping, and paths for pedestrians and cyclists should:

(a) take into account the changing flow regime and width of waterways; and

(b) be constructed of permeable material where practical to reduce stormwater runoff.

14 Buildings and structures adjoining Main North Road (apart from extensions to existing buildings or ancillary buildings located behind existing buildings) should be designed with the following parameters:

Parameter	Value
Minimum setback from Main North Road (eastern side)	100 metres
Minimum setback from Main North Road (western side and south of Clarke Road)	100 metres
Minimum setback from Main North Road (Western side and north of Clarke Road	20 metres
Maximum building height	7 metres
Fencing	Open style

Land Division

15 Land division should not be undertaken except where:

(a) it will facilitate the development of an envisaged use in the zone or policy area;

(b) it will facilitate the development of an envisaged road in the zone or policy area; or

(c) no additional allotments are created.

PROCEDURAL MATTERS

Complying Development

16 Complying developments are prescribed in Schedule 4 of the *Development Regulations 2008*.

Non-complying Development

17 Development (including building work, a change in the use of land, or division of an allotment) for the following is **non-complying**:

Advertisement and /or advertising hoarding
Amusement machine centre
Consulting room
Crematorium
Dairy
Dwelling
Education facility
Fuel depot
Hospital
Hotel
Industry
Intensive animal keeping
Motel
Motor repair station
Nursing home
Office except in association with recreation facilities
Petrol filling station
Place of worship
Pre-school
Prescribed mining operations
Restaurant
Road transport terminal
Service trade premises

Shop of group of shops except where the gross leasable area is less than 80 square metres
Stock sales yard
Stock slaughter works
Store
Tourist accommodation
Warehouse
Waste reception, storage, treatment or disposal
Wrecking yard

Public Notification

18 Categories of public notification are prescribed in Schedule 9 of the *Development Regulations 2008.*

120 Traffic movement, spray drift, dust, noise, odour and the use of frost fans and gas guns associated with primary production should not lead to unreasonable impact on adjacent land uses.

121 Existing primary production and mineral extraction should not be prejudiced by the inappropriate encroachment of sensitive uses such as urban development.

122 Development that is adjacent to land used for primary production (within either the zone or adjacent zones) should include appropriate setbacks and vegetative plantings designed to minimise the potential impacts of chemical spray drift and other impacts associated with primary production.

123 New urban development should provide a buffer of at least 40 metres wide (inclusive of any fuel break, emergency vehicle access or road) separating urban and rural activities.

124 Development located within 300 metres of facilities for the handling, transportation and storage of bulk commodities should:

(a) not prejudice the continued operation of those facilities;

(b) be located, designed and developed having regard to the potential environmental impact arising from the operation of such facilities and the potential extended hours of operation.

Land Division

OBJECTIVES

Objective 45: Land division in appropriate localities to create a compact urban area.

Development of the metropolitan area should proceed in an orderly and convenient manner, making proper use of the State's economic resources and avoiding scattered development caused by haphazard and premature division of land.

Development which satisfies urban demands and requirements should be confined to sites within identified urban areas. This objective may be achieved through selective development of infill housing, redevelopment and refurbishment of existing housing, and use of vacant and under-utilised land, with the aim of reducing the social, environmental and economic costs of urban development, and maximising use of the community investment in facilities and services in existing housing areas. While a compact form of development is generally desirable, recognition must be given to areas of particular character of amenity, or to specific constraints such as environmental or historical value, water catchment areas and areas of bushfire hazard.

PRINCIPLES OF DEVELOPMENT CONTROL

125 Land should not be divided where community facilities or public utilities are lacking or inadequate or where land in the vicinity has been divided and the allotments have not been substantially developed.

126 Land should not be divided:

(a) in a manner which would prevent the satisfactory future division of the land, or any part thereof;

(b) if the proposed use, or the establishment of the proposed use, is likely to lead to undue erosion of the land or land in the vicinity thereof;

(c) unless wastes produced by the proposed use of the land, or any use permitted by the principles of development control, can be managed so as to prevent pollution of a public water supply or any surface or underground water resources;

(d) if the size, shape and location of, and the slope and nature of the land contained in, each allotment resulting from the division is unsuitable for the purpose for which the allotment is to be used;

(e) if any part of the land is likely to be inundated by tidal or floodwaters and the proposed allotments are to be used for a purpose which would be affected detrimentally when the land is inundated;

(f) where the proposed use of the land is the same as the proposed use of other existing allotments in the vicinity, and a substantial number of the existing allotments have not been used for that purpose;

(g) if it would cause an infringement of any provisions of relevant building legislation or any by-law or regulation made thereunder; or

(h) where existing significant trees or remnant vegetation will be removed or compromised.

127 When land is divided:

(a) any reserves or easements necessary for the provision of public utility services should be provided;

(b) stormwater should be capable of being drained safely and efficiently from each proposed allotment and disposed of from the land in a satisfactory manner;

(c) a water supply sufficient for the purpose for which the allotment is to be used should be made available to each allotment;

(d) provision should be made for the disposal of waste waters, sewage and other effluents from each allotment without risk to health;

(e) roads or thoroughfares should be provided where necessary for safe and convenient communication with adjoining land and neighbouring localities;

(f) each allotment resulting from the division should have safe and convenient access to the carriageway of an existing or proposed road or thoroughfare at all times;

(g) proposed roads should be graded, or be capable of being graded to connect safely and conveniently with an existing road or thoroughfare;

(h) for urban purposes, provision should be made for suitable land to be set aside for usable local open space; and

(i) if it borders a watercourse the land immediately adjoining the watercourse should become public open space, with a public road fronting the open space and be rehabilitated for appropriate public use.

128 Where land which has a frontage onto the Gawler River, North Para River and South Para River is divided, a reserve at least 30 metres wide, when measured from the top of the bank, should be provided along such a frontage.

129 Land division within an area identified as being 'Excluded Area from Bushfire Protection Planning Provisions' on Bushfire Protection Area Figures Ga(BPA)/1 to 5 should be designed to make provision for:

(a) emergency vehicle access through to the Bushfire Protection Area and other areas of open space connected to it;

(b) a mainly continuous street pattern serving new allotments that eliminates the use of cul-de-sacs or dead end roads; and

(c) a fire hazard separation zone isolating residential allotments from areas that pose an unacceptable bushfire risk by containing the allotments within a perimeter road or through other means that achieve an adequate separation.

Mining

OBJECTIVES

Objective 46: Continued availability of metallic, industrial and construction, minerals by preventing development likely to inhibit their exploitation.

Building and construction minerals are significant to the metropolitan area due to scarcity of natural timbers for building construction. Adelaide is particularly dependent on resources of clay and shale for brick manufacture, and sand and stone for concrete and mortar aggregate. Equally important are materials such as filling sand and quarry products used in road building and general construction. Transport costs of these bulky low-value products rise rapidly as the distance increases between the workings and the point of consumption, with a consequent increase in price to the consumer.

Although large reserves of most of these materials exist, they can be easily sterilized by other uses of the land. Workable deposits should therefore be kept free of building and other development so that the deposits are available when needed.

Objective 47: Protection of the landscape from undue damage from quarrying and similar extractive and associated manufacturing industries.

Land should not be left derelict following the extraction of minerals, and wherever possible steps should be taken to reclaim the land and put it to a suitable use. After-use plans should form the basis of the working program, indicate the depths and direction of working, access roads, support for abutting roads and adjoining land, disposal of waste and screening of plant and machinery by trees.

The remaining natural environment of land adjoining the Gawler River which has not been affected by loam extraction, should be preserved.

PRINCIPLES OF DEVELOPMENT CONTROL

130 Known reserves of economically-workable mineral deposits should be kept free from development until such time as the deposits are able to be exploited.

131 Quarrying and similar extractive and associated manufacturing industries should be sited and managed so that their impact on the landscape is minimal.

132 Removal of undesirable structures and the beautification of quarry faces by landscaping or restoration of the natural cover of the land, should be undertaken after mining and quarry workings are finished.

133 Mining operations in areas of remnant bushland or scenic areas should only proceed following full evaluation of the benefits to the community in retaining bushland or scenery, as opposed to the development of the deposit and the relative abundance of alternative deposits.

134 Mining operations should be based on a rehabilitation plan to ensure a close correlation between the operations and the after-use of the site.

135 No new loam pits should be opened within the Gawler Rivers Floodplain Area identified on Figures Fl/1 to Fl/8 and further loam extraction should be:

(a) contained within existing approved pits; and

(b) worked in accordance with a development and rehabilitation plan that describes the intended stages of rehabilitation and long-term after-use.

Public Utilities

OBJECTIVES

Objective 72: Economy in the provision of public services.

The majority of the urban metropolitan area can be serviced with essential urban services.

Routes of main transmission lines should be defined in advance of development to ensure there is adequate clearance between the two. Infrastructure and buildings should be sited carefully to ensure that the appearance of surrounding areas is not marred by unsightly buildings and equipment. Where conspicuous sites are essential, the site should be large enough to allow for landscape planting.

Provision of adequate stormwater drains are essential to the orderly development of much of the Adelaide Plains which has poorly defined watercourses.

PRINCIPLES OF DEVELOPMENT CONTROL

223 Buildings and structures associated with the supply and maintenance of public utilities should, wherever practicable, be sited unobtrusively and landscaped.

Regulated Trees

OBJECTIVES

Objective 73: The conservation of regulated trees that provide important aesthetic and/or environmental benefit.

Objective 74: Development in balance with preserving regulated trees that demonstrate one or more of the following attributes:

(a) significantly contributes to the character or visual amenity of the locality;

(b) indigenous to the locality;

(c) a rare or endangered species;

(d) an important habitat for native fauna.

PRINCIPLES OF DEVELOPMENT CONTROL

224 Development should have minimum adverse effects on regulated trees.

225 A regulated tree should not be removed or damaged other than where it can be demonstrated that one or more of the following apply:

(a) the tree is diseased and its life expectancy is short;

(b) the tree represents a material risk to public or private safety;

(c) the tree is causing damage to a building;

(d) development that is reasonable and expected would not otherwise be possible;

(e) the work is required for the removal of dead wood, treatment of disease, or is in the general interests of the health of the tree.

226 Tree damaging activity other than removal should seek to maintain the health, aesthetic appearance and structural integrity of the tree.

(c) soil erosion, silting of watercourses and the creation of unstable embankments or cuttings;

(d) detrimental impact on hydrology, including drainage patterns;

(e) generation of noise, smoke, dust, odours, light spill, traffic or any other nuisance, particularly in relation to nearby residential areas;

(f) reduction of scenic views;

(g) safety hazards; and

(h) any other factor likely to affect detrimentally the environment, including the health and welfare of the community.

320 Development in rural areas should not take place unless there is available:

(a) an SA Water Corporation reticulated water supply; or

(b) an adequate alternative water supply source.

Note: Within the Northern Adelaide Plains Proclaimed Region (as declared under the Water Resources Act), an alternative water supply source does not include underground water unless the issue of adequate licences for withdrawal of underground waters is approved by the Minister of Water Resources in respect of the proposed development.

321 Development in rural areas should not cause pollution of surface or underground water.

Rural Living

OBJECTIVES

Objective 87: Low-density living areas in defined locations with a rural character.

Significant Trees

OBJECTIVES

Objective 88: Conservation of significant trees in Metropolitan Adelaide which provide important aesthetic and environmental benefit.

Trees are a highly valued part of the Metropolitan Adelaide environment and are important for a number of reasons including high aesthetic value, conservation of bio-diversity, provision of habitat for fauna, and conservation of original and remnant vegetation.

While indiscriminate and inappropriate significant tree removal should be generally prevented, the conservation of significant trees should occur in balance with achieving appropriate development.

PRINCIPLES OF DEVELOPMENT CONTROL

322 Where a significant tree:

(a) makes an important contribution to the character or amenity of the local area; or

(b) is indigenous to the local area and/or a species is listed under the National Parks and Wildlife Act 1972 as a rare or endangered native species; or

(c) represents an important habitat for native fauna; or

(d) is part of a wildlife corridor of a remnant area of native vegetation; or

(e) is important to the maintenance of biodiversity in the local environment; or

(f) forms a notable visual element to the landscape of the local area;

development should preserve these attributes.

323 Development should be undertaken with the minimum adverse affect on the health of a significant tree.

324 Significant trees should be preserved and tree-damaging activity should not be undertaken unless:

(a) in the case of tree removal;

(1) (i) the tree is diseased and its life expectancy is short; or

(ii) the tree represents an unacceptable risk to public or private safety; or

(iii) the tree is within 20 metres of a residential, tourist accommodation or habitable building and is a bushfire hazard within a Bushfire Protection Area; or

(iv) the tree is shown to be causing or threatening to cause substantial damage to a substantial building or structure of value; and

all other reasonable remedial treatments and measures have been determined to be ineffective.

(2) it is demonstrated that all reasonable alternative development options and design solutions have been considered to prevent substantial tree-damaging activity occurring.

(b) in any other case;

(i) the work is required for the removal of dead wood, treatment of disease, or is in the general interests of the health of the tree; or

(ii) the work is required due to unacceptable risk to public or private safety; or

(iii) the tree is within 20 metres of a residential, tourist accommodation or habitable building and is a bushfire hazard within a Bushfire Protection Area; or

(iv) the tree is shown to be causing, or threatening to cause damage to a substantial building or structure of value; or

(v) the aesthetic appearance and structural integrity of the tree is maintained; or

(vi) it is demonstrated that all reasonable alternative development options and design solutions have been considered to prevent substantial tree-damaging activities occurring.

325 Development involving ground work activities such as excavation, filling, and sealing of surrounding surfaces (whether such work takes place on the site of a significant tree or otherwise) should only be undertaken where the aesthetic appearance, health and integrity of a significant tree, including its root system, will not be adversely affected.

326 Land should not be divided or developed where the division or development would be likely to result in a substantial tree-damaging activity occurring to a significant tree.

Sloping Land

OBJECTIVES

Objective 89: Development on sloping land designed to minimise environmental and visual impacts and protect soil stability and water quality.

PRINCIPLES OF DEVELOPMENT CONTROL

327 Development and associated driveways and access tracks should be sited and designed to integrate with the natural topography of the land and minimise the need for earthworks.

328 Development and associated driveways and access tracks, including related earthworks, should be sited, designed and undertaken in a manner that:

(a) minimises their visual impact;

(b) reduces the bulk of the buildings and structures;

(c) minimises the extent of cut and/or fill;

(d) minimises the need for, and the height of, retaining walls;

(e) does not cause or contribute to instability of any embankment or cutting;

(f) avoids the silting of watercourses;

(g) protects development and its surrounds from erosion caused by water run-off.

329 Driveways and access tracks across sloping land should be accessible and have a safe, all-weather trafficable surface.

330 Development sites should not be at risk of landslip.

331 Development on steep land should include site drainage systems to minimise erosion and avoid adverse impacts on slope stability.

332 Steep sloping sites in unsewered areas should not be developed unless the physical characteristics of the allotments enable the proper siting and operation of an effluent drainage field suitable for the development intended.

Transportation and Access

OBJECTIVES

Objective 90: A comprehensive, integrated, affordable and efficient air, rail, sea, road, cycle and pedestrian transport system that will:

(a) provide equitable access to a range of public, community and private transport services for all people;

(b) ensure a high level of safety;

(c) effectively support the economic development of the State;

(d) have minimal negative environmental and social impacts;

(e) maintain options for the introduction of suitable new transport technologies.

Contaminated Land

OBJECTIVES

Objective 18: Protection of human health and the environment wherever site contamination has been identified or is suspected to have occurred.

Objective 19: Appropriate assessment and remediation of site contamination to ensure land is suitable for the proposed use and provides a safe and healthy living and working environment.

PRINCIPLE OF DEVELOPMENT CONTROL

41 Development, including land division, should not occur where site contamination has occurred unless the site has been assessed and remediated as necessary to ensure that it is suitable and safe for the proposed use.

Crime Prevention

OBJECTIVE

Objective 20: A safe, secure, crime resistant environment where land uses are integrated and designed to facilitate community surveillance.

PRINCIPLES OF DEVELOPMENT CONTROL

42 Development should be designed to maximise surveillance of public spaces through the incorporation of clear lines of sight, appropriate lighting and the use of visible permeable barriers wherever practicable.

43 Buildings should be designed to overlook public and communal streets and public open space to allow casual surveillance.

44 Development should provide a robust environment that is resistant to vandalism and graffiti.

45 Development should provide lighting in frequently used public spaces including those:

(a) along dedicated cyclist and pedestrian pathways, laneways and access routes

(b) around public facilities such as toilets, telephones, bus stops, seating, litter bins, automatic teller machines, taxi ranks and car parks.

46 Development, including car park facilities should incorporate signage and lighting that indicate the entrances and pathways to, from and within sites.

47 Landscaping should be used to assist in discouraging crime by:

(a) screen planting areas susceptible to vandalism

(b) planting trees or ground covers, rather than shrubs, alongside footpaths

(c) planting vegetation other than ground covers a minimum distance of 2 metres from footpaths to reduce concealment opportunities.

48 Site planning, buildings, fences, landscaping and other features should clearly differentiate public, communal and private areas.

49 Buildings should be designed to minimise and discourage access between roofs, balconies and windows of adjoining dwellings.

50 Public toilets should be located, sited and designed:

(a) to promote the visibility of people entering and exiting the facility (eg by avoiding recessed entrances and dense shrubbery that obstructs passive surveillance)

(b) near public and community transport links and pedestrian and cyclist networks to maximise visibility.

51 Development should avoid pedestrian entrapment spots and movement predictors (eg routes or paths that are predictable or unchangeable and offer no choice to pedestrians).

Energy Efficiency

OBJECTIVES

Objective 21: Development designed and sited to conserve energy.

Objective 22: Development that provides for on-site power generation including photovoltaic cells and wind power.

PRINCIPLES OF DEVELOPMENT CONTROL

52 Development should provide for efficient solar access to buildings and open space all year around.

53 Buildings should be sited and designed:

(a) to ensure adequate natural light and winter sunlight is available to the main activity areas of adjacent buildings;

(b) so that open spaces associated with the main activity areas face north for exposure to winter sun.

On-site Energy Generation

54 Development should facilitate the efficient use of photovoltaic cells and solar hot water systems by:

(a) taking into account overshadowing from neighbouring buildings;

(b) designing roof orientation and pitches to maximise exposure to direct sunlight.

55 Public infrastructure and lighting should be designed to generate and use renewable energy.

Form of Development

OBJECTIVES

Objective 23: Orderly and economic development, consistent also with Maps Ga/1 (Overlay 1) Enlargements A, B, C, D, E, F, G and H.

The maps illustrate the distribution of living, business, rural, recreational and conservation areas and the main routes for traffic and transport.

Objective 24: A sustainable urban form that reduces the ecological footprint of the town, whilst also enhancing the quality of life of residents.

Development of new areas within the urban boundary shown on Map Ga/1 should occur in a logical and systematic manner with a clearly defined edge between urban and surrounding rural areas.

Objective 25: Location of suitable areas of land for living, working, recreation and rural production.

Current and anticipated demographic trends within the Adelaide metropolitan area show declining dwelling occupancy rates, particularly in the inner and middle suburbs. This will necessitate increasing dwelling density to maintain population levels and services.

Concerns about population change, increased housing demand, efficient use of urban infrastructure and reducing fringe growth can be addressed by increasing the number of dwellings that can be accommodated within the existing boundary of the metropolitan area, and positively influencing decline in population.

Objective 26: Effective location of public and community facilities by the reservation of suitable land in advance of need.

Development should not hinder the reservation of land needed for transport, public services, schools and the provision of other essential services.

PRINCIPLES OF DEVELOPMENT CONTROL

56 Extensions of built-up areas should not be in the form of ribbon development along arterial roads unless indicated in zone policies or structure plans.

57 Development in localities having a bad or unsatisfactory layout, or unhealthy or obsolete development, should improve or rectify those conditions.

58 Urban development should be confined to areas within the urban boundary of Metropolitan Adelaide and be based on principles of ecologically sustainable development (ESD) that includes water sensitive urban design (WSUD), energy efficiency, biodiversity protection and enhancement, natural resource protection, waste, minimisation, indoor and outdoor environmental quality and sustainable selection and use of materials.

59 Development adjacent to the rural/urban interface, as indicated on Map Ga/1 (Overlay 1) Enlargements Part A and Part B should incorporate suitable buffers to minimise the effect of potential impacts.

60 Development should minimise the potential for personal and property damage arising from natural hazards including landslip, bushfires and flooding.

61 Septic tanks should:

(a) not be installed where the effluent is likely to lead to the pollution of surface or underground water; and

(b) be installed on allotments large enough to allow the disposal of the effluent within the allotment boundaries.

62 Development should not create conditions which are likely to exceed the capacity of existing roads, public utilities, and other community services and facilities.

63 Development should be supplied with adequate energy, water, waste disposal and drainage facilities to serve the needs of users.

Hazards

OBJECTIVES

Objective 27: Maintenance of the natural environment and systems by limiting development in areas susceptible to flooding.

Objective 28: Development located away from areas that are vulnerable to, and cannot be adequately and effectively protected from, the risk of flooding.

Objective 29: Critical community facilities such as hospitals, emergency control centres, major service infrastructure facilities, and emergency service facilities located where they are not exposed to flooding.

Objective 30: Development located and designed to minimise the risks to safety and property from flooding.

Objective 31: Development located and designed so as not to impede the flow of flood waters.

PRINCIPLES OF DEVELOPMENT CONTROL

64 Development should be excluded from areas that are vulnerable to, and cannot be adequately and effectively protected from, flooding.

65 There should not be any significant interference with natural processes in order to reduce the exposure of development to the risk of natural hazards.

Flooding

66 Development should not occur on land where the risk of flooding is likely to be harmful to safety or damage property.

67 Development should not be undertaken in areas liable to inundation by tidal, drainage or flood waters unless the development can achieve all of the following:

(a) it is developed in an area having a public stormwater system capable of catering for a 1 in 100 year average return interval flood event; and

(b) buildings and structures for human habitation or for the keeping of animals have a finished floor level and gully traps at least 300mm above the Australian Height Datum level of a 1 in 100 year average return interval flood event.

68 Development, including earthworks associated with development, should not:

(a) impede the flow of floodwaters through the land or other surrounding land; or

(b) increase the potential hazard risk to public safety of persons during a flood event; or

(c) aggravate the potential for erosion or siltation or lead to the destruction of vegetation during a flood; or

(d) cause any adverse effect on the floodway function; or

(e) increase the risk of flooding of other land; or

(f) obstruct a watercourse.

69 Development of buildings, structures, farming and horticultural activities should maintain the natural landform in areas subject to flooding by:

(a) locating and designing driveways, access tracks and parking areas to follow the natural contours of the land; and

(b) minimising the amount of excavation and limiting the level of fill for driveways, access tracks and parking areas to no more than 300mm above natural or existing surface level; and

(c) minimising the area of fill required to accommodate buildings above the Australian Height Datum level of a 1 in 100 year average return interval flood event; and

(d) avoiding the use of levees or channels for the irrigation or protection of crops.

70 Construction and placement of structures, including roads, in a watercourse, a floodplain of a watercourse, a lake, a wetland, or an area subject to inundation should:

(a) not result in flooding either upstream or downstream; and

(b) be constructed in a manner that prevents the structure, or any debris collected by the structure, increasing the risk of damage to property or the risk to safety of persons.

71 Development should avoid the discharge or deposit of waste, wastewater and waste treatment systems (including processes such as seepage, infiltration or carriage by wind, rain, stormwater or by the rising of the water table) onto land or into any waters that are subject to inundation by a 1 in 100 year average return interval flood event.

72 Development should not occur where essential services cannot be economically provided and maintained having regard to flood risk or where emergency vehicle access would be prevented by a 1 in 100 year average return interval flood event.

73 Emergency service facilities such as hospitals, fire stations, police stations and other similar types of facilities should be located above the predicted level for a 1 in 1000 year ARI flood event.

Gawler Rivers Floodplain Area

The following objective and principles of development control apply to land identified in Figures Fl/1 to Fl/8 as being flood prone land. This land is referred to throughout the Development Plan as the Gawler Rivers Floodplain Area and shown to be at risk of inundation by flood waters.

Where there is inconsistency between the following objectives or principles of development control, and objectives or principles of development control in a specific zone or policy area within a zone, the following objectives or principles of development control will prevail to the extent of the inconsistency.

There are allotments containing both areas of flood prone and non-flood prone land having regard to Figures Fl/1 to Fl/8. Equally, there are allotments with two or three different hazard flood risk areas. In such situations, it will be necessary to define the site or activity-boundary of the proposed building or land use, and to proceed according to the relevant flood risk status of that area. If more than one hazard flood risk area applies to the site or activity-boundary, the development will be treated as if it is wholly within the higher hazard flood risk area.

OBJECTIVE

Objective 32: Development within the Gawler Rivers Floodplain Area appropriate to the varying hazard flood risk areas.

The Gawler Rivers Floodplain Area comprises areas of land having three different hazard flood risk areas:

(a) *Low* relates to low depth and low velocity flooding where evacuation via wading by people is possible and escape by small vehicle is achievable.

Zero to 0.3 metres depth at flood where velocities are generally low (up to 0.3m/s).

(b) *Medium* relates to areas where the flood depth is deeper and/ or flows are faster. Wading through water by children and elderly is more difficult and evacuation by small vehicle is only possible in the early stages of flooding, with larger 4WD vehicles or trucks required at later stages.

Sloping Land

OBJECTIVES

Objective 89: Development on sloping land designed to minimise environmental and visual impacts and protect soil stability and water quality.

PRINCIPLES OF DEVELOPMENT CONTROL

327 Development and associated driveways and access tracks should be sited and designed to integrate with the natural topography of the land and minimise the need for earthworks.

328 Development and associated driveways and access tracks, including related earthworks, should be sited, designed and undertaken in a manner that:

(a) minimises their visual impact;

(b) reduces the bulk of the buildings and structures;

(c) minimises the extent of cut and/or fill;

(d) minimises the need for, and the height of, retaining walls;

(e) does not cause or contribute to instability of any embankment or cutting;

(f) avoids the silting of watercourses;

(g) protects development and its surrounds from erosion caused by water run-off.

329 Driveways and access tracks across sloping land should be accessible and have a safe, all-weather trafficable surface.

330 Development sites should not be at risk of landslip.

331 Development on steep land should include site drainage systems to minimise erosion and avoid adverse impacts on slope stability.

332 Steep sloping sites in unsewered areas should not be developed unless the physical characteristics of the allotments enable the proper siting and operation of an effluent drainage field suitable for the development intended.

Transportation and Access

OBJECTIVES

Objective 90: A comprehensive, integrated, affordable and efficient air, rail, sea, road, cycle and pedestrian transport system that will:

(a) provide equitable access to a range of public, community and private transport services for all people;

(b) ensure a high level of safety;

(c) effectively support the economic development of the State;

(d) have minimal negative environmental and social impacts;

(e) maintain options for the introduction of suitable new transport technologies.

Sector	Acceptable Height (Metres) above ground level	Maximum Possible Height (Metres) above ground level[1]
A	0	12
B	5	40
C	20	100
D	60	190

Building Set-backs from Arterial Roads

12 No building should be erected, added to or altered on any land so that any portion of such building is erected, added to or altered nearer to the existing boundary of a road, or to the boundary of any land shown as being required for road widening on the plan deposited under the provisions of the Metropolitan Adelaide Road Widening Plan Act, 1972-1976.

Bushfire Protection

Bushfire Protection Objectives and Principles of Development Control apply to the General, Medium and High Bushfire Risk areas shown on Bushfire Protection Area Figures Ga(BPA)/1 to 5, except where exempted.

OBJECTIVES

Objective 3: Development should minimise the threat and impact of bushfires on life and property while protecting the natural and rural character.

Objective 4: Buildings and the intensification of non-rural land uses directed away from areas of high bushfire risk.

PRINCIPLES OF DEVELOPMENT CONTROL

13 Buildings and structures should be located away from areas that pose an unacceptable bushfire risk as a result of one or more of the following:

(a) vegetation cover comprising trees and/or shrubs;

(b) poor access;

(c) rugged terrain;

(d) inability to provide an adequate building protection zone; or

(e) inability to provide an adequate supply of water for fire-fighting purposes.

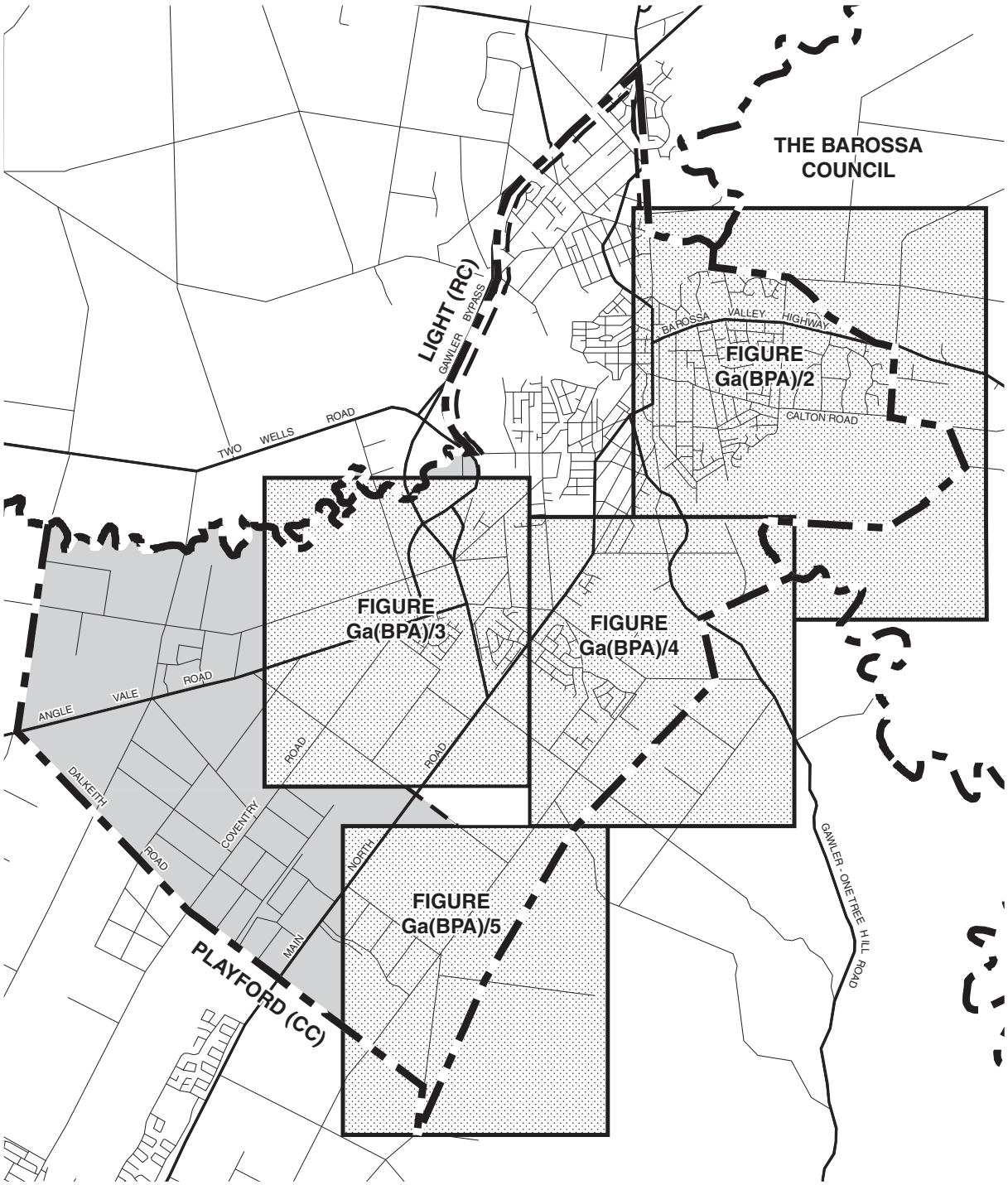
14 Residential, tourist accommodation and other habitable buildings should:

(a) be sited on the flatter portion of allotments and avoid steep slopes, especially upper slopes, narrow ridge crests and the tops of narrow gullies, and slopes with a northerly or westerly aspect;

(b) be sited in areas with low bushfire hazard vegetation and set back at least 20 metres from existing hazardous vegetation; and

(c) have a dedicated and accessible water supply available at all times for fire fighting.

[1] Subject to an assessment of the impact on Obstacle Height Limitation surface for the Helipad.



Scale 1:60000

0 3km

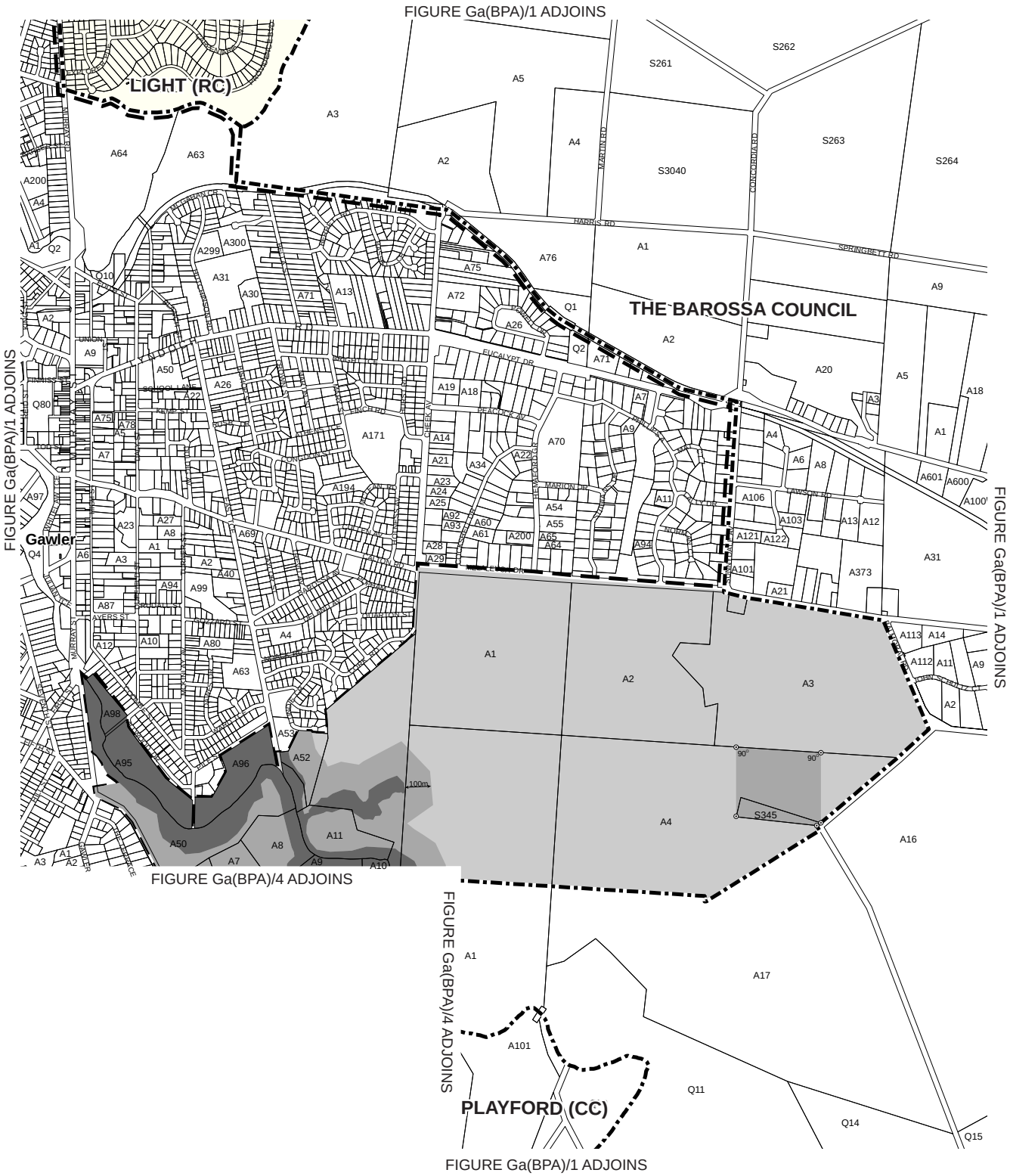
General Bushfire Risk

Excluded Area from Bushfire Protection Planning Provisions

Development Plan Boundary

GAWLER (CT)
INDEX TO
BUSHFIRE PROTECTION AREA
FIGURE Ga(BPA)/1

Consolidated - 20 February 2018



NOTE: The boundaries of areas of high bushfire risk identified by this figure align with the boundaries of the Open Space Zone shown on Maps Ga/6, 9 and 22.

Scale 1:20000

0 1,000 m

High Bushfire Risk

Medium Bushfire Risk

General Bushfire Risk

Excluded Area from Bushfire Protection Planning Provisions

Development Plan Boundary

GAWLER (CT)
BUSHFIRE PROTECTION AREA
FIGURE Ga(BPA)/2

Consolidated - 20 February 2018

FIGURE Ga(BPA)/1 ADJOINS

Scale 1:15000

0 1km

General Bushfire Risk

Excluded Area from Bushfire Protection Planning Provisions

Development Plan Boundary

GAWLER (CT)
BUSHFIRE PROTECTION AREA
FIGURE Ga(BPA)/3

Consolidated - 20 February 2018

FIGURE Ga(BPA)/1 ADJOINS

FIGURE Ga(BPA)/2 ADJOINS

FIGURE Ga(BPA)/3 ADJOINS

FIGURE Ga(BPA)/1 ADJOINS

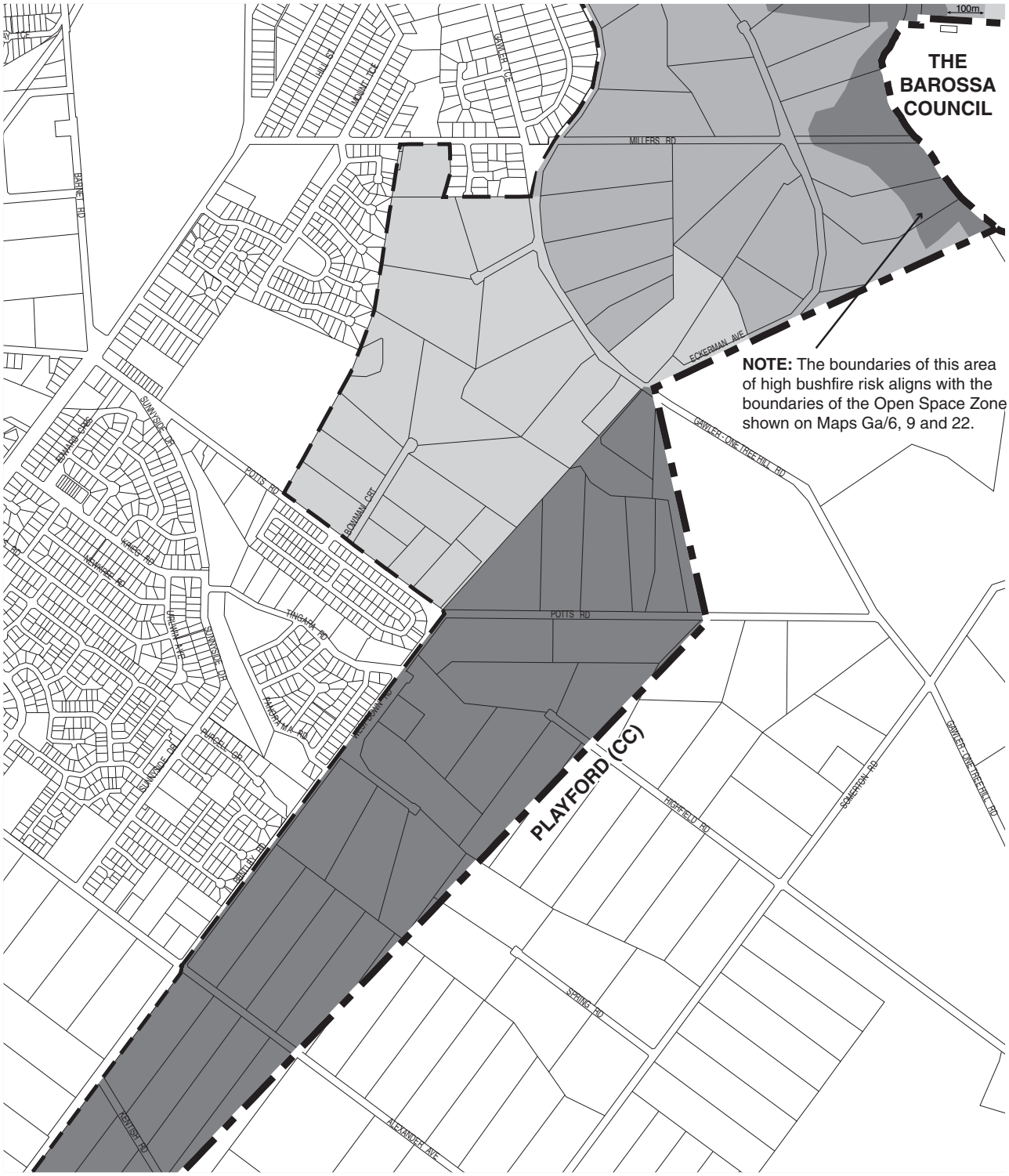


FIGURE Ga(BPA)/5 ADJOINS

Scale 1:15000

0 1km

High Bushfire Risk

Medium Bushfire Risk

General Bushfire Risk

Excluded Area from Bushfire Protection Planning Provisions

Development Plan Boundary

GAWLER (CT)
BUSHFIRE PROTECTION AREA
FIGURE Ga(BPA)/4

Consolidated - 20 February 2018

FIGURE Ga(BPA)/1 ADJOINS

FIGURE Ga(BPA)/4 ADJOINS

FIGURE Ga(BPA)/1 ADJOINS

Scale 1:15000

0 1km

High Bushfire Risk

General Bushfire Risk

Excluded Area from Bushfire Protection Planning Provisions

Development Plan Boundary

GAWLER (CT)
BUSHFIRE PROTECTION AREA
FIGURE Ga(BPA)/5

Consolidated - 20 February 2018

15 Extensions to existing buildings, outbuildings and other ancillary structures should be located and constructed using materials to minimise the threat of fire spread to residential, tourist accommodation and other habitable buildings in the event of bushfire.

16 Buildings and structures should be designed and configured to reduce the impact of bushfire through using simple designs that reduce the potential for trapping burning debris against the building or structure, or between the ground and building floor level in the case of transportable buildings.

17 Land division for residential or tourist accommodation purposes within areas of high bushfire risk should be limited to those areas specifically set aside for these uses.

18 Where land division does occur it should be designed to:

(a) minimise the danger to residents, other occupants of buildings and fire fighting personnel;

(b) minimise the extent of damage to buildings and other property during a bushfire;

(c) ensure each allotment contains a suitable building site that is located away from vegetation that would pose an unacceptable risk in the event of bushfire; and

(d) ensure provision of a fire hazard separation zone isolating residential allotments from areas that pose an unacceptable bushfire risk by containing the allotments within a perimeter road or through other means that achieve an adequate separation.

19 Vehicle access and driveways to properties and public roads created by land division should be designed and constructed to:

(a) facilitate safe and effective operational use for fire-fighting and other emergency vehicles and residents; and

(b) provide for two-way vehicular access between areas of fire risk and the nearest public road.

20 Development in a Bushfire Protection Area should be in accordance with those provisions of the *Minister's Code: Undertaking development in Bushfire Protection Areas* that are designated as mandatory for Development Plan Consent purposes.

Centres and Shops

OBJECTIVES

Objective 5: Shopping, administrative, cultural, community, entertainment, educational, religious, and recreational facilities should be located in integrated centres.

Objective 6: Centres should be established and developed in accordance with a consistent metropolitan hierarchy based on function, so that each type of centre provides a proportion of the total requirement of goods and services commensurate with its role.

There is a metropolitan centres strategy based on the following hierarchy:

(a) Central Business District of the City of Adelaide;

(b) Regional Centre;

(c) District Centre (which includes Gawler Town Centre);

(d) Neighbourhood Centre;

PRINCIPLES OF DEVELOPMENT CONTROL

137 Development should preserve and enhance the character and amenity of land within the Metropolitan Open Space System as shown on Map Ga/1 (Overlay 2).

138 Publicly owned land within the Metropolitan Open Space System should be used to provide natural or landscaped open space, accommodate a range of public recreation, sporting and institutional facilities and uses and to accommodate stormwater management.

139 Publicly owned land within the Metropolitan Open Space System should also be used to conserve wildlife habitats and areas of natural vegetation, to allow for movement of wildlife, to conserve sites of scientific, cultural or heritage interest and for re-vegetation.

140 Privately owned land within the Metropolitan Open Space System should be used for rural activities and agriculture (but not intensive animal keeping), very low-density residential development, low-impact tourist, or sporting facilities, or conservation purposes.

141 Buildings and structures erected on land within the Metropolitan Open Space System should be designed, located and screened so as to be unobtrusive and not detract from the open natural or landscaped character of these areas.

142 When land fronting watercourses within the Metropolitan Open Space System is divided land adjoining the watercourse should become a public reserve.

143 The width of reserves abutting watercourses within the Metropolitan Open Space System should be sufficient to allow for flood control, stormwater management, retention of the riverine ecosystem and to provide areas of open space which can be used to accommodate a range of recreational and sporting facilities.

Natural Resources

OBJECTIVES

Objective 52: Retention, protection and restoration of the natural resources and environment.

Objective 53: Protection of the quality and quantity of South Australia's surface waters, including inland and underground waters.

Objective 54: The ecologically sustainable use of natural resources including water resources, ground water, surface water and watercourses.

Objective 55: Natural hydrological systems and environmental flows reinstated, and maintained and enhanced.

Objective 56: Development consistent with the principles of water sensitive design.

Objective 57: Development sited and designed to:

(a) protect natural ecological systems;

(b) achieve the sustainable use of water;

(c) protect water quality, including receiving waters;

(d) reduce runoff and peak flows and prevent the risk of downstream flooding;

(e) minimise demand on reticulated water supplies;

(f) maximise the harvest and use of stormwater;

(g) protect stormwater from pollution sources.

Objective 58: Storage and use of stormwater which avoids adverse impact on public health and safety.

Objective 59: Native flora, fauna and ecosystems protected, retained, conserved and restored.

Objective 60: Restoration, expansion and linking of existing native vegetation to facilitate habitat corridors for ease of movement of fauna.

Objective 61: Minimal disturbance and modification of the natural landform.

Objective 62: Protection of the physical, chemical and biological quality of soil resources.

Objective 63: Protection of areas prone to erosion or other land degradation processes from inappropriate development.

Objective 64: Protection of the scenic qualities of natural and rural landscapes.

PRINCIPLES OF DEVELOPMENT CONTROL

144 Development should be undertaken with minimum impact on the natural environment, including air and water quality, land, soil, biodiversity, and scenically attractive areas.

145 Development should ensure that South Australia's natural assets, such as biodiversity, water and soil, are protected and enhanced.

146 Development should not significantly obstruct or adversely affect sensitive ecological areas such as creeks and wetlands.

147 Development should be appropriate to land capability and the protection and conservation of water resources and biodiversity.

Water Sensitive Design

148 Development should be designed to maximise conservation, minimise consumption and encourage reuse of water resources.

149 Development should not take place if it results in unsustainable use of surface or underground water resources.

150 Development should be sited and designed to:

(a) capture and re-use stormwater, where practical;

(b) minimise surface water runoff;

(c) prevent soil erosion and water pollution;

(d) protect and enhance natural water flows;

(e) protect water quality by providing adequate separation distances from watercourses and other water bodies;

(f) not contribute to an increase in salinity levels;

(g) avoid the water logging of soil or the release of toxic elements;

(h) maintain natural hydrological systems and not adversely affect:

(i) the quantity and quality of groundwater;

(ii) the depth and directional flow of groundwater;

(iii) the quality and function of natural springs.

151 Water discharged from a development site should:

(a) be of a physical, chemical and biological condition equivalent to or better than its pre-developed state;

(b) not exceed the rate of discharge from the site as it existed in pre-development conditions.

152 Development should include stormwater management systems to protect it from damage during a minimum of a 1-in-100 year average return interval flood.

153 Development should have adequate provision to control any stormwater over-flow runoff from the site and should be sited and designed to improve the quality of stormwater and minimise pollutant transfer to receiving waters.

154 Development should include stormwater management systems to mitigate peak flows and manage the rate and duration of stormwater discharges from the site to ensure the carrying capacities of downstream systems are not overloaded.

155 Development should include stormwater management systems to minimise the discharge of sediment, suspended solids, organic matter, nutrients, bacteria, litter and other contaminants to the stormwater system.

156 Stormwater management systems should preserve natural drainage systems, including the associated environmental flows.

157 Stormwater management systems should:

(a) maximise the potential for stormwater harvesting and re-use, either on-site or as close as practicable to the source;

(b) utilise, but not be limited to, one or more of the following harvesting methods:

(i) the collection of roof water in tanks;

(ii) the discharge to open space, landscaping or garden areas, including strips adjacent to car parks;

(iii) the incorporation of detention and retention facilities;

(iv) aquifer recharge.

158 Where it is not practicable to detain or dispose of stormwater on site, only clean stormwater runoff should enter the public stormwater drainage system.

159 Artificial wetland systems, including detention and retention basins, should be sited and designed to:

(a) ensure public health and safety is protected;

(b) minimise potential public health risks arising from the breeding of mosquitoes.

Water Catchment Areas

160 Development should ensure watercourses and their beds, banks, wetlands and floodplains are not damaged or modified and are retained in their natural state, except where modification is required for essential access or maintenance purposes.

161 No development should occur where its proximity to a swamp or wetland will damage or interfere with the hydrology or water regime of the swamp or wetland.

162 A wetland or low-lying area providing habitat for native flora and fauna should not be drained, except temporarily for essential management purposes to enhance environmental values.

163 Along watercourses, areas of remnant native vegetation, or areas prone to erosion, that are capable of natural regeneration should be fenced off to limit stock access.

164 Development such as cropping, intensive animal keeping, residential, tourism, industry and horticulture, that increases the amount of surface run-off should include a strip of land at least 20 metres wide (30 metres wide in the case of the Gawler, North Para and South Para Rivers) measured from the top of existing banks on each side of a watercourse that is:

(a) fenced to exclude livestock;

(b) kept free of development, including structures, formal roadways or access ways for machinery or any other activity causing soil compaction or significant modification of the natural surface of the land;

(c) revegetated with locally indigenous vegetation comprising trees, shrubs and other groundcover plants to filter run-off so as to reduce the impacts on native aquatic ecosystems and to minimise soil loss eroding into the watercourse.

165 Development resulting in the depositing of an object or solid material in a watercourse or floodplain or the removal of bank and bed material should not:

(a) adversely affect the migration of aquatic biota;

(b) adversely affect the natural flow regime;

(c) cause or contribute to water pollution;

(d) result in watercourse or bank erosion;

(e) adversely affect native vegetation upstream or downstream that is growing in or adjacent to a watercourse.

166 The location and construction of dams, water tanks and diversion drains should:

(a) occur off watercourse;

(b) not take place in ecologically sensitive areas or on erosion-prone sites;

(c) provide for low flow by-pass mechanisms to allow for migration of aquatic biota;

(d) not negatively affect downstream users;

(e) minimise in-stream or riparian vegetation loss;

(f) incorporate features to improve water quality (eg wetlands and floodplain ecological communities);

(g) protect ecosystems dependent on water resources.

167 Irrigated horticulture and pasture should not increase groundwater-induced salinity.

168 Development should comply with the current *Environment Protection (Water Quality) Policy*.

Biodiversity and Native Vegetation

169 Development should retain existing areas of native vegetation and where possible contribute to revegetation using locally indigenous plant species.

170 Development should be designed and sited to minimise the loss and disturbance of native flora and fauna and their breeding grounds and habitats.

171 The provision of services, including power, water, effluent and waste disposal, access roads and tracks should be sited on areas already cleared of native vegetation.

172 Native vegetation should be conserved and its conservation value and function not compromised by development if the native vegetation does any of the following:

(a) provides an important habitat for wildlife or shade and shelter for livestock;

(b) has a high plant species diversity or includes rare, vulnerable or endangered plant species or plant associations and communities;

(c) provides an important seed bank for locally indigenous vegetation;

(d) has high amenity value and/or significantly contributes to the landscape quality of an area, including the screening of buildings and unsightly views;

(e) has high value as a remnant of vegetation associations characteristic of a district or region prior to extensive clearance for agriculture;

(f) is growing in, or is characteristically associated with a wetland environment.

173 Native vegetation should not be cleared if such clearing is likely to lead to, cause or exacerbate any of the following:

(a) erosion or sediment within water catchments;

(b) decreased soil stability;

(c) soil or land slip;

(d) deterioration in the quality of water in a watercourse or surface water runoff;

(e) a local or regional salinity problem;

(f) the occurrence or intensity of local or regional flooding.

174 Development that proposes the clearance of native vegetation should address or consider the implications that removing the native vegetation will have on the following:

(a) provision for linkages and wildlife corridors between significant areas of native vegetation;

(b) erosion along watercourses and the filtering of suspended solids and nutrients from run-off;

(c) the amenity of the locality;

(d) bushfire safety;

(e) the net loss of native vegetation and other biodiversity.

175 Where native vegetation is to be removed, it should be replaced in a suitable location on the site with locally indigenous vegetation to ensure that there is not a net loss of native vegetation and biodiversity.

Community Facilities

OBJECTIVES

Objective 10: Community facilities should be appropriate and conveniently accessible to the population they serve.

Effective education and health services are the basis for the social well-being of a community. It is essential that schools, hospitals, cemeteries and other institutions, are located conveniently for the people they serve.

Demographic change over time affects the community facilities required therefore flexible use of buildings is essential.

Conservation

OBJECTIVES

Objective 11: Conservation, preservation, enhancement or improvement of scenically attractive areas, including land adjoining scenic routes and riverine environments.

Retention of the natural character of the Mount Lofty Ranges is of the utmost importance to present and future generations of city dwellers.

The natural slopes of the foothills and the wooded character of the face of the ranges rising to Mount Lofty, provide a pleasant contrast to the suburbs on the plains, and give Adelaide a special character. It is necessary, therefore, that the face of the ranges and the skyline as seen from various points in the metropolitan area should retain a natural character.

The ranges are still attractively wooded, providing areas of considerable beauty, readily accessible from the suburban plains. However, any action likely to diminish these wooded areas, such as subdivision into unduly small residential allotments, should be resisted in order to conserve biodiversity, avoid soil erosion and protect development from occurring in a bushfire prone area. Acquisition of suitable areas for public use would ensure their retention.

Tree planting should be encouraged, dwellings should be of good design and set well back from the roads. Advertisements should not mar the landscape and overhead services should be carefully sited against tree and hill backgrounds.

Watercourses, with their natural vegetation, are the most significant natural features on the Adelaide Plains. The trees and natural vegetation can add to the attractiveness of suburban areas and, wherever possible, these features should be incorporated in the layout of residential areas whilst also forming biodiversity corridors.

Land bordering watercourses along the Gawler River and North and South Para Rivers should be reserved for public use and rehabilitated and managed through conservation programmes. Buildings should be set well back, and front onto a road and reserve along a watercourse. River reserves should be used for public recreation and provide easy access for maintenance of the watercourse.

The character of the built-up area largely depends on the attractiveness of parks and recreation reserves, and every endeavour should be made to plant and develop reserves as soon as they become available. Reserves should be easily seen from adjoining roads, and housing development should not block out views or back onto reserves. Reserves should also be rehabilitated and managed through conservation programmes.

Objective 12: Retention and enhancement of localities in the Council area of distinctive and valued or historic significance through preservation of State and Local Heritage Places, Contributory Items and other places of historic character, and compatible infill development.

Gawler contains a number of areas of special historic character. In those areas redevelopment and infill should be carried out in preference to demolition which should only be undertaken in association with development which conserves and enhances the special character of those areas.

Outside of recognised areas of special historic character there are many places which are part of the historic character of the Council area. The buildings and structures constructed in the Council area in years prior to about 1930 should be preserved and enhanced to maintain their contribution to the historic character of Gawler.

The character of the heart of the township revolves around the Gawler town centre and adjoining Church Hill, which is of particular significance. That character is largely derived from its setting, framed by the North Para River and South Para River and flanked to the east by the elevated ridge running parallel with the main street, Murray Street. Generous parkland spaces, flanked by wide terraces, encompass the river valleys. The dominating traditional grid road pattern is realigned in response to topographic conditions to create significant entrance points and important vistas. Several landmarks, including the Church Hill town squares are created as significant focal points. Native riverine eucalypts on the North Para River and South Para River parklands are complemented within the town centre area by Moreton Bay Fig trees, pinus species, palms and exotic European trees.

Buildings of historic interest, although containing a diversity of architectural styles from modest, simple colonial cottages to grand villas, and elaborate residences, display a rare cohesiveness, with few disparate new structures. The building form generally consists of:

(a) shape - orthogonal load-bearing building forms with hip, gable and hip-gable combination roofs. Verandahs are commonly found.

(b) scale - generally single-storey, but with lofty, high-pitched roofs.

(c) materials - local building stone (bluestone, limestone) and sandstone, or red brick walls with corrugated iron roofs.

(d) advertising or advertising displays - integrated with the building's architecture so that details which provide interest (such as arches, columns, decorative panels and lacework) are not obscured or disturbed.

Objective 13: Retention of environmentally-significant areas of native vegetation.

Objective 14: Retention of native vegetation where clearance is likely to lead to problems of soil erosion, soil slip and soil salinization, flooding or a deterioration in the quality of surface waters.

Objective 15: Retention of native vegetation for amenity purposes, for livestock shade and shelter and native wildlife corridors.

Objective 16: Retention and maintenance of wetlands and existing native vegetation for its conservation, biodiversity, and habitat value and environmental management function.

Objective 17: Conservation of Aboriginal sites, items and areas which are of archaeological, cultural, mythological or anthropological significance.

PRINCIPLES OF DEVELOPMENT CONTROL

32 The natural character of the North and South Para Rivers and Gawler River valleys should be retained and restored where affected by previous development.

33 Development should be undertaken with the minimum effect on natural features, land adjoining water or scenic routes or scenically-attractive areas.

34 Trees of historical or local significance and single trees or groups of trees of particular visual significance should be preserved and protected against disfigurement. If it is necessary to fell these trees, replanting should proceed as part of the development.

35 Development should not impair the character or nature of buildings or sites of architectural, historical or scientific interest or sites of natural beauty (including those not specifically identified of heritage importance in Table Ga/2 or Table Ga/5).

36 When excavation in historic conservation zones or places and items in Table Ga/2, Table Ga/5 or Table Ga/6 is proposed, consideration should be given to an archaeological assessment prior to excavation. Monitoring should occur during construction to protect and recover artifacts and document important historic features.

37 Native vegetation and roadside vegetation should be preserved and replanted with local indigenous species where practical and should not be cleared if it:

(a) provides important habitat for wildlife;

(b) has a high plant species diversity or has rare or endangered plant species and plant associations;

(c) has high amenity value;

(d) contributes to the landscape quality of an area;

(e) has high value as a remnant of vegetation associations characteristic of a district or region prior to extensive clearance for agriculture;

(f) is associated with sites of scientific, archaeological, historic, or cultural significance; or

(g) is growing in, or is characteristically associated with, a wetland environment.

38 Native vegetation should not be cleared if such clearance is likely to:

(a) create or contribute to soil erosion;

(b) decrease soil stability and initiate soil slip;

(c) create, or contribute to, a local or regional soil salinity problem;

(d) lead to the deterioration in the quality of surface waters; or

(e) create or exacerbate the incidence or intensity of local or regional flooding.

39 When clearance is proposed, consideration should be given to:

(a) retention of native vegetation for, or as:

(i) corridors or wildlife refuges;

(ii) amenity purposes;

(iii) livestock shade and shelter; or

(iv) protection from erosion along watercourses and the filtering of suspended solids and nutrients from run-off;

(b) the effects of retention on farm management; and

(c) the implications of retention or clearance on fire control.

40 Local indigenous plant species should be considered for landscaping, screening buffer planting and revegetation activities.

Contaminated Land

OBJECTIVES

Objective 18: Protection of human health and the environment wherever site contamination has been identified or is suspected to have occurred.

Objective 19: Appropriate assessment and remediation of site contamination to ensure land is suitable for the proposed use and provides a safe and healthy living and working environment.

PRINCIPLE OF DEVELOPMENT CONTROL

41 Development, including land division, should not occur where site contamination has occurred unless the site has been assessed and remediated as necessary to ensure that it is suitable and safe for the proposed use.

Crime Prevention

OBJECTIVE

Objective 20: A safe, secure, crime resistant environment where land uses are integrated and designed to facilitate community surveillance.

PRINCIPLES OF DEVELOPMENT CONTROL

42 Development should be designed to maximise surveillance of public spaces through the incorporation of clear lines of sight, appropriate lighting and the use of visible permeable barriers wherever practicable.

43 Buildings should be designed to overlook public and communal streets and public open space to allow casual surveillance.

44 Development should provide a robust environment that is resistant to vandalism and graffiti.

45 Development should provide lighting in frequently used public spaces including those:

(a) along dedicated cyclist and pedestrian pathways, laneways and access routes

(b) around public facilities such as toilets, telephones, bus stops, seating, litter bins, automatic teller machines, taxi ranks and car parks.

46 Development, including car park facilities should incorporate signage and lighting that indicate the entrances and pathways to, from and within sites.

47 Landscaping should be used to assist in discouraging crime by:

(a) screen planting areas susceptible to vandalism

(b) planting trees or ground covers, rather than shrubs, alongside footpaths

(c) planting vegetation other than ground covers a minimum distance of 2 metres from footpaths to reduce concealment opportunities.

48 Site planning, buildings, fences, landscaping and other features should clearly differentiate public, communal and private areas.

49 Buildings should be designed to minimise and discourage access between roofs, balconies and windows of adjoining dwellings.

Sloping Land

OBJECTIVES

Objective 89: Development on sloping land designed to minimise environmental and visual impacts and protect soil stability and water quality.

PRINCIPLES OF DEVELOPMENT CONTROL

327 Development and associated driveways and access tracks should be sited and designed to integrate with the natural topography of the land and minimise the need for earthworks.

328 Development and associated driveways and access tracks, including related earthworks, should be sited, designed and undertaken in a manner that:

(a) minimises their visual impact;

(b) reduces the bulk of the buildings and structures;

(c) minimises the extent of cut and/or fill;

(d) minimises the need for, and the height of, retaining walls;

(e) does not cause or contribute to instability of any embankment or cutting;

(f) avoids the silting of watercourses;

(g) protects development and its surrounds from erosion caused by water run-off.

329 Driveways and access tracks across sloping land should be accessible and have a safe, all-weather trafficable surface.

330 Development sites should not be at risk of landslip.

331 Development on steep land should include site drainage systems to minimise erosion and avoid adverse impacts on slope stability.

332 Steep sloping sites in unsewered areas should not be developed unless the physical characteristics of the allotments enable the proper siting and operation of an effluent drainage field suitable for the development intended.

Transportation and Access

OBJECTIVES

Objective 90: A comprehensive, integrated, affordable and efficient air, rail, sea, road, cycle and pedestrian transport system that will:

(a) provide equitable access to a range of public, community and private transport services for all people;

(b) ensure a high level of safety;

(c) effectively support the economic development of the State;

(d) have minimal negative environmental and social impacts;

(e) maintain options for the introduction of suitable new transport technologies.

Objective 91: Development that:

(a) provides safe and efficient movement for all motorised and non-motorised transport modes;

(b) ensures access for vehicles including emergency services, public infrastructure maintenance and commercial vehicles;

(c) provides off street parking;

(d) is appropriately located so that it supports and makes best use of existing transport facilities and networks.

Objective 92: A road hierarchy that promotes safe and efficient transportation in an integrated manner throughout the State.

Objective 93: Provision of safe, pleasant, accessible, integrated and permeable pedestrian and cycling networks.

Objective 94: Safe and convenient freight movement throughout the State.

PRINCIPLES OF DEVELOPMENT CONTROL

Land Use

333 Land uses arranged to support the efficient provision of sustainable transport networks and encourage their use.

Movement Systems

334 Development should be integrated with existing transport networks, particularly major rail and road corridors and designed to minimise its potential impact on the functional performance of the transport networks.

335 Transport corridors should be sited and designed so as to not unreasonably interfere with the health and amenity of adjacent sensitive land uses.

336 Roads should be sited and designed to blend with the landscape and be in sympathy with the terrain.

337 Land uses that generate large numbers of visitors such as shopping centres and areas, places of employment, schools, hospitals and medium to high density residential uses should be located so that they can be serviced by existing transport networks and encourage walking and cycling.

338 Development generating high levels of traffic, such as schools, shopping centres and other retail areas, entertainment and sporting facilities, should incorporate passenger pick-up and set down areas. The design of such areas should ensure interference to existing traffic is minimised and give priority to pedestrians, cyclists and public and community transport users.

339 The location and design of public and community transport set-down and pick-up points should maximise safety and minimise the isolation and vulnerability of users.

340 Development should provide safe and convenient access for all anticipated modes of transport including cycling, walking, public and community transport, and motor vehicles.

341 Development at intersections, pedestrian and cycle crossings, and crossovers to allotments should maintain or enhance sightlines for motorists, cyclists and pedestrians to ensure safety for all road users and pedestrians.

342 Driveway cross-overs affecting pedestrian footpaths should maintain the level of the footpath.

343 Development should discourage commercial and industrial vehicle movements through residential streets and adjacent other sensitive land uses such as schools.

344 Industrial/commercial vehicle movements should be separated from passenger vehicle car-parking areas.

345 Development should make sufficient provision on site for the loading, unloading and turning of all traffic likely to be generated.

Cycling and Walking

346 Development should ensure that a permeable street and path network is established that encourages walking and cycling through the provision of safe, convenient and attractive routes with connections to adjoining streets, paths, open spaces, schools, public and community transport stops and activity centres.

347 Development should provide access, and accommodate multiple route options, for cyclists by enhancing and integrating with:

(a) open space networks, recreational trails, parks, reserves and recreation areas;

(b) Adelaide's Metropolitan Open Space System.

348 Cycling and pedestrian networks should be designed to be permeable and facilitate direct and efficient passage to neighbouring networks and facilities.

349 New developments should give priority to and not compromise existing designated bicycle routes.

350 Where development coincides with, intersects or divides a proposed bicycle route or corridor, development should incorporate through-access for cyclists.

351 Developments should encourage and facilitate cycling as a mode of transport by incorporating end-of journey facilities including:

(a) showers, changing facilities, and secure lockers;

(b) signage indicating the location of bicycle facilities;

(c) secure bicycle parking facilities.

352 Pedestrian facilities and networks should be designed and provided in Accordance with relevant provisions of the *Australian Standards and Austroads Guide to Traffic Engineering Practice Part 13.*

353 Cycling facilities and networks should be designed and provided in accordance with the relevant provisions of the *Australian Standards and Austroads Guide to Traffic Engineering Practice Part 14*.

Access

354 Development should have direct access from an all weather public road.

355 Development should be provided with safe and convenient access which:

(a) avoids unreasonable interference with the flow of traffic on adjoining roads;

(b) accommodates the type and volume of traffic likely to be generated by the development or land use and minimises induced traffic through over-provision;

(c) is sited and designed to minimise any adverse impacts on the occupants of and visitors to neighbouring properties.

356 Development should not restrict access to publicly owned land.

357 The number of vehicle access points onto arterial roads should be minimised, and where possible access points should be:

(a) limited to local roads;

(b) shared between developments.

358 The number of access points for cyclists and pedestrians onto all adjoining roads should be maximised.

359 Development with access from roads with existing or projected traffic volumes exceeding 6000 vehicles per day should be sited to avoid the need for vehicles to reverse on to the road.

360 Driveways, access tracks and parking areas should be designed and constructed to:

(a) follow the natural contours of the land;

(b) minimise excavation and/or fill;

(c) minimise the potential for erosion from run-off;

(d) avoid the removal of existing vegetation;

(e) be consistent with *Australian Standard AS 2890 Parking facilities*.

Access for People with Disabilities

361 Development should be sited and designed to provide convenient access for people with a disability.

Vehicle Parking

362 Development should be consistent with *Australian Standard AS 2890 Parking facilities*.

363 Vehicle parking areas should be sited and designed in a manner that will:

(a) facilitate safe and convenient pedestrian linkages to the development and areas of significant activity or interest in the vicinity of the development;

(b) include safe pedestrian and bicycle linkages that complement the overall pedestrian and cycling network;

(c) not inhibit safe and convenient traffic circulation;

(d) result in minimal conflict between customer and service vehicles;

(e) avoid the necessity to use public roads when moving from one part of a parking area to another;

(f) minimise the number of vehicle access points to public roads;

(g) avoid the necessity for backing onto public roads;

(h) provide the opportunity for shared use of car parking and integration of car parking areas with adjoining development to reduce the total extent of vehicle parking areas and the requirement for access points;

(i) not dominate the character and appearance of a centre when viewed from public roads and spaces;

(j) provide landscaping that will shade and enhance the appearance of the vehicle parking areas.

364 Vehicle parking areas should be designed to reduce opportunities for crime by:

(a) maximising the potential for passive surveillance by ensuring they can be overlooked from nearby buildings and roads;

(b) incorporating walls and landscaping that do not obscure vehicles or provide potential hiding places;

(c) being appropriately lit;

(d) having clearly visible walkways.

365 Where parking areas are not obviously visible or navigated, signs indicating the location and availability of vehicle parking spaces associated with businesses should be displayed at locations readily visible to customers.

366 Parking areas that are likely to be used during non daylight hours should provide floodlit entrance and exit points and site lighting directed and shaded in a manner that will not cause nuisance to adjacent properties or users of the car park.

367 Parking areas should be sealed or paved in order to minimise dust and mud nuisance.

368 To assist with stormwater detention and reduce heat loads in summer, vehicle parking areas should include soft (living) landscaping.

369 Parking areas should be line-marked to indicate parking bays, movement aisles and direction of traffic flow.

Infrastructure

370 A Traffic Impact Study should be undertaken to determine the potential impact of developments on the surrounding arterial road network. Works that are required as a direct result of providing safe and efficient access to any proposed development should be provided.

Telecommunications Facilities

OBJECTIVES

Objective 95: Telecommunications facilities provided to meet the needs of the community.

Objective 96: Telecommunications facilities located and designed to minimise visual impact on the amenity of the local environment.

Telecommunications facilities are an essential infrastructure required to meet the rapidly increasing community demand for communications technologies. To meet this demand there will be a need for new telecommunications facilities to be constructed.

The Commonwealth Telecommunications Act 1997 is pre-eminent in relation to telecommunications facilities. The Telecommunications (Low-impact Facilities) Determination 1997 identifies a range of facilities that are exempt from State planning legislation. The development of low impact facilities to achieve necessary coverage is encouraged in all circumstances where possible to minimise visual impacts on local environments.

Where required, the construction of new facilities is encouraged in preferred industrial and commercial and appropriate non-residential zones. Recognising that new facility development will be unavoidable in more sensitive areas in order to achieve coverage for users of communications technologies, facility design and location in such circumstances must ensure visual impacts on the amenity of local environments are minimised.

50 Public toilets should be located, sited and designed:

(a) to promote the visibility of people entering and exiting the facility (eg by avoiding recessed entrances and dense shrubbery that obstructs passive surveillance)

(b) near public and community transport links and pedestrian and cyclist networks to maximise visibility.

51 Development should avoid pedestrian entrapment spots and movement predictors (eg routes or paths that are predictable or unchangeable and offer no choice to pedestrians).

Energy Efficiency

OBJECTIVES

Objective 21: Development designed and sited to conserve energy.

Objective 22: Development that provides for on-site power generation including photovoltaic cells and wind power.

PRINCIPLES OF DEVELOPMENT CONTROL

52 Development should provide for efficient solar access to buildings and open space all year around.

53 Buildings should be sited and designed:

(a) to ensure adequate natural light and winter sunlight is available to the main activity areas of adjacent buildings;

(b) so that open spaces associated with the main activity areas face north for exposure to winter sun.

On-site Energy Generation

54 Development should facilitate the efficient use of photovoltaic cells and solar hot water systems by:

(a) taking into account overshadowing from neighbouring buildings;

(b) designing roof orientation and pitches to maximise exposure to direct sunlight.

55 Public infrastructure and lighting should be designed to generate and use renewable energy.

Form of Development

OBJECTIVES

Objective 23: Orderly and economic development, consistent also with Maps Ga/1 (Overlay 1) Enlargements A, B, C, D, E, F, G and H.

The maps illustrate the distribution of living, business, rural, recreational and conservation areas and the main routes for traffic and transport.

Objective 24: A sustainable urban form that reduces the ecological footprint of the town, whilst also enhancing the quality of life of residents.

Development of new areas within the urban boundary shown on Map Ga/1 should occur in a logical and systematic manner with a clearly defined edge between urban and surrounding rural areas.

Objective 25: Location of suitable areas of land for living, working, recreation and rural production.

Current and anticipated demographic trends within the Adelaide metropolitan area show declining dwelling occupancy rates, particularly in the inner and middle suburbs. This will necessitate increasing dwelling density to maintain population levels and services.

Concerns about population change, increased housing demand, efficient use of urban infrastructure and reducing fringe growth can be addressed by increasing the number of dwellings that can be accommodated within the existing boundary of the metropolitan area, and positively influencing decline in population.

Objective 26: Effective location of public and community facilities by the reservation of suitable land in advance of need.

Development should not hinder the reservation of land needed for transport, public services, schools and the provision of other essential services.

PRINCIPLES OF DEVELOPMENT CONTROL

56 Extensions of built-up areas should not be in the form of ribbon development along arterial roads unless indicated in zone policies or structure plans.

57 Development in localities having a bad or unsatisfactory layout, or unhealthy or obsolete development, should improve or rectify those conditions.

58 Urban development should be confined to areas within the urban boundary of Metropolitan Adelaide and be based on principles of ecologically sustainable development (ESD) that includes water sensitive urban design (WSUD), energy efficiency, biodiversity protection and enhancement, natural resource protection, waste, minimisation, indoor and outdoor environmental quality and sustainable selection and use of materials.

59 Development adjacent to the rural/urban interface, as indicated on Map Ga/1 (Overlay 1) Enlargements Part A and Part B should incorporate suitable buffers to minimise the effect of potential impacts.

60 Development should minimise the potential for personal and property damage arising from natural hazards including landslip, bushfires and flooding.

61 Septic tanks should:

(a) not be installed where the effluent is likely to lead to the pollution of surface or underground water; and

(b) be installed on allotments large enough to allow the disposal of the effluent within the allotment boundaries.

62 Development should not create conditions which are likely to exceed the capacity of existing roads, public utilities, and other community services and facilities.

63 Development should be supplied with adequate energy, water, waste disposal and drainage facilities to serve the needs of users.

Hazards

OBJECTIVES

Objective 27: Maintenance of the natural environment and systems by limiting development in areas susceptible to flooding.

Open Space Zone

Refer to the *Map Reference Tables* for a list of the maps that relate to this zone.

OBJECTIVES

1 A zone:

(a) in which the open space character is preserved to provide a visual contrast to the surrounding urban area

(b) comprising open space that accommodates a range of public and private activities in an open and natural setting, including:

(i) passive and active recreation land uses

(ii) habitat conservation and restoration.

2 Private land located within the Metropolitan Open Space System (MOSS) contributing to regional open space networks and providing an open, natural and rural character accommodating low-scale uses such as non-intensive agriculture.

3 Public land located within the MOSS that provides for recreation areas and facilities, sporting facilities and conservation of the open, natural character.

4 A linear park that:

(a) provides an open space corridor across Regional South Australia

(b) promotes the use, awareness and preservation of the riverine environment and enhancement of natural or semi natural habitats for the movement of wildlife and conservation of biodiversity.

5 A river system which provides for the maintenance of stormwater capacity and flood mitigation measures for adjoining areas.

6 Development that contributes to the desired character of the zone.

DESIRED CHARACTER

The zone recognises the special qualities of the South Para River and environs, and it is intended that the zone will manage the river and its interface.

The zone already has natural character and function based on the existing South Para River, topographically steep contours, floodplains and remnant vegetation. This character and function will be maintained and enhanced though appropriate revegetation.

Areas located within the zone contain significant flora and fauna, wetlands and permanent waterholes and river corridors and adjoin grassy woodland habitats.

The aesthetic and natural landscape, together with biodiversity value of the zone will be maintained and enhanced in a manner which encourages appropriate human enjoyment and interaction. Whilst the primary intent of the zone is to enhance the natural character of the area, carefully managed development of a demonstrated benefit to the community is envisaged.

Facilities will include but are not limited to walking and cycling trails, interpretative and recreational activities, formalised open space and car parking. It is envisaged that roads will be developed in the zone to enable access between areas.

A high pressure gas transmission pipeline traverses the zone as shown on *Concept Plan MAP Baro/15 - Gawler East*. It is required that development located within the zone comply with *AS2885 (Pipeline Gas and Liquid Petroleum)* to ensure minimum pipeline safety requirements have been met.

PRINCIPLES OF DEVELOPMENT CONTROL

Land Use

1 The following forms of development are envisaged in the zone:

- conservation work
- farming
- outbuilding associated with open space maintenance
- lighting
- playground
- recreation area
- sporting club facility
- structure associated with a public facility such as car parking, picnic/barbeque area, shelter and toilet
- toilet block and barbeque facility.

2 Development listed as non-complying is generally inappropriate.

3 Publicly owned land located within the MOSS should be used for any of the following:

(a) to provide natural or landscaped open space using locally indigenous plant species

(b) to accommodate a range of public recreation, sporting and institutional facilities and uses

(c) to accommodate stormwater retention and management

(d) to conserve and restore areas of remnant native vegetation and wildlife habitats and corridors

(e) to conserve sites of scientific, cultural or heritage interest

(f) for revegetation purposes using locally indigenous plant species

(g) to provide a buffer to adjoining areas of conservation significance.

4 Privately owned land located within the MOSS should be used for any of the following:

(a) rural activities and agriculture (but not intensive animal keeping)

(b) low-impact sporting facilities

(c) conservation purposes.

5 Development should allow for unstructured passive and active recreation.

Form and Character

6 **D**evelopment should not be undertaken unless it is consistent with the desired character for the zone.

7 Development should only occur where it is integral to the aesthetic, drainage or recreation function of the zone.

8 Buildings should be:

(a) restricted in size and number

(b) sited so as not to detract from the open natural character of the policy area

(c) constructed of materials which blend with the riverine landscape.

9 Development should ensure co-ordinated design with an emphasis on the creation of pedestrian areas.

10 Landscaped buffers should be provided around the perimeter of recreation or sporting facilities.

11 Landscaping should comprise locally indigenous species and incorporate existing remnant vegetation.

12 Vehicular access or crossings should not occur through the linear park.

13 Development should ensure that public access to the Linear Park is retained and enhanced for cyclists and pedestrians.

14 Development, landscaping and paths for pedestrians and cyclists should:

(a) take into account changing flow regime and width of waterways

(b) be constructed of permeable material where practical to reduce stormwater runoff.

Land Division

15 Land division should not be undertaken except where one of the following applies:

(a) it will facilitate the development of an envisaged use in the zone or policy area

(b) it will facilitate the development of an envisaged road in the zone or policy area

(c) no additional allotments are created.

PROCEDURAL MATTERS

Complying Development

Complying developments are prescribed in Schedule 4 of the *Development Regulations 2008*.

Non-complying Development

Development (including building work, a change in the use of land, or division of an allotment) for the following is non-complying:

Form of Development	Exceptions
Advertisement and/or advertising hoarding	
Amusement machine centre	
Consulting room	
Crematorium	
Dairy	

Form of Development	Exceptions
Dwelling	
Educational establishment	
Fuel depot	
Horticulture	
Hospital	
Hotel	
Industry	
Intensive animal keeping	
Motel	
Motor repair station	
Nursing home	
Office	Except in association with recreation facilities.
Petrol filling station	
Place of worship	
Pre-school	
Prescribed mining operations	
Public service depot	
Residential flat building	
Restaurant	
Road transport terminal	
Service trade premises	
Shop of group of shops	Except where the gross leasable area is 80 square metres or less.
Stock sales yard	
Stock slaughter works	
Store	
Tourist accommodation	
Warehouse	
Waste reception, storage, treatment or disposal	
Wrecking yard	

Public Notification

Categories of public notification are prescribed in Schedule 9 of the *Development Regulations 2008*.

Residential (Gawler East) Zone

Refer to the *Map Reference Tables* for a list of the maps that relate to this zone.

OBJECTIVES

1 A predominately residential area comprising a range of low and medium-density dwellings, with associated infrastructure, retail, commercial, recreational, educational and community development in master-planned locations in accordance with *Concept Plan Map Baro/15 - Gawler East*.

2 A residential zone comprising a range of dwelling types including a minimum of 15 per cent affordable housing.

3 Increased dwelling densities in close proximity to centres, public transport routes and public open spaces.

4 Open space systems designed to provide multiple use reserve areas that promote water management, habitat retention and enhancement, and recreational linkages.

5 Development that contributes to the desired character of the zone.

DESIRED CHARACTER

The zone is located within both the Town of Gawler and The Barossa Council. The area encompasses broad hectare land which is expected to support a population of approximately 10 000 persons.

The zone will develop in accordance with *Concept Plan Map Baro/15 - Gawler East* and be undertaken in an orderly manner that achieves the most efficient use of land, the extension or expansion of infrastructure services and the timely provision of community facilities.

It is essential that development respects and enhances the natural attributes of the zone through the retention of significant views, creek lines, native vegetation and locations of ecological significance. Innovative and best practice solutions in water reuse, grey water supply and stormwater management will be implemented.

The zone will accommodate a diversity of housing forms. Dwellings will range between one and three storeys in height, however buildings at the interface with adjoining zones other than the **Open Space Zone** will not exceed two storeys.

Housing forms will be simple and incorporate a high degree of articulation to the street façade while delivering a mix of housing types and forms to provide interesting streetscapes and promote social interaction. This will include the provision of recessed vehicle garaging and the inclusion of front verandas/porticos and appropriate landscaping.

The delivery of housing diversity will require innovative solutions for front or rear access and parking. Rear access will be provided in the form of ‘service lanes’, which support vehicular access requirements at reduced speeds providing a safe pedestrian environment.

Allotment configuration is envisaged to be compact, with building setbacks minimised to assist in facilitating an enclosed and active street. This will incorporate opportunities for multi-storey apartments, terrace and rear lane mews housing that will achieve a range of housing types within a single street.

The slope of the land will dictate the location of particular dwelling types, with some more compact dwelling types located on relatively flat sites, whilst more traditional dwelling types will be located on those portions of the site with moderate to high slope. Greater setbacks are envisaged on topographically steep sites in order to satisfactorily deal with earthworks and driveway gradients.

The form and distribution of major open space will be influenced by the need for stormwater detention, treatment and re-use given limitations on the potable water supply for the area. It will also be influenced by the location of drainage corridors, and the need to integrate with existing corridors. Public open space areas will need to accommodate both active and passive recreation opportunities and the retention of identified habitat areas of significance.

A network of linear parks including cohesive pedestrian and bicycle movement corridors and visual links will be established between the new development and adjoining natural creek lines, public recreation areas, local shopping and community services and surrounding road networks.

Portion of the southern boundary of the zone is located adjacent to the Para Woodland Reserve. It is essential that development form an appropriate interface with the Para Woodland Reserve. The interface will act as a buffer between the residential area and the Reserve, balancing access, management of bushfire risk, management of potential invasion by pest plants, minimising the impact of domestic pets on native wildlife and as a provision of open space. The interface will vary in width as appropriate to meet the above criteria and will comprise of a combination of roads, paths, public open space and, where appropriate, areas of natural character for stormwater management. Where housing is included in the interface area it is expected that houses will address the Reserve. The interface area will be planted with locally indigenous species (mainly groundcovers and low shrubs) selected to minimise the bushfire risk by providing an area of reduced fuel hazard.

The north, eastern and southern boundary of the zone adjoins agricultural, rural and rural living land. It is essential that development provide an appropriate buffer between dwellings and land used for agriculture. Larger allotments together with open space and road networks and increased dwelling setbacks will be established at the peripheries of the zone boundary in order to provide an appropriate low density transition and interface with adjacent rural and rural living land.

A high pressure gas transmission pipeline traverses the zone as shown on *Concept Plan Map Baro/15 - Gawler East*. It is required that development located within the zone comply with *AS2885 (Pipeline Gas and Liquid Petroleum)* to ensure minimum pipeline safety requirements have been met.

The Infrastructure Corridor has been created in response to the presence of key public infrastructure, namely 132 kV and 275 kV transmission lines. This infrastructure comprises a significant component of the State's high voltage power transmission network. The zone provisions are aimed at protecting this significant public infrastructure from encroachment by incompatible land uses and protecting the infrastructure corridor from being fragmented by land division, and therefore ensuring on-going access for maintenance is available and that the security and reliability of the power network is not compromised. No residential allotments should infringe on the corridor or existing easement. This corridor provides the opportunity for co-locating compatible land use activities such as other appropriate infrastructure, at-grade car parking and roads, a linear park, or a cycling/walking trail.

PRINCIPLES OF DEVELOPMENT CONTROL

Land Use

1 The following forms of development are envisaged in the zone:

- affordable housing
- community facilities
- domestic outbuilding in association with a dwelling
- domestic structure
- dwelling
- dwelling addition
- dwelling with associated home based business uses

- non-residential use that serves the local community, for example:
  - child care facility
  - health and welfare service
  - open space
  - primary and secondary school
  - recreation area
  - shop, office or consulting room
- supported accommodation.

2 Development listed as non-complying is generally inappropriate.

Form and Character

3 Development should not be undertaken unless it is consistent with the desired character for the zone.

4 Development should occur in accordance with the *Concept Plan Map Baro/15 - Gawler East*.

5 Road reserves should be of a width, design and alignment that can:

(a) provide for safe and convenient movement and parking of vehicles and other users according to projected vehicle volumes, speeds and the character of the road

(b) accommodate bus routes where required

(c) provide for shared, on-street parking bays for nearby residents and visitors wherever practical to achieve unrestricted movement along collector roads

(d) allow vehicles to enter or reverse from an allotment or garage in a single movement, allowing for cars parked on the opposite side of the road (where applicable) or fixed infrastructure on the street

(e) allow for the efficient movement of service and emergency vehicles

(f) accommodate street planting, landscaping, street furniture and utilities infrastructure.

6 The use and placement of outbuildings should be ancillary to and in association with a dwelling or dwellings.

Built Form/Setbacks

7 Dwellings will range between one and three storeys in height however buildings at the interface with adjoining zones other than the **Open Space Zone** will not exceed two storeys.

8 Where allotments have direct frontage to an open space reserve, housing should address the reserve.

9 Where an allotment immediately adjoins a public open space, clear, safe and efficient pedestrian access should be provided to the dwelling, along with adequate visitor parking.

10 Residential building setbacks should satisfy the minimum dimensions outlined in following table except where a proposed plan of division is accompanied by a building envelope plan that demonstrates that lesser building setbacks will contribute to the achievement of the desired character for the zone:

Parameter	Value
Primary street frontage (excluding arterial or collector roads forming the zone boundary)	3 metres to front facade 1.5 metres for dwellings where vehicle access obtained from the rear or side 1.5 metres to veranda/balcony elements 0.5 metres to entry porch and portico

Parameter	Value
Secondary street frontage (corner lots)	1.5 metres to facade 0.6 metres for dwellings on allotments with a frontage equal to or less than 9 metres 0.5 metres for veranda/balcony elements 0 metres for entry porch/portico
Side boundary (excluding road frontage)	0 metres for dwellings on allotments with a road frontage equal to or less than 9 metres; 0.9 metres for dwellings on allotments with a frontage greater than 9 metres, other than a garage wall with a maximum length of 6 metres
Rear boundary (other than rear lane)	0.9 metres
Open space reserve frontage	1.5 metres where dwellings front the reserve 0.5 metres to entry porch and portico, veranda and balcony elements.
Single carport/garage	5 metres from primary street frontage 0.5 metres for laneway frontage
Double carport/garage	5 metres from primary street frontage 0.5 metres for laneway frontage
Arterial or collector roads	6 metres to front façade 5.5 metres to carport/garage 4 metres to veranda/balcony
Rear Lane (upper level dwelling)	0.5 metres for laneway frontage

Private Open Space

11 Dwellings should include private open space which conforms to the requirements of the following table:

Site area of dwelling	Minimum area of private open space	Provisions
Greater than 250 square metres	60 square metres (minimum dimension of 2.5 metres)	(a) Balconies, roof patios, decks and the like, can comprise part of this area provided the area of each is 8 square metres or greater and has a minimum dimension of 2 metres. (b) One part of the space should be directly accessible from a living room and have an area of 25 square metres with a minimum dimension of 4 metres and a maximum gradient of 1-in-10.
250 square metres or less	35 square metres (minimum dimension of 2.5 metres)	(a) Balconies, roof patios and the like can comprise part of this area provided the area of each is 8 square metres or greater and has a minimum dimension of 2 metres. (b) One part of the space is directly accessible from a living room and has an area of 16 square metres with a minimum dimension of 4 metres and a maximum gradient of 1-in-10.

Site area of dwelling	Minimum area of private open space	Provisions
	25 square metres (minimum dimension of 2.5 metres) where:	(a) The dwelling has no more than two bedrooms (or rooms that could reasonably be used as bedrooms) and a total floor area of not more than 110 square metres. (b) Separate areas are provided for the provision of a rainwater tank and the storage of refuse and recycling bins.
Upper level dwellings	Minimum area of private open space	8 square metres and accessible from a living room.

Amenity and Public Spaces

12 Residential development should have regard to existing and possible future noise sources with respect to site layout, orientation, design and construction to ensure a safe and comfortable residential environment and to minimise conflict with existing non-residential activities.

13 Front fencing should balance the desire for an open streetscape and passive surveillance with the need for functional privacy. Clear delineation should be provided between public and private spaces, which may incorporate fencing, landscaping or a combination of these elements.

14 Residential development should provide an area for the storage of waste receptacles that is screened from primary and secondary street frontages.

Bushfire Protection

15 To protect against bushfire, dwellings should not be sited within 40 metres of a slope greater than 20 degrees, where the length of the slope is greater than 10 metres and covered by unmanaged vegetation.

Separation of Uses

16 Development should be designed and sited to minimise negative impact on existing and potential future land uses considered appropriate in the locality.

17 Residential development adjacent to non-residential zones and land uses should be located, designed and/or sited to protect residents from potential adverse impacts from non-residential activities.

Car Parking

18 For each dwelling, the maximum width (including the width of any support structure) of any garage or carport opening that faces a street, should be no greater than 6 metres or 50 per cent of the frontage width, whichever is the lesser except where a site has frontage of less than 12 metres and the dwelling:

(a) is two or more storeys

(b) incorporates protrusions such as verandas, projecting windows, porches, balconies etc. which provide articulation in the building as it presents to the street, in which case garages or carports should have a maximum width of 6 metres or 80 per cent of the width of the site, whichever is the lesser.

19 No maximum width applies to garage or carport openings where a site has rear vehicular access and from which vehicular access is obtained.

Affordable Housing

20 Development should include a minimum 15 per cent of residential dwellings for affordable housing.

21 Affordable housing should be distributed throughout the zone to avoid over-concentration of similar types of housing in a particular area.

22 Dwellings constituting affordable housing should be designed located within the parameters shown in following table:

Parameter	Detached Dwelling	Semi-Detached Dwelling	Group Dwelling	Residential Flat Building	Row Dwelling
Minimum area of private open space for ground level dwellings	20 square metres	20 square metres	20 square metres	20 square metres	20 square metres
Minimum area of private open space in the form of a balcony for dwellings above ground level	8 square metres	8 square metres	8 square metres	8 square metres	8 square metres
Minimum open space dimension	3 metres for ground level private open space and 2 metres for balconies	3 metres for ground level private open space and 2 metres for balconies	3 metres for ground level private open space and 2 metres for balconies	3 metres for ground level private open space and 2 metres for balconies	3 metres for ground level private open space and 2 metres for balconies
Minimum number of on site car parking spaces	1	1	1	1	1

Land Division

23 Land division should facilitate the provision of a broad range of housing options, including affordable housing.

24 Land division should accommodate open space and movement networks that provide for strong connections and safe and convenient access to public facilities, public transport and potential future development of adjoining sites.

25 Rear lanes should:

(a) have a minimum reserve width of 6.5 metres

(b) be limited in length to a maximum of 100 metres

(c) generally have a minimum carriageway width of 5.5 metres, although entries may be reduced to a minimum width of 4 metres

(d) protuberances to accommodate landscaping and lighting should not exceed 1 metre however may be increased providing a minimum carriageway width of 5.5 metres is maintained

(e) landscaping should be in the form of tall vertical trees in preference to low level shrubs

(f) be designed to accommodate garbage trucks and emergency service vehicles.

26 Public lighting should be provided to all public roads, laneways, paths and open spaces.

27 Detention and/or retention basins should incorporate good design techniques that:

(a) allow sediments to settle so as to treat stormwater prior to discharge into watercourses or the marine environment

(b) ensure human health and safety, particular with respect to high velocity drainage points

(c) ensures the control of mosquitoes and nuisance insects (eg midges)

(d) where wetlands are used for the cleaning of stormwater it is advisable that the storage is able to retain the 1-in-25 year average return interval, 24 hour rainfall event.

28 Transmission lines should be protected from encroachment through the provision of a:

(a) 30 metre wide corridor (15 metres each side from the centreline) for the 132 kV line

(b) 50 metre wide corridor (25 metres each side from the centreline) for the 275 kV line

29 Residential allotments should not be created located within the '**Infrastructure Corridor**' as shown on *Concept Plan Map Baro/15 - Gawler East* or located within the existing easements for the 132 kV and 275 kV transmission lines.

30 Electricity supply (excluding lines having a capacity greater than or equal to 33 kV) should be installed underground.

31 Existing transmission lines should not be encroached upon by incompatible land uses.

32 Provision should be made for new distribution substations and overhead major electricity line corridors (having a capacity greater than or equal to 33 kV) in optimum locations with adequate access.

PROCEDURAL MATTERS

Complying Development

Complying developments are prescribed in Schedule 4 of the *Development Regulations 2008*.

Non-complying Development

Development (including building work, a change in the use of land, or division of an allotment) for the following is non-complying:

Form of development	Exceptions
Crematorium	
Fuel depot	
Horticulture	
Hospital	
Hotel	
Industry	
Intensive animal keeping	
Junk yard	
Major public service depot	

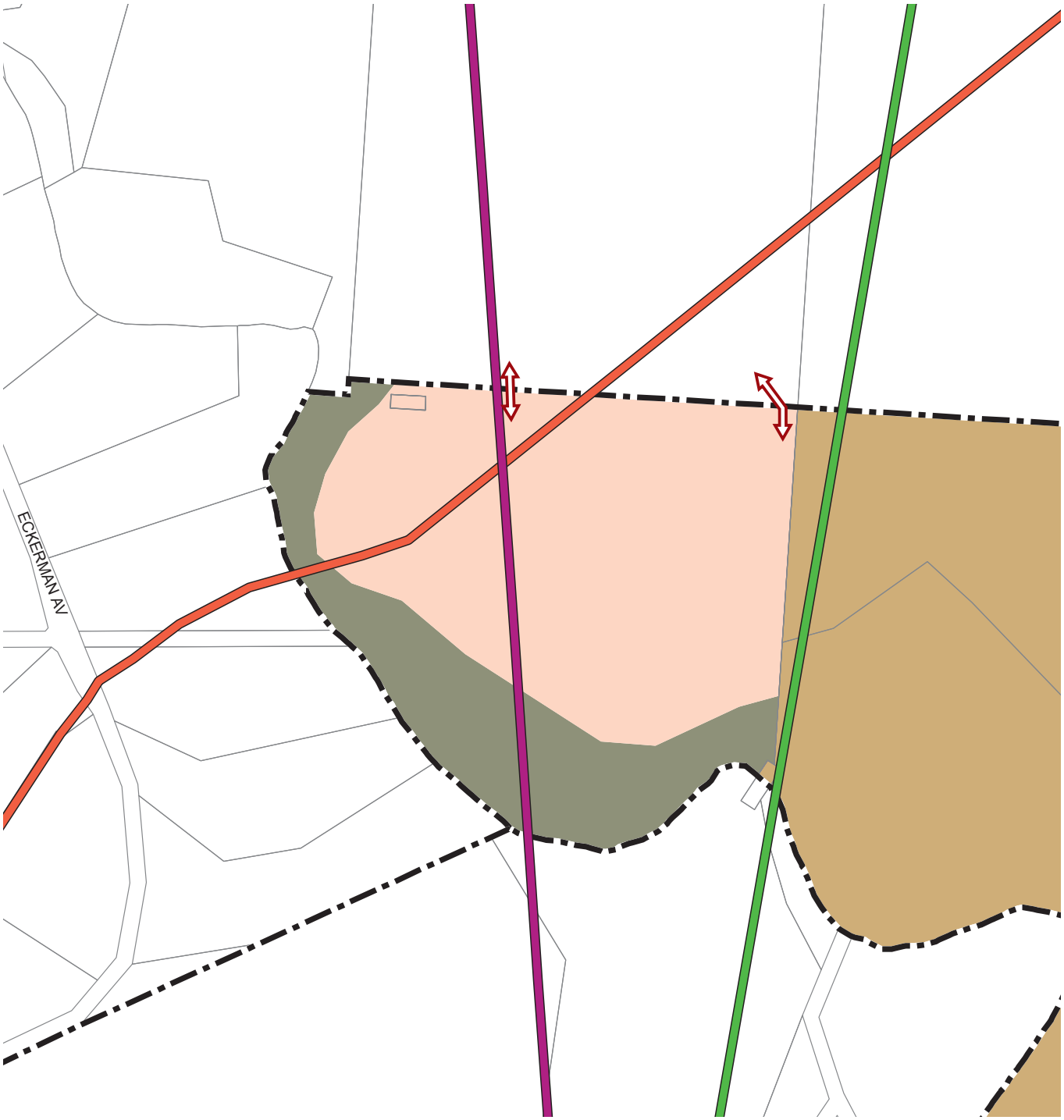
Form of development	Exceptions
Motel	
Office	Except an office of 150 square metres or less.
Prescribed mining operations	
Refuse destructor	
Shop or group of shops	Except a shop or group of shops where the gross leasable area is 250 square metres less.
Telecommunications facility above 30 metres in height	
Warehouse	
Waste reception, storage, treatment or disposal except a sewerage treatment plant	

Public Notification

Categories of public notification are prescribed in Schedule 9 of the *Development Regulations 2008*.

Further, the following forms of development (except where the development is non-complying) are designated:

Category 1	Category 2
	Affordable housing Community facilities Domestic outbuilding in association with a dwelling. Domestic structure Dwelling Dwelling addition Dwelling with associated home based business uses. Non-residential use that serves the local community, including: ▪ child care facility ▪ health and welfare service ▪ open space ▪ primary and secondary school ▪ recreation area ▪ shop, office or consulting room. Supported accommodation



Major Transmission Infrastructure (132kV) Corridor (30Metres)

Major Transmission Infrastructure (275kV) Corridor (50Metres)

Gas Pipelines

Proposed Vehicle Access

Open Space

Primary Production

Residential

Development Plan Boundary

N

0 100 200 300 400 500 metres

GAWLER EAST

Concept Plan Map Baro/15

GAWLER EAST

BAROSSA COUNCIL

Consolidated - 1 November 2018

Land Division

OBJECTIVES

1 Land division that occurs in an orderly sequence allowing efficient provision of new infrastructure and facilities and making optimum use of existing under utilised infrastructure and facilities.

2 Land division that creates allotments appropriate for the intended use.

3 Land division that is integrated with site features, including landscape and environmental features, adjacent land uses, the existing transport network and the availability of infrastructure.

4 Land division restricted in rural areas to ensure the efficient use of rural land for primary production and avoidance of uneconomic infrastructure provision.

PRINCIPLES OF DEVELOPMENT CONTROL

1 When land is divided:

(a) stormwater should be capable of being drained safely and efficiently from each proposed allotment and disposed of from the land in an environmentally sensitive manner

(b) a sufficient water supply should be made available for each allotment

(c) provision should be made for the disposal of wastewater, sewage and other effluent from each allotment without risk to health

(d) proposed roads should be graded, or be capable of being graded to connect safely and conveniently with an existing road or thoroughfare.

2 Land should not be divided if any of the following apply:

(a) the size, shape, location, slope or nature of the land makes any of the allotments unsuitable for the intended use

(b) any allotment will not have a frontage to one of the following:

(i) an existing road

(ii) a proposed public road

(iii) access to a public road via an internal roadway in a plan of community division

(c) the intended use of the land is likely to require excessive cut and/or fill

(d) it is likely to lead to undue erosion of the subject land or land located within the locality

(e) the wastewater treatment plant to which subsequent development will be connected does not have sufficient capacity to handle the additional wastewater volumes and pollutant loads generated by such development

(f) the area is unsewered and cannot accommodate an appropriate onsite wastewater disposal system located within the allotment that complies with (or can comply with) the relevant public and environmental health legislation applying to the intended use(s)

(g) any allotments will straddle more than one zone or policy area.

Design and Layout

3 Land divisions should be designed to ensure that areas of native vegetation and wetlands:

(a) are not fragmented or reduced in size

(b) do not need to be cleared as a consequence of subsequent development.

4 The design of a land division should incorporate:

(a) roads, thoroughfares and open space that result in safe and convenient linkages with the surrounding environment, including public and community transport facilities, and which, where necessary, facilitate the satisfactory future division of land and the inter-communication with neighbouring localities

(b) safe and convenient access from each allotment to an existing or proposed public road or thoroughfare

(c) areas to provide appropriate separation distances between potentially conflicting land uses and/or zones

(d) suitable land set aside for useable local open space

(e) public utility services within road reserves and where necessary within dedicated easements

(f) the preservation of significant natural, cultural or landscape features including State and local heritage places

(g) protection for existing vegetation and drainage lines

(h) where appropriate, the amalgamation of smaller allotments to ensure co-ordinated and efficient site development

5 Land division should facilitate optimum solar access for energy efficiency.

6 Land division within an area identified as being an 'Excluded Area from Bushfire Protection Planning Provisions' as shown on *Bushfire Protection Area BPA Maps - Bushfire Risk* should be designed to make provisions for:

(a) emergency vehicle access through to the Bushfire Protection Area and other areas of open space connected to it

(b) a mainly continuous street pattern serving new allotments that eliminates the use of cul-de-sacs or dead end roads

(c) a fire hazard separation zone isolating residential allotments from areas that pose an unacceptable bushfire risk by containing the allotments within a perimeter road or through other means that achieve an adequate separation.

7 Allotments in the form of a battleaxe configuration should:

(a) have an allotment area consistent with that desired located within the relevant zone or policy area (excluding the area of the 'handle' of such an allotment)

(b) provide for an access onto a public road, with the driveway 'handle' being not less than 6 metres in width nor more than 50 metres in length

(c) contain sufficient area on the allotment for a vehicle to turn around to enable it to egress the allotment in a forward direction

(d) not be created where it would lead to multiple access points onto a road which would dominate or adversely affect the amenity of the streetscape

(e) be avoided where their creation would be incompatible with the prevailing pattern of development.

8 Allotments should have an orientation, size and configuration to encourage development that:

(a) minimises the need for earthworks and retaining walls

(b) maintains natural drainage systems

(c) faces abutting streets and open spaces

(d) does not require the removal of native vegetation to facilitate that development

(e) will not overshadow, dominate, encroach on or otherwise detrimentally affect the setting of the surrounding locality.

9 Within defined townships and settlements where the land to be divided borders a river, lake, wetland or creek, the land adjoining the bank should become public open space and linked with an existing or proposed pedestrian or transport network.

10 Within defined townships and settlements land division should make provision for a reserve or an area of open space that is at least 25 metres wide from the top of the bank of a watercourse and that incorporates land located within the 1-in-100 year average return interval flood event area.

11 The layout of a land division should keep flood-prone land free from development.

12 The arrangement of roads, allotments, reserves and open space should enable the provision of a stormwater management drainage system that:

(a) contains and retains all watercourses, drainage lines and native vegetation

(b) enhances amenity

(c) integrates with the open space system and surrounding area.

Roads and Access

13 Road reserves should be of a width and alignment that can:

(a) provide for safe and convenient movement and parking of projected volumes of vehicles and other users

(b) provide for footpaths, cycle lanes and shared-use paths for the safety and convenience of residents and visitors

(c) allow vehicles to enter or reverse from an allotment or site in a single movement allowing for a car parked on the opposite side of the street

(d) accommodate street tree planting, landscaping and street furniture

(e) accommodate the location, construction and maintenance of stormwater drainage and public utilities

(f) provide unobstructed, safe and efficient vehicular access to individual allotments and sites

(g) allow for the efficient movement of service and emergency vehicles.

14 The design of the land division should facilitate the most direct route to local facilities for pedestrians and cyclists and enable footpaths, cycle lanes and shared-use paths to be provided of a safe and suitable width and reasonable longitudinal gradient.

15 The layout of land divisions should result in roads designed and constructed to ensure:

(a) that traffic speeds and volumes are restricted where appropriate by limiting street length and/or the distance between bends and slow points

(b) there are adequate sight distances for motorists at intersections, junctions, pedestrian and cyclist crossings, and crossovers to allotments to ensure the safety of all road users and pedestrians

(c) that existing dedicated cycling and walking routes are not compromised.

16 The design of the land division should provide space sufficient for on-street visitor car parking for the number and size of allotments, taking account of:

(a) the size of proposed allotments and sites and opportunities for on-site parking

(b) the availability and frequency of public and community transport

(c) on-street parking demand likely to be generated by nearby uses.

17 The layout of land divisions should incorporate street patterns designed to enhance the efficient movement of traffic and minimise trip lengths.

Land Division in Rural Areas

18 Rural land should not be divided if the resulting allotments would be of a size and configuration likely to impede the efficient use of rural land for any of the following:

(a) primary production

(b) value adding industries related to primary production

(c) protection of natural resources.

19 Rural land should not be divided where new allotments would result in any of the following:

(a) fragmentation of productive primary production land

(b) strip development along roads or water mains

(c) prejudice against the proper and orderly development of townships

(d) removal of native vegetation for allotment boundaries, access roads, infrastructure, dwellings and other buildings or firebreaks.

(b) buildings are designed and constructed to prevent the entry of floodwaters in a 1-in-100 year average return interval flood event.

6 Development, including earthworks associated with development, should not do any of the following:

(a) impede the flow of floodwaters through the land or other surrounding land

(b) increase the potential hazard risk to public safety of persons during a flood event

(c) aggravate the potential for erosion or siltation or lead to the destruction of vegetation during a flood

(d) cause any adverse effect on the floodway function

(e) increase the risk of flooding of other land

(f) obstruct a watercourse.

Bushfire

7 The following bushfire protection principles of development control apply to development of land identified as General, Medium and High bushfire risk areas as shown on the *Bushfire Protection Area BPA Maps - Bushfire Risk*.

8 Development in a Bushfire Protection Area should be in accordance with those provisions of the *Minister's Code: Undertaking development in Bushfire Protection Areas* that are designated as mandatory for Development Plan Consent purposes.

9 Buildings and structures should be located away from areas that pose an unacceptable bushfire risk as a result of one or more of the following:

(a) vegetation cover comprising trees and/or shrubs

(b) poor access

(c) rugged terrain

(d) inability to provide an adequate building protection zone

(e) inability to provide an adequate supply of water for fire-fighting purposes.

10 Residential, tourist accommodation and other habitable buildings should:

(a) be sited on the flatter portion of allotments and avoid steep slopes, especially upper slopes, narrow ridge crests and the tops of narrow gullies, and slopes with a northerly or westerly aspect

(b) be sited in areas with low bushfire hazard vegetation and set back at least 20 metres from existing hazardous vegetation

(c) have a dedicated and accessible water supply available at all times for fire fighting.

11 Extensions to existing buildings, outbuildings and other ancillary structures should be sited and constructed using materials to minimise the threat of fire spread to residential, tourist accommodation and other habitable buildings in the event of bushfire.

12 Buildings and structures should be designed and configured to reduce the impact of bushfire through using simple designs that reduce the potential for trapping burning debris against the building or structure, or between the ground and building floor level in the case of transportable buildings.

13 Land division for residential or tourist accommodation purposes within areas of high bushfire risk should be limited to those areas specifically set aside for these uses.

14 Where land division does occur it should be designed to:

(a) minimise the danger to residents, other occupants of buildings and fire fighting personnel

(b) minimise the extent of damage to buildings and other property during a bushfire

(c) ensure each allotment contains a suitable building site that is located away from vegetation that would pose an unacceptable risk in the event of bushfire

(d) ensure provision of a fire hazard separation zone isolating residential allotments from areas that pose an unacceptable bushfire risk by containing the allotments within a perimeter road or through other means that achieve an adequate separation.

15 Vehicle access and driveways to properties and public roads created by land division should be designed and constructed to:

(a) facilitate safe and effective operational use for fire-fighting and other emergency vehicles and residents

(b) provide for two-way vehicular access between areas of fire risk and the nearest public road.

16 Olive orchards should be located and developed in a manner that minimises their potential to fuel bushfires.

Salinity

17 Development should not increase the potential for, or result in an increase in, soil and water salinity.

18 Preservation, maintenance and restoration of locally indigenous plant species should be encouraged in areas affected by dry land salinity.

19 Irrigated horticulture and pasture should not increase groundwater-induced salinity.

Acid Sulfate Soils

20 Development and activities, including excavation and filling of land, that may lead to the disturbance of potential or actual acid sulfate soils should be avoided unless such disturbances are managed in a way that effectively avoids the potential for harm or damage to any of the following:

(a) natural water bodies and wetlands

(b) agricultural or aquaculture activities

(c) buildings, structures and infrastructure

(d) public health.

21 Development, including primary production, aquaculture activities and infrastructure, should not proceed unless it can be demonstrated that the risk of releasing acid water resulting from the disturbance of acid sulfate soils is minimal.

Site Contamination

22 Development, including land division, should not occur where site contamination has occurred unless the site has been assessed and remediated as necessary to ensure that it is suitable and safe for the proposed use.

Containment of Chemical and Hazardous Materials

23 Hazardous materials should be stored and contained in a manner that minimises the risk to public health and safety and the potential for water, land or air contamination.

Character Preservation District Overlay

Refer to the *Map Reference Tables* for a list of maps that relate to this overlay.

The following policies apply to the 'Character Preservation District' shown on the relevant *Overlay Map(s) – Heritage and Character Preservation District*.

INTERPRETATION

Where the Objectives and or Principles of Development Control that apply in relation to the Character Preservation District shown on this Overlay are in conflict with the relevant General Section Objectives and/or Principles of Development Control in the Development Plan, the Overlay will prevail.

OBJECTIVES

1 A district where:

(a) scenic and rural landscapes are highly valued, retained and protected

(b) development near entrances to towns and settlements does not diminish the rural setting, character and heritage values associated with those towns and settlements

(c) the long term use of land for primary production and associated value adding enterprises is assured and promoted

(d) activities positively contribute to tourism

(e) the heritage attributes of the district are preserved

(f) buildings and structures complement the landscape.

2 Residential development is located inside townships, settlements and rural living areas.

3 No expansion of rural living and settlement zones outside township areas.

PRINCIPLES OF DEVELOPMENT CONTROL

Form of Development

1 Development should be consistent with the Objectives for the district.

Natural Resources

OBJECTIVES

1 Retention, protection and restoration of the natural resources and environment.

2 Protection of the quality and quantity of South Australia's surface waters, including inland and underground waters.

3 The ecologically sustainable use of natural resources including water resources, including groundwater, surface water and watercourses.

4 Natural hydrological systems and environmental flows reinstated, and maintained and enhanced.

5 Development consistent with the principles of water sensitive design.

6 Development sited and designed to:

(a) protect natural ecological systems

(b) achieve the sustainable use of water

(c) protect water quality, including receiving waters

(d) reduce runoff and peak flows and prevent the risk of downstream flooding

(e) minimise demand on reticulated water supplies

(f) maximise the harvest and use of stormwater

(g) protect stormwater from pollution sources.

7 Storage and use of stormwater which avoids adverse impact on public health and safety.

8 Native flora, fauna and ecosystems protected, retained, conserved and restored.

9 Restoration, expansion and linking of existing native vegetation to facilitate habitat corridors for ease of movement of fauna.

10 Minimal disturbance and modification of the natural landform.

11 Protection of the physical, chemical and biological quality of soil resources.

12 Protection of areas prone to erosion or other land degradation processes from inappropriate development.

13 Protection of the scenic qualities of natural and rural landscapes.

PRINCIPLES OF DEVELOPMENT CONTROL

1 Development should be undertaken with minimum impact on the natural environment, including air and water quality, land, soil, biodiversity, and scenically attractive areas.

2 Development should ensure that South Australia's natural assets, such as biodiversity, water and soil, are protected and enhanced.

3 Development should not significantly obstruct or adversely affect sensitive ecological areas such as creeks and wetlands.

4 Development should be appropriate to land capability and the protection and conservation of water resources and biodiversity.

Water Sensitive Design

5 Development should be designed to maximise conservation, minimise consumption and encourage re-use of water resources.

6 Development should not take place if it results in unsustainable use of surface or underground water resources.

7 Development should be sited and designed to:

(a) capture and re-use stormwater, where practical

(b) minimise surface water runoff

(c) prevent soil erosion and water pollution

(d) protect and enhance natural water flows

(e) protect water quality by providing adequate separation distances from watercourses and other water bodies

(f) not contribute to an increase in salinity levels

(g) avoid the water logging of soil or the release of toxic elements

(h) maintain natural hydrological systems and not adversely affect:

(i) the quantity and quality of groundwater

(ii) the depth and directional flow of groundwater

(iii) the quality and function of natural springs.

8 Water discharged from a development site should:

(a) be of a physical, chemical and biological condition equivalent to or better than its pre-developed state

(b) not exceed the rate of discharge from the site as it existed in pre-development conditions.

9 Development should include stormwater management systems to protect it from damage during a minimum of a 1-in-100 year average return interval flood.

10 Development should have adequate provision to control any stormwater over-flow runoff from the site and should be sited and designed to improve the quality of stormwater and minimise pollutant transfer to receiving waters.

11 Development should include stormwater management systems to mitigate peak flows and manage the rate and duration of stormwater discharges from the site to ensure the carrying capacities of downstream systems are not overloaded.

12 Development should include stormwater management systems to minimise the discharge of sediment, suspended solids, organic matter, nutrients, bacteria, litter and other contaminants to the stormwater system.

13 Stormwater management systems should preserve natural drainage systems, including the associated environmental flows.

14 Stormwater management systems should:

(a) maximise the potential for stormwater harvesting and re-use, either on-site or as close as practicable to the source

(b) utilise, but not be limited to, one or more of the following harvesting methods:

(i) the collection of roof water in tanks

(ii) the discharge to open space, landscaping or garden areas, including strips adjacent to car parks

(iii) the incorporation of detention and retention facilities

(iv) aquifer recharge.

15 Where it is not practicable to detain or dispose of stormwater on site, only clean stormwater runoff should enter the public stormwater drainage system.

16 Artificial wetland systems, including detention and retention basins, should be sited and designed to:

(a) ensure public health and safety is protected

(b) minimise potential public health risks arising from the breeding of mosquitoes.

Water Catchment Areas

17 Development should ensure watercourses and their beds, banks, wetlands and floodplains are not damaged or modified and are retained in their natural state, except where modification is required for essential access or maintenance purposes.

18 No development should occur where its proximity to a swamp or wetland will damage or interfere with the hydrology or water regime of the swamp or wetland.

19 A wetland or low-lying area providing habitat for native flora and fauna should not be drained, except temporarily for essential management purposes to enhance environmental values.

20 Along watercourses, areas of remnant native vegetation, or areas prone to erosion, that are capable of natural regeneration should be fenced off to limit stock access.

21 Development such as cropping, intensive animal keeping, residential, tourism, industry and horticulture, that increases the amount of surface runoff should include a strip of land at least 20 metres wide measured from the top of existing banks on each side of a watercourse that is:

(a) fenced to exclude livestock

(b) kept free of development, including structures, formal roadways or access ways for machinery or any other activity causing soil compaction or significant modification of the natural surface of the land

(c) revegetated with locally indigenous vegetation comprising trees, shrubs and other groundcover plants to filter runoff so as to reduce the impacts on native aquatic ecosystems and to minimise soil loss eroding into the watercourse.

22 Development resulting in the depositing of an object or solid material in a watercourse or floodplain or the removal of bank and bed material should not:

(a) adversely affect the migration of aquatic biota

(b) adversely affect the natural flow regime

(c) cause or contribute to water pollution

(d) result in watercourse or bank erosion

(e) adversely affect native vegetation upstream or downstream that is growing in or adjacent to a watercourse.

23 The location and construction of dams, water tanks and diversion drains should:

(a) occur off watercourse

(b) not take place in ecologically sensitive areas or on erosion-prone sites

(c) provide for low flow by-pass mechanisms to allow for migration of aquatic biota

(d) not negatively affect downstream users

(e) minimise in-stream or riparian vegetation loss

(f) incorporate features to improve water quality (eg wetlands and floodplain ecological communities)

(g) protect ecosystems dependent on water resources.

24 Irrigated horticulture and pasture should not increase groundwater-induced salinity.

25 Development should comply with the current *Environment Protection (Water Quality) Policy*.

Biodiversity and Native Vegetation

26 Development should retain existing areas of native vegetation and where possible contribute to revegetation using locally indigenous plant species.

27 Development should be designed and sited to minimise the loss and disturbance of native flora and fauna.

28 The provision of services, including power, water, effluent and waste disposal, access roads and tracks should be sited on areas already cleared of native vegetation.

29 Native vegetation should be conserved and its conservation value and function not compromised by development if the native vegetation does any of the following:

(a) provides an important habitat for wildlife or shade and shelter for livestock

(b) has a high plant species diversity or includes rare, vulnerable or endangered plant species or plant associations and communities

(c) provides an important seed bank for locally indigenous vegetation

(d) has high amenity value and/or significantly contributes to the landscape quality of an area, including the screening of buildings and unsightly views

(e) has high value as a remnant of vegetation associations characteristic of a district or region prior to extensive clearance for agriculture

(f) is growing in, or is characteristically associated with a wetland environment.

30 Native vegetation should not be cleared if such clearing is likely to lead to, cause or exacerbate any of the following:

(a) erosion or sediment within water catchments

(b) decreased soil stability

(c) soil or land slip

(d) deterioration in the quality of water in a watercourse or surface water runoff

(e) a local or regional salinity problem

(f) the occurrence or intensity of local or regional flooding.

31 Development that proposes the clearance of native vegetation should address or consider the implications that removing the native vegetation will have on the following:

(a) provision for linkages and wildlife corridors between significant areas of native vegetation

(b) erosion along watercourses and the filtering of suspended solids and nutrients from runoff

(c) the amenity of the locality

(d) bushfire safety

(e) the net loss of native vegetation and other biodiversity.

32 Where native vegetation is to be removed, it should be replaced in a suitable location on the site with locally indigenous vegetation to ensure that there is not a net loss of native vegetation and biodiversity.

33 Development should be located and occur in a manner which:

(a) does not increase the potential for, or result in, the spread of pest plants, or the spread of any non-indigenous plants into areas of native vegetation or a conservation zone

(b) avoids the degradation of remnant native vegetation by any other means including as a result of spray drift, compaction of soil, modification of surface water flows, pollution to groundwater or surface water or change to groundwater levels

(c) incorporates a separation distance and/or buffer area to protect wildlife habitats and other features of nature conservation significance.

34 Development should promote the long-term conservation of vegetation by:

(a) avoiding substantial structures, excavations, and filling of land in close proximity to the trunk of trees and beneath their canopies

(b) minimising impervious surfaces beneath the canopies of trees

(c) taking other effective and reasonable precautions to protect both vegetation and the integrity of structures and essential services.

35 Horticulture involving the growing of olives should be located at least:

(a) 500 metres from:

(i) a national park

(ii) a conservation park

(iii) a wilderness protection area

(iv) the edge of a substantially intact stratum of native vegetation greater than 5 hectares in area

(b) 50 metres from the edge of stands of native vegetation 5 hectares or less in area.

36 Horticulture involving the growing of olives should have at least one locally indigenous tree that will grow to a height of at least 7 metres sited at least every 100 metres around the perimeter of the orchard.

Soil Conservation

37 Development should not have an adverse impact on the natural, physical, chemical or biological quality and characteristics of soil resources.

38 Development should be designed and sited to prevent erosion.

39 Development should take place in a manner that will minimise alteration to the existing landform.

40 Development should minimise the loss of soil from a site through soil erosion or siltation during the construction phase of any development and following the commencement of an activity.

Transportation and Access

OBJECTIVES

1 A comprehensive, integrated, affordable and efficient air, rail, sea, road, cycle and pedestrian transport system that will:

(a) provide equitable access to a range of public and private transport services for all people

(b) ensure a high level of safety

(c) effectively support the economic development of the State

(d) have minimal negative environmental and social impacts

(e) maintain options for the introduction of suitable new transport technologies.

2 Development that:

(a) provides safe and efficient movement for all motorised and non-motorised transport modes

(b) ensures access for vehicles including emergency services, public infrastructure maintenance and commercial vehicles

(c) provides off street parking

(d) is appropriately located so that it supports and makes best use of existing transport facilities and networks.

3 A road hierarchy that promotes safe and efficient transportation in an integrated manner throughout the State.

4 Provision of safe, pleasant, accessible, integrated and permeable pedestrian and cycling networks.

5 Safe and convenient freight movement throughout the State.

PRINCIPLES OF DEVELOPMENT CONTROL

Land Use

1 Land uses arranged to support the efficient provision of sustainable transport networks and encourage their use.

Movement Systems

2 Development should be integrated with existing transport networks, particularly major rail and road corridors as shown on *Location Maps* and *Overlay Maps - Transport*, and designed to minimise its potential impact on the functional performance of the transport networks.

3 Transport corridors should be sited and designed so as to not unreasonably interfere with the health and amenity of adjacent sensitive land uses.

4 Roads should be sited and designed to blend with the landscape and be in sympathy with the terrain.

5 Land uses that generate large numbers of visitors such as shopping centres and areas, places of employment, schools, hospitals and medium to high density residential uses should be located so that they can be serviced by existing transport networks and encourage walking and cycling.

6 Development generating high levels of traffic, such as schools, shopping centres and other retail areas, entertainment and sporting facilities, should incorporate passenger pick-up and set down areas. The design of such areas should ensure interference to existing traffic is minimised and give priority to pedestrians, cyclists and public and community transport users.

7 The location and design of public and community transport set-down and pick-up points should maximise safety and minimise the isolation and vulnerability of users.

8 Development should provide safe and convenient access for all anticipated modes of transport including cycling, walking, public and community transport, and motor vehicles.

9 Development at intersections, pedestrian and cycle crossings, and crossovers to allotments should maintain or enhance sightlines for motorists, cyclists and pedestrians to ensure safety for all road users and pedestrians.

10 Driveway cross-overs affecting pedestrian footpaths should maintain the level of the footpath.

11 Development should discourage commercial and industrial vehicle movements through residential streets and adjacent other sensitive land uses such as schools.

12 Industrial/commercial vehicle movements should be separated from passenger vehicle car-parking areas.

13 Development should make sufficient provision on site for the loading, unloading and turning of all traffic likely to be generated.

Cycling and Walking

14 Development should ensure that a permeable street and path network is established that encourages walking and cycling through the provision of safe, convenient and attractive routes with connections to adjoining streets, paths, open spaces, schools, public transport stops and activity centres.

15 Development should provide access, and accommodate multiple route options, for cyclists by enhancing and integrating with:

(a) open space networks, recreational trails, parks, reserves and recreation areas

(b) Adelaide's principal cycling network (Bikedirect), which includes arterial roads, local roads and off road paths as depicted in *Overlay Maps - Transport*.

16 Cycling and pedestrian networks should be designed to be permeable and facilitate direct and efficient passage to neighbouring networks and facilities.

17 New developments should give priority to and not compromise existing designated bicycle routes.

18 Where development coincides with, intersects or divides a proposed bicycle route or corridor, development should incorporate through-access for cyclists.

19 Developments should encourage and facilitate cycling as a mode of transport by incorporating end-of-journey facilities including:

(a) showers, changing facilities, and secure lockers

(b) signage indicating the location of bicycle facilities

(c) secure bicycle parking facilities.

20 Pedestrian facilities and networks should be designed and provided in Accordance with relevant provisions of the *Australian Standards and Austroads Guide to Traffic Engineering Practice Part 13*.

21 Cycling facilities and networks should be designed and provided in accordance with the relevant provisions of the *Australian Standards and Austroads Guide to Traffic Engineering Practice Part 14*.

Access

22 Development should have direct access from an all weather public road.

23 Development should be provided with safe and convenient access which:

(a) avoids unreasonable interference with the flow of traffic on adjoining roads

(b) accommodates the type and volume of traffic likely to be generated by the development or land use and minimises induced traffic through over-provision

(c) is sited and designed to minimise any adverse impacts on the occupants of and visitors to neighbouring properties.

24 Development should not restrict access to publicly owned land.

25 The number of vehicle access points onto arterial roads shown on *Overlay Maps - Transport* should be minimised, and where possible access points should be:

(a) limited to local roads

(b) shared between developments.

26 The number of access points for cyclists and pedestrians onto all adjoining roads should be maximised.

27 Development with access from roads with existing or projected traffic volumes exceeding 6000 vehicles per day should be sited to avoid the need for vehicles to reverse on to the road.

28 Development with access from arterial roads or roads as shown on *Overlay Maps - Transport* should be sited to avoid the need for vehicles to reverse on to the road.

29 Driveways, access tracks and parking areas should be designed and constructed to:

(a) follow the natural contours of the land

(b) minimise excavation and/or fill

(c) minimise the potential for erosion from runoff

(d) avoid the removal of existing vegetation

(e) be consistent with *Australian Standard AS 2890 Parking facilities*.

Access for People with Disabilities

30 Development should be sited and designed to provide convenient access for people with a disability.

Vehicle Parking

31 Development should provide off-street vehicle parking and specifically marked disabled car parking places to meet anticipated demand in accordance with *Table Baro/1 - Off Street Vehicle Parking Requirements*.

32 Development should be consistent with *Australian Standard AS 2890 Parking facilities*.

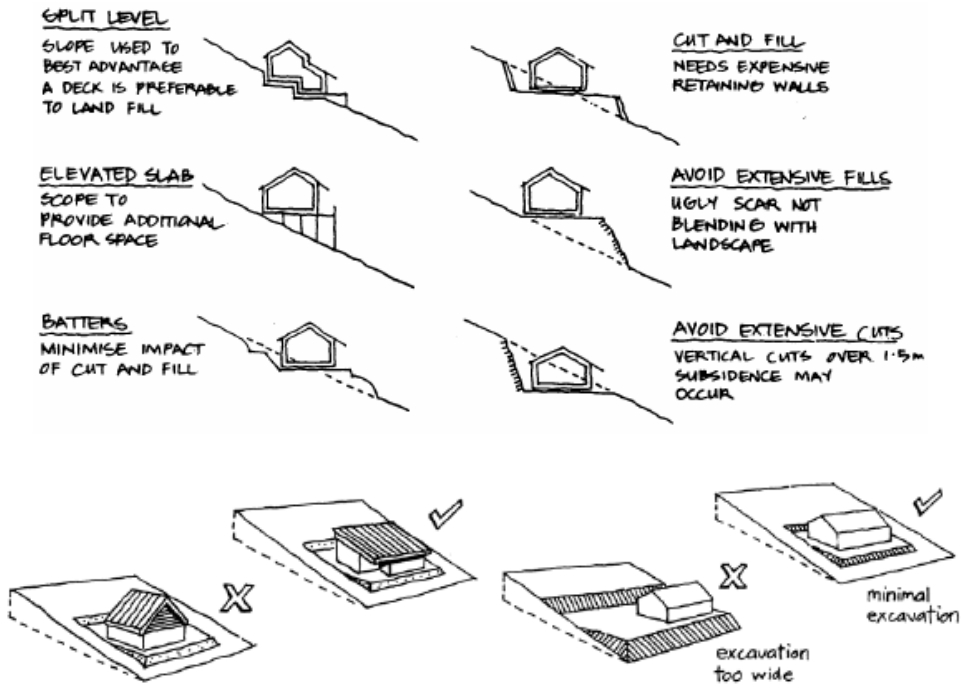
Sloping Land

OBJECTIVES

1 Development on sloping land designed to minimise environmental and visual impacts and protect soil stability and water quality.

PRINCIPLES OF DEVELOPMENT CONTROL

1 Development and associated driveways and access tracks should be sited and designed to integrate with the natural topography of the land and minimise the need for earthworks.



2 Development and associated driveways and access tracks, including related earthworks, should be sited, designed and undertaken in a manner that:

(a) minimises their visual impact

(b) reduces the bulk of the buildings and structures

(c) minimises the extent of cut and/or fill

(d) minimises the need for, and the height of, retaining walls

(e) does not cause or contribute to instability of any embankment or cutting

(f) avoids the silting of watercourses

(g) protects development and its surrounds from erosion caused by water runoff

Open Space and Recreation

OBJECTIVES

1 The creation of a network of linked parks, reserves and recreation areas at regional and local levels.

2 Pleasant, functional and accessible open spaces providing a range of physical environments.

3 A wide range of settings for active and passive recreational opportunities.

4 The provision of open space in the following hierarchy:

- State
- Regional
- District
- Neighbourhood
- Local.

5 Establish and retain linear recreation trails including along natural creeks and to build upon the existing Heysen, Mawson, Kidman and Lavender Trails and the Greater Mount Lofty Parklands System.

PRINCIPLES OF DEVELOPMENT CONTROL

1 Urban development should include public open space and recreation areas.

2 Public open space and recreation areas should be of a size, dimension and location that:

(a) facilitate a range of formal and informal recreation activities

(b) provide for the movement of pedestrians and cyclists

(c) incorporate existing vegetation and natural features, watercourses, wildlife habitat and other sites of natural or cultural value

(d) link habitats, wildlife corridors, public open spaces and existing recreation facilities

(e) enable effective stormwater management

(f) provides for the planting and retention of large trees and vegetation.

3 Open space should be designed to incorporate:

(a) pedestrian, cycle linkages to other open spaces, centres, schools and public transport nodes

(b) park furniture, shaded areas and resting places to enhance pedestrian comfort

(c) safe crossing points where pedestrian routes intersect the road network

(d) easily identified access points

(e) frontage to abutting public roads to optimise pedestrian access and visibility

(f) re-use of stormwater for irrigation purposes.

4 Where practical, access points to regional parks should be located close to public transport.

5 District level parks should be at least 3 hectares in size, and provided within 2 kilometres of all households that they serve.

6 Neighbourhood parks should be at least 0.5 hectares and generally closer to 1 hectare in size, and provided within 500 metres of households that they serve.

7 Local parks should be:

(a) a minimum of 0.2 hectares in size

(b) centrally located within a residential area, close to schools, shops and generally within 300 metres of households that they serve.

8 No more than 20 per cent of land allocated as public open space should:

(a) have a slope in excess of 1-in-4

(b) comprise creeks or other drainage areas.

9 Signage should be provided at entrances to and within public open space to provide clear orientation to major points of interest such as the location of public toilets, telephones, safe routes and park activities.

10 Buildings in open space, including structures and associated car parking areas, should be designed, located and of a scale that is unobtrusive and does not detract from the desired open space character.

11 Development in open space should:

(a) be clustered where practical to ensure that the majority of the site remains open

(b) where practical, be developed for multi-purpose use

(c) be constructed to minimise the extent of hard paved areas.

12 Open spaces and recreation areas should be located and designed to maximise safety and security by:

(a) ensuring that within urban areas, their edges are overlooked by housing, commercial or other development that can provide effective informal surveillance

(b) ensuring fenced parks and playgrounds have more than one entrance or exit when fenced

(c) locating play equipment where it can be informally observed by nearby residents and users during times of use

(d) clearly defining the perimeters of play areas

(e) providing lighting around facilities such as toilets, telephones, seating, litter bins, bike storage and car parks

(f) focusing pedestrian and bicycle movement after dark along clearly defined, adequately lit routes with observable entries and exits.

13 Landscaping associated with open space and recreation areas should:

(a) not compromise the drainage function of any drainage channel

(b) provide shade and windbreaks along cyclist and pedestrian routes, around picnic and barbecue areas and seating, and in car parking areas

(c) maximise opportunities for informal surveillance throughout the park

(d) enhance the visual amenity of the area and complement existing buildings

(e) be designed and selected to minimise maintenance costs

(f) provide habitat for local fauna.

14 Development of recreational activities in areas not zoned for that purpose should be compatible with surrounding activities.

15 Recreation facilities development should be sited and designed to minimise negative impacts on the amenity of the locality.

Orderly and Sustainable Development

OBJECTIVES

1 Orderly and economical development that creates a safe, convenient and pleasant environment in which to live.

2 Development occurring in an orderly sequence and in a compact form to enable the efficient provision of public services and facilities.

3 Development that does not jeopardise the continuance of adjoining authorised land uses.

4 Development that does not prejudice the achievement of the provisions of the Development Plan.

5 Development abutting adjoining Council areas having regard to the policies of that Council's Development Plan.

6 Urban development contained within existing townships and settlements and located only in zones designated for such development.

7 Development of rural land primarily for primary production and other uses compatible with maintaining rural productivity.

8 Localities having substandard, unhealthy or obsolete development improved.

9 Integrated re-development of poor quality buildings and under-utilised land.

PRINCIPLES OF DEVELOPMENT CONTROL

1 Development should not prejudice the development of a zone for its intended purpose.

2 Land outside of townships and settlements should primarily be used for primary production and conservation purposes.

3 The economic base of the region should be expanded in a sustainable manner.

4 Urban development should form a compact extension to an existing built-up area.

5 Ribbon development should not occur along arterial roads shown in *Overlay Maps - Transport*.

6 Development should be located and staged to achieve the economical provision of public services and infrastructure, and to maximise the use of existing services and infrastructure.

7 Where development is expected to impact upon the existing infrastructure network (including the transport network), development should demonstrate how the undue effect will be addressed.

8 Vacant or underutilised land should be developed in an efficient and co-ordinated manner to not prejudice the orderly development of adjacent land.

9 Development involving the expansion of an existing use should be designed to improve the visual appearance of the site and lead to a reduction of any negative impact on the locality.

10 Development which would remove productive land from agriculture or diminish its overall productivity for primary production should not be undertaken unless the land is required for essential public purposes.