

2 July 2020

Anthony Douglas  
57 Hay St  
Collaroy NSW 2097

anthony@douglastribe.com

**Stormwater engineering design for proposed residence at 57 Hay Street**

Dear Anthony

**Introduction**

Stellen Consulting was engaged to prepare a stormwater management plan in support of the proposed DA residence at 57 Hay Street, Collaroy.

**Proposed Development**

The proposed development is shown on the drawings prepared by Wincrest Group Pty Ltd listed in the document list below. The development proposes a two stories residence in single lot area of 696.77m<sup>2</sup>.

The site is a low-level property that falls away from street.

**Performance Criteria**

The stormwater management plan has been prepared to meet with noted exceptions:

- *Australian Standard AS3500.3 (2018) – Plumbing and Drainage: Part 3 Stormwater Drainage*
- Northern Beaches Council (Warringah) – Stormwater Drainage from Low Level Properties Technical Specification

**Stormwater Management Plan**

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

|               |                   |                                                 |
|---------------|-------------------|-------------------------------------------------|
| <i>DR-000</i> | <i>Revision 2</i> | <i>Legend</i>                                   |
| <i>DR-001</i> | <i>Revision 2</i> | <i>Pipe Layout &amp; Level Spreader Details</i> |
| <i>DR-002</i> | <i>Revision 2</i> | <i>Roof Layout</i>                              |
| <i>DR-003</i> | <i>Revision 2</i> | <i>Details</i>                                  |
| <i>DR-004</i> | <i>Revision 0</i> | <i>Site Areas</i>                               |

After examining the site conditions for a suitable disposal method, we propose a combination of a charged system and level spreader. The roof is charged to the street and the driveway drains to a level spreader at the rear yard of the property. All remaining pervious area continue to fall naturally to the back.

This disposal philosophy was chosen for the following reasons:

1. Connection to an existing council stormwater drainage line is not available.
2. An easement to drain stormwater to council's drainage infrastructure through the downstream property was refused (see attached letter).
3. On site detention with a level spreader was not viable. The rear downstream neighbour (1011 Pittwater Road) has built up the rear of the yard adjoining the subject site boundary fence approximately 600mm higher as shown in the survey details by Terralinks Group Pty Ltd dated (13/03/2020), refer to photo. This forms an obstruction across the full width of the property that prevents water flowing in an easterly direction away from the 57 Hay Street.
4. The soil is not suitable for absorption based on empirical observations and measurements. During a <10%AEP rainfall event, water pooled to approximately 200mm deep in the back yard, refer to photo.
5. The existing roof is charged and has drained successfully to the kerb in Hay Street presumably since the house was built in the 1950s.



#### **On-site detention does not reduce catchment peak flows**

The subject site falls within the Collaroy catchment. According to council information there is no flood study conducted for that catchment.

The catchment area is approximately 101 hectares and it falls to Collaroy Basin. 57 Hay Street is approximately 686m to the catchment outlet.

By virtue of the location of the subject site in the catchment, the use of OSD is not recommended as it will compound the peak flow at the outlet of Collaroy catchment during the critical 1%AEP storm (refer to Figures 2 and 3 for details). Hydrographs of the site and the greater catchment support this hypothesis.

Adding OSD to the design increases the peak flow at the catchment outlet.

#### **Modelling**

The proposed stormwater system and catchment was modelled using DRAINS Hydrologic and Hydraulic Urban Catchment modelling. Rainfall data was derived from BOM IFD based on latitude/longitude for the site using storm durations from 5 minutes to 3 hours. The following design parameters were adopted:

- soil type = 3
- impervious areas retardance coefficient 'n': 0.013
- pervious areas retardance coefficient 'n': 0.330

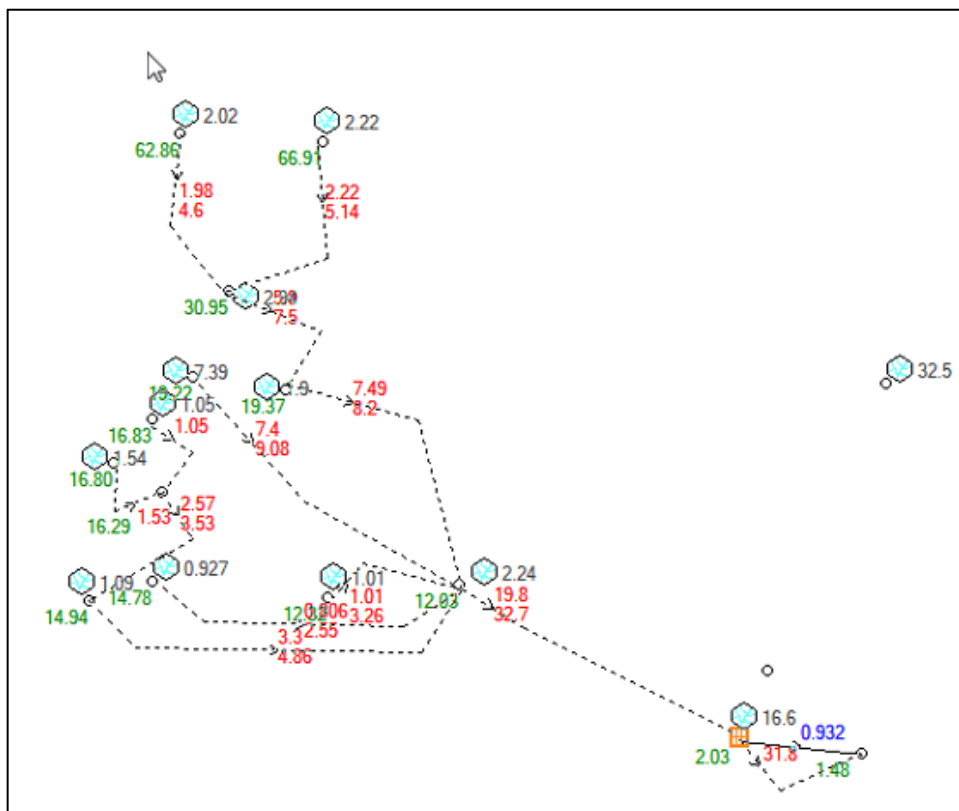
The process undertaken for this project within DRAINS is outlined below:

1. Delineating the catchment sizes, council stormwater system and flow path lengths.

2. Model Collaroy Catchment
3. Model the proposed development without OSD
4. Model the proposed development with OSD
5. Calculate the time of concentration for the proposed development
6. Check the effect of the use of OSD on the hydrograph for the catchment

Due to the developed nature of Collaroy Catchment, it was modelled as 70% impervious.

Because during the 1%AEP storm, the pipes are full, the overland flow governs the time to concentration. To simplify the modelling, all pipes have conservatively assumed to be blocked. This overestimates the flow peak but not the time to concentration.



**Figure 1:** Collaroy Catchment representation in DRAINS—a simplified representation is on the right for verification.

### Time of Concentration $T_c$

The time of concentration is generally the time required for runoff to travel from the kerb at the site discharge point to the catchment outlet by the longest available flow path. For this model, the time of concentration for the property is calculated as follows:

$$T_c = T_{Kerb} + T_{Pipe} \quad \text{Minutes}$$

$$T_{Kerb} = 0.025L/S^{0.5} \quad \text{Minutes} \quad L = 57 \text{ m}, \quad S = 0.65, \quad \gg \quad T_{Kerb} = 1.68 \text{ min}$$

$$T_{Pipe} = L/v * 60 \quad \text{Minutes} \quad L = 669 \text{ m}, \quad v = 2.7 \text{ m/s}, \quad \gg \quad T_{Pipe} = 5.57 \text{ min}$$

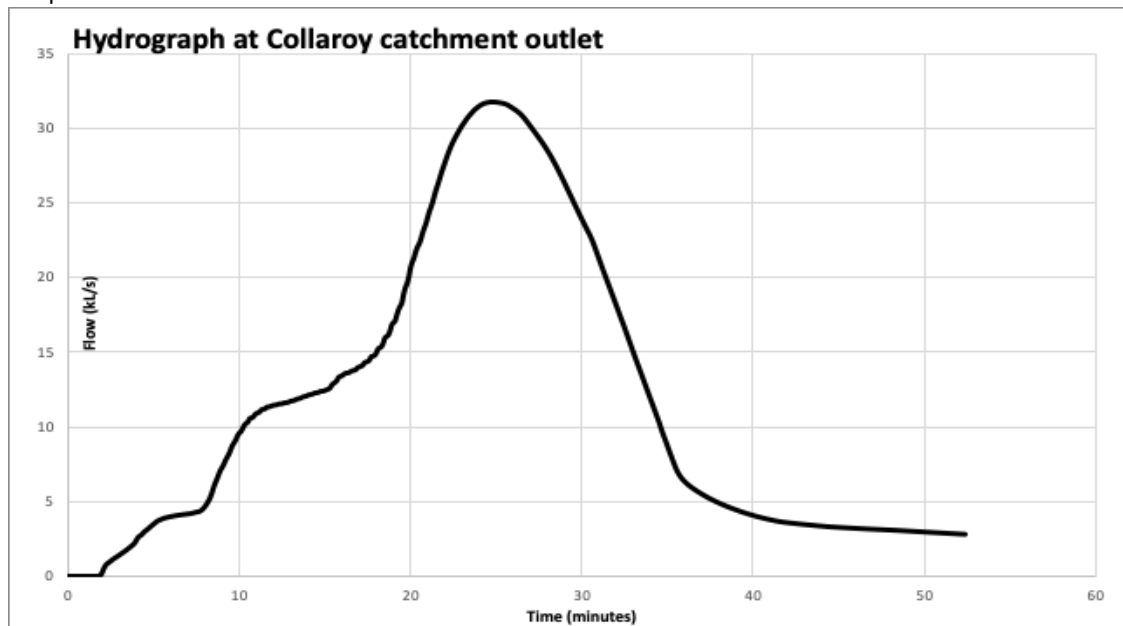
The velocity was calculated using Manning's Formula assuming  $n=0.015$  for road,  $R=0.01$  depth of water, and  $S$  calculated to be 0.76

$$T_c = 1.68 + 5.57 = 7.25 \text{ min}$$

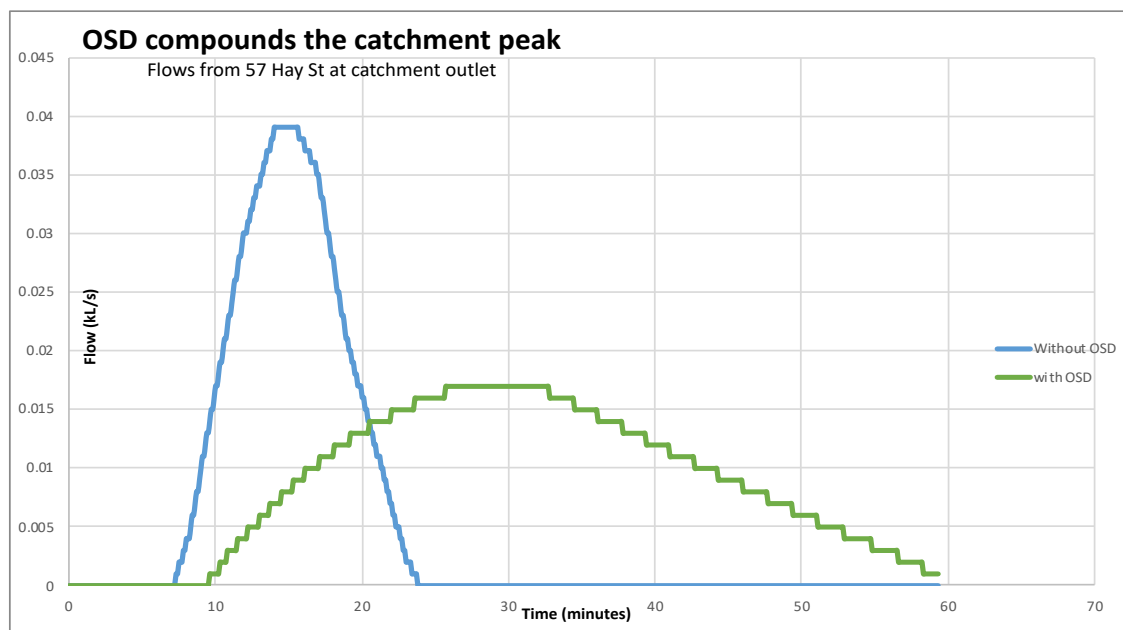
## Results

Figures 2 and 3 show the hydrographs that produce maximum peak flows for the Collaroy catchment, and the proposed site with and without OSD, respectively. It can be clearly seen from Figure 3 that the time to peak for the site is approximately 10 minutes faster than that of the greater catchment. That is to say, for the critical storm, the water from the subject site drains to the catchment outlet at Collaroy beach before the peak flow at the outlet from the greater catchment arrives.

The results also demonstrate that the application of OSD to this design is not just ineffective, it actually increases the peak flows in council's asset in the critical storm.



**Figure 2:** Collaroy Catchment Hydrograph - 1% AEP, 20 min burst, Storm 10



**Figure 3:** Hydrographs for the subject site with & without OSD - 1% AEP, 10 min burst, storm 7 and 8 respectively

## Conclusion and Recommendations

The stormwater concept presents a feasible and safe way to manage the property's stormwater, given the known issues with drainage on site and to the rear.

Because of site's position in the catchment adding OSD to the design increases the peak flows at the catchment outlet.

The use of OSD is therefore not recommended for the proposed development at 57 Hay Street, Collaroy. We recommend a simple roof charge to the street as the safest solution for this site.

I have attached the DRAINS model file to the email containing this letter. Please contact me with any questions regarding this report.

Kind regards,



**Civil Engineer**

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### Document List

**Architectural drawing** by WINCREST Group Pty  
Ltd

Date: (09/12/2019)

HT01-HT01

**Survey Drawing** by TERRALINKS Group Pty Ltd

Ref: 5968CO\_WG .dwg

Date: (17/03/2020)

### Quality Information

Revision: Draft

Date: 01 July 2020

Prepared by: Yasser

Checked by: Ian Warren

Principal Engineer

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**Attachment 1 – Sample Letter**

Dear DAVID & TONIA

I/we ANTHONY DOUGLAS  
are proposing to redevelop our property at 57 HAY ST, COLLAROY

Before we can proceed with this proposal Council has advised us that we have two options for the drainage of stormwater, the first, which is Council's preferred method, is to obtain a drainage easement to convey the stormwater runoff from our property to the nearest public stormwater drainage infrastructure or Council approved discharge point, being PITTWATER RD

This will require you to grant me/us a drainage easement through your property with all legal and survey costs for the creation of the easement being borne by us, together with any consideration for the use of your property as determined by an independent valuation or agreement. (Attach independent valuation or agreement to this form)

The other alternative is to install an underground absorption system or level spreader (if appropriate for this site) to spread and disperse the stormwater flow. As the runoff and seepage from this system may flow towards your property because of the slope of the land, the best solution would be to have a drainage system that will convey our stormwater via an inter-allotment drainage pipe to PITTWATER RD

You are advised that if Council determines that the only way for the drainage of stormwater is via an easement through your property, I/we may have to use Section 88K of the Conveyancing Act 1919 to request the Supreme Court to grant me/us the drainage easement. This will probably result in legal expenses and time spent for both you and I/us.

Could you please indicate your position regarding this matter so that we can advise Council to enable our application to progress.

~~YES I/we are willing to grant you a drainage easement.~~

Name

Address

NO I/we are not willing to grant you a drainage easement.

DAVID HELLYAR

1011 PITTWATER ROAD COLLAROY

Name

Address

01 APR 2020