6 December 2018

Re: Stormwater Management Plan
at 96-104 Carabita Road, Avalon Beach
Job Nº 180411

Northern Beaches Consulting Engineers Pty Ltd have been instructed by Mark Hurcum Design Practise Pty Ltd to carry out the stormwater management plans for the proposed development for Development Application submission. This letter is to be read in conjunction with the following:

- The stormwater management plans prepared by Northern Beaches Consulting Engineers P/L (Job No: 180411, drawings D01A, D02A, D03A, D04A & D05A)
- Flood Risk Management Report dated 23 November 2018
- Realignment of Council's Stormwater Drainage Asset

Stormwater Management System

The proposed stormwater management system consists of a central stormwater drainage network connecting both the stormwater drainage systems for each of the nine proposed lots and the shared driveway.

On-Site Detention System (OSD)

Due to the proximity to Careel Bay, on-site detention has not been provided for the development site as this would likely coincide with peak flows and therefore increase the peak runoff rate during heavy rainfall events.

Water Sensitive Urban Design (WSUD)

The proposed development site presents multiple challenges in obtaining a satisfactory water quality treatment outcome due to both the topography of the site and proximity to Careel Bay. The area beyond the foreshore building line at the base of the site must remain unchanged and cannot be developed. Therefore, this area has been excluded from the site treatment area considered for the MUSIC analysis. This bypass area is contained within catchment 'BYPASS AREA' – refer D02A on the Stormwater Management plans.

Below is a table of the reduction targets achieved for the considered development area.

Table 1 – MUSIC output targets for the considered development area

Stormwater Pollutant	Council Requirements	Actual Development
Gross Pollutants	95%	100%
Total Suspended Solids (TSS)	80%	84.4%
Total Phosphorus (TP)	60%	62.6%
Total Nitrogen (TN)	45%	65.7%

Realignment of Council's Stormwater Drainage Asset

Existing and proposed drainage regime

The site generally falls in a northerly direction. There is an existing council-owned drainage easement along the western boundary that extends through the site and discharges to Careel Bay through a sea wall. The existing stormwater network consists of both a piped and open channel system, which conveys the public stormwater runoff from Cabarita road above. There currently exists a series of kerb inlet pits which are located at a sag point beyond the site boundary of 88 Cabarita road. Collected runoff is conveyed through a 675mm diameter RCP pipeline through a headwall on the western boundary at 96 Cabarita road which discharges into an open channel. The open channel meanders east of the western boundary prior to discharging into a 450mm diameter RCP pipeline via a headwall which then extends west, discharging through a sea wall beyond the north-western boundary.

The proposed stormwater drainage system seeks to maintain the existing drainage regime at the kerb and gutter on Cabarita road through to the boundary of 96 Cabarita road. Beyond the boundary of 96 Cabarita road, a series of new concrete junction pits and RCP pipelines are proposed to convey upstream runoff the existing 450mm RCP pipeline prior to discharging to Careel Bay. Refer to Appendix A below for detail.

The proposed stormwater drainage system peak runoff rate will match the pre-developed peak runoff rate up to the 5% AEP storm event. Further, the proposed piped peak discharge rate for the 5% AEP storm event has resulted in a reduction in overflows due to a capacity exceedance within the open channel through 96 Cabarita. The overland flow path will not be increased up to the 1% AEP storm event as a result of the proposed stormwater drainage infrastructure. Refer to Appendix A below and the DRAINS model of the existing and proposed stormwater drainage system for further details.

Flood Risk Management Report

The subject site is not significantly affected by flooding and therefore is not considered to have any adverse impacts as a result of the development. Refer Flood Control Certificate by NBCE for further detail.

Conclusion:

In consideration of the above results, we recommend that the proposed development be approved as being in general accordance with the Northern Beaches Council (Pittwater area) requirements. The proposed development will be protected from flooding, with nil to minimal impact on surrounding properties.

Please contact the undersigned with any questions relating to the contents of this report.

Yours sincerely

NORTHERN BEACHES CONSULTING ENGINEERS P/L

Rick Wray

BE CPEng NPER Director

\\NBADS\Company\Synergy\Projects\180411 96-104 CABARITA ROAD, AVALON BEACH\ENG Design\Stormwater\180411 - Stormwater Report - 2018-12-06.docx

Appendix A

DRAINS modelling results

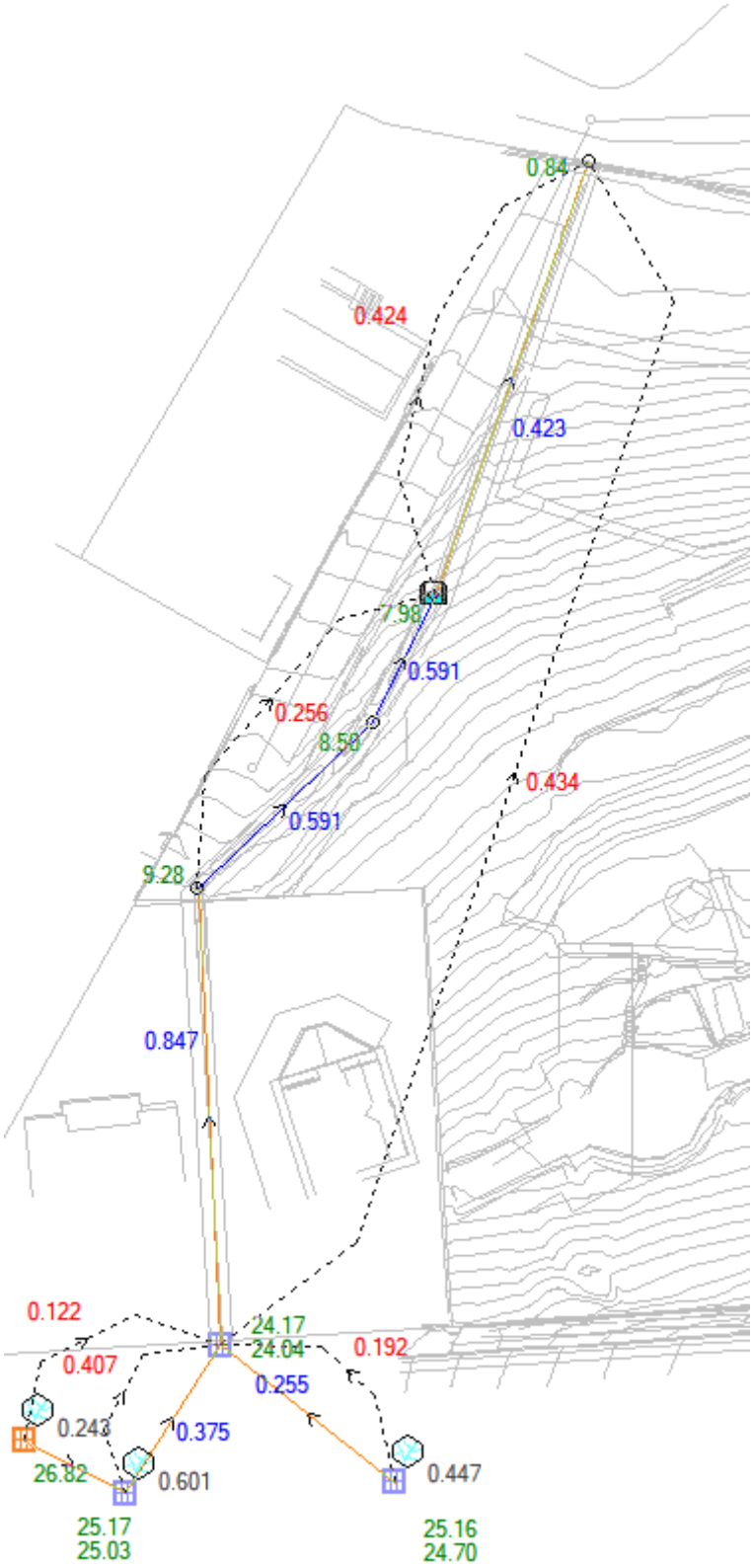

Figure 1 - Existing Stormwater Drainage Regime (5% AEP Storm Event). Source: DRAINS

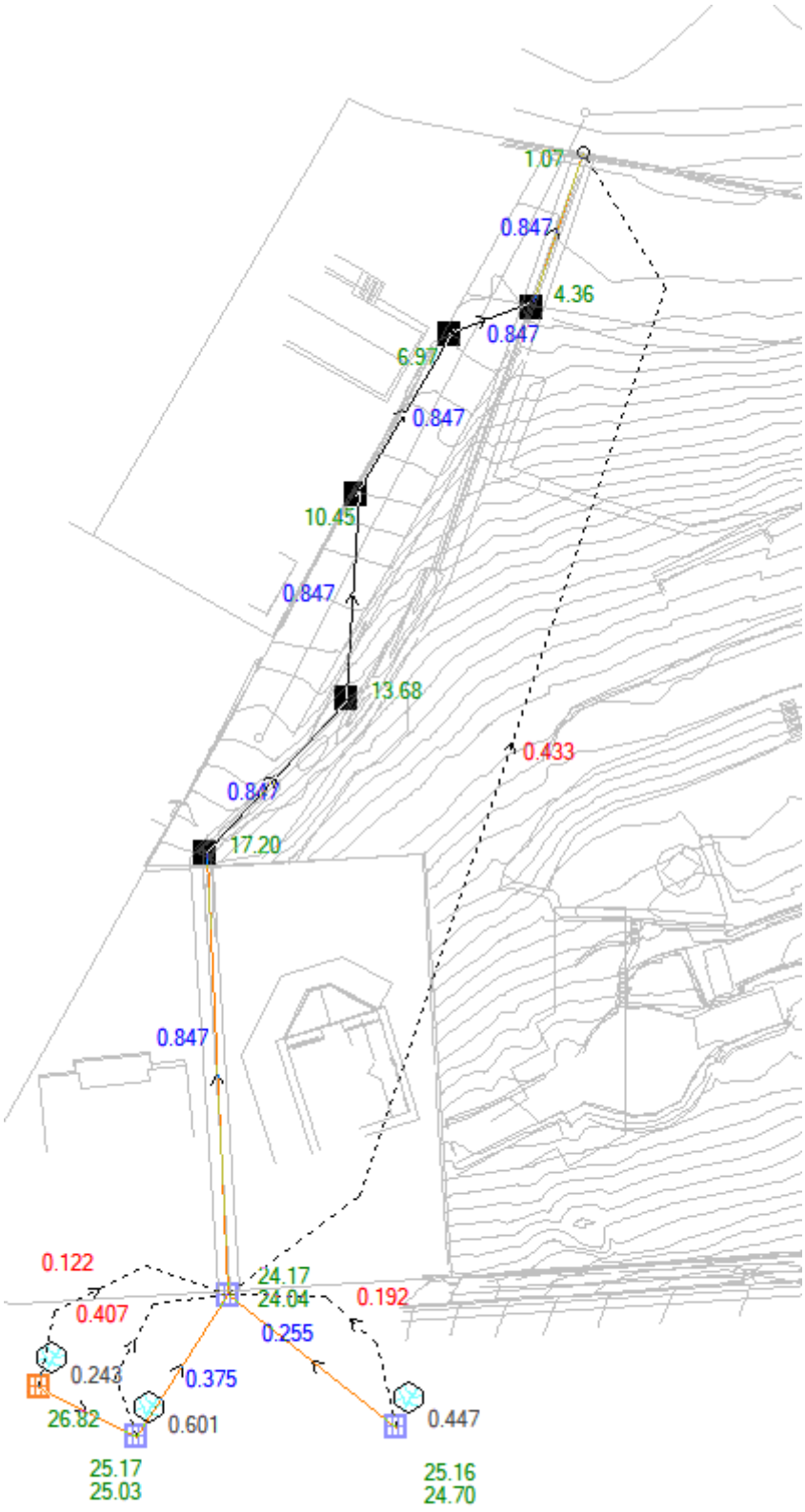

Figure 2 - Proposed Stormwater Drainage Regime (5% AEP Storm Event). Source: DRAINS

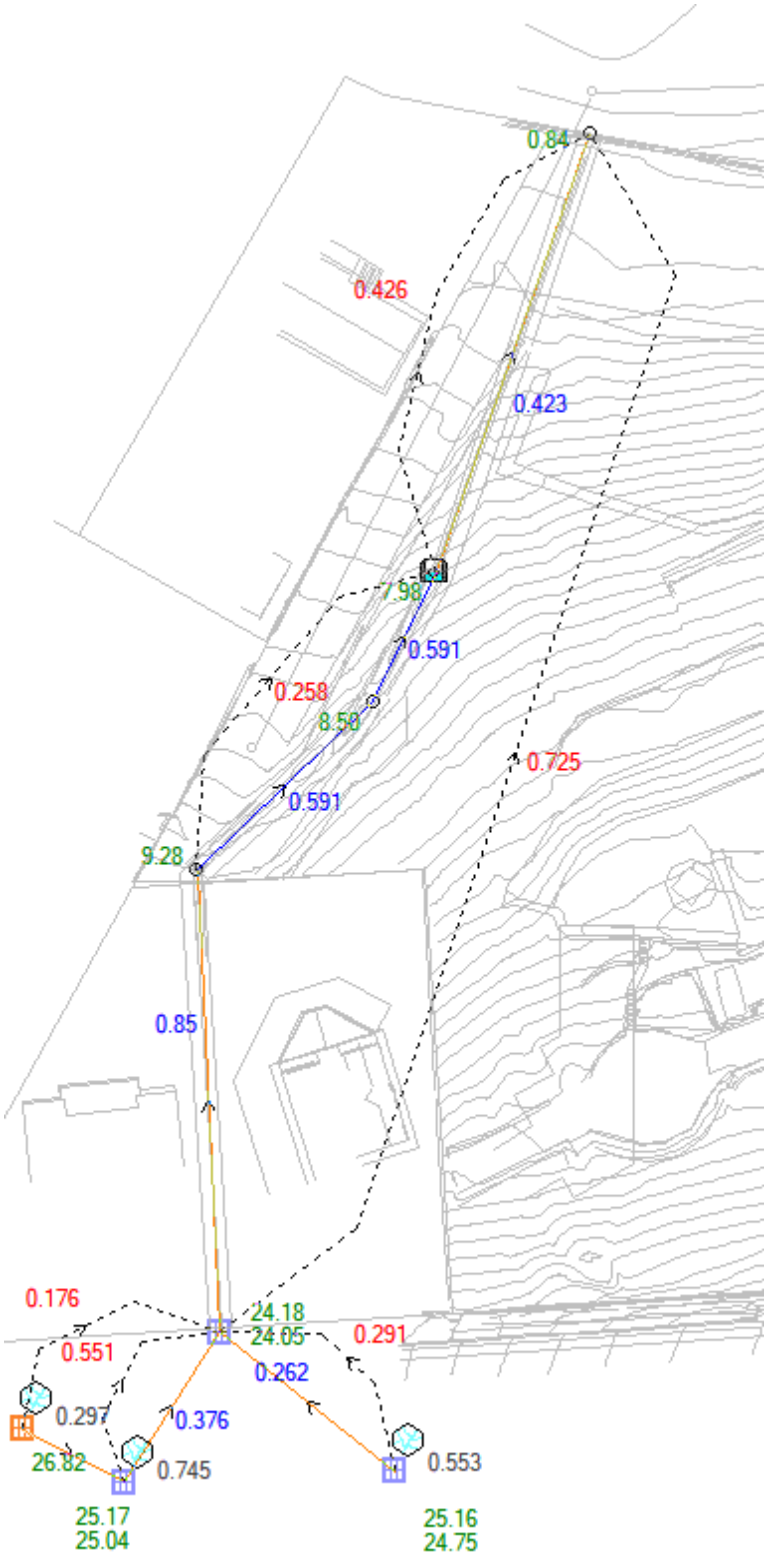

Figure 3 - Existing Stormwater Drainage Regime (1% AEP Storm Event). Source: DRAINS

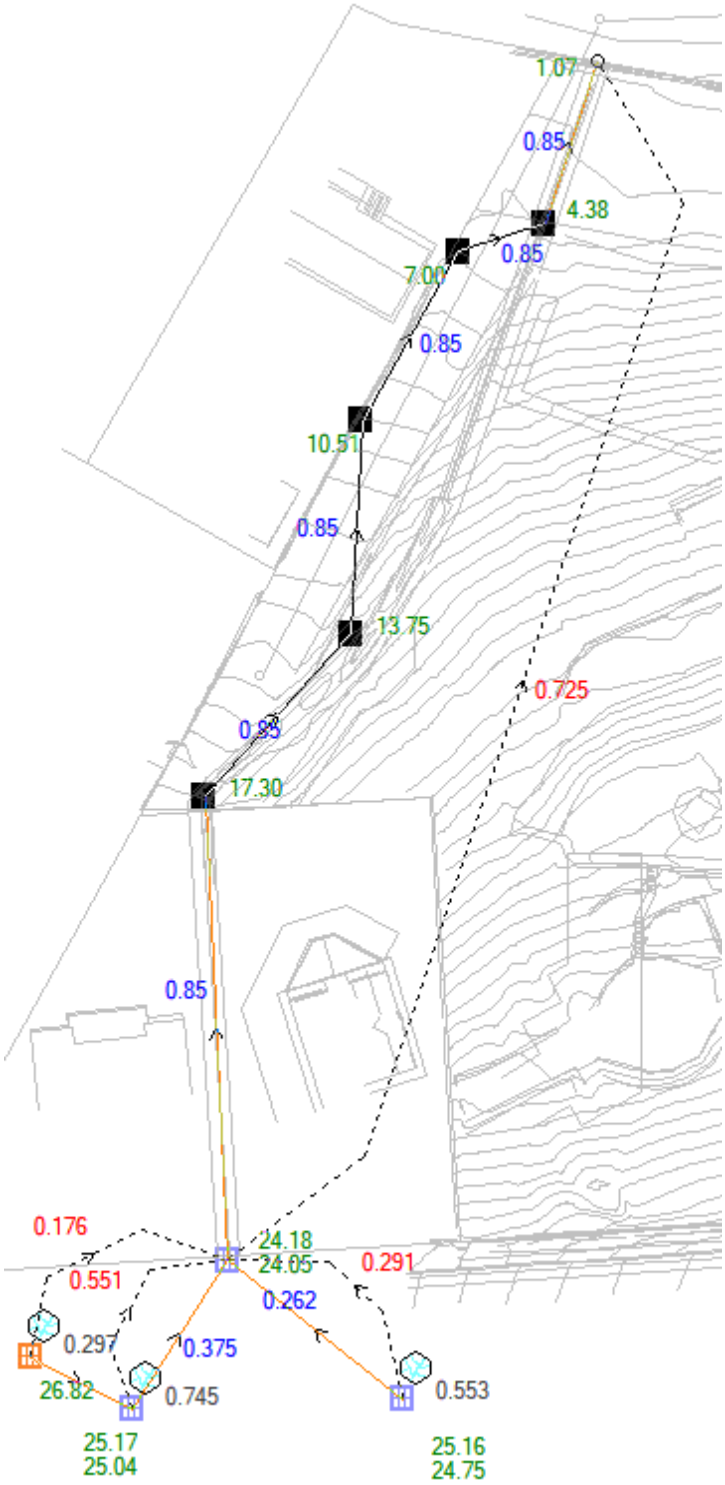

Figure 4 - Proposed Stormwater Drainage Regime (1% AEP Storm Event). Source: DRAINS