



Stormwater Management Report for

Aspiring Properties at
6 The Corso & 46-50 East Esplanade, Manly



REVISION HISTORY

Revision Number	Prepared By	Description	Date
1	Stephen Hazlewood	Issued for DA	27/08/2019

DOCUMENT ACCEPTANCE

Action	Name	Signed	Date
Prepared by	Stephen Hazlewood	SH	27/07/2019
Reviewed by	Ben Hogarth	BH	19/07/2019
Approved by	Chris White	CW	27/08/2019
On behalf of	Adams Consulting Engineers Pty Ltd		

This report is of a defined scope and only for this commission. Adams should be consulted where any questions regarding the interpretation or completeness of our report arise.

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1 INTRODUCTION

Adams Consulting Engineers Pty Ltd (Adams) has been engaged by Aspiring Properties to prepare a Stormwater Management Report for the proposed development of an office, commercial and school building at 6 The Corso & 46-50 East Esplanade, Manly (Site). It is understood that the development of the Site consists of the combining of three separate properties into a single larger property. These properties are comprised of 6 The Corso, 46-48 East Esplanade and 50 East Esplanade.

This report will outline the methodology adopted and associated results of:

- Pre and post development stormwater flows generated due to development of the Site;
- Requirement of a detention tank; and
- Water sensitive urban design.

It is understood that this report will be utilised in the Development Application submission and will also inform the basis of the next phase of design works to ensure continuity through the project.

2 EXISTING SCENARIO

2.1 Existing Site Description

The Site is located approximately 10km to the north east of Sydney's CBD or 400m south west from Manly Beach, located within the suburb of Manly and has an area of approximately 0.1382 hectares. The Site is surrounded by The Corso to the north west and East Esplanade to the south west. Manly Wharf is located approximately 100m to the south west of the Site.

The Site currently serves as a commercial space made up of three separate building. As the majority of the existing Site is developed it is estimated that the total impervious area across the Site is approximately 100% of the total area. Refer to **Figure 1** For the location of the Site.



Figure 1- Site Aerial Image (Google Earth, 2019 accessed July 2019)

2.2 Existing Stormwater Pipe Infrastructure

A review of the Dial Before You Dig (DBYD) information and information obtained from Northern Beaches Council (Council) indicates that there are the following nearby stormwater assets in close proximity to the Site:

1. A 375mm stormwater pipe to the north of the Site along the southern verge of The Corso;
2. There are no stormwater pipes shown in East Esplanade.

Refer to **Figure 2** for the Dial Before You Dig stormwater information obtained from Council.

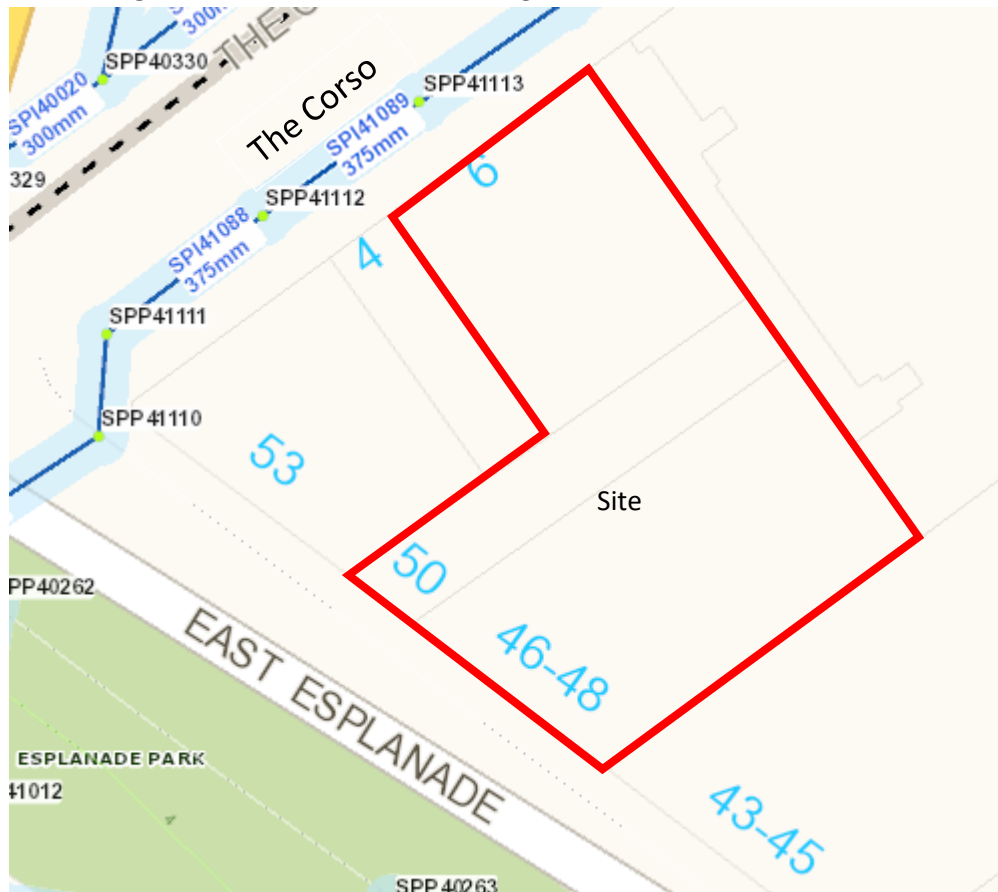


Figure 2 - Dial Before You Dig – Stormwater Maps (Northern Beaches Council, July 2019)

2.3 Existing Land Flooding Overlays

A review was undertaken of the Councils "Manly to Seaforth Flood Study by Cardno, 22 February 2019" to determine if the Site is flooded during a 1% Annual Exceedance Probability (AEP) rainfall event. The report showed that the Site was not affected in a 1% AEP event stormwater Peak Flood Depths. Please refer to "Manly to Seaforth Flood Study by Cardno, 22 February 2019 refer to Appendix B"

2.4 Site Drainage Description

A review of the Site shows that the properties along East Esplanade (46-48 East Esplanade and 50 East Esplanade) currently discharge to the kerb and gutter which is evident by the kerb outlets along East Esplanade (as shown below). It is not known how 6 The Corso discharges it's stormwater into the council system as it is not clear from the outside of the building or picked up on the current survey. However, it is expected that direct connection from the property occurs to the 375mm stormwater main in The Corso.



Figure 3 - Existing Kerb and Channel Outlets (Google Street View accessed 27.08.19)

3 PROPOSED DEVELOPMENT

- 4 The proposed development of the Site will consist of one multi-story building comprising of teaching, communal and office space. Refer to **Figure 4** which indicates the building layout.

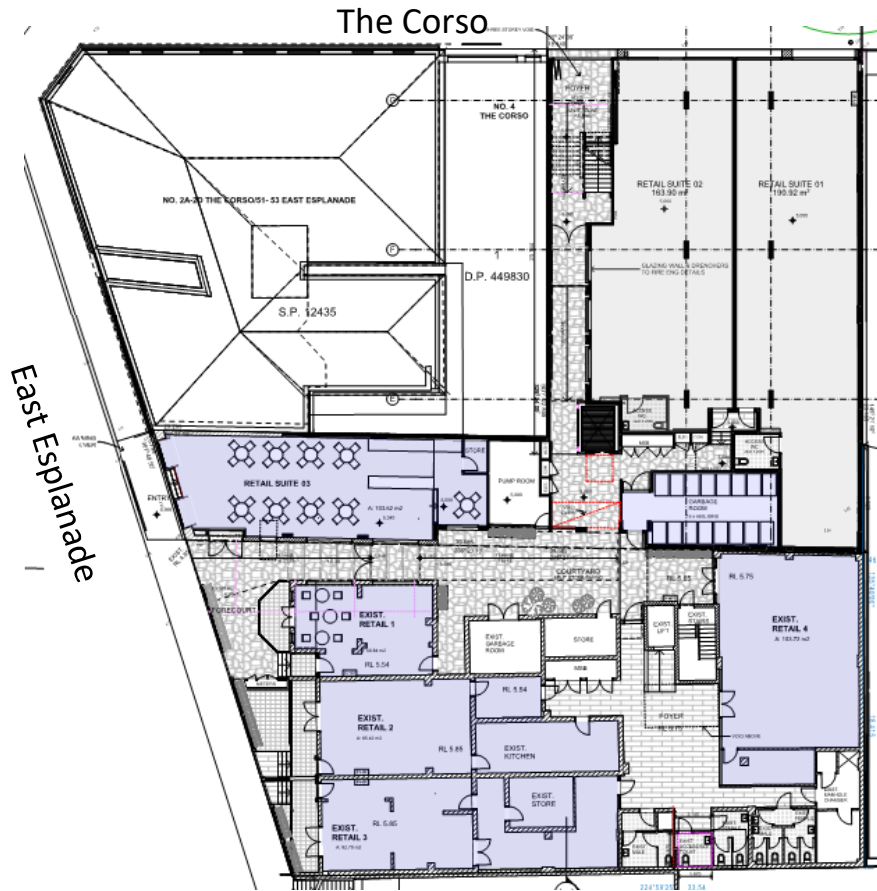


Figure 4 - Site Plan (Wolski.Coppin Architecture 21 August 2019)

A review of the most recent architectural schedule indicates that the proposed development is intended to have a total impervious area of 100% of the total Site area.

5 DESIGN CRITERIA

5.1 Hydraulic Modelling Methodology

Referring to Manly specification for On-Site Stormwater Management (March 2004) Section 4.4 Permissible Site Discharge (PSD) from the Site may be calculated by using the Rational Method in accordance with Australian Rainfall and Runoff, Volume 1, 1987 or later editions.

$$Q = \frac{CIA}{3600}$$

Where:

Q = Stormwater flow (L/s);

C = Coefficient of impervious area;

I = Rainfall Intensity (mm/hr);

A = Area (m²);

5.2 IFD Data

2016 rainfall intensity data was obtained from the Bureau of Meteorology website (accessed July 2019) and is presented in the below table.

Table 1 - Annual Exceedance Probability (AEP) – Rainfall Intensity (mm/hr)

Duration	Annual Exceedance Probability (AEP)						
	63.20%	50%	20%	10%	5%	2%	1%
1min	150	167	223	262	301	354	395
2min	125	139	181	210	238	277	308
3min	115	128	168	195	222	259	289
4min	108	120	159	185	212	248	276
5min	102	114	151	177	202	237	264
10 min	80.7	90.4	121	143	164	193	216
15 min	67.3	75.4	101	119	137	162	180
20 min	58.1	65.1	87.4	103	118	139	155
25 min	51.4	57.5	77	90.6	104	122	136
30 min	46.2	51.7	69	81.1	93.1	109	122
45 min	36	40.1	53.3	62.4	71.4	83.7	93.3
1 hour	29.9	33.3	43.9	51.3	58.7	68.7	76.6
1.5 hour	22.9	25.3	33.2	38.8	44.3	51.9	57.9
2 hour	18.9	20.9	27.3	31.8	36.3	42.6	47.5
3 hour	14.4	15.9	20.7	24.2	27.7	32.5	36.4
4.5 hour	11	12.2	15.9	18.6	21.4	25.2	28.3
6 hour	9.18	10.1	13.3	15.6	18	21.3	24
9 hour	7.12	7.88	10.4	12.3	14.3	17	19.2
12 hour	5.97	6.63	8.85	10.5	12.2	14.6	16.5
18 hour	4.66	5.21	7.05	8.41	9.84	11.8	13.4
24 hour	3.91	4.39	6	7.19	8.44	10.1	11.5
30 hour	3.41	3.84	5.28	6.35	7.47	8.98	10.2
36 hour	3.04	3.43	4.75	5.72	6.73	8.1	9.19
48 hour	2.53	2.87	3.99	4.81	5.66	6.81	7.71
72 hour	1.92	2.18	3.05	3.68	4.32	5.17	5.83
96 hour	1.55	1.77	2.47	2.97	3.47	4.14	4.65
120 hour	1.31	1.49	2.07	2.48	2.89	3.42	3.83
144 hour	1.13	1.28	1.77	2.11	2.45	2.9	3.23
168 hour	0.991	1.12	1.54	1.83	2.12	2.49	2.77

5.3 Catchment Data

The catchment area is consistent for the pre and post development scenarios – approximately 0.1382 hectares.

5.4 Existing Development

As outlined in Section 2.1, it is assumed that the existing Site is approximately 100% impervious.

5.5 Proposed Development

As outlined in Section 3, the architectural plans indicate that the Site is 100% impervious. **Figure 5** below shows the proposed catchment plan with the area in blue discharging to East Esplanade and the area in red discharging to The Corso

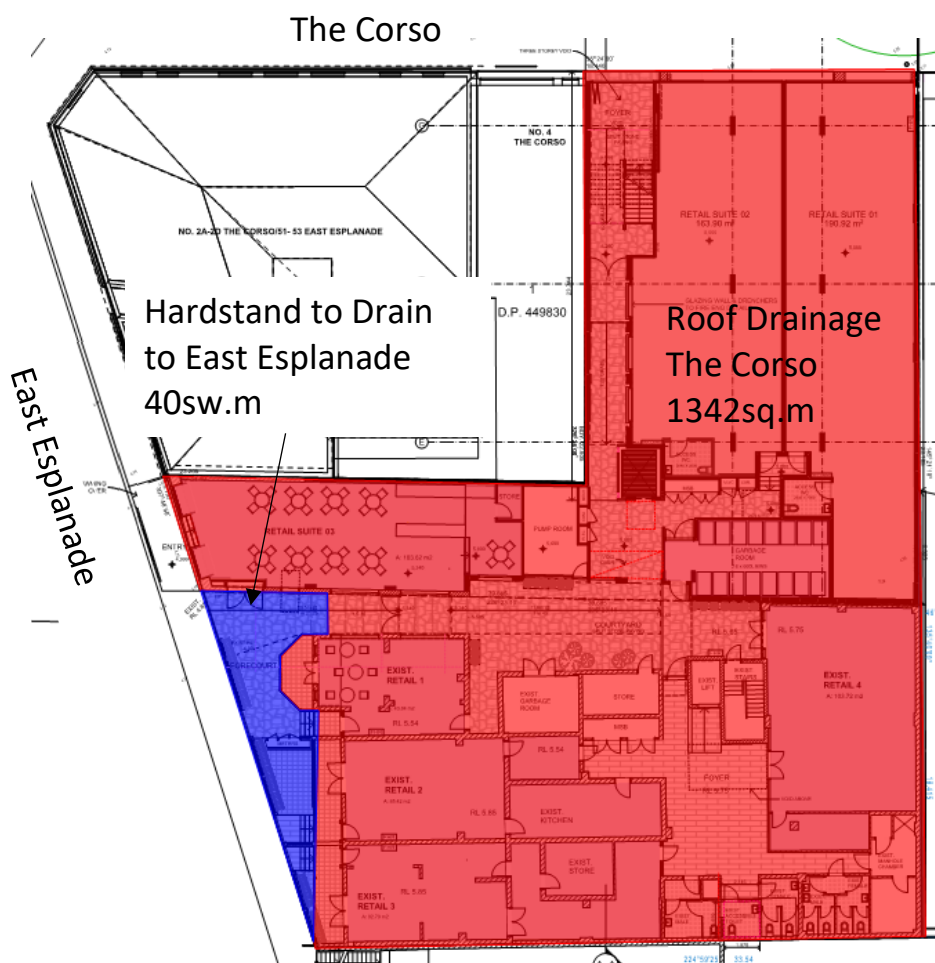


Figure 5 - Proposed Catchment Plan

5.6 Detention Requirements

A discussion with Council was held to confirm the requirement of On-Site Detention (OSD). Council has confirmed that due to the pre and post developed Site being 100% impervious, they do not require OSD. Refer to **Appendix A** for Council correspondence.

5.7 Stormwater Discharge Controls

Referring to Manly specification for On-Site Stormwater Management (March 2004) Section 4.4, (Permissible Site Discharge (PSD)) the maximum PSD into kerb and gutter is 25L/s. This limits the amount that can discharge out to East Esplanade.

As outlined in Section 2.2 there is an existing Council stormwater pipe in The Corso that does not have any restrictions on stormwater discharge rates.

5.8 Water Sensitive Urban Design

The developments should comply with Manly Development Control Plan Part 3.5.8 Water Sensitive Urban Design to achieve the following water quality planning objectives:

- 80% retention of the typical urban annual load for Total Suspended Solids (TSS);
- 60% retention of the typical urban annual load for Total Phosphorus (TP);
- 45% retention of the typical urban annual load for Total Nitrogen (TN);
- 90% retention of the typical urban annual load for gross pollutants (litter);

Methods to achieve the above treatment targets can include the use of proprietary products, rainwater reuse, raingardens or detention basins.

5.9 Proposed Proprietary Products

Water Sensitive Urban Design (WSUD) has primary and secondary forms of treating stormwater runoff from site. Below are two proprietary products and the treatment rates that can achieve the requirements set out in the Manly Development Control Plan.

Primary Treatment Device (Trash Screens/ Ocean Protect Enviropod 200 inserts)

Ocean Protect Enviropod 200 inserts will be used as the primary treatment method for stormwater runoff to capture litter and coarse sediment from part of the Site. Trash screens will be installed in proposed selected locations. The following capture rates, based on information provided by Ocean Protect are as follows:

o TSS	54%
o TN	21%
o TP	30%
o Litter	100%

Secondary Treatment Device (Ocean Protect Psorb(MMC) Stormfilter Cartridges)

The design as a secondary treatment filter device located within a treatment chamber at the end of the treatment train. The following capture rates, based on information provided by Ocean Protect are as follows:

o TSS	94%
o TN	55.9%
o TP	86.1%
o Litter	100%

6 ANALYSIS RESULTS

6.1 Stormwater Flows

Stormwater runoff analysis was conducted to determine the amount of runoff generated by the Site for the pre and post development scenarios below. As outlined in Section 4.4 and 4.5, it is understood that the impervious area will not change and as a result there is no increase in run-off generated by the proposed development.

6.2 Stormwater Runoff

A C value of 1 was adopted due to the Site being 100% impervious.

$$Q_{Existing} = Q_{Proposed} = CIA$$
$$Q_{Existing} = \frac{1 * 264 \left(\frac{mm}{hr} \right) * 1,382(m^2)}{3600}$$
$$Q_{Existing} = 101.3 \frac{L}{s}$$

As shown above, for a 100 Year ARI, 5 minute storm, the Site is expected to generate a peak discharge flow rate of approximately 101.3 L/s.

6.3 Discharge Connections

Due to the limited discharge to East Esplanade being 25L/s to kerb and gutter, and the site producing 102.7L/s the discharge is either:

- Required to be split between East Esplanade and The Corso to spread the stormwater discharge load and between the two streets; or
- Send the stormwater to the council 375mm stormwater pipe in The Corso to meet the Council discharge requirements.

As such it is proposed to discharge to The Corso via connection to the existing Council stormwater pipe located in the southern verge of The Corso. There will also be a minor discharge to kerb along East Esplanade to control any of the surface flow not captured by the roof.

6.4 Discharge to Kerb and Channel

A C value of 1 was adopted due to the Site being 100% impervious.

It was measured that the area at the front of East Esplanade not drained by roof is 40m².

$$Q_{Existing} = Q_{Proposed} = CIA$$

$$Q_{Existing} = \frac{1 * 264 \left(\frac{mm}{hr} \right) * 40(m^2)}{3600}$$

$$Q_{Existing} = 2.93 \frac{L}{s}$$

As shown above, for a 100 Year ARI, 5 minute storm, the Site is expected to generate a peak discharge flow rate of approximately 2.93 L/s which is less than the 25L/s allowable to discharge to kerb and channel.

6.5 Water Sensitive Urban Design Implementation

The Software MUSIC has been used to create a water quality model that provides an indication of the pollutant removal rates expected when a treatment train of water quality measures is applied to the proposed development.

The water quality modelling software MUSIC v6.3 was used to analyse the performance of the treatment train. **Figure 6** below shows the MUSIC node and link diagram used to describe the proposed treatment train. The model has been built to assess the adequacy of the Stormwater treatment measure proposed and to ensure that the quality of stormwater meets the objectives prior to stormwater runoff leaving the Site. The Water Sensitive urban design has been met through the use of 2 Ocean Protect Enviropod200 and 6x Ocean Protect 460Psorb (MCC) StormFilter;

The results of the analysis showed the treatment train will achieve the water quality targets set out by Councils. **Table 2** below displays the effectiveness of the treatment train for the primary and secondary treatment.

Table 2 - MUSIC Model Results

Pollutant	Before Treatment	After Treatment	% Reduction	% Objective	Compliance
Total Suspended Solids (kg/yr)	47.3	9.16	80.6	80	OK
Total Phosphorus (kg/yr)	0.239	0.0621	74	60	OK
Total Nitrogen (kg/yr)	3.31	1.52	54.1	45	OK
Gross Pollutants (kg/yr)	38.1	0.0536	100	90	OK

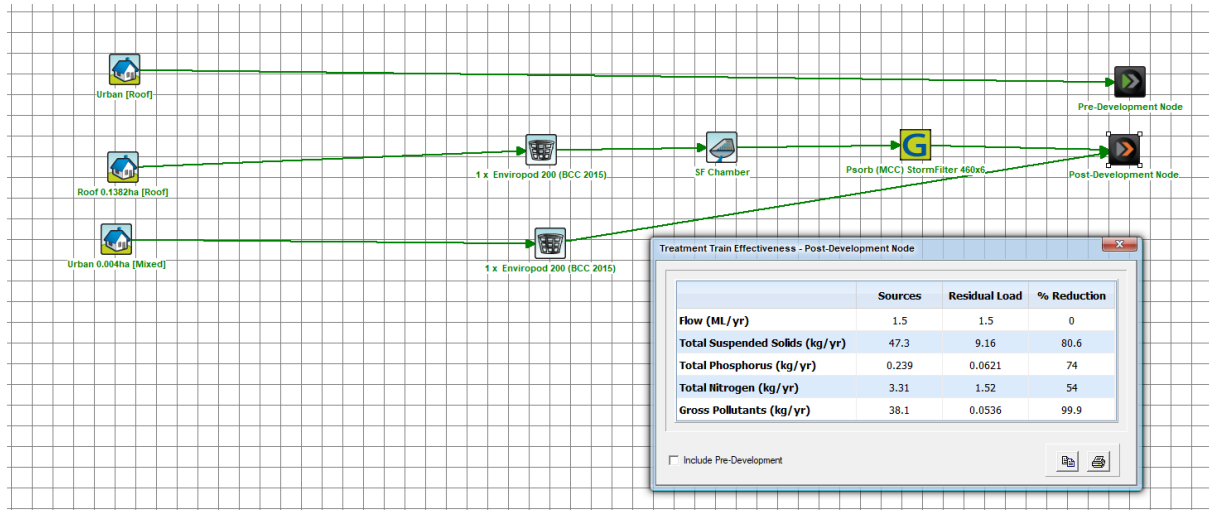


Figure 6 - MUSIC Link and Node Diagram

7 CONCLUSION

Adams Consulting Engineers Pty Ltd (Adams) has been engaged by Aspiring Properties to prepare a Stormwater Management Report for the proposed development of an office, commercial and school building at 6 The Corso & 46-50 East Esplanade, Manly (Site). This report outlines the methodology adopted and associated results of:

- Pre and post development stormwater flows generated due to development of the Site;
- Requirement of a detention tank; and
- Water sensitive urban design.

As outlined in this report, the following key items have been identified:

- The Site is 100% impervious in both the pre and post developed conditions;
- The Site previously discharged to kerb and gutter on East Esplanade and it is not known how The Corso connected into Council's stormwater system. It is expected that the Site will discharge the majority of stormwater to existing Council infrastructure within The Corso and a minor amount to kerb and gutter onto East Esplanade;
- The Site is expected to discharge approximately 102.7L/s for the pre and post development scenarios in a 1 in 100 Year ARI, 5 minute storm event;
- No On-Site Detention System is required based on council correspondence;
- The Water Sensitive Urban Design requirements has been met through the use of 2 Ocean Protect Enviropod200 and 6x Ocean Protect 460Psorb (MCC) StormFilter;

APPENDIX A – COUNCIL CORRESPONDENCE

RE: 6 The Corso & 46-50 East Esplanade, Manly Stormwater Discharge



Alex Kwok <Alex.Kwok@northernbeaches.nsw.gov.au>

To Stephen Hazlewood

Retention Policy 7 Years (7 years)

You replied to this message on 16/07/2019 1:58 PM.

Hi Stephen,
Sorry about the late reply.

In my understanding, a new DA will be lodged.
And there is no major amendment to the existing buildings.
The roof areas of the buildings will be similar or retained.
As such, Council will not require an OSD in the DA.

In relation to the stormwater discharge point, Council has a 375 diameter pipe on The Corso.
The roof water can be connected into the pipeline if it suits your design.
Also, the roof water can be discharged into the kerb & gutter on East Esplanade with max 25l/s.

Please feel free to contact me on 9942 2633 for any further assistance.

Regards,

Alex

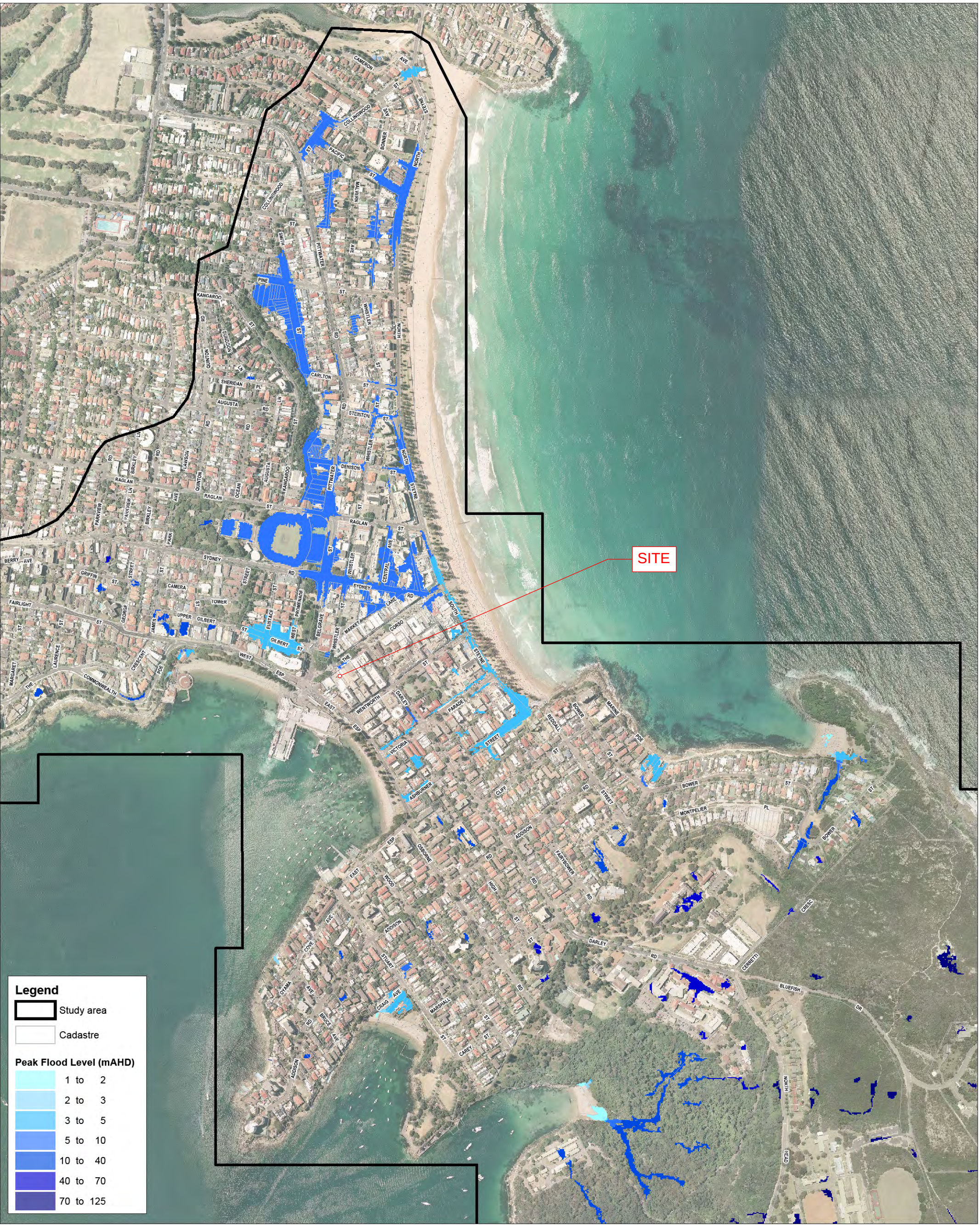
Alex Kwok

Development Engineer

Development Engineering & Certification
t 02 9942 2633
alex.kwok@northernbeaches.nsw.gov.au
northernbeaches.nsw.gov.au



APPENDIX B – COUNCIL CORRESPONDENCE



Manly to Seaforth Flood Study
1% Peak Flood Water Level
Map 3/4



Figure 11

