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Stormwater Management Plan

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PROJECT:	Adelaide Central Plaza	**DATE:**	4/06/2025
TITLE:	Stormwater Management Plan	**PAGES:**	

1.0 Introduction

1.1 Background

Innovis have been engaged for the provision of civil engineering design services for the proposed development, located at 210 North Terrace (the Site), Adelaide. The current site is the northern portion of an existing retail building. The subject site is bunded by North Terrace to the north, Charles Street to the east, a laneway to enter the existing basement to the west, and existing retail building to the south, as shown in Figure 1.

This Stormwater Management Plan report provides an overview of the current site conditions, assesses the existing stormwater infrastructures, and outlines the required stormwater detention volume.

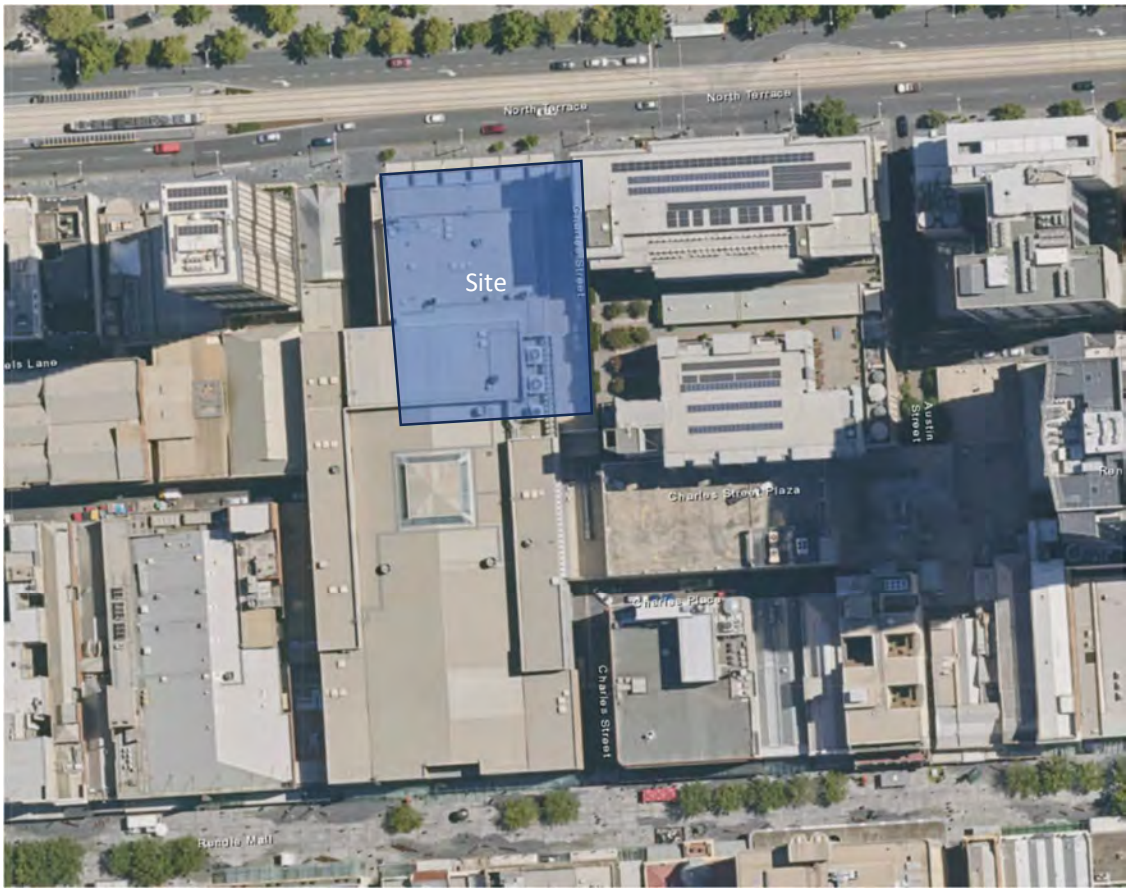

Figure 1 Site Location (from Location SA Viewer)

1.2 Subject Site

The total area of the site is approximately 1700 m^2. The site is currently the northern portion of an existing retail building, which comprises four above-ground levels and an existing basement. The Issued for Construction (IFC) hydraulic drawings indicate that the downpipes surrounding the building collect roof runoff from the existing retail structure and discharge into the Council drainage network on North Terrace, Fisher Place, Charles Street and Rundle Mall at multiple locations. The hydraulic IFC drawings for the existing development show 11 Discharge Points (LDPs) in Figure 2 (southern half of building) and Figure 3 (Northern Half of building). Based on the available information, it is reasonable to assume the majority of the drainage system for the existing site is separate from that of the southern portion of the retail building. The existing drainage system for the site either joins the Council drainage system along Charles Street at LPD 8, or along North Terrace at LDP 10 and LDP 11. There is a small portion of roof runoff from the southern area flowing into the northern portion's drainage system. This connection would be isolated from the northern drainage system during demolition works.

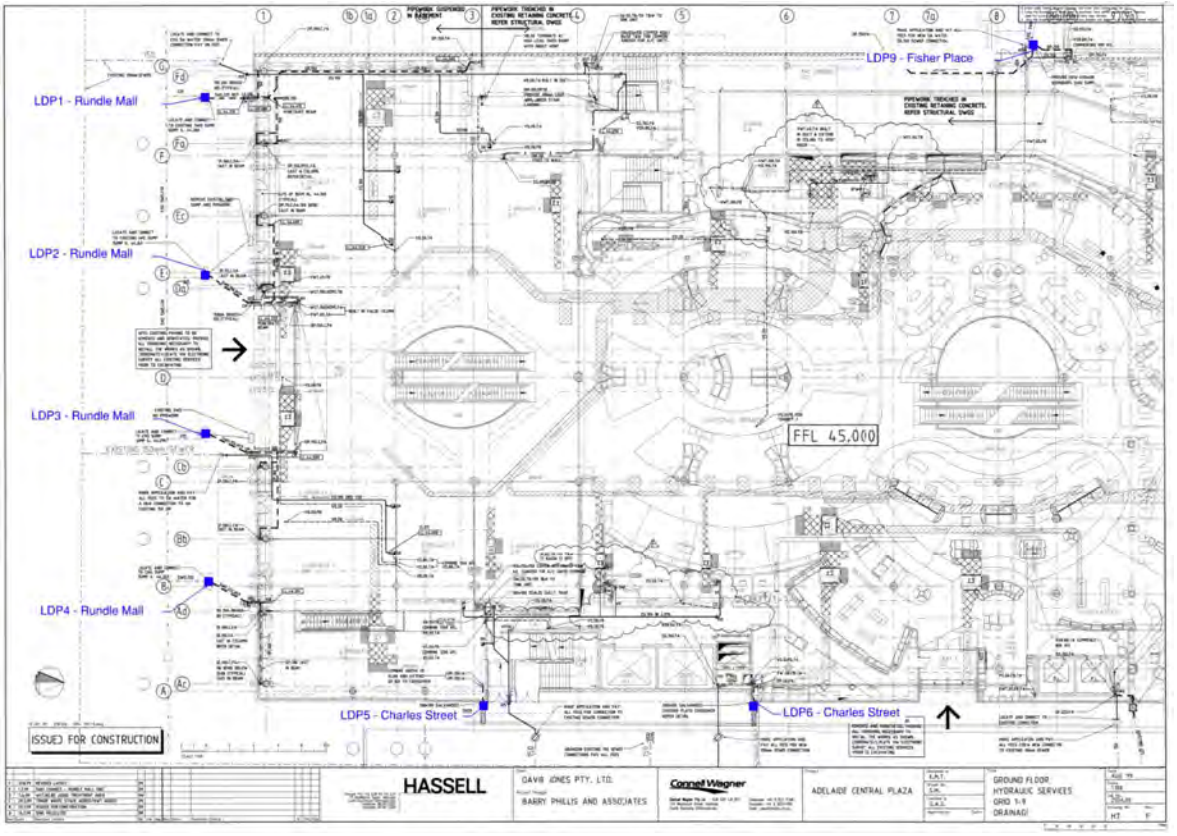

Figure 2 IFC Hydraulic Drawing with Existing LPD Locations Markup – Southern Portion of the Retail Building

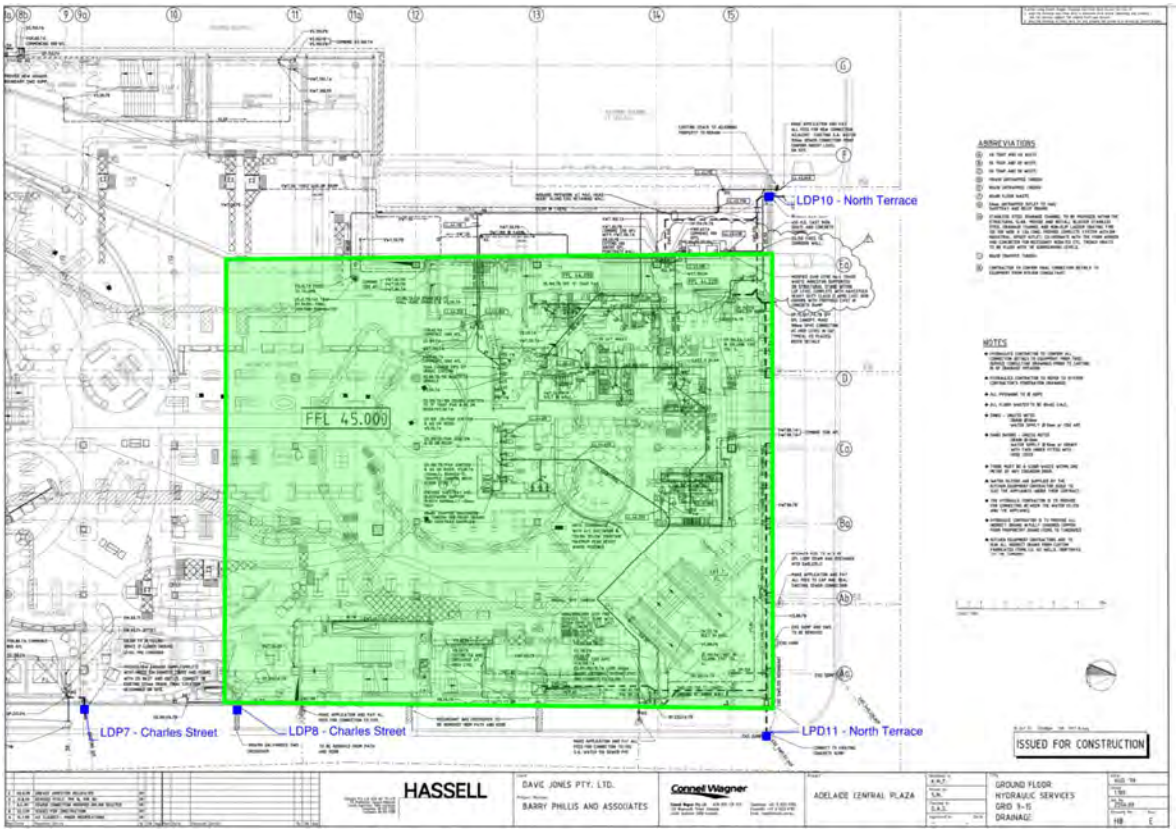

Figure 3 IFC Hydraulic Drawing with Existing LPD Locations Markup – Northern Portion of the Retail Building (Site is within the Green Shaded Area)

1.3 Proposed Development

The site will involve construction of a 30 storey, 132m tall mixed use commercial office tower, and provide connectivity and integration into remaining existing building. A plan of the proposed development by PACT architects is shown in Figure 4.

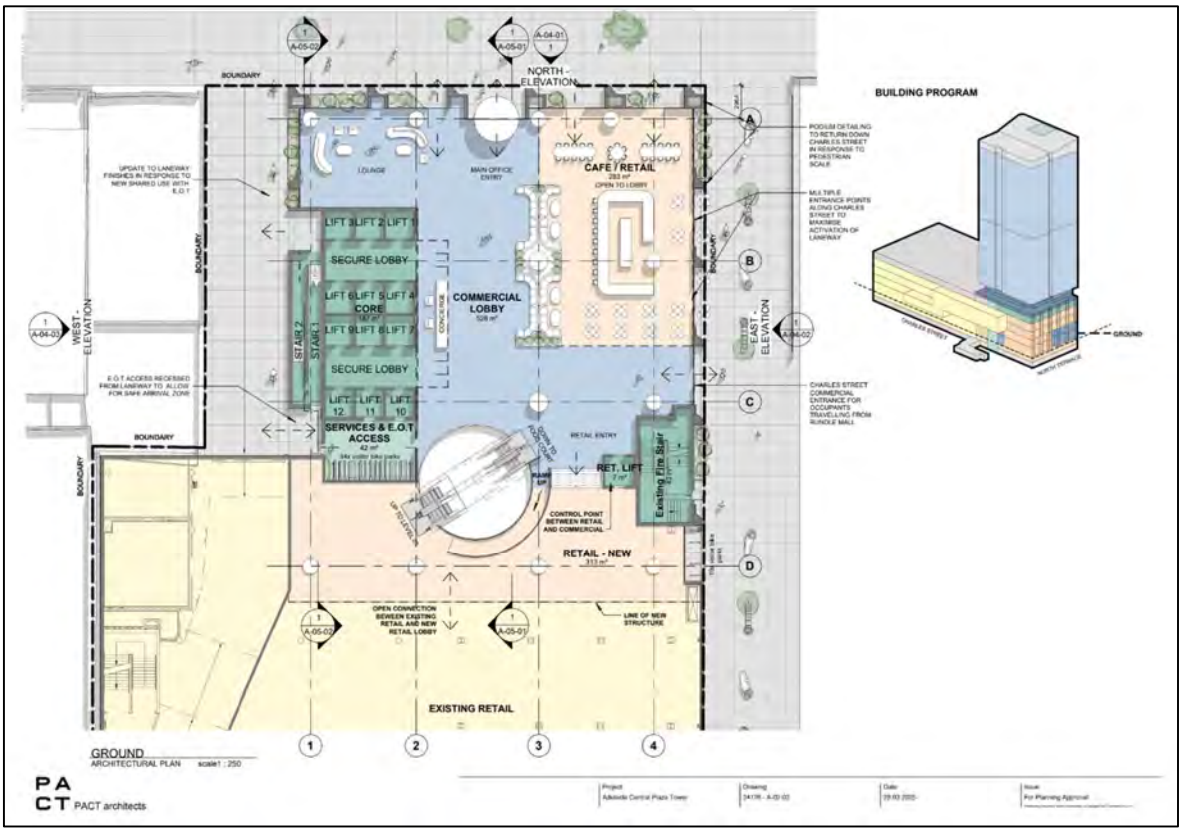

Figure 4 Design Layout (PACT architects)

This includes:

- Lower Podium Levels – Public Precinct:
  - Basement servicing/loading via new connection to existing loading area;
  - Lower ground food court to connect into existing;
  - At grade double height commercial lobby with cafe retail;
  - Level 2 new food and beverage precinct;
  - Level 3 new retail;
  - Level 4 EOT

- Terrace Precinct – Level 05-06:
  - Levels 05 & 06 comprise recessed levels with internal commercial office & shared meeting areas along with external terrace with landscaping opportunities;
  - Landscaped, communal high value amenity

- Tower – Levels 07-30
  - PCA Premium A-Grade commercial office tower.

2.0 Stormwater Management Objectives

2.1 Stormwater Runoff Quantity Objectives

The overarching stormwater management design objectives are listed below:

- All minor drainage system to be designed for the 5% design events;
- All major drainage system to be designed for the 1% AEP design events; and
- Detention shall be provided to limit the 1% AEP post-development flowrate to the 5% AEP predevelopment flowrate.

2.2 Stormwater Runoff Quality Objectives

In accordance with the South Australian water sensitive urban design (WSUD) policy to create more liveable and water sensitive cities in South Australia, the key state-wide stormwater runoff performance targets for WUSD have been adopted for the site below:

- 80% reduction in Total Suspended Solids (TSS)
- 60% reduction in Total Phosphorus (TP)
- 45% reduction in Total Nitrogen (TN)
- 90% reduction in Gross Pollutant (GP); and
- No visible oils for flows up to the three-month peak flow.

3.0 Stormwater Management Design

3.1 Legal Point of Discharge (LPD)

Based on the existing drainage infrastructure and the proposed design layout, the two existing Legal Points of Discharge (LPDs) - LPD 10 and LPD 11 are proposed to be reused for the new development. LPD 10 is an existing Grated Inlet Pit located at northwest corner of the site and LPD 11 is an existing Grated Inlet Pit located at northeast corner of the site, as shown in Figure 3. Both of these points ultimately connect to the Council drainage system along North Terrace.

3.2 Stormwater Management Strategies

In order to restrict the 1% AEP post-development flowrate to the 5% AEP predevelopment flowrate, the following stormwater management strategies have been proposed:

- Roof runoff will be collected by downpipes and discharge into an underground detention tank located in the basement;
- Wall runoff where collected on any canopies constructed within the building façade will be collected by downpipes and discharge into an underground detention tank located in the basement;
- Wall runoff where not collected on canopies will be managed within the façade system and discharged at ground level;
- Strip drains are proposed at the main building entrances where insufficient protection is provided by canopies;
- Outflow from the underground detention tank will be pumped out to join the Council drainage system; and
- It is noted all the site runoff is generated from roof or/and building wall, which is relatively clean and thus, no treatment will be provided.

3.3 Freeboard

The finished ground floor level shall be set a minimum of 300 mm above the top of North Terrace kerb level to achieve the required freeboard.

The existing driveway into the basement will not be impacted by the proposed new development, and existing freeboard condition will be retained without any proposed amendments.

3.4 Design Exclusions

No flood prevention measures have been considered for the basement ramp access, as it is existing infrastructure and there are no modifications proposed to this as part of the development.

4.0 Hydrological and Hydraulic Analysis

The urban drainage modelling software DRAINS is used to estimate the peak flowrate for the 5% and 1% design storm events. This assessment is completed using the latest Australian Rainfall and Runoff (ARR 2019) Guideline. The adopted parameters constructed the ILSAX model in DRAINS are described below:

- Rainfall data: The rainfall intensity data and temporal patterns required for the DRAINS model are extracted from Bureau of Meteorology website and area based on the 2016 Intensity Frequency Duration (IFD) rainfalls;
- Paved (impervious) area depression storage = 1 mm
- Supplementary area depression storage = 1 mm
- Grass (pervious) area depression storage = 5 mm

- Soil type = 3
- Antecedent Moisture Condition (AMC) : 3 (all storms)

4.1 Catchment Characteristics

For predevelopment scenario, the site catchment is considered as the roof area with 100% paved area. The site will be developed into a 30 storey, 132m tall mixed use commercial office building. Based on the Australian/New Zealand Standard (AS/NZS 3500.3), the site catchment is considered as roof area plus half of the critical side of the building wall area for post development scenario. The catchment characteristics are shown in Table 1.

Table 1 Catchment Characteristics for Pre- and Post-development Scenarios

Scenario	Area (m^2)	Paved (%)	Time of Concentration (min)
Predevelopment	1700	100	10
Post-development	3944	100	10

4.2 DRAINS Model Layout

The DRAINS model layout is shown in Figure 5.

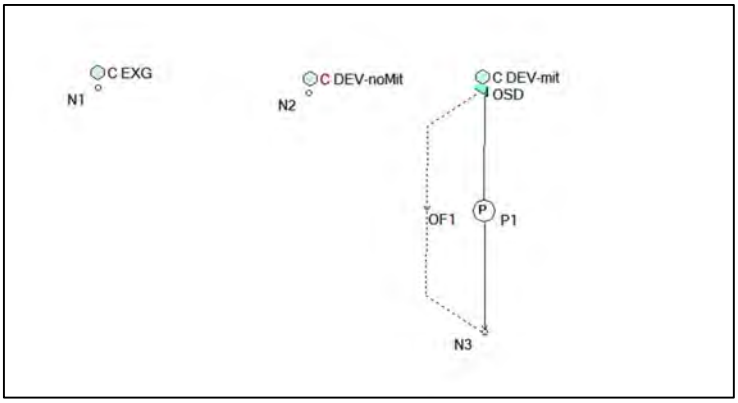

Figure 5 DRAINS Model Layout

4.3 DRAINS Model Results

4.3.1 Peak Flowrate Estimation Results

The DRAINS model has been run for the 5% and 1% AEP design events for predevelopment, post-development without mitigation and post-development with mitigation scenarios. DRAINS results are presented in Table 2. DRAINS model results for the 5% and 1% AEP design events are presented in Figure 6 and Figure 7, respectively. Detailed data and results of the DRAINS model can be found in Appendix A.

Table 2 DRAINS Model Results

AEP	Flowrate (L/s)		
	Predevelopment	Post-development no Mitigation	Post-development With Mitigation
5%	39	89	39
1%	57	133	39

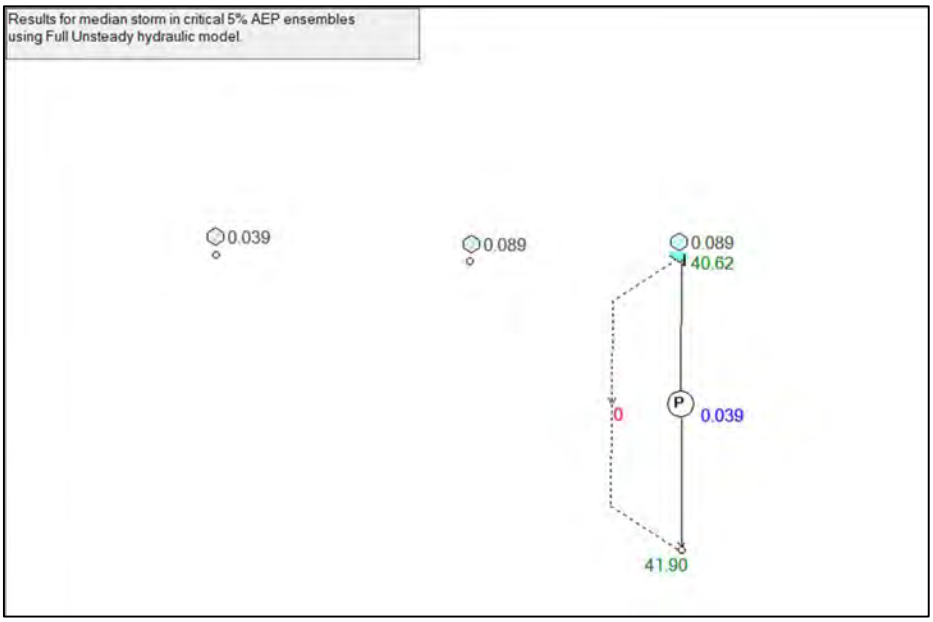

Figure 6 DRAINS Model Results for the 5% AEP Events

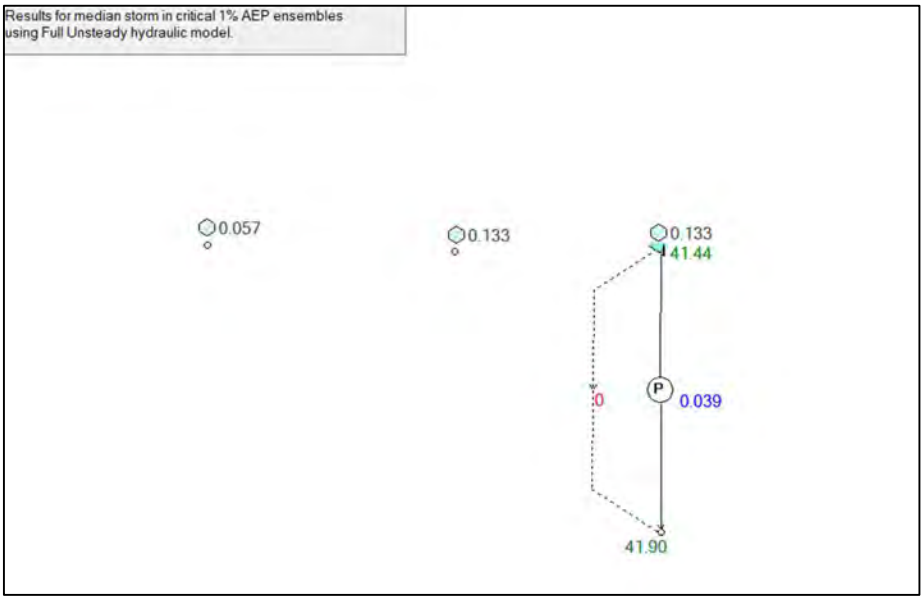

Figure 7 DRAINS Model Results for the 1% AEP Events

4.3.2 Detention Estimation Results

The Council require the 1% AEP post development flowrates to match the 5% AEP predevelopment flowrates. It can be seen from Table 2 that with the pump rate of 39 L/s, the proposed detention tank achieves the Council's requirements. DRAINS model results show the peak volume of the underground detention tank is 57.65 m^3, as shown in Figure 8.

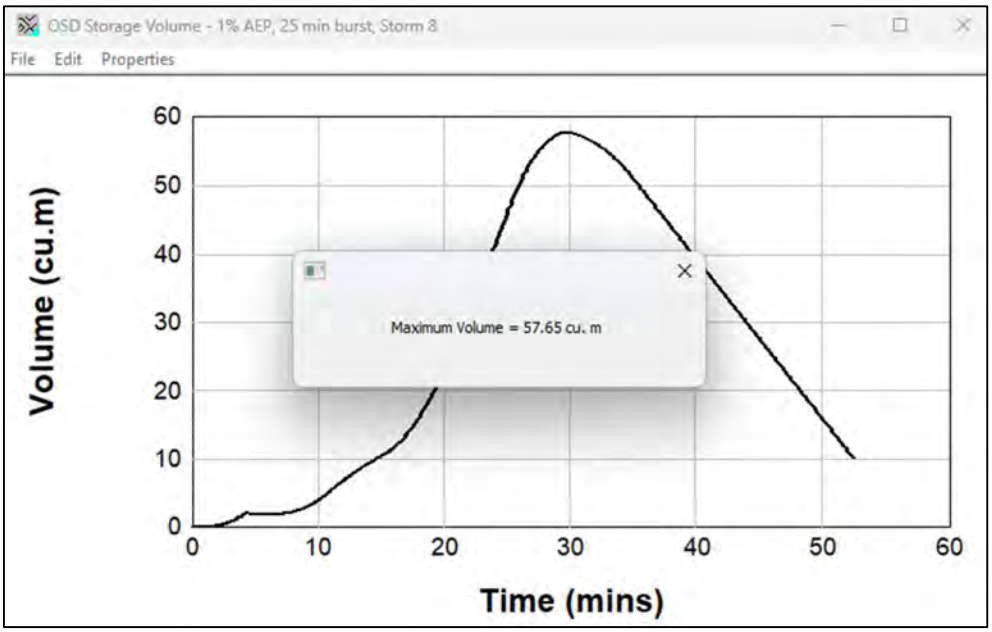

Figure 8 Peak Volume of the Underground Tank

5.0 Summary

Innovis have been engaged to prepare a Stormwater Management Plan (SMP) for the proposed development (the Site) located at 210 North Terrace (the Site), Adelaide.

The retained portion of the existing building is not expected to be substantially amended and will retain 9 discharge points to Rundle Mall, Charles Street and Fisher Place. The existing basement entrance is also not proposed to be amended and will retain its existing freeboard conditions and cross over.

The new development will reuse two existing legal points of discharge (LPDs). One LPD is at the existing Grated Inlet Pit located at northwest corner of the site and the other LPD is at the existing Grated Inlet Pit located at northeast corner of the site. Both discharge points will ultimately connect to the Council drainage system along North Terrace.

To meet the Council requirements for discharge flows and detention, an underground tank is proposed to detain stormwater runoff generated from roof and building side wall. Outflow from the underground tank will be pumped to the Council drainage system along North Terrace. The stormwater management design is modelled using DRAINS for the 5% AEP minor design events and the 1% AEP major design events. DRAINS model results show the proposed detention tank is sufficient to restrict the 1% AEP post development flow to the 5% AEP predevelopment flowrate. DRAINS model also shows the peak volume of the tank is 57.65 m^3 with the pump rate of 39 L/s.

It is noted the site runoff is generated from the roof or/and building side wall. This means the water is relatively clean and thus, no treatment is required.

The ground finished floor level for the building shall be set a minimum of 300 mm above the top of kerb level to achieve the required freeboard. No modifications are proposed to the existing basement entrance ramp which does not present risk of flood ingress at the 1% AEP design events.

APPENDIX A – DRAINS Model Data and Results

PIT / NODE DETAILS Version 15

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Loss	Inflow Hydrograph	Pit is	Internal Width (mm)	Inflow is Misaligned	Minor Safe Pond Dept (m)	Major Safe Pond Depth (m)
N1	Node							0		1446	-335		657		No					
N2	Node							0		1643	-340		2938		No					
N3	Node							0		1807	-564		4857		No					

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Not Used	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Leng	id
OSD	40	40		None						1805	-339	No			4852
	42	40													

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%) %	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %	Gutter FlowFactor	Rainfall Multiplier
C EXG	N1	0.17	100	0	0	10	5	2										0				1
C DEV-noMit	N2	0.3944	100	0	0	10	5	2										0				1
C DEV-mit	OSD	0.3944	100	0	0	10	5	2										0				1

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	Rl (m)	Chg (m)	RL (m)	etc (m)

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	etc	etc

CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Stor (m)	SafeDepth Minor Stor (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id	U/S IL	D/S IL	Length (m)
OF1	OSD	N3	0.1	42	0.225	1.67	Swale with	0.45	0.3	1	1	0	6164	42	41.9	10

PIPE COVER DETAILS

Name	Type	Dia (mm)	Safe Cover	Cover (m)

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surfac Flow Arrivi (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
N3	41.9		0				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
C EXG	0.057	0.057	0	10	5	2	1% AEP, 10 min burst, Storm 1
C DEV-noMit	0.133	0.133	0	10	5	2	1% AEP, 10 min burst, Storm 3
C DEV-mit	0.133	0.133	0	10	5	2	1% AEP, 10 min burst, Storm 3

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF1	0	0	0.979	0	0	0	0	
P1	0.039	0.039						1% AEP, 5 min burst, Storm 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD	41.44	57.6	0.039	0	0.039

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surfac Flow Arrivi (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
N3	41.9		0				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
C EXG	0.039	0.039	0	10	5	2	5% AEP, 10 min burst, Storm 1
C DEV-noMit	0.089	0.089	0	10	5	2	5% AEP, 10 min burst, Storm 2
C DEV-mit	0.089	0.089	0	10	5	2	5% AEP, 10 min burst, Storm 2

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF1	0	0	0.332	0	0	0	0	
P1	0.039	0.039						5% AEP, 5 min burst, Storm 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD	40.62	25	0.039	0	0.039