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26 November 2021

Attn: Mike Ryan
Erilyan Pty Ltd
1/27 Hotham Parade
Artarmon NSW 2064

mryan@erilyan.com.au

Northside West Health Clinic - Stormwater Management Plan and Water Sensitive Urban Design

Dear Mike

1.0 Introduction

Stellen Consulting was engaged to assess the proposed development at 23-27 Lytton St, Wentworthville in reference to stormwater quantity and quality. This report details the design process for the concept stormwater management system and its assessment in accordance with the relevant requirements of Holroyd Development Control Plan 2013.

The scope and approach of the assessment are summarised below:

- Desktop review of Architectural drawings by Team 2 listed in Appendix A, survey, and other readily available information for the site
- Design of stormwater system for the proposed development including a Council stormwater diversion.
- Assessment of the stormwater management plan in terms of relevant policies and guidelines

2.0 Stormwater Management

The stormwater management plan is described in the following Stellen Consulting drawings:

DR-000	*Rev 1*	*Legend*
DR-100	*Rev 1*	*Pipe Layout – Lower Ground Floor*
DR-101	*Rev 1*	*Pipe Layout – Ground Floor*
DR-110	*Rev 1*	*Details*
DR-200	*Rev 1*	*Stormwater Diversion*
DR-210	*Rev 1*	*Long Sections – Sheet 1*

The stormwater management plan for the proposed development is consistent with the relevant requirements of the following documents:

- *Australian Standard AS3500.3 (2018) – Plumbing and Drainage: Part 3 Stormwater Drainage*
- *Holroyd Development Control Plan 2013, Part:A – Section 7, Stormwater Management*

3.0 Stormwater Diversion

The Site is currently burdened by an existing stormwater drainage easement containing a 600mm diameter pipe which conveys stormwater from Lytton Street to a Sydney Water drainage channel at the rear of the site. The development proposed relocation of the existing easement and drainage pipe to the southern boundary of the site. The proposed stormwater diversion is shown in DR-200.

3.1 Council Consultation

The proposed stormwater diversion was discussed in principle with Council (Rolyn Sario and Mark Evans) and Sydney Water, with sketches provided for comment. During a number of phone calls Council indicated that they were open to the proposed diversion but were only able to provide limited feedback/comments without full detailed drawings to review formally.

As part of the SEARs process, Council provided a set of *"Drainage Redirection Requirements"* and *"Drainage System Capacity Analysis"* documents (refer Appendix C). The proposed stormwater diversion has been design generally in accordance with these requirements. In particular, the design conforms to the following key criteria outlined by Council:

- No structures overhang the pipe or easement.
- Proposed system matches existing hydraulic function of system (5% AEP).
- Surcharging flow is safely managed with a surcharge pit on the downstream end of the new drainage line.

3.2 Design and Modelling

The proposed stormwater system was designed using DRAINS Hydrologic and Hydraulic Urban Catchment modelling. Rainfall data was derived from BOM IFD based on latitude/longitude for the site. The following design parameters were adopted:

- soil type = 2.5
- antecedent moisture content, AMC = 3
- infiltration rates: initial paved = 1 mm, grassed = 5 mm
- hardstand areas retardance coefficient 'n': 0.012
- pervious areas retardance coefficient 'n': 0.15 (sparse vegetation)
- pit loss coefficients in accordance with Queensland Urban Drainage Manual

The design process undertaken for this project within DRAINS is outlined below:

1. Determine pre-development peak flows for 5% and 1% AEP rain events
2. Match pre and post development 5% and 1%AEP pipe flows by adjusting the pipe sizes
3. Check piped flows to ensure that the proposed diversion has not negatively affected conveyance of the system.

<u>Additional Modelling Parameters</u>

- A tailwater level equal of 19 mAHD was adopted in the 1% AEP storm event. No tailwater level was selected for the 5% AEP storm event and is assumed to discharge to atmosphere.

- Pit loss coefficients are selected using the Queensland Urban Drainage Manual (QUDM) charts for structure losses.
- Pipes material selected: Concrete.
- Upstream Boundary Conditions:
    - Council pipes assumed at capacity with flow calculated based on total conveyance potential.
    - Lytton Street overland flow provided by ACOR Consultants, assumed 2m^3/s for both design events (refer Appendix B email correspondence.

The modelling results are shown in Appendix B. The DRAINS model showed that the proposed diversion will have a overall net positive effect on the system. The proposed works:

- Increase the conveyance capacity of the system by approximately 40%
- Reduce peak overland flow in Lytton Street by 5-10%.

4.0 Stormwater Quality

Conceptual water quality modelling using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) Version 6.3 was undertaken to estimate the effectiveness of the proposed stormwater management strategy at removing pollutants, particularly sediment, phosphorous and nitrogen, over the long term.

A number of Water-sensitive urban design (WSUD) measures are proposed to manage runoff from the site including:

- Rainwater tanks with combined volume of 20kL connected to an outdoor irrigation system.
- A total of 4 off Ocean Protect Psorb cartridges (690mm) split into two pits.
- 6 Ocean Protect pit baskets

The water quality catchments for roof/rainwater and other areas were estimated based on the proposed architectural drawings listed in Appendix A. Figure 1 shows the WSUD catchment plan and areas.

The model configuration and proposed treatment train is shown in Figure 2.

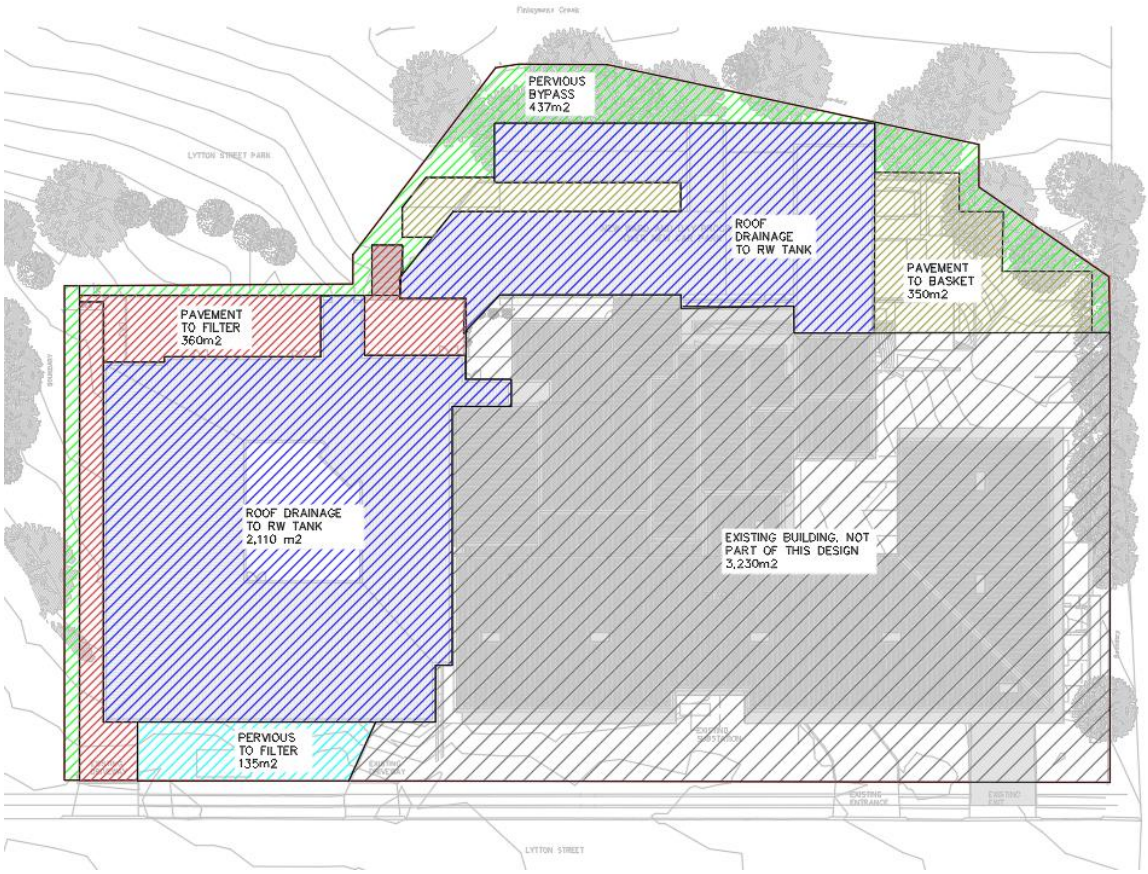

Figure 1 - Catchment plan

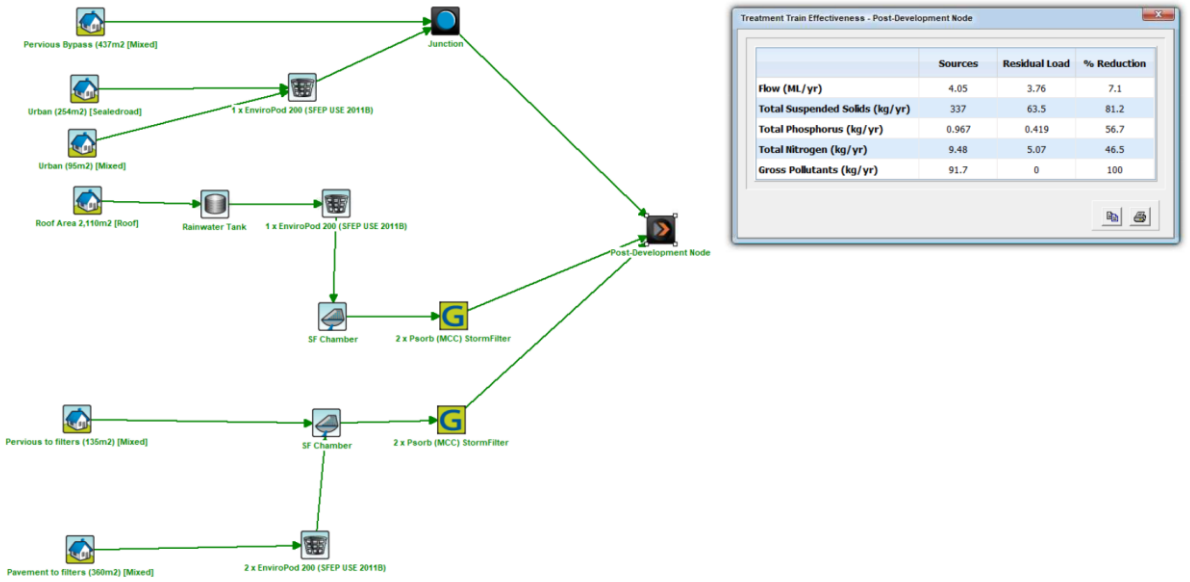

Figure 2 - Water Quality Management Strategy MUSIC Model Configuration

The Water Quality Management Strategy design is required to meet the requirements of the Holroyd Development Control Plan 2013, Part A, Table 6. The stormwater quality improvement targets are outlined below in Table 1.

Table 1: Water Quality Objectives (Council DCP)

Pollutant	Load Reduction Targets
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	45%
Total Nitrogen (TN)	45%
Gross Pollutants	70%

The MUSIC model results (Figure 2) show that the proposed Water Quality Management Strategy provides a reduction in post-development loads of Total Suspended Solids, Total Phosphorous, Total Nitrogen and Gross Pollutants that meet Council's pollution reduction targets of 80%, 45%, 45% and 70% respectively.

5.0 Rainwater Harvesting Initiatives

Clean rainwater collected from the non-trafficable areas will be harvested via charged or syphonic drainage systems through first flush devices prior to entry into the proposed 20m3 (total) rainwater storage tanks. The rainwater captured will be used in the outdoor irrigation system.

In the event of overflow from rainwater harvesting tanks, the water will overflow via a piped gravity drainage system to the surface drainage system for collection.

6.0 Conclusion

The proposed stormwater management plan has been designed in accordance with the relevant codes and standards.

A DRAINS model was prepared for assessment of the proposed stormwater diversion through the development and predicts an overall net positive effect on the system in terms of overall conveyance and flooding within Lytton Street.

The MUSIC model results showed that the proposed WSUD measures are capable of meeting council's pollutant reduction targets.

We recommend the stormwater management plan (as described in the drawings) as a safe and practical solution to support the development.

Kind regards,

Logan English-Smith
Senior Engineer

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Stellen

Appendix A – Architectural plans

Architectural Plans by Team 2

SK1021	Roof	Rev P1
A3090	Ramping Section	Rev 1
DA1001	Lower Ground – West Parking	Rev 4
DA1004	Ground – West Parking	Rev 4

X-Landscape Base_211022[1459].dwg

Existing Stormwater System by AJ Whipps Consulting Group

H01/B	Cover Sheet, Legend & Drawing Schedule
H02/B	Hydraulic Services, Site Plan
H03/C	Lower Ground Floor, Stormwater Services
H04/C	Ground Floor, Stormwater Services
H05/C	Level 1 Drainage Service
H06/C	Level 1 Pressure Service
H07/C	Roof
H08/B	Detail Sheet No. 1
H09/B	Detail Sheet No. 2

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Appendix B – Drains Model Results

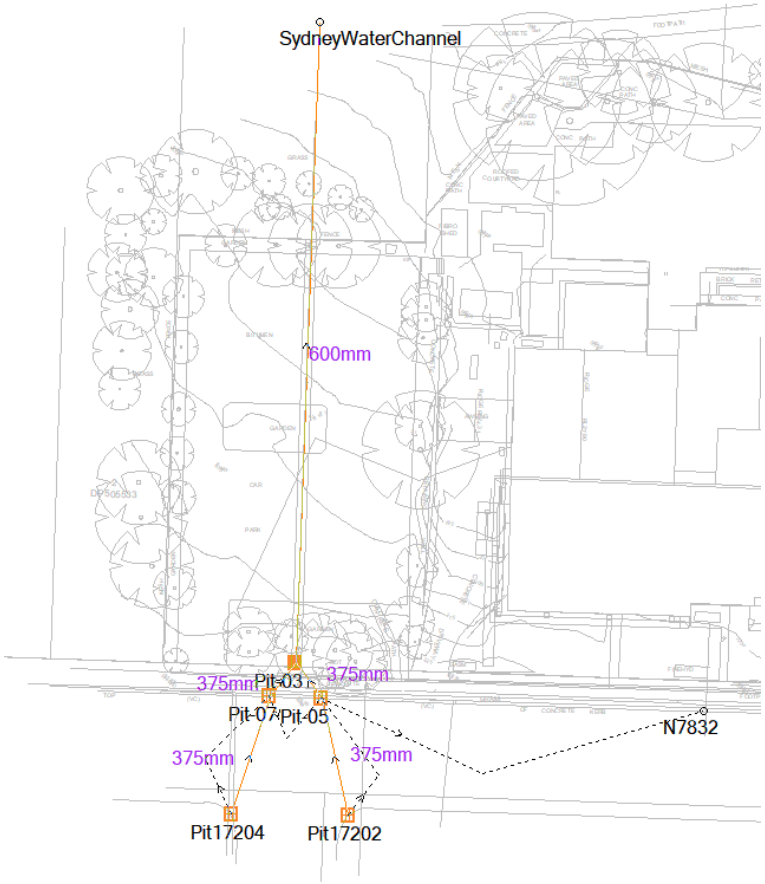

Figure 3 - Pre-development Model

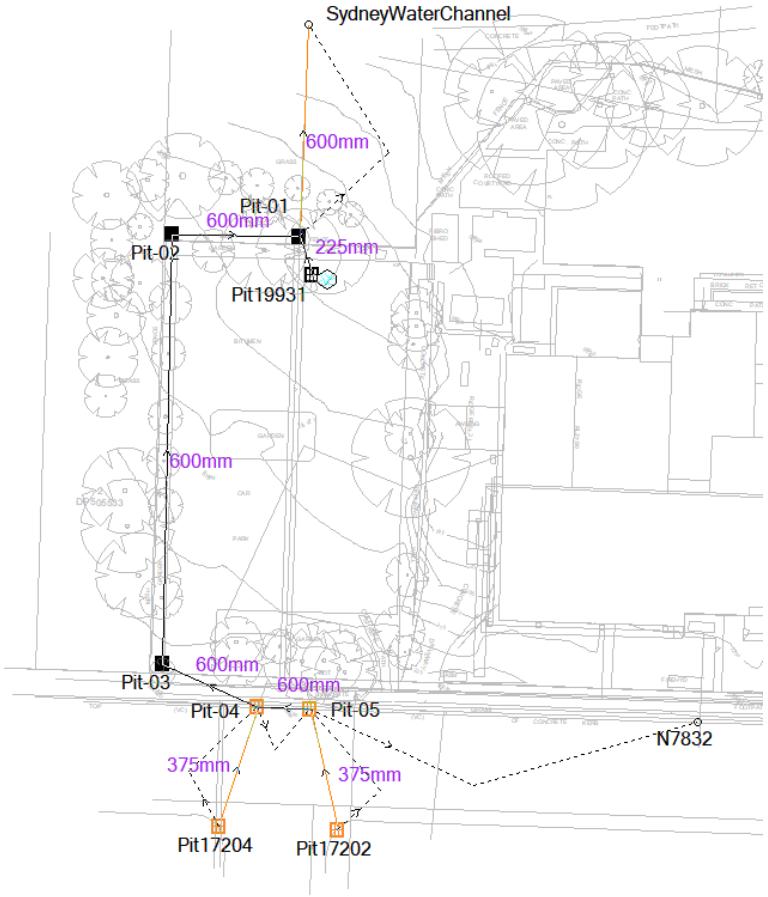

Figure 4 - Post-development Model

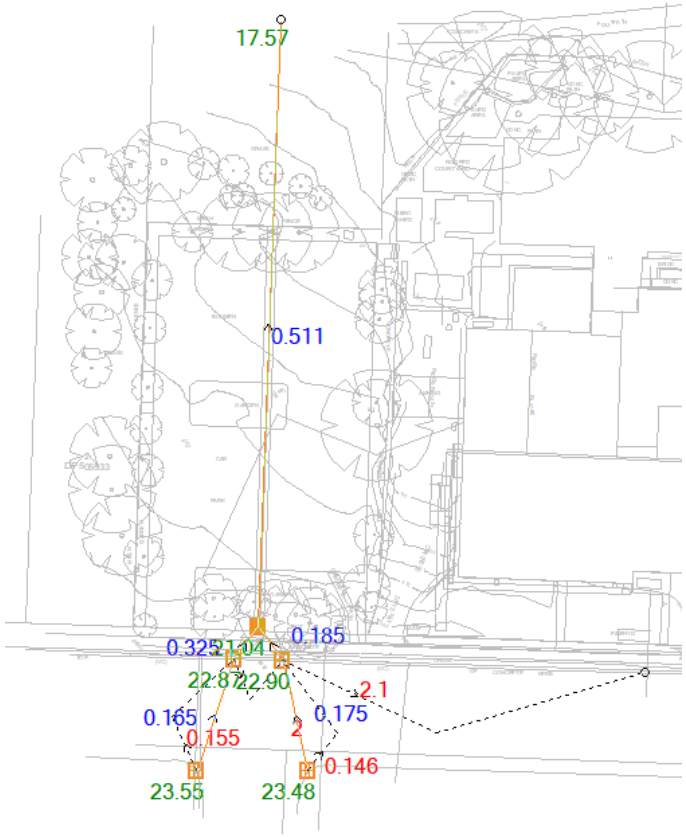

Figure 5 - Pre-development 5% AEP

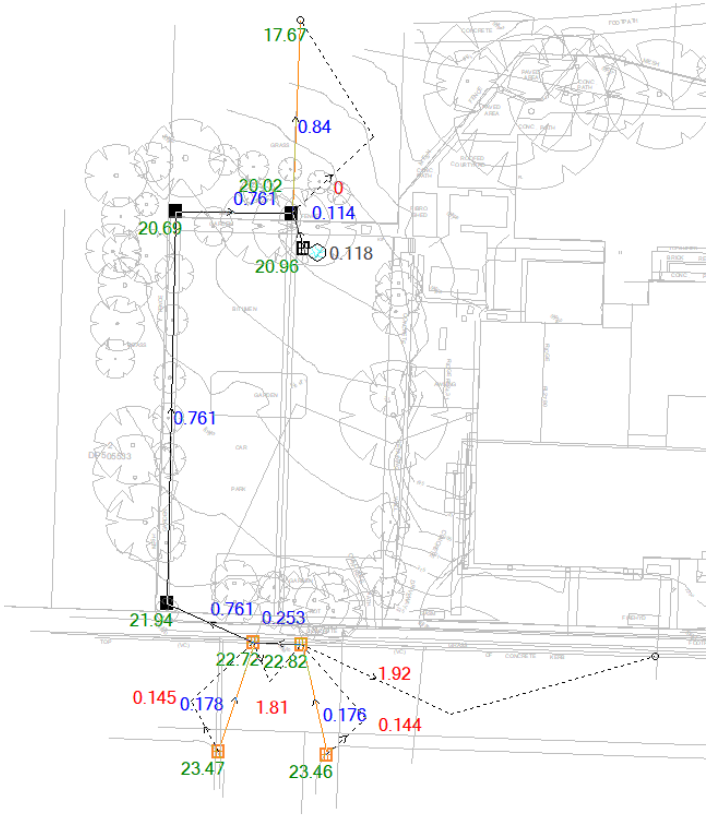

Figure 6 - Post-development 5% AEP

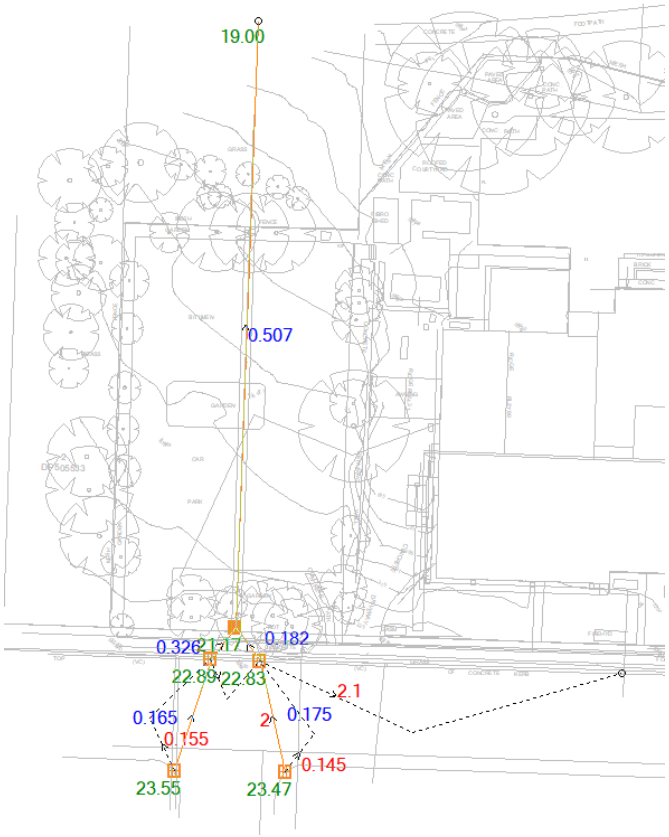

Figure 7 - Pre-development 1% AEP

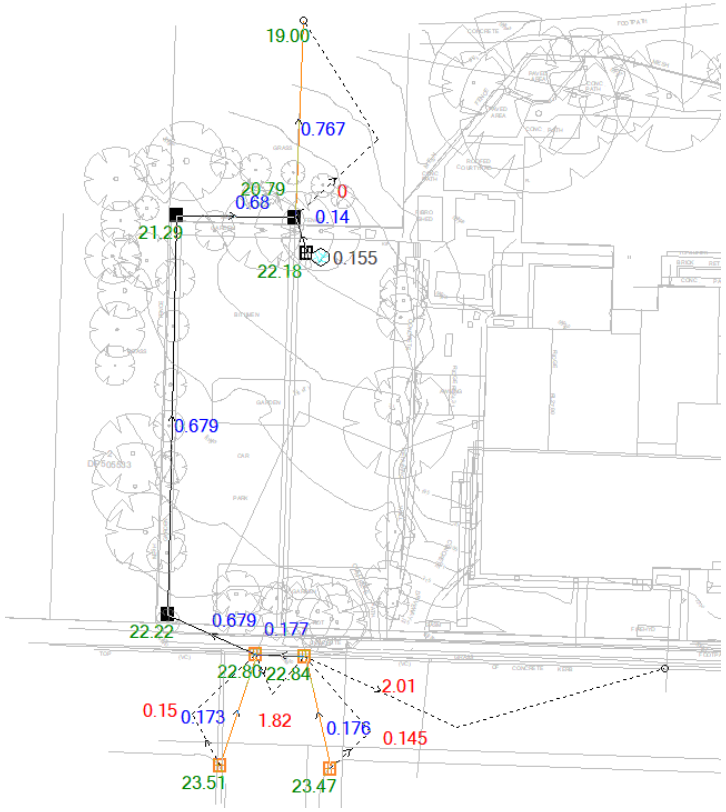

Figure 8 - Post-development 1% AEP

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Email Correspondence – Selected Overland Flow

From: Ray Engelbrecht <ray@acor.com.au>
Sent: Monday, 10 May 2021 12:53 PM
To: Logan English-Smith <logan.englishsmith@stellenconsulting.com.au>
Cc: Ian Warren <ian.warren@stellenconsulting.com.au>; Nick Weeks <nweeks@erilyan.com.au>
Subject: RE: NS West Stage 2 - Updated Survey

Hi Logan,

Please find flood report attached as promised, noting that the designated design flood flows are as follows:

Q100 Design flow to match Council Flood Mapping (see extract Tables below)

Northern Car Park flood peak overland flow rate	0.25m3/sec (allowed for 0.5m3/sec as sensitivity check)
Southern Car Park flood peak overland flow rate	0.50m3/sec (allowed for 1.0m3/sec as sensitivity check)
Total Both Car Parks	0.75m3/sec design flood flow (allowed for 1.5m3/sec as sensitivity check)

Noting that the existing s/w pipe (600RCP?) would also contribute roughly up to 0.8m3/sec into the proposed pipe upgrade if kept on the same alignment as discussed, giving gross total flow to be captured and piped at a minimum 1.6m3/sec.

We therefore recommend that the strategy aim for a minimum design flow of, say, 2m3/sec to allow for technical contingencies.

Kind regards,

Ray

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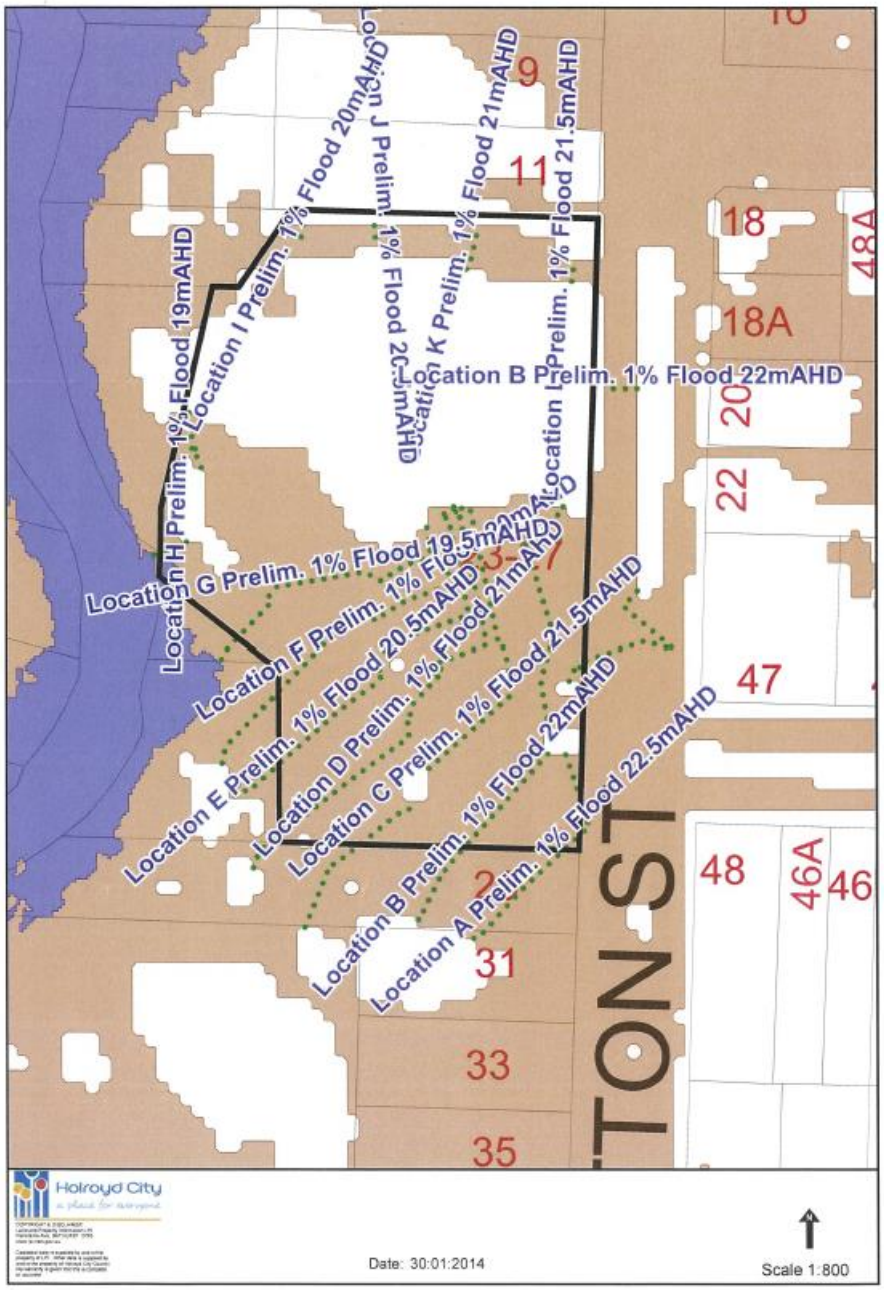
Council Flood Mapping 1% AEP



Appendix C – Council stormwater diversion requirements

Drainage Redirection Requirements

Public drainage system redirection

General advise to an applicant's at the pre DA stage when a site contains a public system is as follows:-

Council records indicate that the site contains public stormwater drainage infrastructure and easement. In this regard the following shall be addressed:-

i. The existing drainage easement and public stormwater drainage shall be accurately shown on the drawings.

ii. All proposed structures/works, including roof, eaves and gutters, stormwater drainage lines shall be clear of the existing public drainage easement or 1m clear of the existing public stormwater drainage if the drainage is not located within an easement.

iii. A survey drawing prepared by a registered surveyor that includes existing site contours and spot levels throughout the site along with the location of all existing structures to the Australian Height Datum (mAHD).

iv. Ensure that the finished floor level of the habitable floor and basement protection is set with appropriate freeboard to the 1% AEP overland flow path level, at the upstream side of the structure.

Any proposed relocation of the system requires the following minimum to be provided:

i. The relocated drainage shall be designed to a 5% (20-year ARI) capacity with a surcharge pit on the downstream end of the new drainage line. A detailed HGL analysis shall be prepared by a qualified hydraulic engineer having NER accreditation with all calculations, including pit k values, to be submitted to Council. The applicant shall demonstrate that the capacity of the drainage system, immediately upstream from the site is maintained (with no additional surcharge).

ii. Provide full design details including hydraulic grade lines (HGL) based on the 5% (20-year ARI) and 1%AEP (100-year ARI) storm events, long section of the pipe and a pipe trench cross-section detail for the drainage works proposed within the site. If the proposed pipeline does not follow the 1% (100-year ARI) flowpath, the 1% (100-year ARI) HGL analysis is not required. All design details and specifications shall be in accordance with Council's Works Specification.

iii. Drainage easement shall be created over the relocated systems with minimum width being 2.5m or the width of the pipe plus 2m, whichever is greater, and the pipe shall be centrally located within the easement. The proposed drainage easement is to be totally contained within the site where the old drainage easement/pipeline was located.

iv. All proposed structures, including roof eaves and gutters, retaining walls etc, shall be clear of the public drainage easement and structure.

v. Any stormwater gully pit(s) to be proposed within the roadway shall be in accordance with Council's standard detail – SD 8010.

Note:

All electronic models shall be submitted to Council with the application.

Drainage system capacities analysis

The process required to determine the capacity of the drainage network includes the following:

1. Obtain a catchment map from Council. It is the designer's responsibility to obtain invert and ground levels for this analysis and to allow for appropriate blockage factors to each inlet pit.

2. Set up a DRAINS model of the existing drainage system. Details on how the hydrology was determined shall be documented with the results in a report.

3. For developments, the HGL analysis is to extend to two pits upstream and downstream of the system being analysed (control pits). A detailed survey of all drainage infrastructure between the controls pits is to be carried out. These details shall be incorporated into the DRAINS model.

4. The designer shall run various storm events (from the 5, 10 or 20-year ARI or higher) and durations from 5 minutes to 3 hours, until there is an observed surcharge in the drainage system (for developments, between the control pits). When this occurs the previous storm event that did not cause any surcharge (excluding sealed pits), is the capacity of the drainage system - D_c.

5. The DRAINS model must be recalibrated to use the inbuilt "k" values according to the QUDM 2008 charts. Repeat step 5, this may increase or decrease the flood carrying capacity to the drainage system.

6. Save this model, copy and then modify the copied DRAINS model to represent the improvements or diverted drainage line(s) using 20-year ARI rainfall and assuming that the upstream drainage system has been upgraded to the same standard. Recalibrate the inbuilt "k" values according to the QUDM 2008 charts.

7. For developments, the HGL level of the modified drainage system (using D_c) must be at or lower than the HGL levels at the control pits for the existing drainage system. The modified drainage system must not surcharge throughout the development site.

8. A long-section of pipeline shall be provided, showing, at a minimum, the chainages, 20-year HGL, surface and invert levels for the pre and post scenarios. This is an inbuilt feature of the DRAINS program.

9. An appropriate transition/surcharge structure at the end of the redirected pipeline shall be provided.

10. For developments, Drainage Easements (pipe diameter plus 2m, rounded up to the nearest 0.1m) shall be created over the pipe and, where required, redundant easements are to be extinguished.

11. For developments, all electronic models shall be submitted with the application. Drainage assessments will not be undertaken if these working models are not provided to Council.