

NL171426.B09 [A]



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E newcastle@northrop.com.au

11th October 2019

AVEO Group Attention: Kegan Lacey kegan.lacey@aveo.com.au

Dear Kegan,

Re: 79 Cabbage Tree Road, Bayview – Revised Flood Impact Assessment

Northrop Consulting Engineers have undertaken a two-dimensional flood investigation, on behalf of their client AVEO group to assess the flood impact of the proposed development located at number at 77-79 Cabbage Tree Road, Bayview, herein known as 'the subject site'.

The purpose of this correspondence is to outline the latest updates undertaken to the 2D Flood Impact Assessment for the subject site and to present the results of the investigation. This correspondence should be read in conjunction with the previously prepared revised Flood Impact Assessment dated the 17th of April 2019, titled NL171426.B03 [A] and herein referred to as the "Revised Flood Impact Assessment".

Following submission of the Revised Flood Impact Assessment, feedback was received from Council with the latest round of modelling presented herein, aimed to address Council's queries. The following provides a brief outline of the modifications made and presents the results of the investigation.

Modelling Updates

The attached Figures A2, A4 and A6 presents the updated model setup, model terrain and model roughness. The following provides a brief summary of the changes to the XP-STORM model since the Revised Flood Impact Assessment.

Updated development extent in response to Council's feedback.

A portion of the western side of the proposed development has been reduced along with the removal of the previously proposed piping of the creek to the south of the proposed development. The modelled land-use has been updated to include the changes to the development layout as shown in the attached Figure A6.

Updated design surface

The development design surface has been updated to include the latest layout along with modifications to the existing and developed topography around Units 15 to 18. The aim was to replicate, as close as possible, the existing stage storage relationship in the Regional Detention Basin up to the depth below the PMF. As a result, there is an increase in the available flood storage within the basin for all events up to and including the PMF;

Prepared	LG	11/10/2019
Reviewed	GB	11/10/2019
Reviewed	LB	11/10/2019



Inclusion of the pit and pipe network into the XP-STORM flood model

The pit and pipe network has been included and is based on a combination of the TUFLOW model files in the Regional Flood Study (RHDHV, 2017) as well as detailed survey and observations made on site during a site investigation.

Results

The attached Figures E1 and E3 present the pre to post developed case results for the 1% AEP and PMF design storm events respectively. For both the 1% AEP and PMF design storm events, a decrease is observed in the Regional Detention Basin. This decrease is expected to be due to an increase in the available flood storage within the Regional Detention Basin as previously discussed.

During the 1% AEP a decrease of approximately 20mm is observed in the properties downstream of the subject site while, a decrease of approximately 30-50mm observed during the PMF. This is expected to be due to the introduction of additional flood storage within the Regional Detention Basin changing the characteristics of flow into the pit and pipe network.

A localised increase is observed downstream of the subject site within Samuel Street during both the 1% AEP and PMF design storm events. This increase is again expected to be due to a change in the relationship of overland flow and flow through the pit and pipe network. The increase is generally contained within the road reserve during the 1% AEP with only a slight encroachment into private property during the PMF. Given the magnitude of the events considered and the extent of the increase being largely contained within the road reserve, they are not considered to result in a significant adverse impact

Similarly, during the PMF a minor increase of up to approximately 25mm is observed in the properties adjacent to the eastern boundary of the subject site. This is expected to be due to a redirection of flows from the subject site. Given the magnitude of the event and the very minor extent of the increase, it is not considered to create a significant adverse impact on the adjacent property.

Conclusion

The updated results for the 1% AEP and PMF design storm events have been presented in the above correspondence with a brief summary of the modelling modifications presented for consideration by the Northern Beaches Council.

The results presented herein show an improvement to the flood behaviour observed when compared to the previously submitted Revised Impact Assessment dated the 17th of April 2019. Generally, reductions in Flood Elevation are observed in the downstream properties and as such the proposed development is not considered to result in a significant adverse impact within the adjacent properties.

We commend our findings to Council for their review. Should you have any queries regarding this correspondence, please feel free to contact the undersigned on (02) 4943 1777.

Prepared by:

Laurence Gitzel Civil/Environmental Engineer

Reviewed by:

Angus Brien Civil Engineer

Figure List

Figure A2: 2D Model Setup

Figure A4: Developed Scenario – Topography

Figure A6: Developed Scenario – Manning's Roughness

Figure E1: Pre to Post Developed - 1% AEP Elevation Comparison

Figure E3: Pre to Post Developed – PMF Elevation Comparison

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 Aveo Group.

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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Figure A2 [C] 2D Model Setup

Legend

- Existing Pits & Headwalls
- Developed Pits & Headwalls
- ---- Existing Culverts
- ---- Developed Culverts
- Flow Boundaries
- Head Boundaries
- Creeks
- **[**] Indicative Extent of Works
- Rainfall Polygon
- Model Extent

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Figure A4 [C] **Developed Scenario** Topography

Legend **2** Indicative Extent of Works Elevation (mAHD) 0.0 - 5.0 5.0 - 10.0 10.0 - 15.0 15.0 - 20.0 20.0 - 25.0 25.0 - 30.0 30.0 - 35.0 35.0 - 40.0 40.0 - 45.0 45.0 - 50.0 50.0 - 55.0 55.0 - 60.0 60.0 - 70.0 70.0 - 80.0 80.0 - 90.0 90.0 - 100.0

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Figure A6 [C] **Developed Scenario** Mannings Roughness

Legend

2 Indicative Extent of Works Flow Constrictions Mannings Roughness Developed Grass (0.040) Developed Access Track (0.025) Developed Hardstand (0.015) Developed Basin (0.060) Developed Buildings (Varies) Road Reserve (0.020) Rural Residential (0.050) Med Density Residential (0.200) High Density Residential (0.400) Dense Vegetation (0.100) Grassed Areas (0.040) Vegetated Allotment (0.100)

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Figure E1 [C] Pre to Post Comparison Flood Elevation 1% AEP

Legend Model Extent **Indicative Extent of Works** Cadastre **Development Layout** Elevation Comparison (m) ≤ -0.500 -0.499 to -0.250 -0.249 to -0.100 -0.099 to -0.050 -0.049 to -0.010 -0.009 to -0.005 -0.004 to 0.004 0.005 to 0.010 0.011 to 0.050 0.051 to 0.100 0.101 to 0.250 0.251 to 0.500 >0.501

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Figure E3 [C] Pre to Post Comparison Flood Elevation PMF

Legend Model Extent **2** Indicative Extent of Works Cadastre **Development Layout** Elevation Comparison (m) ≤ -0.500 -0.499 to -0.250 -0.249 to -0.100 -0.099 to -0.050 -0.049 to -0.010 -0.009 to -0.005 -0.004 to 0.004 0.005 to 0.010 0.011 to 0.050 0.051 to 0.100 0.101 to 0.250 0.251 to 0.500 >0.501 **Peninsula Gardens Retirement Village Bayview**



