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17 July 2019

NL130142-02

Planning Ingenuity
c/-Southern Cross Care
David Waghorn
PO Box 715
Miranda, NSW 1490

Dear David,

Re: 45 Barcom St, Merrylands West - Cardinal Gilroy Village – Flooding and Stormwater Assessment

Northrop Consulting Engineers have undertaken a preliminary assessment of the existing overland flow paths that drain through the Cardinal Gilroy Village, located at 45 Barcom St, Merrylands West, NSW, herein referred to as the 'subject site'. The purpose of the assessment was to identify the overland flow paths and how they could be accommodated within the proposed development masterplan of the site. In addition to this we have provided a broad overview of the proposed stormwater philosophy for the development. The aim of this correspondence is to summarise the findings of our assessment to support the Planning Proposal submission to Council.

Flooding

The south-eastern part of the subject site, being Lot 5 DP 701151, is shown to be flood affected on the Flood Information Certificate provided by Council (attached to this letter). The existing drainage path falls generally in a north-easterly direction through the subject site before discharging downstream through residential properties. The overall contributing catchment to this drainage path at the downstream end of the site is in the order of 13Ha, and includes a portion of the subject site, as well as upstream properties on the north-west, west and south, which are conveyed to the main drainage path (floodway) via various localised overland flow paths. Note there are also existing stormwater pipes that traverse the subject site, which drain a portion of the contributing catchment in minor storm events, connecting to the existing Council stormwater network.

The site masterplan proposes to provide buildings within the abovementioned drainage path, thereby requiring the drainage path (floodway) to be relocated. To enable this, a new overland flow path is proposed to be provided, collecting the upstream catchments from the west (catchment 1) and south side (catchment 2), and diverting runoff around the proposed building footprints to the existing point of discharge, as shown indicatively in Figure 1 overleaf. A pit and pipe network is proposed to be provided to collect and manage runoff in minor storm events. Runoff from storm events exceeding the pipe network capacity shall flow overland in a controlled manner.

		Date
Prepared by	KS	17/07/2019
Checked by	AB	17/07/2019
Admin	BBR	17/07/2019

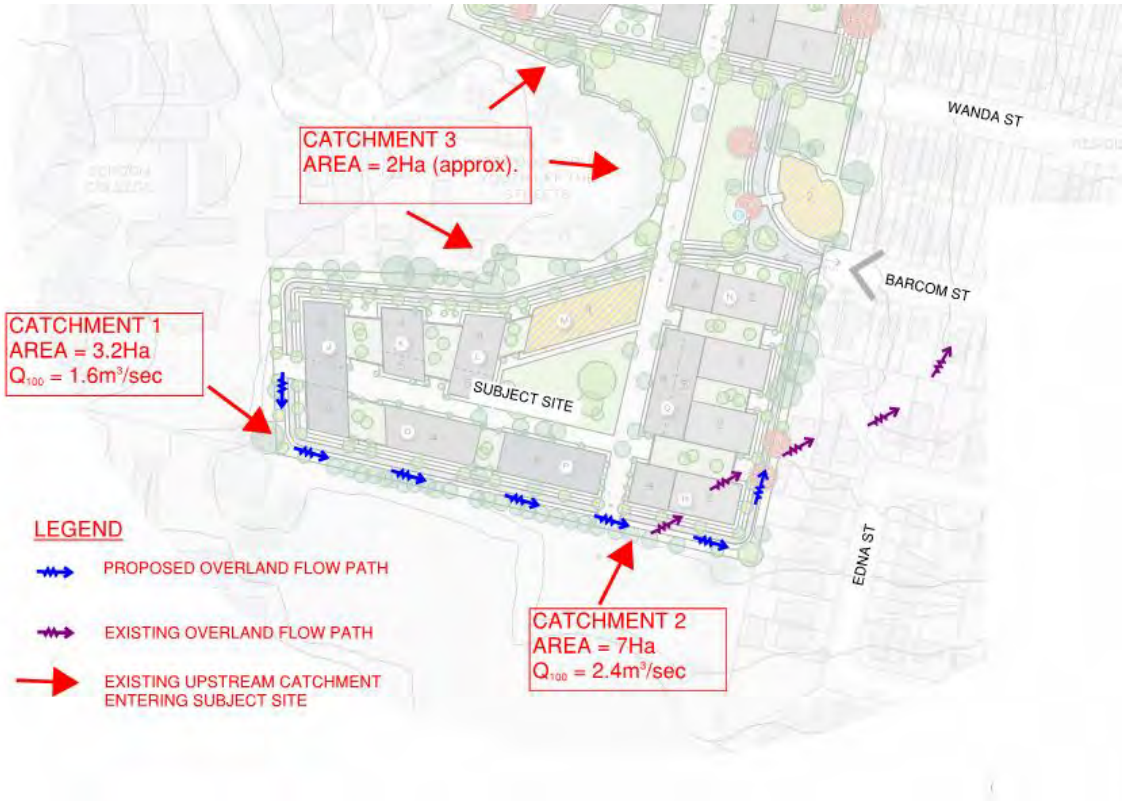

Figure 1 – Proposed Overland Flow Path

The two catchments were analysed in the proprietary software DRAINS to determine the anticipated peak flows for the 1% AEP storm event, which indicated approximately 1.6m^3/s derived from Catchment 1 and 2.4m^3/sec from Catchment 2. This requires an overland flow capacity of approximately 3.5m^3/sec for the combined flows of the two catchments (excluding freeboard), after deducting the minor storm flow which could be conveyed below ground.

Calculations using Mannings Equation were undertaken to determine the required overland flow capacity to convey the 1% AEP flow for the critical section in the south-east corner of the subject site, which conveys runoff from both Catchment 1 and 2. The estimated maximum depth in the 1% AEP was in the order of 280mm, and an average velocity of approximately 1.45m/sec, assuming a minimum flow path width of 12m. This results in a VD less than 0.4, in accordance with the NSW Floodplain Development Manual. The required width for the overland flow path is compatible with the proposed site masterplan. The overland flow path should be cut in below existing ground surface, or a vertical barrier employed, in order to provide the required conveyance capacity and flood storage. This can be accurately quantified as part of the detailed design in the future once the development layout has been further determined.

The analysis which has been undertaken is preliminary and commensurate with a Planning Proposal assessment, however it indicates that stormwater derived from upstream catchments can be adequately diverted around the proposed building footprints to the existing point of discharge, thereby replacing the existing drainage path on-site and adequately managing flow. In order to more accurately analyse the existing flood regime and assess the implication the development may have on floodwater levels within the subject site and neighbouring properties, it is considered that detailed flood modelling will be required, as outlined in Council's DCP and Flood Information Certificate at the Development Application or Construction Certificate stage.

Lastly, overland flow from Catchment 3 will enter the subject site in various locations (as shown in Figure 1), as per the existing scenario, and should be managed via the proposed stormwater system for the site, rather than be diverted around the development footprint. From our review of LIDAR, there does not appear to be any other upstream catchments which drain overland through the subject site.

On-Site Stormwater Management

The topography across the existing site varies with a number of undulations, however generally the site falls in an easterly and north-easterly direction. Elevation varies from approximately 48m down to 39mAHD, with typical gradients in the order of 2-8%. From a topographical perspective, the site is considered to be generally suitable for an aged care development, however will require earthworks to locally shape to accommodate the proposed development and provide accessible grades. The ensuing paragraphs provide a general overview of the stormwater management philosophy that will likely be implemented for the development.

Stormwater conveyance across the site will adopt a 'minor' and 'major' approach, consisting of pit and pipe networks and vegetated swales to convey regular storm events, which will drain to the various existing points of connections across the site. Major storms will be conveyed overland in a safe, controlled manner, via road networks, swales etc.

Water Sensitive Urban Design measures are proposed to be implemented across the site to minimise the impact on the natural water cycle. Appropriate water quality devices shall be selected to satisfy Council's pollutant targets and stormwater flow targets (stream erosion index). The treatment train will likely include vegetated buffer strips and swales to maximise passive irrigation, bio-retention gardens/basins, gross pollutant traps, rainwater tanks and on-site detention basins.

The site is located within the A'Becketts Creek Catchment, requiring a Permissible Site Discharge (PSD) and Site Storage Rate (SSR) of 140L/s/Ha and 300m^3/Ha respectively, as per Councils On-Site Stormwater Detention Policy. Therefore, for the total site area of approximately 7.5Ha, the maximum allowable PSD is 1,050L/sec and the minimum SSR is 2,250m^3. The storage will likely be provided via a combination of above and below ground basins/tanks, located in the low points of the respective catchments prior to discharging to the existing stormwater networks. A high level review of the masterplan indicated there is sufficient footprint to accommodate the required OSD volume and water quality treatment measures, and the specific location and format of detention will be integrated with the future detailed development planning.

Rainwater tanks will be provided on-site, with the collected water being potentially used internal to buildings as well as externally for irrigation purposes. The required volume will be subject to BASIX requirements and will be further investigated at a later stage, however are likely to be approximately 15-20kl per multi-storey building, in accordance with Council's OSD Policy.

Erosion and Sediment control measures will be implemented for the duration of construction, in accordance with the 'Blue Book', to minimise the potential for sediment and silt coming off the site into existing watercourses.

A number of existing drainage easements are located on site. On the southern part of the site there are two existing easements which service a portion of Catchment 1 and 2 (as per Figure 1). This overland flow path will be redefined as part of the development, thereby making the existing easements redundant. Further investigation is to be undertaken on the other existing easements on-site to determine if they are to be maintained, relocated or rescinded.

Conclusion

Northrop Consulting Engineers have undertaken a preliminary assessment of the existing overland flow paths that drain through the Cardinal Gilroy Village. The south-eastern part of the site is known to be flood affected, with the existing flow path (floodway) having contributing catchments from upstream properties as well as the subject site. To enable development to occur within this area, it is suggested the upstream catchments be diverted around the proposed building footprints and conveyed to the existing point of discharge, via a pit and pipe network and overland flow path. Our assessment indicates that this is feasible and that the required conveyance capacity and flood storage volume can be accommodated spatially within the proposed masterplan. However, it is recommended that more detailed flood modelling be undertaken to more accurately assess the implication the development may have on floodwater levels within the subject site and neighbouring properties.

On-site stormwater is proposed to be managed via a 'minor' and 'major' approach. As part of the development, on-site detention, rainwater tanks and various other water sensitive urban design measures will be adopted to minimise the impact on the natural water cycle and to downstream stormwater networks.

We trust that the enclosed assessment is sufficient for planning proposal stage of the development. Should you have any queries, please feel free to contact the undersigned on (02) 4943 1777.

Prepared by

Kane Sinclair
Civil Engineer
BE (Civil Hons) MIE Aust

Reviewed by

Andrew Brown
Principal | Civil & Environmental Manager
BEng (Environmental Hons)
MIEAust CPEng NER(Environmental and Civil)

Limitation Statement

Northrop Consulting Engineers Pty Ltd (Northrop) has been retained to prepare this report based on specific instructions, scope of work and purpose pursuant to a contract with its client. It has been prepared in accordance with the usual care and thoroughness of the consulting profession for the use by Southern Cross Care Pty Ltd.

The report is based on generally accepted practices and standards applicable to the scope of work at the time it was prepared. No other warranty, express or implied, is made as to the professional advice included in this report except where expressly permitted in writing or required by law, no third party may use or rely on this report unless otherwise agreed in writing by Northrop.

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CUMBERLAND COUNCIL

26 October 2018

Our Reference SC7-08
Contact Rolyn Sario
Telephone 8757 9536

Northrop Consulting Engineers – C/o Kane Sinclair
Level 1, 215 Pacific Highway
CHARLESTOWN NSW 2290

Dear Sir/Madam

FLOOD LEVELS AT NO 45 BARCOM STREET, MERRYLANDS
BEING LOT 5 DP 701151

Council refers to your request dated 24 October 2018 requesting flood information at the above property.

The above property is shown to be affected by the 1% Annual Exceedance Probability (AEP) flood, according to the information available to Council from the "Draft A'Becketts Creek Overland Flood Study" prepared by Lyall & Associates Pty Ltd in March 2015.

The 1% AEP flood level refers to a flood which has a 1% chance of being equalled or exceeded in any one year and this site has been assessed as a medium flood risk. It should be noted that a flood could occur that is more severe than the 1% AEP flood at any time.

The maximum 1% AEP flood level relevant to the subject property has been determined (see the attached plan) to Australian Height Datum (AHD) are as follows:

1. At location A - 40.5 mAHD
2. At location B - 40.2 mAHD
3. At location C - 40.0 mAHD
4. At location D - 39.8 mAHD
5. At location E - 39.0 mAHD
6. At location F - 38.0 mAHD
7. At location G - 37.5 mAHD
8. At location H - 37.0 mAHD

The subject property has been identified as Flood Control lot. Under the SEPP (Exempt & Complying Development) 2008 Regulation 3.36C, a Complying Development Certificate must not be issued for, "*any part of a flood control lot unless that part of the lot has been certified, for the purposes of the issue of the relevant complying development certificate, by the council or a professional engineer who specialises in hydraulic engineering as not being any of the following:*

a) *a flood storage area,*
b) *a floodway area,*
c) *a flow path,*
d) *a high hazard area,*
e) *a high risk area."*

Council has determined that part of the flood control lies in three of the five items above – items a, *b* and *c* therefore; a CDC cannot be issued on this site. The identified flood items are represented by the darker area within the 1% AEP flood extent on the attached map. If the development is proposed within any part of this zone (dark blue area), a pre and post flood study must accompany the Development Application. Alternatively, if the development is proposed within the uncoloured and/or light blue areas (flood fringe zone), a CDC may be considered for this site. However, the surface flows must not be impeded (blocked) and the redevelopment shall allow the free movement of the flood around any proposed structure(s).

In all cases, flood level on adjacent properties shall not be increased. Supporting documentation is to accompany the development.

Minimum habitable floor levels shall be 0.5m above the flood level at the upstream side of the structure. Minimum non-habitable floor levels (garages, laundry, sheds, etc.) shall be 0.15m above the flood level at the upstream side of the structure. Interpolation between flood levels is allowed.

The relationship between these levels and the ground surface may be determined by a survey of the property undertaken by a Registered Surveyor.

It should be noted that where the development or redevelopment of the property is proposed, reference should be made to the relevant Development Control Plan with regard to flooding and drainage issues. Please include a copy of this letter and map with any Development Application that you may lodge with Council for the subject site.

Flood levels are not static due to changing circumstances (e.g. revision of the flood model) and accordingly the above flood level is only valid for six months from the above date.

FLOOD LEVELS AT NO 45 BARCOM STREET, MERRYLANDS BEING LOT 11 DP 1075418 & LOT 8 DP 732058

Council refers to your request dated 24 October 2018, requesting flood information at the above property.

According to the information available to Council, the above properties are <u>not affected</u> by the 1% Annual Exceedance Probability (AEP) flood event.

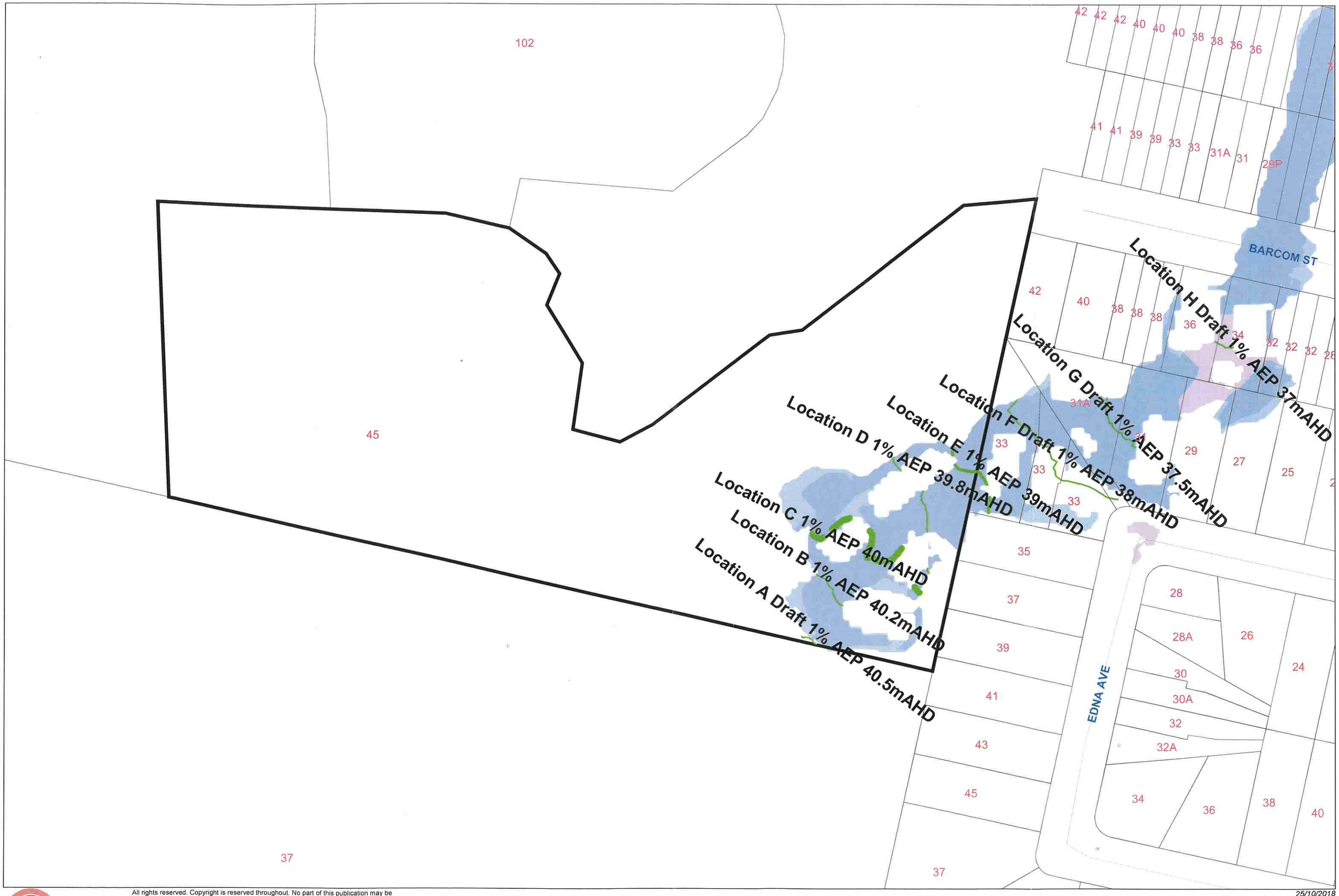
The 1% AEP flood level refers to a flood which has a 1% chance of being equalled or exceeded in any one year. It should be noted that a flood could occur that is more severe than the 1% AEP flood at any time.

Please note: This property may be affected by runoff (surface flows) from upstream land.

If you have any further enquiries regarding this matter please contact Council's Senior Stormwater Engineer, Mr Mark Evens on 8757 9538 or Council's Drainage Engineer, Mr Rolyn Sario on 02 8757 9536.

Yours sincerely,

SIVA SIVAKUMAR
MANAGER ENGINEERING
ROADS AND WASTE



25/10/2018

N

Scale 1 : 1000
when printed at A3

Note:

a) Blue Line – Drainage Line

b) No information in relation to the depth of the pipes