

# WATER MANAGEMENT PLAN

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**Property:** Lots 11 & 12 DP 1087962 (No.'s 22-27)  
Lambridge Place, Penrith

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**Date:** 6 November 2017

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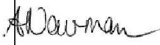

DEVELOPMENT  
CONSULTANTS

## Document Identification

Our Reference: **GO170521**

For and on behalf of ACOR Consultants (CC) Pty Ltd

## Quality Information

Version	Description	Date	Author	Signature	Reviewer	Signature
1.0	DRAFT Water Management Plan for Council comment	18/10/2017	Amanda Newman			
2.0	Water Management Plan	06/11/17	Amanda Newman		Bruce Kenny	

## Distribution

No. of Copies	Format	Distributed to	Date
1 (v 1.0)	pdf	Ezzy Architects	18/10/2017
1 (v 2.0)	pdf	Ezzy Architects	06/11/2017

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## ANNEXURES

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## 1.0 Introduction

ACOR Consultants (CC) Pty Ltd (ACOR) has been commissioned to prepare a Water Management Plan in response to the requirements of Penrith Development Control Plan (DCP) 2014 Part C3 Water Management and Penrith Local Environmental Plan (LEP) 2010 Clause 7.2. In the preparation of this report, ACOR has relied upon certain data and information contained within the following documents:

- Architectural plans prepared by Ezzy Architects, Project No J1441, Sheets A00 to A700, no revision, dated 16 October 2017;
- Site survey prepared by Chase Burke & Harvey, reference 2017235-1, Drawing No. D17235-1, Revision 1, dated 16 August 2017;
- Penrith DCP 2014;
- Penrith LEP 2010;
- Pre-lodgement advice issued by Penrith City Council, reference PL17/0002, dated 13 January 2017;
- Flood level information advice issued by Penrith City Council, contained in email correspondence dated 13 September 2017;
- 'Technical flood risk management guideline: Flood hazard' published by the Attorney-General's Department, dated 2014;
- 'Reducing Vulnerability of Buildings to Flood Damage: Guidance on Building in Flood Prone Areas' published by the Hawkesbury-Nepean Floodplain Management Steering Committee (HNFMSC), dated 2006; and
- 'Floodplain Development Manual: the management of flood liable land' published by NSW Department of Infrastructure, Planning and Natural Resources (NSW DIPNR), dated April 2005.

The report will demonstrate that stormwater can be managed on-site in a manner which assists in the maintenance of streamflow and which meets targets for the reduction of gross pollutants, nutrients and chemical pollutants. Additionally, the report will examine the impact of flooding at the subject site and recommend measures to ensure that future redevelopment of the site will meet flood compatibility standards. The purpose of this report is to provide Penrith City Council with sufficient information to assess the proposed development which is located on flood affected lands.

## 2.0 Site Description

The subject site consists of the sites known as Lot 11 DP 1087962 and Lot 12 DP 1087962 (No.'s 22-27) Lambridge Place, Penrith. The site is located on the northern side of Lambridge Place and is located amongst industrial development.

The subject site is a partly developed site of area 12,559 square metres. The site is zoned IN1 General Industrial. Existing development of the site consists of a refrigerated warehouse facility. Two earthen mounds exist near the eastern site boundary.

The site generally falls towards Lambridge Place. Elevations on site are within the range 23.7 m AHD to 25.2 m AHD.

The site owner proposes to extend the existing refrigerated warehouse. The proposed development seeks to match the warehouse extension floor levels with the floor levels of the existing building. Associated with the warehouse extension is the creation of additional car parking at the site, and a truck refuelling station. The proposed development is largely confined to Lot 11, with limited additional development proposed on Lot 12. The total area proposed to be developed is 6,633 m<sup>2</sup>. The primary features of the proposed development are depicted in architectural plans prepared by Ezzy Architects, Project No J1441, Sheets A00 to A700, no revision, dated 16 October 2017.

### 3.0 Flooding

This section of the report describes existing flood behaviour at the site, discusses the impact of the proposed development on flood behaviour, and recommends measures to ensure that future redevelopment of the site will meet flood compatibility standards. Existing flood behaviour is described in Section 3.1. Measures to mitigate the impact of flooding at the subject site are discussed in Section 3.3, while the impact of the proposed development is discussed in Section 3.2.

#### 3.1 Flood Characteristics

The site is impacted by both mainstream flooding from the Nepean River and local overland flooding. Local overland flooding will be discussed first, followed by mainstream flooding.

The local overland floodwaters primarily impact Lot 12, with flooding of Lot 11 confined to the ground immediately adjacent to the eastern site boundary. The 1% AEP overland floodwaters impact the site at elevation 24.4 m AHD. The 1% AEP overland floodwaters cause partial inundation of the eastern boundary of Lot 11 to depths within the range 0.0 m to 0.6 m. The western parts of Lot 12 are partially inundated to depths within the range 0.0 m to 0.7 m. We note the existing warehouse and proposed extension are located outside the 1% AEP overland flood extents. The 1% AEP overland floodwaters are expected to pose Low to High Hazard to occupants of the site.

The 1% AEP overland floodwaters impact Lambridge Place to depths within the range 0.0 m to 0.8 m. During the 1% AEP overland flood event, Lambridge Place is not expected to be trafficable by vehicles (Attorney-General's Department 2014) and poses High Hazard to pedestrians.

The 1% AEP mainstream floodwaters impact Lot 11 at 24.9 m AHD and impact Lot 12 at 24.8 m AHD. The 1% AEP mainstream floodwaters partially inundate Lot 11 to depths within the range 0.0 m to 1.2 m. The 1% AEP mainstream floodwaters partially inundate Lot 12 to depths within the range 0.0 m to 1.1 m. The existing warehouse is located largely outside the 1% AEP mainstream flood inundation extents. The 1% AEP mainstream floodwaters are expected to pose Low to High Hazard to occupants of the site.



The 1% AEP mainstream floodwaters impact Lambridge Place to depths within the range 0.1 m to 1.2 m. During the 1% AEP mainstream flood event, Lambridge Place is not expected to be trafficable by vehicles (Attorney-General's Department 2014) and poses High Hazard to pedestrians.

Mainstream flooding creates the highest 1% AEP flood levels and poses higher hazard conditions at the site. A 1% AEP flood level of 24.9 m AHD will be adopted for the purposes of this report.

### **3.2 Impact of the Proposed Development**

As the proposed development is located on ground above the 1% AEP overland flood level, the proposed development will have no impact on the 1% AEP local overland flood behaviour within the floodplain.

The existing 1% AEP mainstream flood storage volume on Lot 11 is approximately 1488 m<sup>3</sup>. Filling and regrading of the site will result in a post-development 1% AEP mainstream flood storage volume of approximately 99 m<sup>3</sup>. The proposed development will cause the loss of approximately 1389 m<sup>3</sup> of 1% AEP mainstream flood storage volume. The impact of the loss of flood storage on the 1% AEP Nepean River flood event has not been modelled. From our discussions with Council, we understand Council is not concerned about loss of flood storage or disruption to flow paths at the subject site during the 1% AEP mainstream flood event. In this regard, the proposed development does not result in unacceptable impact on the existing 1% AEP mainstream flood regime.

### **3.3 Flood Risk Management**

Based on the foregoing, we offer the following response, having due regard for the requirements of Penrith DCP 2014 Part C3 Section 3.5, Penrith LEP 2010 and 'Floodplain Development Manual' (NSW DIPNR 2005).

#### **3.3.1 Floor Level**

The proposed extensions have a floor level of 26.3 m AHD, to tie in with the floor levels of the existing cold storage facility. The proposed floor level provides 1.4 m freeboard to the 1% AEP floodwaters. In this regard, the proposed floor level meets the minimum floor level requirements of Penrith DCP 2014 Part C3 Section 3.5 Clauses 6 a) and 7 a).

#### **3.3.2 Building Components and Method**

The proposed extensions shall be constructed of flood compatible building materials below 25.4 m AHD. Extensive guidance on flood compatible building materials and methods is provided in 'Reducing Vulnerability of Buildings to Flood Damage: Guidance on Building in Flood Prone Areas' (HNFMSC 2006); a selection of the flood compatible materials and practices, applicable to the proposed development, described in this resource is summarised below.

Flood compatible floor and sub-floor materials include reinforced or mass concrete and masonry. Suitable wall structure materials include solid brickwork, blockwork, concrete and steel frames. Steel frames should be constructed of open sections where possible and have holes drilled into the bottom steel plates to allow water to drain from the frame in the event of immersion.

Flood compatible wall and ceiling linings include fibre-cement board, brick, concrete (including concrete blocks), stone with waterproof grout, clay tiles glazed with waterproof mortar, glass (including glass blocks), plastic sheeting with waterproof adhesive, steel with waterproof applications, exterior grade plywood, and fully sealed solid wood products. Plasterboard is not a flood compatible material as it requires replacement after extended immersion, however for shallow and short duration floods there may be little damage to plasterboard wall linings. It is recommended that sheet wall linings be installed horizontally with a 20-30 mm gap provided between the bottom wall plate and the base of the wall lining to facilitate ventilation and cleaning of the wall cavity after a flood event. The gap may be covered with skirting board when access to the wall cavity is not required.

Insulation should be closed cell type foam. Nails, bolts, hinges and fittings should be made from nylon, brass, stainless steel or hot dipped galvanised steel. Hinges should be of a removable pin type.

Flood compatible doors include solid panel doors with waterproof adhesives, flush doors with marine ply and closed cell foam, metal doors, and aluminium or galvanised steel frame doors. Aluminium frame windows with stainless steel rollers or similar corrosion and water resistant materials suffer least damage during flood events.

Connection to mains power supply, including metering equipment should be located above 25.4 m AHD. All electrical wiring, switches and outlets should, where possible be located above 25.4 m AHD. All wiring, connections and conduit below 25.4 m AHD should be suitable for submergence in water. Conduits shall be installed such that they will be self-draining in the event of flooding.

Heating and air-conditioning systems, including fuel supply and ducting, should be installed above 25.4 m AHD. Where this is not possible, they should be installed in such a manner as to minimise damage from submersion. This may be achieved through measures such as access for cleaning and draining of water after flood events, manually operated cut off valves for fuel supply lines and ducts, securely fastening heating equipment and fuel storage tanks to prevent buoyancy and movement, and venting of fuel supply tanks at an elevation of 26.0 m AHD.

### 3.3.3 Structural Soundness

We strongly recommend the proposed cold storage facility extensions be constructed to withstand the loads imposed by the 1% AEP mainstream floodwaters plus 0.5 m freeboard (25.4 m AHD). Consideration should be given to hydrostatic, hydrodynamic, buoyancy and debris impact forces. The structural design should be reviewed by a practicing Structural Engineer with relevant experience designing structures on flood affected lands.

### 3.3.4 Car Parking and Driveway Access

The additional car parking area is proposed to have finished surface levels above natural ground levels as depicted in ACOR Consultants (CC) Pty Ltd Civil Engineering Plans, reference GO170521, drawing No.'s D1 to D2, issue A, dated 18 October 2017 (copy enclosed under Annexure A). The car parking area and truck refuelling area is proposed to be raised to levels between 25.0 m AHD and 25.2 m AHD. As such, the proposed carparking and truck refuelling area will be above the 1% AEP flood level of 24.9 m AHD.

### 3.3.5 Materials Storage

We understand the goods and materials associated with the proposed extensions to the cold storage facility will be stored at or above the proposed and existing floor level of 26.3 m AHD. As such, these goods and materials will be stored a minimum of 1.4 m above the 1% AEP floodwaters.

The proposed diesel tanks servicing the proposed truck refuelling area will be a fully self-bunded tank design. In this regard, the proposed diesel storage area will be protected to the 1% AEP flood level plus 0.5 m freeboard (25.4 m AHD).

Based on the foregoing, we are of the view that the proposed facility provides sufficient area above the 1% AEP flood level plus 0.5 m freeboard (25.4 m AHD) to store goods and materials which may become hazardous, may be damaged by floodwaters or has the potential to pollute floodwaters. In this regard, we are of the view that the proposed development complies with the requirements of Penrith City Council DCP 2014 Part C3 Section 3.5 Clause 12 a).

### 3.3.6 Fencing

Architectural plans prepared by Ezzy Architects depict the erection of additional fencing in conjunction with the proposed development. The proposed fencing is a metal tube fencing similar to the existing fencing erected along the eastern and southern boundaries of Lot 12. The proposed fencing is an open flow-through fencing type which will not impede the passage of stormwater flows or floodwaters.



### 3.3.7 Evacuation

The State Emergency Service of NSW (SES) is responsible for providing flood updates which can be received by local, radio and television news and SMS messaging. The timing for evacuation of persons is to be established in consultation with the SES.

To increase the flood-readiness of the staff and operators of the proposed cold storage facility, owners/occupiers of the site should be made aware of FloodSafe kits developed by the SES which aid development of an Emergency Business Continuity Plan. Information regarding FloodSafe kits is available from <http://www.floodsafe.com.au/>. Future owners/occupiers of the site should prepare, regularly review and update an Emergency Business Continuity Plan. A copy of the Emergency Business Continuity Plan should be accessible to staff, and staff should be made aware of its existence and regularly trained in the appropriate response(s) to emergency situations.

The proposed floor level of 26.3 m AHD will provide 1.4 m freeboard to the 1% AEP floodwaters. While this provides occupants of the site with an area of refuge above the 1% AEP floodwaters, it is not recommended that staff of the cold storage facility attempt to remain on site in the event that a flood event equal to or exceeding the 1% AEP Nepean River flood event. This is due to the long duration of Nepean River flood events.

During the 1% AEP mainstream and overland flood events, Lambridge Place is not expected to be trafficable for pedestrians or vehicles. We recommend a flood level of 23.8 m AHD be adopted to trigger evacuation of the site. Lambridge Place is expected to be trafficable during flood events at or below 24.0 m AHD.

In the event that the 1% AEP flood event is expected to be exceeded, strategies should be adopted in accordance with NSW Government operational guidelines and SES Emergency Evacuation operational guidelines.

## 4.0 Stormwater Quality

This section of the report assesses the impact of the proposed development on stormwater quality and demonstrate that stormwater can be managed on-site in a manner which assists in the maintenance of streamflow and which meets targets for the reduction of gross pollutants, nutrients and chemical pollutants. This includes an assessment of:

- Existing (pre-development) stormwater quality, including the identification of pollutant sources and treatment devices;
- Post-development stormwater quality, including the identification of pollutant sources and pollutant influx to the proposed treatment train; and
- Performance of the proposed treatment train.



Stormwater quality analysis was undertaken using a MUSIC model of the pre-development and post-development site scenarios.

#### 4.1 Stormwater Treatment Requirements

The proposed development is required to incorporate a stormwater treatment train capable of meeting the pollutant reduction targets outlined in Table 1.

**Table 1: Stormwater Pollution Retention Targets**

Pollutant	Retention target
Total suspended solids (TSS)	85%
Total phosphorus (TP)	60%
Total nitrogen (TN)	45%
Gross pollutants (GP)	90%
Free oils and grease	90% with no visible discharge

In accordance with guidance contained within Penrith City Council's WSUD Technical guidelines, the treatment train was designed to capture and treat the 3 month ARI site discharge. The 3 month ARI site discharge was taken to be half the 1 year ARI peak discharge rate from the site (The et al. 2015). The peak 1 year ARI discharge was calculated using the DRAINS software package. The 3 month ARI site discharge was determined to be 0.067 m<sup>3</sup>/s.

#### 4.2 Proposed Stormwater Treatment Train

The stormwater treatment measures for the proposed development consist of:

- Ecosol Cartridge Filter (ECF Triple) (1).

The pollutant removal parameters of the proposed Ecosol ECF Triple were provided by the manufacturer, Ecosol Pty Ltd. The Ecosol ECF Triple provides three stage treatment of stormwater to remove gross pollutants; oil, grease and other hydrocarbons; nitrogen; phosphorous; and heavy metals (Ecosol 2014). The Ecosol ECF Triple has a treatable flowrate of 71 L/s (Ecosol 2014). The Ecosol ECF Triple is capable of storing 1 m<sup>3</sup> of solid pollutants and 1.13 m<sup>3</sup> of free oil and grease (Ecosol 2014). The pollutant removal efficiency of the proposed Ecosol ECF Triple is summarised in Table 2.

**Table 2: Ecosol ECF Triple Pollutant Removal Efficiency (Ecosol 2014)**

Pollutant	Removal efficiency (%)
TSS	92
TP	60
TN	60
GP	99
Total petroleum and hydrocarbons	95
Heavy metals	97

### 4.3 MUSIC Model Development

A pre-development and post-development MUSIC model was set up for the subject site. This section describes the climate data, MUSIC parameters and catchment representation used to assess site stormwater quality in the pre-development and post-development conditions.

MUSIC requires climate data, in the form of rainfall and potential evapotranspiration (PET) data, and rainfall-runoff parameters to generate stormwater runoff from the site. This data was acquired through the use of a Penrith City Council MUSIC-link model.

Stormwater pollutant loads were generated using the stochastic generation tool within MUSIC. This results in log-normally distributed, uncorrelated pollutant loads for each storm event. The pollutant load parameters vary by land use type. Pollutant load parameters were acquired through MUSIC-link for each land use type.

The pre-development and post-development catchments were defined based on topographic features indicated during site survey, and anticipated flow paths. The pre-development and post-development catchments are anticipated to encompass the same area, consisting of Lot 11 and part of Lot 12. The total site area being developed is 6,633 m<sup>2</sup>.

The pre-development and post-development MUSIC model layout is depicted in Figure 1. The pre-development model consists of:

- Source node: Parking & storage; and
- Outlet node: Pre-Development Node.

The post-development model consists of:

- Source node: Carpark & driveway;
- Source node: Roof;
- Source node: Landscaping
- Treatment node: Ecosol Cartridge Filter Triple (Offline); and
- Outlet node: Post-Development node.

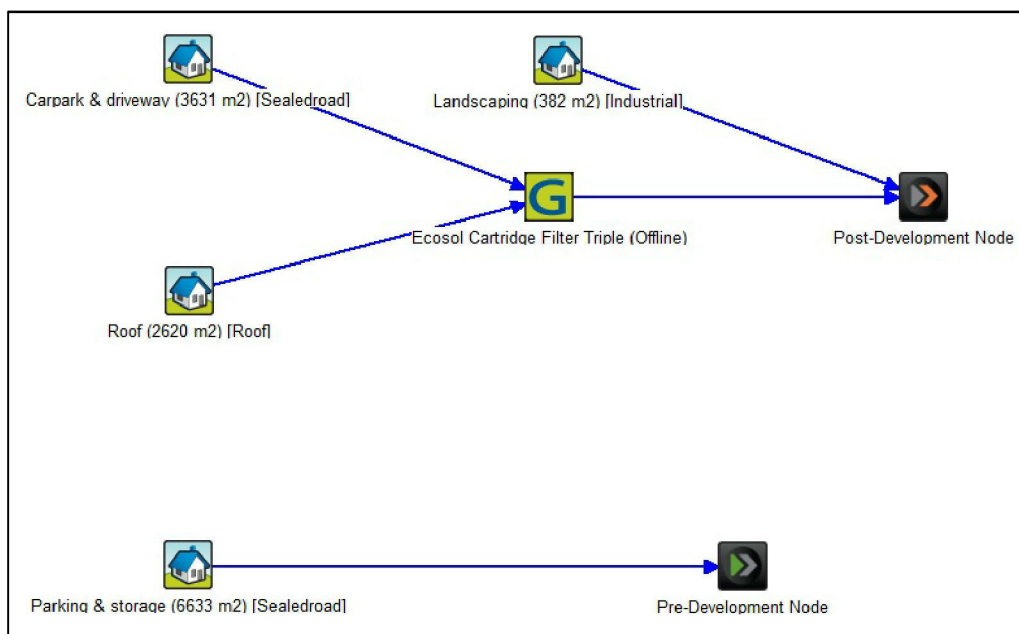


Figure 1: MUSIC model layout

Land use categorisation was used to determine the amount of impervious area on site, presented in Table 3 below, and determine appropriate pollutant generation parameters. The land use and site composition for the pre-development catchment was determined by site inspection and satellite imagery. Land use for the post-developed catchment was assessed from the proposed development plans.

Table 3: Catchment Properties

Catchment	Catchment area (ha)	Impervious area (%)	Pervious area (%)	Land use
<i>Pre-development</i>				
Parking & storage	0.662	100	0	Sealed road (Urban)
<i>Post-development</i>				
Carpark & driveway	0.433	100	0	Sealed road (Urban)
Landscaping	0.038	0	100	Industrial (Urban)
Roof	0.229	100	0	Roof (Urban)

#### 4.4 Water Quality Assessment

The pollutant loads of stormwater discharge for the pre-development and post-development scenarios were estimated using MUSIC. The MUSIC model set-up is described in Section 4.3. The MUSIC model output is presented and discussed in this section. Note that anticipated oil and grease generation and removal is not assessed by MUSIC, and is thus not presented in this report.

The mean annual loads of the pre-development site are presented in Table 4. The absence of any reduction in pollutant loads between the source and site outlet reflects the current lack of stormwater treatment device servicing the area of the site proposed to be developed.

**Table 4: Pre-development Mean Annual Pollutant Loads.**

Pollutant	Source release	Site discharge	Reduction (%)
Flow (ML/year)	3.920	3.920	0.0
TSS (kg/year)	1360.000	1360.000	0.0
TP (kg/year)	2.350	2.350	0.0
TN (kg/year)	9.380	9.380	0.0
GP (kg/year)	110.000	110.000	0.0

The mean annual loads of the post-development site are presented in Table 5. The proposed Ecosol ECF Triple captures the bulk of the gross pollutants and TSS, and over half the total nitrogen and phosphorous generated on site.

**Table 5: Post-development Mean Annual Pollutant Loads.**

Pollutant	Source release	Site discharge	Reduction (%)
Flow (ML/year)	3.730	3.730	0.0
TSS (kg/year)	827.000	95.200	88.5
TP (kg/year)	1.520	0.638	58.0
TN (kg/year)	8.770	3.710	57.7
GP (kg/year)	104.000	1.980	98.1

As a result of the proposed development it is expected that TP loads will be reduced by 72%, TN loads will be reduced by 60%, TSS loads will be reduced by 93%, and gross pollutant loads will be reduced by 98% from pre-development levels. This represents a substantial reduction in pollutants entering the downstream receiving waters.



The proposed stormwater quality treatment device captures a higher percentage of gross pollutants, TSS and TN than required under Penrith DCP 2014 Part C3 Section 3.2 Clause 5B. However, the proposed stormwater treatment train does not meet the 60% target for TP removal, removing only 58% of the phosphorous developed on site. We request that Council consider the proposed TP reduction on a merit basis, due to the substantial reduction in post-development TP loading from pre-development conditions, and the significant improvement in water quality from pre-development conditions.

## 5.0 On-site Detention (OSD)

Information contained within pre-lodgement advice issued by Penrith City Council, reference PL17/0002, dated 13 January 2017 indicates that OSD is required to service the proposed development. The advice provided in pre-lodgement discussions prescribes 185 m<sup>3</sup> of OSD with a permissible site discharge of 0.079 m<sup>3</sup>/s.

Following further discussion with Council, we understand that Council no longer requires OSD to be provided to service the proposed development. Additionally, we note Penrith DCP 2014 Part C3 Section 3.6 Clause 3a) requires that the proposed development does not increase peak flows downstream for all storm events up to and including the 100 year ARI storm event. As the proposed development does not propose increased impervious area or shortening of drainage paths within the site, the proposed development will not increase peak flowrates downstream.

Based on the foregoing, OSD is not required for the proposed development.

## 6.0 Conclusions

Alterations and additions to the existing cold storage facility are proposed. The proposed development will largely be confined to the eastern part of the site, being Lot 11. Associated with the proposed alterations and additions is the addition of new carparking spaces and a truck refuelling area. It is proposed to fill the site during construction of the driveway, carparking area and truck refuelling area. A total area of 6633 m<sup>2</sup> is proposed to be developed. The proposed development does not propose the creation of additional impervious area.

The impact of overland and mainstream 1% AEP flooding of the site has been assessed and measures to manage the risk posed by flooding at the site are presented in Section 3.0. During an assessment of the existing flood behaviour, it was established that the portion of the site proposed to be developed is not impacted by the 1% AEP overland floodwaters, which occur at elevation 24.4 m AHD. The site is impacted by 1% AEP mainstream flooding from the Nepean River. The 1% AEP Nepean River floodwaters impact areas of the site where development is proposed at elevation 24.9 m AHD, resulting in partial inundation to depths within the range 0.0 m to 1.2 m.

The additional cold storage floorspace is proposed at elevation 26.3 m AHD, which is above the Flood Planning Level (FPL) of 25.4 m AHD. ACOR recommends the proposed warehouse additions be designed to withstand the loads imposed by the 1% AEP floodwaters plus 0.5 m freeboard. The proposed warehouse extensions are to be constructed of flood compatible building materials below 25.4 m AHD. Guidance on appropriate flood compatible building materials is provided in Section 3.3.2.

The proposed carparking and truck refuelling area is proposed to be filled to levels above 25.0 m AHD. In this regard, the proposed carparking and refuelling area will not be impacted by the 1% AEP floodwaters. Additionally, the risk of diesel fuel entering the 1% AEP floodwaters is further minimised by the fully bunded nature of the proposed diesel tanks which will provide protection above the FPL of 25.4 m AHD.

All materials stored on site which may become hazardous, pollute floodwaters or be damaged by floodwaters will be stored either within the proposed warehouse, which has a proposed floor level of 26.3 m AHD, or within the proposed bunded diesel tanks. In this regard, the proposed development provides adequate area to store goods either above, or protected above, the FPL of 25.4 m AHD.

The proposed filling of the site results in the loss of approximately 1389 m<sup>3</sup> of 1% AEP mainstream flood storage. The impact of the loss of flood storage on the 1% AEP Nepean River flood event has not been modelled. From our discussions with Council, we understand Council is not concerned about loss of flood storage or disruption to flow paths at the subject site during the 1% AEP mainstream flood event.

During the 1% AEP mainstream and overland flood events, Lambridge Place is not expected to be trafficable for pedestrians and vehicles. It is expected that Lambridge Place will be trafficable during floods up to 24.0 m AHD. We recommend that a flood level of 23.8 m AHD be adopted as the trigger to self-evacuate the site. The timing of evacuation of the site is to be established in consultation with the NSW SES.

The impact of the proposed development on stormwater quality has been assessed in Section 4.0. Stormwater can be managed on-site in a manner which assists the maintenance of streamflow and controls the emission of gross pollutants, chemical pollutants and nutrients from the site. Concept stormwater management plans have been developed and a copy is enclosed under Annexure A. A stormwater treatment train is proposed, consisting of an Ecosol Cartridge Filter (ECF Triple). The proposed stormwater treatment device removes 88.5% of TSS, 58.0% of TP, 57.7% of TN and 98.1% of GP generated by the proposed development and is reported to remove 95% of the petroleum and hydrocarbons from stormwater. The proposed stormwater quality treatment device falls 2% short of the TP capture target but exceeds the minimum capture requirement of all other pollutants. As a result of the proposed development, TP and TN loads are reduced by 60% or more from pre-development levels and TSS and gross pollutant loads are reduced by over 90% from pre-development levels. Stormwater runoff from the proposed development will convey substantially less pollutants into the downstream receiving waters than stormwater flows from the existing site.

The proposed development does not require OSD, refer Section 5.0 for details.

Based on the foregoing, we are of the view that the proposed development generally complies with the intent of Penrith DCP 2014 Part C3 Water Management.

## 7.0 References

Attorney-General's Department. (2014). *Technical flood risk management guideline: Flood hazard*. Barton, ACT: Author.

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Hawkesbury-Nepean Floodplain Management Steering Committee (HNFMSC). (2006). *Reducing Vulnerability of Buildings to Flood Damage: Guidance on Building in Flood Prone Areas*. Available from [http://www.ses.nsw.gov.au/content/documents/pdf/resources/Building\\_Guidelines.pdf](http://www.ses.nsw.gov.au/content/documents/pdf/resources/Building_Guidelines.pdf)

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The C., Beesley C., Podger S., Green J., Jolly C., and Hutchinson M. (2015). 'Very Frequent Design Rainfalls – An Enhancement to the New IFDs'. In Engineers Australia (ed.) *36<sup>th</sup> Hydrology and Water Resources Symposium (HWRS 2015)*. Barton, ACT: Author.

## **ANNEXURE A**

**ACOR Consultants (CC) Pty Ltd Civil Engineering Plans  
Reference GO170521  
Drawing No.'s D1 to D2  
Issue A  
Dated 18 October 2017**



# PROPOSED INDUSTRIAL DEVELOPMENT 24-27 LAMBRIDGE PLACE, PENRITH CIVIL ENGINEERING PLANS

## GENERAL NOTES

1. ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH THE LOCAL COUNCIL'S RELEVANT CIVIL CONSTRUCTION SPECIFICATION AND STANDARDS AND TO THE SATISFACTION OF COUNCIL'S AND/OR THE PRINCIPAL CERTIFYING AUTHORITY'S INSPECTOR OF WORKS. ANY DISCREPANCY, VARIATION OR ADDITIONAL WORKS SHALL BE APPROVED BY THE BUILDER'S REPRESENTATIVE BEFORE PROCEEDING WITH SUCH WORKS.
2. THE LOCAL COUNCIL'S AND/OR THE PRINCIPAL CERTIFYING AUTHORITY'S INSPECTOR OF WORKS IS TO BE NOTIFIED AT LEAST 48 HOURS PRIOR TO THE COMMENCEMENT OF WORKS. THE CONTRACTOR IS TO ESTABLISH THE INSPECTOR'S INSPECTION SCHEDULE REQUIREMENTS AND ENSURE THAT EACH IDENTIFIED STAGE OF WORKS IS ACCORDINGLY INSPECTED.
3. THESE DRAWINGS ARE A DIAGRAMMATIC REPRESENTATION OF WORK TO BE CARRIED OUT ONLY AND DIMENSIONS ARE NOT TO BE SCALED.
4. ALL LEVELS SHALL BE OBTAINED FROM ESTABLISHED BENCH MARKS ONLY. DATUM USED ON THESE DRAWINGS IS AUSTRALIAN HEIGHT DATUM (AHD) UNLESS NOTED OTHERWISE.
5. EROSION AND SEDIMENT CONTROL
  - 5.1. EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE INSTALLED IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN AND TO THE SATISFACTION OF THE PRINCIPAL CERTIFYING AUTHORITY'S INSPECTOR OF WORKS.
  - 5.2. EROSION CONTROL MEASURES ARE TO BE INSTITUTED PRIOR TO THE COMMENCEMENT OF ANY WORKS AND ARE TO BE MAINTAINED BY THE CONTRACTOR FOR THE DURATION OF WORKS.
  - 5.3. THE EXTENT OF DISTURBED SURFACES IS TO BE MINIMISED AS MUCH AS PRACTICABLE DURING THE COURSE OF WORKS.
  - 5.4. ALL FOOTPATHS, FILL BATTERS AND DISTURBED AREAS ARE TO BE TOPSOILED AND TURFED, OR STABILISED BY OTHER APPROVED MEANS, AS SOON AS PRACTICABLE.
6. ALL PUBLIC UTILITY SERVICES ARE TO BE LOCATED ON-SITE BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF WORKS. ANY SERVICES SHOWN ON THIS PLAN HAVE BEEN LOCATED FROM INFORMATION SUPPLIED BY SURVEY PLANS AND/OR RELEVANT AUTHORITIES. THE PRESENCE, LOCATION AND EXTENT OF SERVICES SHOWN ARE NOT GUARANTEED COMPLETE OR CORRECT. ANY ADJUSTMENTS OR REPAIRS REQUIRED TO SERVICES ARE TO BE UNDERTAKEN AT THE CONTRACTOR'S EXPENSE TO THE SATISFACTION OF THE RELEVANT AUTHORITY.
7. NO TREES PROTECTED UNDER THE LOCAL COUNCIL'S TREE PRESERVATION ORDER ARE TO BE REMOVED UNLESS APPROVED BY DEVELOPMENT CONSENT OR PERMIT OBTAINED FROM COUNCIL.
8. THE CONTRACTOR IS TO ENSURE THAT ALL WORKS ARE CARRIED OUT IN ACCORDANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY ACT.
9. THE CONTRACTOR IS TO OBTAIN FROM THE BUILDER AND BE AWARE OF THE RELEVANT CONDITIONS OF DEVELOPMENT CONSENT AND/OR CIVIL WORKS APPROVAL.
10. THE CONTRACTOR MUST ENSURE APPROVAL OF MATERIALS BY THE INSPECTOR OF WORKS PRIOR TO DELIVERY TO SITE.
11. WORK INVOLVING THE USE OF MECHANICAL PLANT AND EQUIPMENT IS TO BE UNDERTAKEN ONLY DURING THE HOURS OF 7AM TO 6PM MON-FRI AND 8AM TO 1PM SATURDAYS WITH NO WORK PERMITTED ON SUNDAYS OR PUBLIC HOLIDAYS UNLESS AS OTHERWISE SPECIFIED BY THE LOCAL COUNCIL'S REQUIREMENTS.
12. SMOOTH TRANSITIONS ARE TO BE PROVIDED BETWEEN ALL NEW WORKS AND EXISTING WORKS.
13. WHERE FILL IS PROPOSED ON NATURAL SURFACE SLOPES EXCEEDING ONE (V) IN FOUR (H) (1:4) GRADIENT, BENCHES ARE TO BE CUT TO PREVENT SLIPPING OF FILL MATERIAL AS REQUIRED BY THE LOCAL COUNCIL'S AND/OR THE PRINCIPAL CERTIFYING AUTHORITY'S INSPECTOR OF WORKS.
14. ALL BATTERS ARE TO BE SCARIFIED TO ASSIST WITH ADHESION OF TOPSOIL TO THE BATTER FACE.
15. INSITU DENSITY TESTS ARE TO BE CARRIED OUT ON ALL SIGNIFICANT FILLS, ROAD SUBGRADES AND PAVEMENT COURSES AS DIRECTED BY THE INSPECTOR OF WORKS. ALL TESTS ARE TO BE CARRIED OUT BY A REGISTERED N.A.T.A. GEOTECHNICAL LABORATORY.
16. ANY WORKS REQUIRING INTERFERENCE TO ADJOINING LOTS ARE TO BE CONSENTED TO IN WRITING BY THE OWNER OF THE RELEVANT LOT PRIOR TO THE COMMENCEMENT OF THOSE WORKS.
17. UPON COMPLETION OF WORKS, ALL RUBBISH, CONSTRUCTION BUILDINGS AND FENCES ETC ARE TO BE REMOVED.
18. PRIOR TO THE COMMENCEMENT OF EARTHWORKS, ALL VEGETATION AND OTHER DELETERIOUS MATERIALS ARE TO BE REMOVED. REMOVAL OF TREES REQUIRES APPROVAL FROM COUNCIL AND/OR THE INSPECTOR OF WORKS.
19. EXISTING TOPSOIL FROM THE SITE IS TO BE STRIPPED AND STOCKPILED FOR LATER RE-USE. REFER TO LANDSCAPING PLANS FOR ANY SPECIAL REQUIREMENTS.
20. FOLLOWING STRIPPING, THE EXPOSED SUBGRADE MATERIALS ARE TO BE INSPECTED TO IDENTIFY ANY UNSOUND AREAS. SUCH AREAS TO BE REMOVED AND REINSTATED TO THE SATISFACTION OF THE INSPECTOR OF WORKS.
21. THE CONTRACTOR IS RESPONSIBLE FOR SETOUT AND LEVEL CONTROL. ANY DISCREPANCIES BETWEEN DESIGN DRAWINGS AND SITE CONDITIONS IS TO BE RESOLVED BY THE INSPECTOR OF WORKS PRIOR TO CONTINUING WORKS.
22. ALL EARTHWORKS SHOULD BE UNDERTAKEN IN ACCORDANCE WITH AS3798-2007. THE GEOTECHNICAL ENGINEER TO IS HAVE A LEVEL 2 RESPONSIBILITY AS DEFINED IN SECTION 8 OF AS 3798-2007 AND SHALL CERTIFY AT THE END OF THE WORKS THAT EARTHWORKS COMPLY WITH THE REQUIREMENTS OF THE SPECIFICATIONS AND DRAWINGS.
23. PROVIDE SMOOTH TRANSITION AT ALL CHANGES IN GRADE UNLESS OTHERWISE SPECIFIED.
24. THE PROJECT ARCHITECT IS TO INSPECT THE WORKS FOLLOWING COMPLETION OF BULK EARTHWORKS AND PRIOR TO COMMENCEMENT OF DETAIL EARTHWORKS.

## CIVIL LEGEND

### PROPOSED IN CIVIL SITEWORKS PACKAGE HEREWITH

- FINISHED SURFACE LEVEL
- CENTRELINE CHAINAGE
- STORMWATER DRAINAGE LINE  
INVERT LEVEL UPSTREAM  
PIPE SIZE, MATERIAL AND CLASS  
PIPE GRADE AND LENGTH  
INVERT LEVEL DOWNSTREAM
- STORMWATER DRAINAGE PIT WITH NUMBER (REFER STORMWATER DRAINAGE STRUCTURES SCHEDULE)
- STORMWATER DRAINAGE HEADWALL (REFER STORMWATER DRAINAGE STRUCTURES SCHEDULE)
- KERB ONLY
- DISH DRAIN
- KERB AND GUTTER
- ISOLATION JOINT
- DOWELLED CONSTRUCTION JOINT
- SAWN CONTRACTION JOINT
- DIRECTION OF OVERLAND FLOW
- CIVIL SITEWORKS SETOUT POINT LABEL
- DENOTES EXISTING UNDERGROUND TELSTRA SERVICE LINE
- DENOTES EXISTING UNDERGROUND WATER SERVICE LINE
- DENOTES EXISTING OVERHEAD ELECTRICITY LINE
- DENOTES EXISTING UNDERGROUND GAS LINE

IMPORTANT: THE CONTRACTOR IS TO MAINTAIN A CURRENT SET OF "DIAL BEFORE YOU DIG" DRAWINGS ON SITE AT ALL TIMES.



## SHEET INDEX

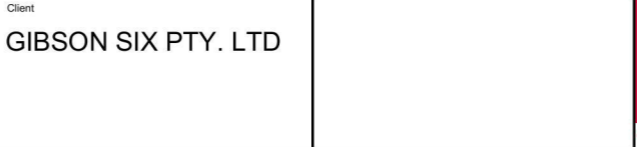
COVER SHEET & NOTES	SHEET D1
STORMWATER MANAGEMENT PLAN	SHEET D2

## LOCALITY MAP



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	Client <b>GIBSON SIX PTY. LTD</b>	
A	ISSUED FOR DA ASSESSMENT	18.10.17 SJ BK
Issue	Description	Date Drawn Approved

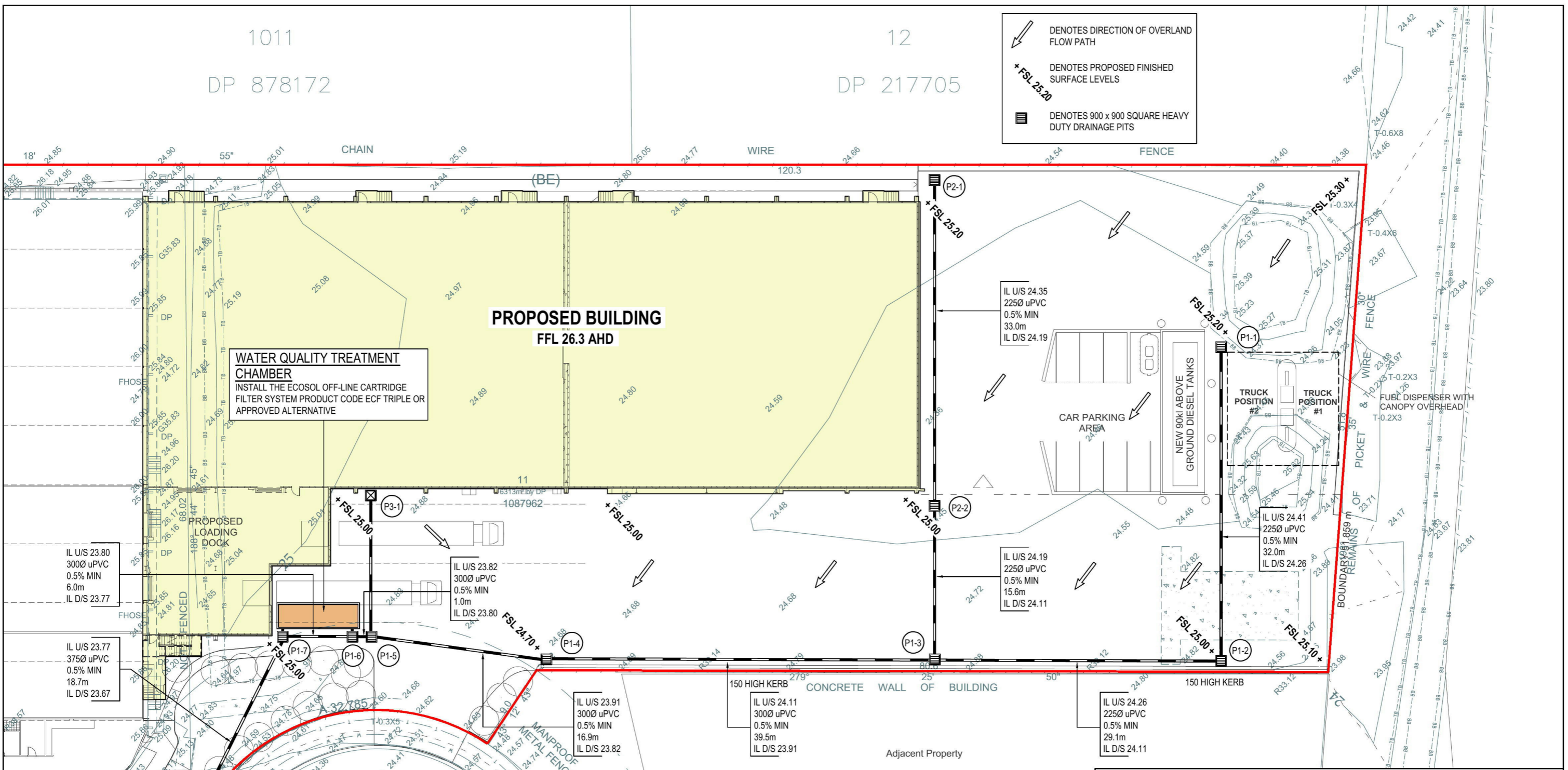


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Project  
**PROPOSED INDUSTRIAL DEVELOPMENT**  
No.s 24-27  
LAMBRIDGE PLACE  
PENRITH

Drawing Title <b>COVER SHEET &amp; NOTES</b>				
Drawn	Date	Scale	A1	Q.A. Check
SJ	18.10.17	AS NOTED	-	-
Designed	Project No.	Dwg. No.	-	Issue
BK	GO170521	D1	-	A



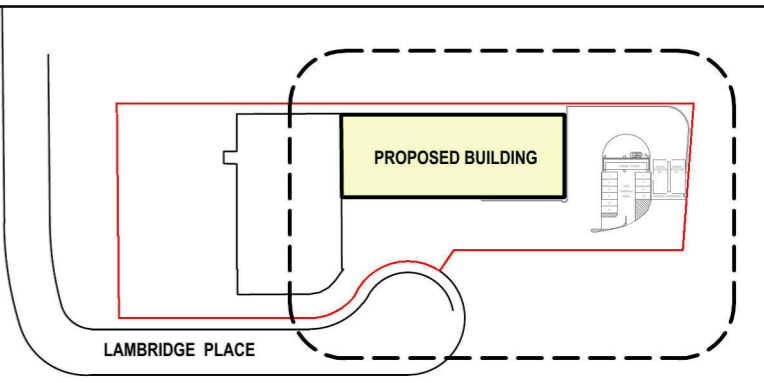


DENOTES DIRECTION OF OVERLAND FLOW PATH  
 DENOTES PROPOSED FINISHED SURFACE LEVELS  
 DENOTES 900 x 900 SQUARE HEAVY DUTY DRAINAGE PITS

**WATER QUALITY TREATMENT CHAMBER**  
 INSTALL THE ECOSOL OFF-LINE CARTRIDGE FILTER SYSTEM PRODUCT CODE ECF TRIPLE OR APPROVED ALTERNATIVE

DISCHARGE STORMWATER TO EXISTING EASEMENT DRAINAGE PIT TO THE SATISFACTION OF COUNCIL MAKE GOOD EXISTING CONSTRUCTION. INVERT LEVEL OF OUTLET SHALL BE SITE CONFIRMED PRIOR TO COMMENCEMENT OF WORKS DESIGN INVERT: IL 23.67 NOM.

**LOCATION PLAN**



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Drawing Title: COVER SHEET & NOTES				
Drawn: SJ	Date: 18.10.17	Scale: AS NOTED	A1	Q.A. Check: -
Designed: BK	Project No: GO170521	Dwg. No: D2	Issue: A	

**ANNEXURE B**

**MUSIC-Link report**

MUSIC-*link* Report

Project Details		Company Details	
<b>Project:</b>	Proposed Industrial Development No.'s 22-27 Lambridge Place, PENRITH	<b>Company:</b>	ACOR Consultants (CC) Pty Ltd
<b>Report Export Date:</b>	18/10/2017	<b>Contact:</b>	Bruce Kenny
<b>Catchment Name:</b>	GO170521_20171017 MUSIC v2	<b>Address:</b>	Platinum Building, Suite 2.01 4 Ilya Avenue ERINANSW2250
<b>Catchment Area:</b>	0.663ha	<b>Phone:</b>	(02) 4324 3499
<b>Impervious Area*:</b>	94.26%	<b>Email:</b>	ccreception@acor.com.au
<b>Rainfall Station:</b>	67113 PENRITH		
<b>Modelling Time-step:</b>	6 Minutes		
<b>Modelling Period:</b>	1/01/1999 - 31/12/2008 11:54:00 PM		
<b>Mean Annual Rainfall:</b>	691mm		
<b>Evapotranspiration:</b>	1158mm		
<b>MUSIC Version:</b>	6.2.1		
<b>MUSIC-link data Version:</b>	6.22		
<b>Study Area:</b>	Penrith		
<b>Scenario:</b>	Penrith Development		

\* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Post-Development Node	Reduction	Node Type	Number	Node Type	Number
<b>Flow</b>	-1.61E-07%	Generic Node	1	Urban Source Node	4
<b>TSS</b>	88.5%				
<b>TP</b>	58%				
<b>TN</b>	57.7%				
<b>GP</b>	98.1%				

Comments
TP capture is 2% below target for post-development scenario.
Pre-development capture targets all fail as there is no treatment servicing the part of the site proposed to be developed.



**Passing Parameters**

Node Type	Node Name	Parameter	Min	Max	Actual
Post	Post-Development Node	% Load Reduction	None	None	-1.61
Post	Post-Development Node	GP % Load Reduction	90	None	98.1
Post	Post-Development Node	TN % Load Reduction	45	None	57.7
Post	Post-Development Node	TSS % Load Reduction	85	None	88.5
Pre	Pre-Development Node	% Load Reduction	None	None	0
Urban	Carpark & driveway (3631 m2)	Area Impervious (ha)	None	None	0.363
Urban	Carpark & driveway (3631 m2)	Area Pervious (ha)	None	None	0
Urban	Carpark & driveway (3631 m2)	Total Area (ha)	None	None	0.363
Urban	Landscaping (382 m2)	Area Impervious (ha)	None	None	0
Urban	Landscaping (382 m2)	Area Pervious (ha)	None	None	0.038
Urban	Landscaping (382 m2)	Total Area (ha)	None	None	0.038
Urban	Parking & storage (6633 m2)	Area Impervious (ha)	None	None	0.663
Urban	Parking & storage (6633 m2)	Area Pervious (ha)	None	None	0
Urban	Parking & storage (6633 m2)	Total Area (ha)	None	None	0.663
Urban	Roof (2620 m2)	Area Impervious (ha)	None	None	0.262
Urban	Roof (2620 m2)	Area Pervious (ha)	None	None	0
Urban	Roof (2620 m2)	Total Area (ha)	None	None	0.262

Only certain parameters are reported when they pass validation

**Failing Parameters**

Node Type	Node Name	Parameter	Min	Max	Actual
Post	Post-Development Node	TP % Load Reduction	60	None	58
Pre	Pre-Development Node	GP % Load Reduction	90	None	0
Pre	Pre-Development Node	TN % Load Reduction	45	None	0
Pre	Pre-Development Node	TP % Load Reduction	60	None	0
Pre	Pre-Development Node	TSS % Load Reduction	85	None	0

Only certain parameters are reported when they pass validation