Stellen
Civil Engineering

Stellen Consulting
Level 1, 27 Belgrave Street
Manly NSW 2095

PO Box 151
Freshwater NSW 2096

+61 450 460 496 tel
ABN 61 149 095 189

27 July 2020

Jiri Albrecht
45 Oxford Falls Road
Beacon Hill NSW 2100

c/o vmdc@bigpond.net.au

Overland flow assessment for a proposed subdivision at 45 Oxford Falls Road

Dear Jiri

1.0 Introduction

Stellen Consulting was engaged to assess the proposed development at 45 Oxford Falls Road in reference to overland flow.

The purpose of the assessment was to:

- Estimate whether the property is subject to overland flow from the upstream catchment during the 1% annual exceedance period (AEP) storm event.
- Evaluate the need for a further detailed catchment study and/or overland flow analysis.

2.0 Information used

The following information was used:

- NSW Government LiDAR (1m) aerial survey (2015)
- Australian Government Bureau of Meteorology (BOM) Intensity Frequency Duration Data for 3 Mayfair
- Site observations made on 12 April 2019
- Survey by J.Mcclure dated 18 December 2018, refer to Appendix A
- Subdivision plans by Michal Korecky dated 24 December 2019, refer Appendix A.

3.0 Description of the Property

The property is a battle-axe block (1126m^2) with a driveway entrance located on the eastern side of 16 Dareen Street. The property slopes steeply north-east toward Oxford Falls Rd.

Council's stormwater asset mapping information (available on council's website) indicates the presence of a 525mm diameter stormwater pipe along the property's western boundary line conveying stormwater from an on-grade kerb inlet pit (lintel only) in Dareen Street to a kerb inlet pit (with grate) on Oxford Falls Rd/Iris Street. A site investigation on 12 April 2019 confirmed the presence of this pipe in approximately the same location. The pipe size was also confirmed via survey.

Based on the 1m survey information no defined channel above the drainage easement (Dareen to Iris Street) exists, this was confirmed during the site visit.

4.0 Proposed development

The development proposes subdivision of the land into two new lots, Lot 1 (585 m^2) and Lot 2 (541 m^2). The proposed subdivision plans are prepared by Michal Korecky and attached in Appendix A.

5.0 Modelling

5.1 Catchment description

An on-grade kerb inlet pit (lintel opening only) at 16/18 Dareen Street forms part of council's minor drainage network. The upstream catchment is predominantly urban and approximately 3.5ha in area. Catchment 1 is shown in Figure 1 and is shaded pink. Catchment 1 (2.55 ha) includes a pit and pipe network for minor stormwater flows with major flows conveyed overland in the kerb and gutter of the street. During major storm events, only 2.55ha drains towards the pit, the remaining overland flow is expected to drain east overland down Warringah Road. This is a result of the pit inlets having insufficient capacity and the topography of the land.

Catchment 2 (0.36ha, shaded green) between Dareen and Iris Street was also included to consider the impact of the sheet flow through the property.

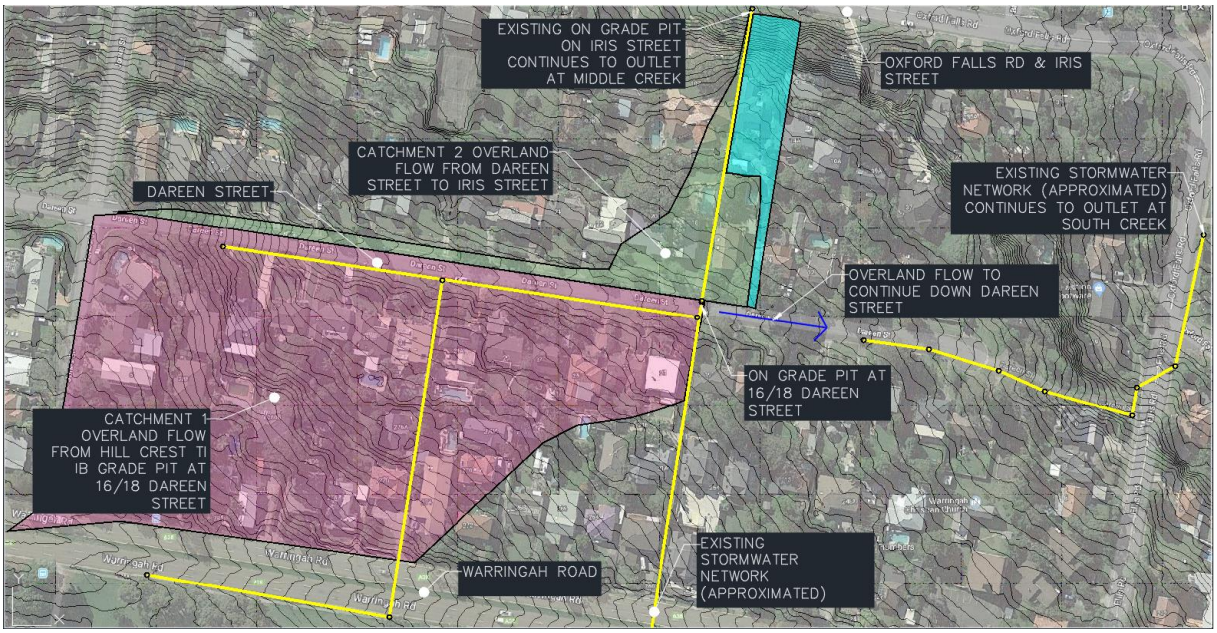

Figure 1. Catchment areas and existing stormwater networks (approximated).

5.2 Modelling approach

The modelling approach consisted of the following:

Catchment 1

1. Determine catchment draining to the on-grade pit fronting 16/18 Dareen Street using LIDAR information.
2. Calculate flow arriving at the pit (16/18 Dareen Street) assuming a 100% pipe and pit blockage factor during the 1% Annual Exceedance Probability (AEP) rain event.
3. Estimate Dareen street's flow capacity using Queensland Urban Drainage Manual (QUDM) road conveyance charts.

4. Compare the estimated street flow capacity against the predicted overland flow and assess the requirement for further investigation.

Catchment 2

5. Check topography, size and flow of Catchment 2 (Dareen to Iris Street) for the 1% AEP rain event.
6. Evaluate the impact of the predicted Catchment 2 flows on the development and assess the requirement for further investigation.

5.3 Model setup

Watercom's stormwater drainage system design and analysis (DRAINS) software was used to predict the 1% AEP peak overland flow arriving at the pit in Dareen Street, directly upstream of the site.

The following assumptions were made when building the model:

- 100% pit & pipe blockage of council's drainage system
- 70% Impervious faction for the catchment area (urban)
- A retardance coefficient 'n' of 0.012 for impervious areas was used
- A retardance coefficient 'n' of 0.33 for pervious areas was used
- Catchment slope calculated from lidar information (approximately 8%)
- Catchment flow path length 310m (from hill crest to on-grade pit)

5.4 Modelling results

The predicted flows for Catchment 1 and during the 1% AEP storm event are shown in Table 1 below.

TABLE 1 – PREDICTED CATCHMENT FLOW RESULTS (DRAINS)

Catchment	$Q_{1\%AEP}$	unit
Catchment 1	1.44	m^3/s
Catchment 2	0.203	m^3/s

6.0 Assessment

6.1 Assessment of Dareen Street's ability to convey the predicted 1% AEP peak overland flow

The flow capacity of Darren Street's kerb, gutter and road were estimated using road flow capacity charts available in the Queensland Urban Drainage Manual (2013-QUDM). The following assumptions about the road geometry were made:

- Dareen street is ~8m wide (gutter to gutter)
- Top of kerb to gutter invert ~0.16m
- Flow width 4m per side of the road
- Longitudinal grade at pit 3.5%
- Crossfall at pit 2.5%
- Kerb type - M1 (barrier crossing was unavailable for 8m road widths)
- Carriageway pavement manning's 0.015, Kerb (M1) manning's 0.013
- Flow is contained in the street only (the road reserve was not included)

Based on the above assumptions the flow capacity within the carriageway of Dareen Street was estimated to be 1.89m^3/s which is 0.45 m^3/s greater than the estimated overland flow from the 1% AEP storm event. Therefore, no overland flow is expected to overtop the kerb at 16/18 Dareen Street.

If overland flow was to overtop the kerb, during storm events greater than the 1% AEP or blockage, an existing grass crested mound is present between the kerb and front boundaries on the northern side of Dareen street, effectively providing additional capacity to the overland flow conveyance capacity of the street. Figures 2, 3 and 4 below provide photographic evidence of the crest and street.

Figure 2. Grass crest present if overland flow toppled the kerb (pit located behind Mitsubishi).

Figures 3,4 & 5 are photos of the on-grade pit (lintel opening only) at 16/18 Dareen Street and show evidence of the overland flow route consistent with the location indicated in Figure 1.

Figure 3. Existing on-grade pit (no grate) at 16/18 Dareen Street – front view

Figure 3. Existing on-grade pit (no grate) at 16/18 Dareen Street - side view with crest - photo looking downstream.

Figure 4. Existing pit's (RHS under Mitsubishi) overland flow route if pit surcharged (12 Dareen Street- photo looking upstream)

6.2 Assessment of Catchment 2 sheet flow and any impact on the development

The DRAINS model predicted that during the 1% AEP event the site will be subject to 203 l/s of overland sheet flow. Based on the topography of the land this flow will likely be wide, slow moving and shallow, presenting a low hazard based on the Floodplain Development Manual (2005) Figure L2.

Based on the above information the predicted sheet flow can be dealt with in the stormwater drainage system for the site using a combination of pits, pipes and swales to protect the development.

7.0 Conclusion and Recommendations

An assessment of the catchments draining toward the subject site was completed using 1m LIDAR information and found two possible catchments (1 & 2). Each catchment was modelled using Watercom's DRAINS software to estimate the predicted flow generated during a 1% AEP rain event assuming a 100% blockage factor for the pit and pipe network.

Catchment 1

During the 1% AEP rain event a predicted 1.44 m^3/s of flow will arrive (overland) at the pit fronting 16/18 Dareen Street.

The flow capacity of Darren Street's kerb, gutter and road was estimated using road flow capacity charts available in the Queensland Urban Drainage Manual (2013-QUDM) and found to be of sufficient size (1.89 m^3/s) to convey the predicted 1% AEP flows generated by Catchment 1 (1.44 m^3/s) past the development site toward Ellis Street.

The site is not subject to any overland flow generated by Catchment 1.

No further investigation is recommended.

Catchment 2

The DRAINS model predicted that during the 1% AEP event the site will be subject to 0.203 m^3/s of overland sheet flow generated by Catchment 2. Based on the topography of the land this flow will be wide, slow-moving and shallow, presenting a low hazard (Floodplain Development Manual (2005) - Figure L2).

Based on the above information the predicted sheet flow can be dealt with in the stormwater drainage system for the site using a combination of pits, pipes and swales to protect the development.

We recommend that the stormwater design for the development include the provision for capturing and conveying the sheet flow generated by Catchment 2 safely through the site.

No further investigation of the flow generated by Catchment 2 is recommended.

Please contact me with any questions regarding this report.

Kind regards,

Logan English-Smith
Senior Engineer

Stellen Consulting
Level 1, 27 Belgrave Street, Manly, NSW 2095
T. 0430 472 389
E. logan.englishsmith@stellenconsulting.com.au

Stellen

Stellen
Civil Engineering

Appendix A – Detailed Survey and Subdivision Plans