

Our Ref: 80813340 – 18 – 0077 :PL  
Contact: Pak Lau

4 July 2018

Artazan Property Group  
Level 8, 210 George Street  
**Sydney NSW 2000**

Attention: Cian Fitzgerald

Cardno (NSW/ACT) Pty Ltd  
ABN 95 001 145 035

Suite 3.01, Level 3  
3 Horwood Place  
Parramatta 2150  
Australia

Phone +61 2 9496 7700  
Fax +61 2 9439 5170

Dear Cian,

## **ST AUGUSTINE COLLEGE GOOLD BUILDING EXTENSION - OVERLAND FLOW ASSESSMENT**

Cardno (NSW/ACT) has been engaged by Artazan Property Group (APG) to undertake a flood assessment of the existing overland flow path adjacent to the Goold Building, which is located on the eastern corner of St Augustine College. The college is proposing to:

1. Demolish the existing building (St Possidus Chalets) between the Goold building and the site boundary; and
2. Construct an extension and refurbishment of the Goold Building.

This report has been prepared to detail the result of the hydraulic assessment of the overland flow path, hence provides a guidance on the finished floor level of the proposed extension.

### **Catchment Analysis**

The existing Goold Building is located in close proximity of the existing overland flowpath, which follows the alignment of an existing drainage easement. The existing overland flow path, has a catchment area of 38.6ha, which was delineated from the aerial photographs, 2m contours and the GIS data for the existing stormwater drainage infrastructure. Figure 1 shows the location of the buildings and the extent of the catchment.

A DRAINS model has been set up and the peak flow was calculated by ILSAX hydrological method. The Rainfall IFD data (2016) and the temporal patterns were obtained from the Bureau of Meteorology and Australian Rainfall and Runoff Datahub respectively.

Based on the current land use, the catchment has divided into two catchments. Catchment A has an area of 28.8ha, which is predominantly a residential area with 40% impervious. The time of concentration was assumed to be 20mins based on the travel time along the gutter and through the stormwater pipes. Catchment B has an area of 9.76ha, which represents the dense vegetated area to the north west of the school site. DRAINS modelling result shows the 1% AEP peak flow discharges at the overland flow path is approximately 5.5m<sup>3</sup>/s.





**Figure 1** Extent of catchment



### Hydraulic Assessment

Hydraulic modelling software, HEC-RAS, was used to analyse the flood levels and flow velocities along the existing and designed overland flowpath. The existing model is based on the detail survey data and imported to HEC-RAS from 12d design software. The model for the proposed overland flowpath is based on the detailed survey of the site. Cross sections have been created at 2m intervals along the centreline of the overland flowpath. The overland flowpath alignment is shown in Figure 2.

The roughness coefficient Manning's 'n' used in the analysis was 0.015 (paved area) and 0.035 (grassed area). The upstream boundary condition for the analysis were assumed to be normal depth.

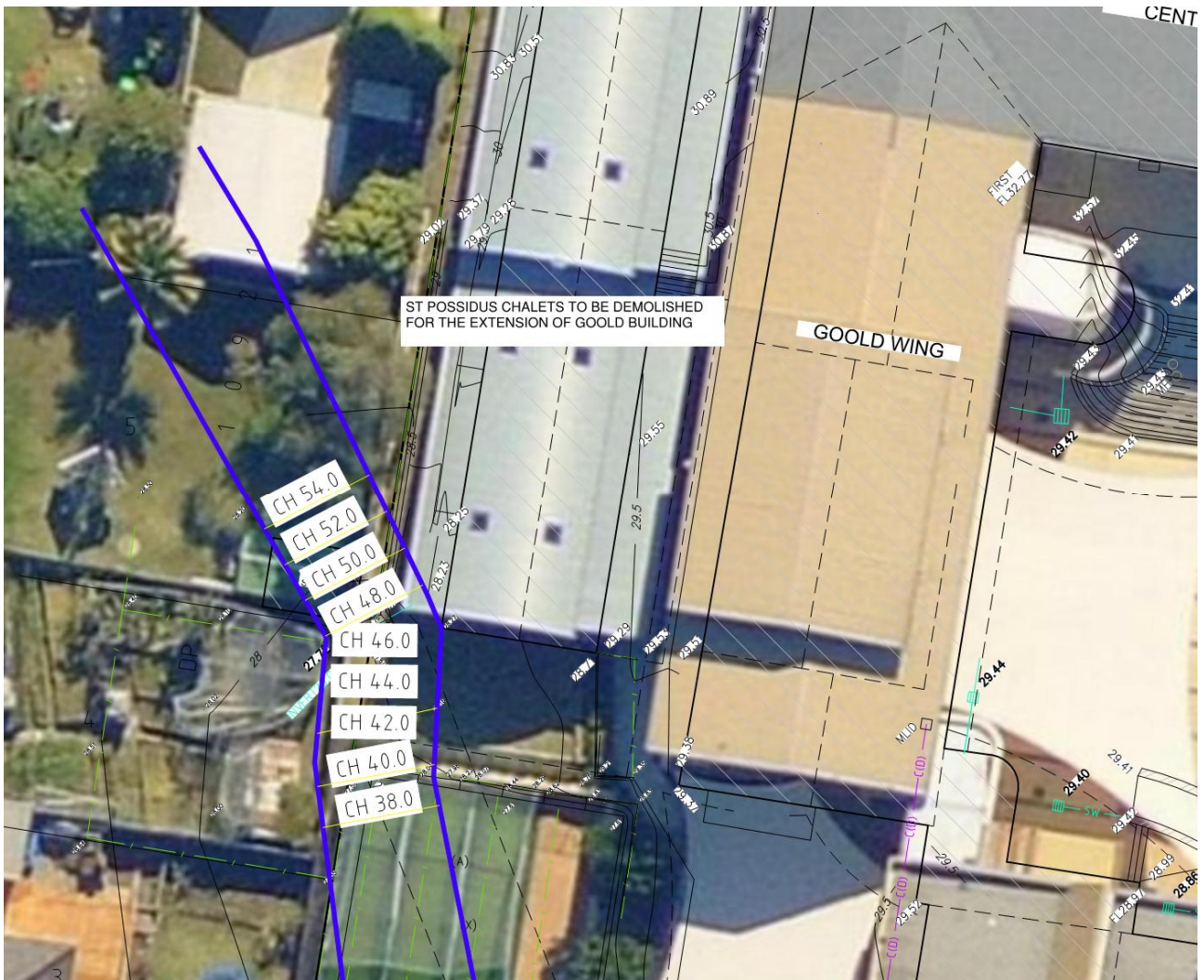


Figure 2 Overland flowpath alignment

## Results

The 1% AEP flow depth along the existing overland flowpath that is adjacent to the Goold Building is between RL 27.76m and RL 28.31m. Table 1 shows the water levels at different location of the overland flowpath.

**Table 1 HEC-RAS results**

Location	1% AEP Water Level (RLm)	Comments
CH 54.00	28.69	At the metal shed in the neighbouring property. Existing surface level at the school boundary RL 28.25m. Proposed Goold Building Ground Floor RL 29.59m
CH 52.00	28.49	
CH 50.00	28.34	
CH 48.00	28.22	At the corner of the Goold Building
CH 42.66	28.16	Fore court of the Goold Building
CH 40.00	28.10	At the top of the retaining wall adjacent to the cricket nets
CH 38.00	27.95	At the bottom of the retaining wall, within the cricket nets area

A 500mm freeboard to the finished floor level is required from the 1% AEP flood level as per Northern Beach Council design guidelines. The proposed extension of Goold Building will have a finished floor level of RL 29.59m, which is 900mm higher than the 1% AEP flood level.

## Conclusion

The proposed development will not cause any adverse impact on the existing flow condition as the demolition of the existing St Possidus Chalets will increase the available flow area, hence reduce the flow depths along the flow path.

The proposed extension of the Goold Building has more than 500mm freeboard from the 1% AEP flood level, which satisfies council's design requirement.

It is anticipated there will be some civil works associated with the proposed development, which may change the surface level along the overland flowpath. A detailed hydraulic analysis on the post development condition may be required for the development application submission.

If you have any query regarding to the above, please do not hesitate to contact the undersigned.

Yours sincerely,



Pak Lau  
Civil Engineer  
for Cardno  
Direct Line: +61 2 9496 7846  
Email: pak.lau@cardno.com.au



## Appendix 16 – On-site Detention Checklist

This checklist is to be used to determine the on-site stormwater disposal requirement for developments and must be completed and included with the submission of any development application for these works. Please read this form carefully for its notes, guidelines, definition and relevant policies.

For assistance and support, please contact Council's Development Engineering and Certification team on 1300 434 434.

Part 1 Location of the Property			
House Number	33	Legal Property Description	VACANT LAND
Street	CONSUL	Lot	3
Suburb	BROOKVALE	Section	
Postcode		DP	12815

Part 2 Site Details			
Northern Beaches Stormwater Regions (refer to Map 2 of Northern Beaches Council's Water Management for Development policy)		Total Site Area	556.11 m <sup>2</sup> (AS PER CAD)
Pre-Development Impervious Area	0%	Post-Development Impervious Area	452.47 m <sup>2</sup>
Is the site of the development located within an established Flood Prone Land as referred to Council's Local Environmental Plans?  If yes, On-site stormwater Detention system (OSD) is not required and please proceed to part 5 of this checklist If no, please proceed to part 3 of this checklist.			Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>  NO. OSD IS REQUIRED

Part 3: Northern Beaches Stormwater Regions (refer to Map 2 of Northern Beaches Council's Water Management for Development policy)
If the site of the development located within Region 1, please proceed to the part 4.1 of this checklist
If the site of the development located within Region 2, please proceed to the part 4.2 of this checklist ✓
If the site of the development located within Region 3, please proceed to the part 4.3 of this checklist
If the site of the development located within Region 4, please refer to Council's Warriewood Valley Water Management Specification.

**Part 4 Determination of OSD Requirements**

**Part 4.1 Northern Beaches Stormwater Region 1**

N/A

Is the additional impervious area of the development more than 50 m<sup>2</sup> on a cumulative basis since February 1996?

Yes  No

If yes, OSD is required and please refer to section 9.3.1 of Council's Water Management for Development Policy  
If no, OSD is not required and please proceed to the part 5 of this checklist

**Part 4.2 Northern Beaches Stormwater Region 2**

**Part 4.2.1 Description of Work**

Residential flat building, commercial, industrial, multiple occupancy development and subdivisions resulting in the creation of three lots or more, will require OSD in all case. Please provide a design in accordance with the section 9.3.2 of Council's Water Management for Development Policy.  
Any single residential building development, please proceed to part 4.2.2 of this checklist.

**Part 4.2.2 Exemption**

Is the site area less than 450m<sup>2</sup>?

Yes  No

Does the site of the development drain directly to the ocean without the need to pass through a drainage control structure such as pipe, bridge, culvert, kerb and gutter or natural drainage system?

Yes  No

Is it an alternation and addition development to the existing dwellings?

Yes  No

If yes to any of the above questions, OSD is not required.  
If no to all the above questions, proceed to part 4.2.3

**Part 4.2.3 Determination of OSD Requirements**

Calculation

a) Site area m<sup>2</sup> x 0.40 (40%) = ..... 222.93 ..... m<sup>2</sup>  
b) Post- development impervious area = ..... ~~452.47~~ ..... m<sup>2</sup>

**OSD will not be required when (a) is greater than (b)**

Is OSD required for this development (tick one only) Yes  No

If yes, provide a design in accordance with the section 9.3.2 of Council's Water Management for Development Policy.

If no, OSD is not required and please proceed to part 5 of this checklist.



**Part 5 Disposal of Stormwater**

Does the site fall naturally towards the street?                      Yes  No

If yes, provide a design in accordance with section 5.1 of Council's Water Management for Development Policy.  
 If no, provide a design in accordance with section 5.5 of Council's Water Management for Development Policy.

**Definitions**

Designed to help you fill out this application

**Site area:** This refers to the area of the land bounded by its existing or proposed boundaries.  
**Impervious area:** This refers to driveways, parking spaces, pathways, paved areas, hardstand areas, roofed areas, garages and outbuildings.  
**Pre Development Impervious area:** This refers all impervious areas of the site before the development.  
**Post Development Impervious areas:** This refers all the impervious areas within the site after the development is completed.