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CIVIL ENGINEERING REPORT
DEVELOPMENT APPLICATION

LAKES BUSINESS PARK
(SOUTHERN PRECINCT)
11-13 LORD STREET
BOTANY NSW

Prepared For:

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TABLE OF CONTENTS

1 INTRODUCTION

1.1 Introduction

DEXUS Property Management proposes to revitalise existing buildings and construct a new development over part of the site at 11-13 Lord Street in Botany, NSW. The site is currently occupied and comprises two existing commercial buildings, hardstand and parking areas.

The proposed development is for alterations and additions to the existing buildings for light industrial and food and beverage uses, and the construction of a new multi-storey building with a basement carpark, commercial/ industrial units and storage facilities.

1.2 Scope

Costin Roe Consulting Pty Ltd has been commissioned by *Project Strategy*, on behalf of *DEXUS*, to prepare this Engineering Report in support of the proposed Development Application for the site.

This report provides a summary of the design principles and planning objectives for the following civil engineering components of the project:

- Earthworks
- Stormwater Management; and
- Erosion Control.

The engineering objectives for the development are to create a site which, based on the proposed architectural layout, responds to the existing topography and site constraints and to provide an appropriate and economical stormwater management system which incorporates best practice in water sensitive urban design and is consistent with the requirements of council's water quality objectives.

A set of drawings have been prepared to show the proposed finished levels, stormwater drainage and water quality requirements for the development. These drawings are conceptual only and are subject to change during detailed design.

A pre-development application meeting was held with council and the developers on Friday 23 February 2018. The engineering solution has been provided for the site to be consistent with the discussions made during this meeting.

1.3 Authority Jurisdiction

Bayside City Council is the consent authority for the development however, the site resides in the former Botany City Council (BCC) local government area. Given the newly formed Bayside Council has not formulated overarching development control plans, the requirements of the BCC *Development Control Plan 2013* and *Part 10 -Stormwater Management Technical Guidelines* apply and have been adopted for the engineering and stormwater management strategy for the development.

2 DEVELOPMENT SITE

2.1 Location

The proposed development is located within the suburb of Botany at 11-13 Lord Street as shown in **Figure 2.1**.

Figure 2.1. Locality Map (Nearmap 2018)

2.2 Existing Site Description

The Lord Street property is situated in an existing industrial area which is flanked by a mix of residential and parkland land uses.

The property occupies an area of approximately 2.98Ha and is bounded by Lord Street and industrial development to the north, Booralee Park to the east, and light industrial and residential land to the south and industrial development to the west.

The property currently comprises two existing two-storey buildings. Car parking and hardstand areas are located to the north and south of the buildings with a larger parking area encompassing the south-west portion of the site. Concrete pavement slabs cover about half of the site external to the existing buildings.

There is an existing in-ground drainage system comprised of pits and pipes associated with the existing development on the property. The system conveys the site drainage toward the discharge point for the site, which is located at the north-western boundary of the site. Prior to discharge water is attenuated and filtered through an existing detention/ filtration basin.

Access to the site is currently available via Lord Street at the western and eastern end of the site.

The existing buildings are sited at RL 6.6m (Building A) and RL 6.8m (Building B) A.H.D.

2.3 Proposed Development

The proposed development is for modifications of existing Buildings A and B to suit light industrial tenancies, food and beverage and neighbourhood shops. A new building, Building C, is proposed through the southern parking zone. The new building will comprise basement car park, storage and light industrial tenancies.

Minor site layout changes and kerb re-alignments will also be made to improve pedestrian and vehicle movements and to revitalise the overall development site. The indicative layout for the development produced by Nettleton Tribe has been included in **Figure 2.2**.

Civil works will include minor earthworks and site trimming to suit the new building layout, stormwater drainage and pavements.

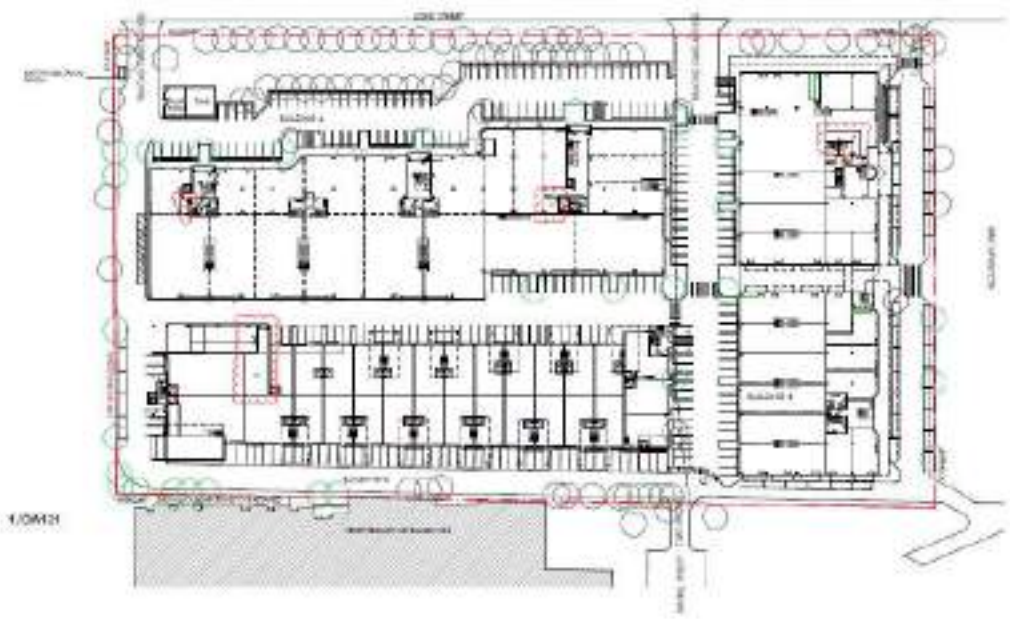

Figure 2.2. Proposed Development Layout

3 SITE WORKS

3.1 Earthworks

Given the existing development on the site and proposed levels being similar in level to the existing levels, only minimal earthworks and trimming will be required for the proposed re-development and associated drainage system around Buildings A and B. Excavation and removal of spoil (approximately 20,000m^3) will be required for the new basement for Building C. Detailed geotechnical, environmental and earthworks assessments will be made as part of detail design and construction certificate phase of the development.

The existing and proposed levels are shown on the Costin Roe drawings in **Appendix A**.

Soil Erosion and Sediment Control measures are to be placed in accordance with submitted drawings and the Soil and Water Management Plan in **Section 8** of this report.

3.2 Supervision of Earthworks

All geotechnical testing and inspections performed during the earthworks operations will be undertaken to Level 1 geotechnical control, in accordance with AS3798-1996.

3.3 Retaining Walls

The civil engineering objective is to minimise retaining walls within the constraints of the architectural layout and allowable grading (as per AS2890.1 and AS2890.2) through paved areas and batters in landscaped areas.

Given the existing development on the site and the nature of the proposed development, no additional retaining walls are required on the site. It is noted that shoring/ basement walls would be necessary for proposed Building C which would form part of structural engineering package in Construction Certificate phase of the development.

4 STORMWATER MANAGEMENT

4.1 Hydrology

4.1.1 General Design Principles

The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice, Botany Bay Council Development Control Plan and accepted engineering practice.

Runoff from buildings will generally be designed in accordance with AS 3500.3 National Plumbing and Drainage Code Part 3 – Stormwater Drainage.

Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication "Australian Rainfall and Runoff" (1987 Edition), Volumes 1 and 2 (AR&R).

4.1.2 Minor/ Major System Design

The piped stormwater drainage (minor) system has been designed to accommodate the 20-year ARI storm event (Q20). Overland flow paths (major) which will convey all stormwater runoff up to and including the Q100 event.

4.1.3 Rainfall Data

Rainfall Intensity Frequency Duration (IFD) data used as a basis for DRAINS modelling for the 5 to 100 year ARI events, was taken from The Bureau of Meteorology Online IFD Tool.

4.1.4 Runoff Models

The calculation of the runoff from storms of the design ARI will be calculated with the catchment modelling software DRAINS using council nominated IFD data.

The design parameters for the DRAINS model are to be based on typical parameters for the area and are as follows:

Model	Model for Design and analysis run	Rational method	
	Rational Method Procedure	ARR87	
	Soil Type-Normal	3.0	
	Paved (Impervious) Area Depression Storage	1	mm
	Supplementary Area Depression Storage	1	mm
	Grassed (Pervious) Area Depression Storage	5	mm
AMC	Antecedent Moisture Condition (ARI=1-5 years)	2.5	
AMC	Antecedent Moisture Condition (ARI=10-20 years)	3.0	
AMC	Antecedent Moisture Condition (ARI=50-100 years)	3.5	
	Sag Pit Blocking Factor (Minor Systems)	0	
	On Grade Pit Blocking Factor (Minor Systems)	0	
	Sag Pit Blocking Factor (Major Systems)	0.5	
	On Grade Pit Blocking Factor (Major Systems)	0.2	
	Inlet Pit Capacity		

Table 4.1: DRAINS Parameters

4.2 Hydraulics

4.2.1 General Requirements

Hydraulic calculations will be carried out utilising DRAINS modelling software during the detail design stage to ensure that all surface and subsurface drainage systems perform to or exceed the required standard.

4.2.2 Freeboard

The calculated water surface level in open junctions of the piped stormwater system will not exceed a freeboard level of 150mm below the finished ground level, for the peak runoff from the Major System runoff. Where the pipes and junctions are sealed, this freeboard would not be required.

The calculated water surface for the peak runoff from the Major System runoff will not exceed a freeboard level of 300mm below the finished floor level of the building.

4.2.3 Public Safety

For all areas subject to pedestrian traffic, the product (dV) of the depth of flow d (in metres) and the velocity of flow V (in metres per second) will be limited to 0.4, for all storms up to the 100-year ARI.

For other areas, the dV product will be limited to 0.6 for stability of vehicular traffic (whether parked or in motion) for all storms up to the 100-year ARI.

4.2.4 Inlet Pit Spacing

The spacing of inlets throughout the site will be such that the depth of flow, for the Major System design storm runoff, will not exceed the top of the kerb (150mm above gutter invert).

4.2.5 Overland Flow

The piped system has been designed to convey all storms up to and including the 20-year ARI. Dedicated flow paths have been shown which will convey stormwater from the site to the discharge point and in the event of full system blockage to the council road system towards Lord Street.

4.3 Site Drainage

4.3.1 Existing Site Drainage

The property currently comprises developed land with an existing in-ground drainage system. This system drains runoff from the site via the in-ground drainage system to the discharge point at the north-western corner of the site.

Stormwater management for the site is made via an existing open detention and infiltration system also located at the north-west corner of the site. The existing basin has an active storage of approximately 500m^3 with a low flow and high flow discharge control system. Infiltration of stormwater is able to be made through the pervious sand base and basin sides. The existing infiltration allows for tertiary treatment of stormwater discussed in following sections.

We have shown an approximation of the existing drainage layout over the site based on inferred location of pits and levels over the site. The layout shown is suitable for a development approval concept however should be confirmed on site via a detail survey prior to construction certificate phase of the project. Refer Costin Roe Consulting drawings in **Appendix A**.

The site is noted to be affected by flooding. Discussion on flooding and flood planning requirement has been provided in **Section 4.4** of this report.

4.3.2 Proposed Site Drainage

The drainage system for the development is proposed to provide a combination of new and existing drainage. The new building footprint will require removal of some existing drainage and re-routing of roofwater drainage connections for Building A. The proposed drainage layout is included in drawing **Co9759.02-DA40** in **Appendix A**.

It is noted that the proposed site works comprises an impervious area of approximately 95%. There is negligible difference between the existing and proposed impervious area over the site, hence the development will not increase

runoff to council infrastructure. Given there is no change to the site runoff due to the development, further that the site detention system is flood affected during 1 in 100 year rainfall runoff events, and the site is near the bottom of the catchment, it is proposed that no adjustment to the existing detention system be made as part of the site redevelopment works. This arrangement was discussed during the pre-development application meeting held with council on 23 February 2018 and was generally agreed during the meeting by Council planners, subject to review of the engineering report. Further discussion is made on these points in **Sections 4.4, 5 and 6**.

As per general engineering practice and the guidelines of Bayside Council, the proposed stormwater drainage system for the development will comprise a minor and major system to safely and efficiently convey collected stormwater run-off from the development to the legal point of discharge.

The minor system is to consist of a piped drainage system which has been designed to accommodate the 1 in 20-year ARI storm event (Q20). This results in the piped system being able to convey all stormwater runoff up to and including the Q20 event. This meets the requirements of Council and is the minimum recommended capacity for a commercial development.

The major system will be designed to cater for storms up to an included the 1 in 100-year ARI storm event (Q100). The major system will employ the use of defined overland flow paths, such as roads and open channels, to safely convey excess run-off from the site.

The design of the stormwater system for this site will be based on relevant national design guidelines, Australia Standard Codes of Practice, the standard of Council and accepted engineering practice. Runoff from buildings will generally be designed in accordance with AS 3500.3 National Plumbing and Drainage Code part 3 – Stormwater Drainage. Overall site runoff and stormwater management will generally be designed in accordance with the Institute of Engineers, Australia publication "Australian Rainfall and Runoff" (1988 Edition), Volumes 1 and 2 (ARR).

Stormwater Management is required to be provided for water quantity and quality in accordance with the requirements of Botany Bay DCP. Further discussion on the *Stormwater Management Strategy* is provided in **Section 5** and **6** of this report. Reference to drawing **CO9579.02-DA40** shows the proposed drainage layout.

4.3.3 Proposed Site Discharge

Discharge from the site is proposed to remain as per existing conditions. The location of the discharge point is at the northern boundary of the property toward the north-west of the site, draining to the existing Lord Street drainage infrastructure following attenuation and infiltration within the existing detention basin described in this report.

4.4 Flooding

The site has been identified as being flood affected. As part of a previous planning application for rezoning of the land during 2015 a comprehensive flood study was undertaken for DEXUS by WMA Water (refer **Appendix B**). This study has been reviewed by our office and considered suitable for use in the current application to confirm flood planning requirements for the new and existing development.

We provide the following review and summary of key points relating to the flood study undertaken by WMA Water.

Summary as follows:

- The assessment included a comprehensive TUFLOW hydrologic and hydraulic assessment. The WMA report is considered suitable to use to define flood planning levels and requirements relating to the current development.
- The study area hydrology is based on a DRAINS model and input hydrographs at the extent of the 2D TUFLOW domain.
- The TUFLOW model adopts a 2m grid with typical land uses, building and roughness coefficients, downstream tailwater levels adopted, as set out in Section 5.2 of the WMA report.
- The flood extent can be seen to encompass Lord Street, the Lord Street frontage landscape zone (including the existing detention system) and Booralee Park. Flooding is generally associated with Mill Pond to the north of Lord Street. Local overland flow is present from Booralee Park however this is generally shallow and considered to be gutter flow or similar low risk flooding.
- The 1% AEP (1 in 100-year ARI) flood level has been defined at RL 5.4m A.H.D.
- The flood planning level for the site, allowing for 500mm of freeboard, is hence RL 5.9m.
- Existing and proposed buildings are sited at levels between RL 6.3-6.9m AHD, hence meet flood planning requirements. It is noted the threshold of the basement ramp also needs to be above the flood planning level.
- Flood storage volumes are required to be maintained between pre and post development conditions. The existing flooding extent on the site is confined to the Lord Street landscaping zone and open detention basin on the Lord Street frontage where generally no works are proposed, hence there will be limited effect on flood storage as a result of the development. It is noted that the proposed sprinkler and pump room will require some flood storage compensation as described below.
- Flood evacuation can be made during 1% AEP and PMF storm events through emergency egress paths to Daniel Street and Daphne Street to the south-east. Access to Lord Street will need to be restricted during flood evacuation events.

As noted above, flood storage volumes are required to be maintained over the development. Due to the construction of a pump room and sprinkler tank in the north-west of the site, approximately $15m^3$ of flood storage is lost in the existing detention basin and flood storage zone of Lord Street. This lost storage has been considered and compensated for by providing extending the existing basin

and introducing a new retaining wall and extended cut into the existing batter. Compensation storage of 15m^3 has been provided which will ensure the existing flood conditions and detention conditions remain consistent.

Overall the proposed and existing development meets flood planning, freeboard and egress requirements. Refer **Appendix B** for a full copy of the WMA Water Flood assessment.

5 STORMWATER QUANTITY MANAGEMENT

Botany City Council adopts the principles of water quantity management to ensure the cumulative effect of increased runoff from development does not have a detrimental effect on the existing stormwater infrastructure and watercourses located within their LGA downstream from the particular site.

Botany City Councils *DCP2013 Section 10 - Stormwater Management Technical Guidelines* of requires that stormwater runoff generated for all storm durations be managed via infiltration or on-site detention system up to and including the 100- year ARI.

As discussed in earlier sections of this report, there is an existing detention and infiltration basin located at the north-west corner of the site, within landscaped area adjacent to Lord Street and the legal point of discharge – refer drawing **Co9759.02-DA40** in **Appendix A**.

The existing detention and infiltration basin provides approximately 500m^3 of active storage, attenuating post development flows to pre-developed flows and allowing for infiltration through the base and sides of the basin. The detention storage and site discharge rate is based on the council policy which was present at the time of construction of the existing development and allows for a staged discharge for different average recurrence interval (ARI) storms and storm durations.

It has also been discussed that the existing site comprises approximately 95% impervious surfaces, and that the proposed development will have negligible change to the impervious surface and hence negligible change to overall site runoff. As such, there will be no adverse effect on existing infrastructure or flooding conditions as a result of the development and the existing detention system is proposed to be utilised for the redevelopment of the site without any major adjustment or augmentation of the system. The existing system will be cleared of leaf and litter and a make-good process to existing inlet and discharge pits is expected to be undertaken. Further it is noted that the site and detention system will be fully inundated during the 1% AEP event hence the detention system will be ineffective during flood events and any change to the existing system would have no effect on flooding or council infrastructure capacity.

The proposed arrangement and utilisation of the existing detention and infiltration system was discussed during the pre-development application meeting held with council on 23 February 2018 and was generally agreed during the meeting by Council planners. This was further discussed between Mark Wilson of Costin Roe Consulting and Mr Lincoln Lawler from Bayside Council following receipt of the pre-development meeting minutes (Refer **Appendix D**) which do not align with the discussion in the pre-da meeting as described in this report. Our report and stormwater concept is based on these discussions.

Minor adjustment is proposed to accommodate a proposed sprinkler room and existing storage conditions are maintained as discussed in **Section 4.4** of this report.

6 STORMWATER QUALITY CONTROLS

6.1 Stormwater Quality Control

There is a need to provide design which incorporates the principles of Water Sensitive Urban Design (WSUD) and to target pollutants that are present in the stormwater so as to minimise the adverse impact these pollutants could have on receiving waters and to also meet the requirements specified by the Bayside City Council.

On-site water quality treatment is required for this development and a review of the existing system, in relation to the existing infiltration system and provided drainage system to confirm any new requirements for the development.

Water quantity and water quality treatment measures will be adopted to meet the requirements as per the City of Botany Bay *Development Control Plan* and the *Botany Bay & Catchment Water Quality Improvement Plan (BBWQIP)* respectively.

The *BBWQIP* nominates that the following stormwater pollution reduction targets be met (presented in terms of annual percentage pollutant reductions on developed catchments):

Gross Pollutants	90%
Total Suspended Solids	80%
Total Phosphorus	55%
Total Nitrogen	40%

6.2 Proposed Stormwater Treatment System

Impervious areas are required to be treated by the Stormwater Treatment Measures (STM). The STM shall be sized according to the whole catchment area of the site. The STM's for the development are based on a treatment train approach as discussed in the NSW EPA document *Managing Urban Stormwater: Treatment Techniques* to ensure that all of the objectives above are met.

Treatment of the site catchment will utilise the existing detention/infiltration basin at the north of the site for tertiary site treatment. New pits will be fitted with pit inserts, otherwise existing drainage systems will remain per existing. An assessment of the effectiveness of the existing infiltration basin was made using MUSIC as described following.

6.3 Stormwater Quality Modelling

6.3.1 Introduction

The MUSIC model was chosen to model water quality. This model has been released by the Cooperative Research Centre for Catchment Hydrology (CRCCH) and is a standard industry model for this purpose. MUSIC (the Model for Urban Stormwater Improvement Conceptualisation) is suitable for simulating catchment areas of up to 100 km^2 and utilises a continuous simulation approach to model water quality.

By simulating the performance of stormwater management systems, MUSIC can be used to determine if these proposed systems and changes to land use are appropriate for their catchments and are capable of meeting specified water quality objectives (CRC 2002). The water quality constituents modelled in MUSIC and of relevance to this report include Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN).

The pollutant retention criteria set out in Section 3.3 in Chapter 3.2 of the *Development Control Plan* and nominated in **Section 5.1** of this report were used as a basis for assessing the effectiveness of the selected treatment trains.

The MUSIC model "9759.02 *Lakes Rev1.sqz*" was set up to examine the effectiveness of the water quality treatment train and to determine if BC requirements have been achieved.

6.3.2 Rainfall Data

Six minute pluviographic data was provided by MUSIC-link which has been sourced from the Bureau of Meteorology (BOM) as nominated below. Evapo-transpiration data for the period was sourced from the Monthly Areal PET data set supplied with the MUSIC-link software.

Input	**Data Used**
Rainfall Station	Sydney Observatory Hill
Rainfall Period	1 January 1973 – 31 December 1993 (20 years)
Mean Annual Rainfall (mm)	1273
Evapo-tanspiration	Monthly Areal PET
Model Timestep	6 minutes

6.3.3 Rainfall Runoff Parameters

Parameter	**Value**
Rainfall Threshold (mm)	0.3 (roofs); 1.5 (roads)
Soil Storage Capacity (mm)	250
Initial Storage (% capacity)	25
Field Capacity (mm)	100
Infiltration Capacity Coefficient a	200
Infiltration Capacity exponent b	1.0
Initial Depth (mm)	10
Daily Recharge Rate (%)	30
Daily Baseflow Rate (%)	5
Daily Seepage Rate (%)	0

6.3.4 Pollutant Concentrations

Pollutant concentrations for source nodes are based on CMA land use parameters as per the **Table 6.1**:

Flow Type	Surface Type	TSS (log_{10} values)		TP (log_{10} values)		TN (log_{10} values)	
		Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Baseflow	Roof	n/a	n/a	n/a	n/a	n/a	n/a
	Roads	1.20	0.17	-0.85	0.19	0.11	0.12
Stormflow	Roof	1.30	0.32	-0.89	0.25	0.30	0.19
	Roads	2.43	0.32	-0.30	0.25	0.34	0.19

Table 6.1. Pollutant Concentrations

6.3.5 Source Nodes

The MUSIC model has been setup with a treatment train approach based on the pollutant concentrations in **Table 6.1** above and the catchments shown in design drawings.

6.3.6 Treatment Nodes

Gross pollutant trap (GPT), infiltration basin and generic treatment nodes have been used in the modelling of the development.

6.3.7 Results

Table 6.3 shows the results of the MUSIC analysis. The reduction rate is expressed as a percentage and compares the post-development pollutant loads without treatment versus post-development loads with treatment.

	Source	**Residual Load**	**% Reduction**
Total Suspended Solids (kg/yr)	4840	926	80.9
Total Phosphorus (kg/yr)	10.5	2.11	79.9
Total Nitrogen (kg/yr)	74.7	15.9	78.6
Gross Pollutants (kg/yr)	788	0	100

Table 6.3. MUSIC analysis results

The model results indicate that, through the use of the SQID's in the treatment train, pollutant load reductions for Total Suspended Solids, Total Phosphorous and Total Nitrogen will meet the requirements of BCC on an overall catchment basis.

6.3.8 Modelling Discussion

MUSIC modelling has been performed to assess the effectiveness of the selected treatment trains and to ensure that the pollutant retention requirements of Section 3G.4 of the *Development Control Plan, 2013* have been met.

6.4 Maintenance and Monitoring

It is important that each component of the water quality treatment train is properly operated and maintained. In order to achieve the design treatment objectives, an indicative maintenance schedule has been prepared (refer to **Table 6.4** below) to assist in the effective operation and maintenance of the various water quality components.

Note that inspection frequency may vary depending on site specific attributes and rainfall patterns in the area. In addition to the below nominated frequency it is recommended that inspections are made following large storm events.

Table 6.4. Indicative Maintenance Schedule

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
LANDSCAPED AREAS			
Check density of vegetation and ensure minimum height of 150mm is maintained. Check for any evidence of weed infestation	Six monthly	Maintenance Contractor	Replant and/or fertilise, weed and water in accordance with landscape consultant specifications
Check for any evidence of channelisation and erosion	Six monthly/ After Major Storm	Maintenance Contractor	Reinstate eroded areas so that original, designed swale profile is maintained
Weed Infestation	Three Monthly	Maintenance Contractor	Remove any weed infestation ensuring all root ball of weed is removed. Replace with vegetation where required.
INLET & JUNCTION PITS			
Inside Pit	Six Monthly	Maintenance Contractor	Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter.
Outside of Pit	Four Monthly/ After Major Storm	Maintenance Contractor	Clean grate of collected sediment, debris, litter and vegetation.
STORMWATER SYSTEM			
General Inspection of complete stormwater drainage system	Bi-annually	Maintenance Contractor	Inspect all drainage structures noting any dilapidation in structures and carry out required repairs.

7 EROSION & SEDIMENT CONTROL PLAN

An erosion and sediment control plan (ESCP) is shown on drawing **Co9759.02-DA20**. This is a conceptual plan only providing sufficient detail to clearly show that the works can proceed without undue pollution to receiving waters. A detailed plan will be prepared once consent is given and before works start.

7.1 General Conditions

- The ESCP will be read in conjunction with the engineering plans, and any other plans or written instructions that may be issued in relation to development at the subject site.
- Contractors will ensure that all soil and water management works are undertaken as instructed in this specification and constructed following the guidelines stated in Managing Urban Stormwater, Soils and Construction (1998) and Central Coast Council specifications.
- All subcontractors will be informed of their responsibilities in minimising the potential for soil erosion and pollution to down slope areas.

7.2 Land Disturbance

Where practicable, the soil erosion hazard on the site will be kept as low as possible and as recommended in **Table 7.1**

Land Use	Limitation	Comments
Construction areas	Limited to 5 (preferably 2) metres from the edge of any essential construction activity as shown on the engineering plans.	All site workers will clearly recognise these areas that, where appropriate, are identified with barrier fencing (upslope) and sediment fencing (downslope), or similar materials.
Access areas	Limited to a maximum width of 5 metres	The site manager will determine and mark the location of these zones onsite. They can vary in position so as to best conserve existing vegetation and protect downstream areas while being considerate of the needs of efficient works activities. All site workers will clearly recognise these boundaries.
Remaining lands	Entry prohibited except for essential management works	

Table 7.1 Limitations to access

7.3 Erosion Control Conditions

- Clearly visible barrier fencing shall be installed as shown on the plan and elsewhere at the discretion of the site superintendent to ensure traffic control and prohibit unnecessary site disturbance. Vehicular access to the site shall be limited to only those essential for construction work and they shall enter the site only through the stabilised access points.
- Soil materials will be replaced in the same order they are removed from the ground. It is particularly important that all subsoils are buried and topsoils remain on the surface at the completion of works.
- Where practicable, schedule the construction program so that the time from starting land disturbance to stabilisation has a duration of less than six months.
- Notwithstanding this, schedule works so that the duration from the conclusion of land shaping to completion of final stabilisation is less than 20 working days.
- Land recently established with grass species will be watered regularly until an effective cover has properly established and plants are growing vigorously. Further application of seed might be necessary later in areas of inadequate vegetation establishment.
- Where practical, foot and vehicular traffic will be kept away from all recently established areas
- Earth batters shall be constructed in accordance with the Geotechnical Engineers Report or with as law a gradient as practical but not steeper than:

  2H:1V where slope length is less than 7 meters

  2.5H:1V where slope length is between 7 and 10 meters

  3H:1V where slope length is between 10 and 12 meters

  4H:1V where slope length is between 12 and 18 meters

  5H:1V where slope length is between 18 and 27 meters

  6H:1V where slope length is greater than 27 meters

- All earthworks, including waterways/drains/spillways and their outlets, will be constructed to be stable in at least the design storm event.
- During windy weather, large, unprotected areas will be kept moist (not wet) by sprinkling with water to keep dust under control. In the event water is not available in sufficient quantities, soil binders and/or dust retardants will be used or the surface will be left in a cloddy state that resists removal by wind.

7.4 Pollution Control Conditions

- Stockpiles will not be located within 5 meters of hazard areas, including likely areas of high velocity flows such as waterways, paved areas and driveways.
- Sediment fences will:
  - Be installed where shown on the drawings, and elsewhere at the discretion of the site superintendent to contain the coarser sediment fraction (including aggregated fines) as near as possible to their source.

- Have a catchment area not exceeding 720 square meters, a storage depth (including both settling and settled zones) of at least 0.6 meters, and internal dimensions that provide maximum surface area for settling, and
- Provide a return of 1 meter upslope at intervals along the fence where catchment area exceeds 720 square meters, to limit discharge reaching each section to 10 litres/second in a maximum 20 year t_c discharge.

- Sediment removed from any trapping device will be disposed in locations where further erosion and consequent pollution to down slope lands and waterways will not occur.
- Water will be prevented from directly entering the permanent drainage system unless it is relatively sediment free (i.e. the catchment area has been permanently landscaped and/or likely sediment has been treated in an approved device). Nevertheless, stormwater inlets will be protected.
- Temporary soil and water management structures will be removed only after the lands they are protecting are stabilised.

7.5 Waste Management Conditions

Acceptable bind will be provided for any concrete and mortar slurries, paints, acid washings, lightweight waste materials and litter. Clearance service will be provided at least weekly.

7.6 Site Inspection and Maintenance

A self-auditing program will be established based on a Check Sheet. A site inspection using the Check Sheet will be made by the site manager:

- At least weekly.
- Immediately before site closure.
- Immediately following rainfall events in excess of 5mm in any 24 hour period.

The self audit will include:

- Recording the condition of every sediment control device
- Recording maintenance requirements (if any) for each sediment control device
- Recording the volumes of sediment removed from sediment retention systems, where applicable
- Recording the site where sediment is disposed
- Forwarding a signed duplicate of the completed Check Sheet to the project manager/developer for their information

In addition, a suitably qualified person will be required to oversee the installation and maintenance of all soil and water management works on the site. The person shall be required to provide a short monthly written report. The responsible person will ensure that:

- The plan is being implemented correctly
- Repairs are undertaken as required
- Essential modifications are made to the plan if and when necessary
- The report shall carry a certificate that works have been carried out in accordance with the plan.

Waste bins will be emptied as necessary. Disposal of waste will be in a manner approved by the Site Superintendent.

Proper drainage will be maintained. To this end drains (including inlet and outlet works) will be checked to ensure that they are operating as intended, especially that,

No low points exist that can overtop in a large storm event

Areas of erosion are repaired (e.g. lined with a suitable material) and/or velocity of flow is reduced appropriately through construction of small check dams of installing additional diversion upslope.

Blockages are cleared (these night occur because of sediment pollution, sand/soil/spoil being deposited in or too close to them, breached by vehicle wheels, etc.).

Sand/soil/spoil materials placed closer than 2 meters from hazard areas will be removed. Such hazard areas include and areas of high velocity water flows (e.g. waterways and gutters), paved areas and driveways.

Recently stabilised lands will be checked to ensure that erosion hazard has been effectively reduced. Any repairs will be initiated as appropriate.

Excessive vegetation growth will be controlled through mowing or slashing.

All sediment detention systems will be kept in good, working condition. In particular, attention will be given to:

- Recent works to ensure they have not resulted in diversion of sediment laden water away from them
- Degradable products to ensure they are replaced as required, and
- Sediment removal, to ensure the design capacity or less remains in the settling zone.

Any pollutants removed from sediment basins or litter traps will be disposed of in areas where further pollution to down slope lands and waterways should not occur.

Additional erosion and/or sediment control works will be constructed as necessary to ensure the desired protection is given to down slope lands and waterways, i.e. make ongoing changes to the plan where it proves inadequate in practice or is subjected to changes in conditions at the work site or elsewhere in the catchment.

Erosion and sediment control measures will be maintained in a functioning condition until all earthwork activities are completed and the site stabilised

Litter, debris and sediment will be removed from the gross pollutant traps and trash racks as required.

8 CONCLUSION

Costin Roe Consulting Pty Ltd has been commissioned to prepare this Civil Engineering Report to support the development application for a proposed mixed use redevelopment at 11-13 Lord Street, Botany, NSW.

A civil engineering strategy for the site has been developed which provides a best fit solution within the constraints of the existing landform, structures and pavements, and the proposed architectural layout.

The proposed redevelopment and new building do not result in increased runoff and the existing detention system is proposed to be utilised to manage site runoff, as discussed and generally with Bayside Council (refer **Section 5**). A MUSIC assessment has been completed which confirms the requirement of councils load based pollution reduction policy are met.

It has also been confirmed that the proposed development meets flood planning requirements in terms of flood immunity to buildings and no adverse effect on upstream, downstream or adjoining properties.

It is recommended that the management strategies mentioned in this report be incorporated into the future detailed design. Detailed design may result in changes to the concept however design criteria will be followed.

Appendix A

DRAWINGS BY COSTIN ROE CONSULTING

PROPOSED DEVELOPMENT - LAKES BUSINESS PARK - SOUTH PRECINCT
11-13 LORD STREET, BOTANY, 2019
CIVIL ENGINEERING DRAWINGS FOR DEVELOPMENT APPLICATION

DRAWING LIST

DRAWING NO.	DRAWING TITLE
C09759.02-DA 10	DRAWING LIST & GENERAL NOTES
C09759.02-DA 20	EROSION & SEDIMENT CONTROL PLAN
C09759.02-DA 25	EROSION & SEDIMENT CONTROL DETAILS
C09759.02-DA 40	STORMWATER DRAINAGE PLAN
C09759.02-DA 45	STORMWATER DRAINAGE DETAILS - SHEET 1
C09759.02-DA 46	STORMWATER DRAINAGE DETAILS - SHEET 2
C09759.02-DA 47	DETENTION BASIN PLAN
C09759.02-DA 50	FINISHED LEVELS PLAN

ELECTRONIC INFORMATION NOTES:

1. THE ISSUED DRAWINGS IN HARD COPY OR PDF FORMAT TAKE PRECEDENCE OVER ANY ELECTRONICALLY ISSUED INFORMATION, LAYOUTS OR DESIGN MODELS.
2. THE CONTRACTOR'S DIRECT AMENDMENT OR MANIPULATION OF THE DATA OR INFORMATION THAT MIGHT BE CONTAINED WITHIN AN ENGINEER-SUPPLIED DIGITAL TERRAIN MODEL AND ITS SUBSEQUENT USE TO UNDERTAKE THE WORKS WILL BE SOLELY AT THE DISCRETION OF AND THE RISK OF THE CONTRACTOR.
3. THE CONTRACTOR IS REQUIRED TO HIGHLIGHT ANY DISCREPANCIES BETWEEN THE DIGITAL TERRAIN MODEL AND INFORMATION PROVIDED IN THE CONTRACT AND/OR DRAWINGS AND IS REQUIRED TO SEEK CLARIFICATION FROM THE SUPERINTENDENT.
4. THE ENGINEER WILL NOT BE LIABLE OR RESPONSIBLE FOR THE POSSIBLE ON-GOING NEED TO UPDATE THE DIGITAL TERRAIN MODEL, SHOULD THERE BE ANY AMENDMENTS OR CHANGES TO THE DRAWINGS OR CONTRACT INITIATED BY THE CONTRACTOR.

GENERAL NOTES:

G1 THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANTS' DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

G2 ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE RELEVANT AND CURRENT STANDARDS AUSTRALIA CODES AND WITH THE BY-LAWS AND ORDINANCES OF THE RELEVANT BUILDING AUTHORITIES EXCEPT WHERE VARIED BY THE PROJECT SPECIFICATION.

G3 ALL DIMENSIONS SHOWN SHALL BE VERIFIED BY THE BUILDER ON SITE.
ENGINEER'S DRAWINGS SHALL NOT BE SCALED FOR DIMENSIONS.
ENGINEER'S DRAWINGS ISSUED IN ANY ELECTRONIC FORMAT MUST NOT BE USED FOR DIMENSIONAL SETOUT.
REFER TO THE ARCHITECT'S DRAWINGS FOR ALL DIMENSIONAL SETOUT INFORMATION.

G4 DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED. TEMPORARY BRACING SHALL BE PROVIDED BY THE BUILDER TO KEEP THE WORKS AND EXCAVATIONS STABLE AT ALL TIMES.

G5 UNLESS NOTED OTHERWISE ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES.

G6 ALL WORKS SHALL BE UNDERTAKEN IN ACCORDANCE WITH ACCEPTABLE SAFETY STANDARDS & APPROPRIATE SAFETY SIGNS SHALL BE INSTALLED AT ALL TIMES DURING THE PROGRESS OF THE JOB.

SITE LOCALITY
N.T.S

SITE PREPARATION NOTES:

1. ALL EARTHWORKS SHALL BE COMPLETED GENERALLY IN ACCORDANCE WITH THE GUIDELINES SPECIFIED BY THE GEOTECHNICAL REPORT PROVIDED.
2. EXISTING LEVELS ARE BASED ON INFORMATION PROVIDED BY REALSERVE TITLED "DETAIL SURVEY OVER PART OF THE LAKES BUSINESS PARK LOT 2 IN D.P. 717692, 11-13 LORD STREET, BOTANY, NSW" REF:30883AS DATED 17/07/2006
3. STRIP ANY TOP SOIL OR DELETERIOUS MATERIAL AND DISPOSE OF FROM SITE OR STORE AS DIRECTED.
4. COMPLETE CUT TO FILL EARTHWORKS TO ACHIEVE THE REQUIRED LEVELS AS INDICATED ON THE DRAWINGS WITHIN A TOLERANCE OF +0mm/-10mm THROUGH BUILDING PADS/PAVEMENTS AND +0mm/-20mm ELSEWHERE.
5. PREPARE STEEP BATTERS TO RECEIVE FILL BY CONSTRUCTING BENCHING TO FACILITATE FILL PLACEMENT AND COMPACTION.
6. AREAS TO RECEIVE FILL (THAT ARE NOT ON BENCHED BATTERS) AND AREAS IN CUT SHALL BE PROOF ROLLED TO IDENTIFY ANY SOFT HEAVING MATERIAL. SOFT MATERIAL SHALL BE BOXED OUT AND REMOVED PRIOR TO FILL PLACEMENT. PROOF ROLLING TO BE INSPECTED BY A GEOTECHNICAL ENGINEER OR THE EARTHWORKS DESIGNER.
7. SITE WON FILL SHALL BE COMPACTED IN MAXIMUM 300mm LAYERS AND TO DRY OR HILF DENSITY RATIOS (STANDARD COMPACTION) OF BETWEEN 98% AND 103%. THE PLACEMENT MOISTURE VARIATION OR HILF MOISTURE VARIATION SHALL BE CONTROLLED TO BE BETWEEN 2% DRY AND 2% WET.
8. IMPORTED FILL SHALL BE COMPACTED IN MAXIMUM 300mm LAYERS AND TO DRY OR HILF DENSITY RATIOS (STANDARD COMPACTION) OF BETWEEN 98% AND 103%. THE PLACEMENT MOISTURE VARIATION OR HILF MOISTURE VARIATION SHALL BE CONTROLLED TO BE BETWEEN 2% DRY AND 2% WET.
9. ALL ENGINEERED FILL PARTICLES SHALL BE ABLE TO BE INCORPORATED WITHIN A SINGLE LAYER. FURTHER, LESS THAN 30% OF PARTICLES SHALL BE RETAINED ON THE 37.5 MM SIEVE. ENGINEERED FILL SHALL BE ABLE TO BE TESTED IN ACCORDANCE WITH THE STANDARD COMPACTION METHOD (AS1289.5.4.1) OR HILF TEST METHOD (AS1289.5.7.1). THESE METHODS REQUIRE LESS THAN 20% RETAINED ON THE 37.5 MM SIEVE. WHERE BETWEEN 20% AND 30% OF PARTICLES ARE RETAINED ON THE 37.5 MM SIEVE THE ABOVE TEST METHODS SHALL STILL BE ADOPTED AND TEST REPORTS ANNOTATED APPROPRIATELY. THESE REQUIREMENTS SHOULD BE MET BY THE MATERIAL AFTER PLACEMENT AND COMPACTION
10. ALL THE EARTHWORKS UNDERTAKEN AND THE SUBGRADE CONDITION IN THE CUT AREAS (IN THE STATED PERIOD) ARE DOCUMENTED IN THE REPORTS AND HAVE BEEN UNDERTAKEN IN ACCORDANCE WITH THE SPECIFICATION (EG. COSTIN ROE SITE PREPARATION NOTES IN DWG C013003.01-EWC10)
11. PRIOR TO ANY EARTHWORKS, EROSION CONTROL AS OUTLINED IN THE EROSION AND SEDIMENTATION CONTROL PLAN SHALL BE COMPLETED.
12. EXISTING ROCK, IF ANY, SHALL BE REMOVED BY HEAVY ROCK BREAKING OR RIPPING.
13. MATCH EXISTING LEVELS AT BATTER INTERFACE.
14. CONTRACTOR TO MATCH EXISTING LEVELS AT THE INTERFACE OF EARTHWORKS AND EXISTING SURFACE AT BATTER LOCATIONS OR WHERE NO RETAINING WALLS ARE PRESENT. ANY DISCREPANCY BETWEEN DESIGN AND EXISTING LEVELS TO BE REFERRED TO THE ENGINEER FOR DIRECTION OR ADJUSTMENTS TO DESIGN LEVELS.

FINISHED LEVELS PLAN NOTES:

1. LEVELS DATUM IS A.H.D.
2. ALL CONTOUR LINES & SPOT LEVELS INDICATE FINISHED PAVEMENT LEVELS U.N.O. ON PLAN.
3. THE MAJOR CONTOUR INTERVAL IS 0.5m
4. THE MINOR CONTOUR INTERVAL IS 0.1m.
5. MINIMUM PAVEMENT GRADE IS TO BE 1:100 (1%).
6. MAXIMUM PAVEMENT GRADE IS TO BE 1:20 (5%) IN CARPARKING AREAS AND 1:25 (4%) ELSEWHERE.
7. MAXIMUM RAMP GRADES ARE TO BE 1:12 (8.3%) U.N.O. ON PLAN
8. PROVIDE MINIMUM 3.0m LONG TRANSITION WHERE CHANGES GRADE EXCEED 1:20 (5%).
9. PERMANENT BATTER SLOPES ARE TO HAVE A MAXIMUM GRADE OF 1V:3H.
10. ALL BATTER SLOPE WITH GRADES AT OR EXCEEDING 1V:6H ARE TO BE TURFED IMMEDIATELY OR APPROPRIATE EROSION CONTROL IS TO BE PROVIDED TO THE SATISFACTION OF THE ENGINEER.
11. ALL FOOTPATHS ARE TO FALL AWAY FROM THE BUILDING AT 2.5% NOMINAL. GRADE.
12. ALL PAVEMENTS ARE TO BE SET AT 50mm BELOW THE FINISHED FLOOR LEVEL OF THE WAREHOUSE AND OFFICE AREAS.

EROSION CONTROL NOTES

ALL CONTROL WORK INCLUDING DIVERSION BANKS AND CATCH DRAINS, V-DRAINS AND SILT FENCES SHALL BE COMPLETED DIRECTLY FOLLOWING THE COMPLETION OF THE EARTHWORKS.

1. SILT FENCES AND SILT FENCE RETURNS SHALL BE ERECTED CONVEX TO THE CONTOUR TO POND WATER.
2. HAY BALE BARRIERS AND GEOFABRIC FENCES ARE TO BE CONSTRUCTED TO TOE OF BATTER, PRIOR TO COMMENCEMENT OF EARTHWORKS, IMMEDIATELY AFTER CLEARING OF VEGETATION AND BEFORE REMOVAL OF TOP SOIL.
3. ALL TEMPORARY EARTH BERMS, DIVERSION AND SILT DAM EMBANKMENTS ARE TO BE MACHINE COMPACTED, SEEDED AND MULCHED FOR TEMPORARY VEGETATION COVER AS SOON AS THEY HAVE BEEN FORMED.
4. CLEAR WATER IS TO BE DIVERTED AWAY FROM DISTURBED GROUND AND INTO THE DRAINAGE SYSTEM.
5. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING AND PROVIDING ON GOING ADJUSTMENT TO EROSION CONTROL MEASURES AS REQUIRED DURING CONSTRUCTION.
6. ALL SEDIMENT TRAPPING STRUCTURES AND DEVICES ARE TO BE INSPECTED AFTER STORMS FOR STRUCTURAL DAMAGE OR CLOGGING, TRAPPED MATERIAL IS TO BE REMOVED TO A SAFE, APPROVED LOCATION.
7. ALL FINAL EROSION PREVENTION MEASURES INCLUDING THE ESTABLISHMENT OF GRASSING ARE TO BE MAINTAINED UNTIL THE END OF THE DEFECTS LIABILITY PERIOD.
8. ALL EARTHWORKS AREAS SHALL BE ROLLED ON A REGULAR BASIS TO SEAL THE EARTHWORKS.
9. ALL FILL AREAS ARE TO BE LEFT WITH A BUND AT THE TOP OF THE SLOPE AT THE END OF EACH DAYS EARTHWORKS. THE HEIGHT OF THE BUND SHALL BE A MINIMUM OF 200MM.
10. ALL CUT AND FILL SLOPES ARE TO BE SEEDED AND HYDROMULCHED WITHIN 10 DAYS OF COMPLETION OF FORMATION.
11. AFTER REVEGETATION OF THE SITE IS COMPLETE AND THE SITE IS STABLE IN THE OPINION OF A SUITABLY QUALIFIED PERSON ALL TEMPORARY WORK SUCH AS SILT FENCE, DIVERSION DRAINS ETC SHALL BE REMOVED.
12. ALL TOPSOIL STOCKPILES ARE TO BE SUITABLY COVERED TO THE SATISFACTION OF THE SITE MANAGER TO PREVENT WIND AND WATER EROSION.
13. ANY AREA THAT IS NOT APPROVED BY THE CONTRACT ADMINISTRATOR FOR CLEARING OR DISTURBANCE BY THE CONTRACTOR'S ACTIVITIES SHALL BE CLEARLY MARKED AND SIGN POSTED, FENCED OFF OR OTHERWISE APPROPRIATELY PROTECTED AGAINST ANY SUCH DISTURBANCE.
14. ALL STOCKPILE SITES SHALL BE SITUATED IN AREAS APPROVED FOR SUCH USE BY THE SITE MANAGER. A 6m BUFFER ZONE SHALL EXIST BETWEEN STOCKPILE SITES AND ANY STREAM OR FLOW PATH. ALL STOCKPILES SHALL BE ADEQUATELY PROTECTED FROM EROSION AND CONTAMINATION OF THE SURROUNDING AREA BY USE OF THE MEASURES APPROVED IN THE EROSION AND SEDIMENTATION CONTROL PLAN.
15. ACCESS AND EXIT AREAS SHALL INCLUDE SHAKE-DOWN OR OTHER METHODS APPROVED BY THE SITE MANAGER FOR THE REMOVAL OF SOIL MATERIALS FORM MOTOR VEHICLES.
16. THE CONTRACTOR IS TO ENSURE RUNOFF FROM ALL AREAS WHERE THE NATURAL SURFACE IS DISTURBED BY CONSTRUCTION, INCLUDING ACCESS ROADS, DEPOT AND STOCKPILE SITES, SHALL BE FREE OF POLLUTANTS BEFORE IT IS EITHER DISPERSED TO STABLE AREAS OR DIRECTED TO NATURAL WATERCOURSES.
17. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN SLOPES, CROWNS AND DRAINS ON ALL EXCAVATIONS AND EMBANKMENTS TO ENSURE SATISFACTORY DRAINAGE AT ALL TIMES WATER SHALL NOT BE ALLOWED TO POND ON THE WORKS UNLESS SUCH PONDING IS PART OF AN APPROVED ESCP / SWMP.

STORMWATER DRAINAGE NOTES:

1. ALL STORMWATER WORKS TO BE COMPLETED IN ACCORDANCE WITH AUSTRALIAN STANDARD AS3500.3:2003 PLUMBING AND DRAINAGE, PART 3: STORMWATER DRAINAGE.
2. THE MINOR (PIPED) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 20 YEAR ARI STORM EVENT AND THE MAJOR (OVERLAND) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 100 YEAR ARI STORM EVENT.
3. ALL FINISHED PAVEMENT LEVELS SHALL BE AS INDICATED ON FINISHED LEVELS PLANS.
4. PIT SIZES SHALL BE AS INDICATED IN THE SCHEDULE WHILE PIPE SIZES AND DETAILS ARE PROVIDED ON PLAN.
5. EXISTING STORMWATER PIT LOCATIONS AND INVERT LEVELS TO BE CONFIRMED BY SURVEY PRIOR TO COMMENCING WORKS ON SITE.
6. ALL STORMWATER PIPES Ø375 OR GREATER SHALL BE CLASS 2 REINFORCED CONCRETE WITH RUBBER RING JOINTS UNLESS NOTED OTHERWISE.
7. ALL PIPES UP TO AND INCLUDING Ø300 TO BE uPVC GRADE SN8 UNO.
8. PIPE CLASS NOMINATED ARE FOR IN-SERVICE LOADING CONDITIONS ONLY. CONTRACTOR IS TO MAKE ANY NECESSARY ADJUSTMENTS REQUIRED FOR CONSTRUCTION CONDITIONS.
9. ALL CONCRETE PITS GREATER THAN 1000mm DEEP SHALL BE REINFORCED USING N12-200 EACH WAY CENTERED IN WALL AND BASE. LAP MINIMUM 300mm WHERE REQUIRED. ALL CONCRETE FOR PITS SHALL BE F'c 25 MPA. PRECAST PITS MAY BE USED WITH THE APPROVAL OF THE ENGINEER.
10. IN ADDITION TO ITEM 9 ABOVE, ALL CONCRETE PITS GREATER THAN 3000mm DEEP SHALL HAVE WALLS AND BASE THICKNESS INCREASED TO 200mm.
11. PIPES SHALL BE LAID AS PER PIPE LAYING DETAILS. PARTICULAR CARE SHALL BE TAKEN TO ENSURE THAT THE PIPE IS FULLY AND EVENLY SUPPORTED. RAM AND PACK FILLING AROUND AND UNDER BACK OF PIPES AND PIPE FAUCETS, WITH NARROW EDGED RAMMERS OR OTHER SUITABLE TAMPING DETAILS.
12. WHERE PIPE LINES ENTER PITS, PROVIDE 2m LENGTH OF STOCKING WRAPPED SLOTTED Ø100 uPVC TO EACH SIDE OF PIPE.
13. ALL SUBSOIL DRAINAGE LINES SHALL BE Ø100 SLOTTED uPVC WITH APPROVED FILTER WRAP LAID IN 300mm WIDE GRANULAR FILTER UNLESS NOTED OTHERWISE. LAY SUBSOIL LINES TO MATCH FALLS OF LAND AND/OR 1 IN 200 MINIMUM. PROVIDE CAPPED CLEANING EYE (RODDING POINT) AT UPSTREAM END OF LINE AND AT 30m MAX. CTS. PROVIDE SUBSOIL LINES TO ALL PAVEMENT/ LANDSCAPED INTERFACES, TO REAR OF RETAINING WALLS (AS NOMINATED BY STRUCTURAL ENGINEER) AND AS SHOWN ON PLAN.
14. ALL PIPE GRADES 1 IN 100 MINIMUM UNO.
15. PROVIDE STEP IRONS IN PITS DEEPER THAN 1000mm.
16. MIN. 600 COVER TO PIPE OBVERT BENEATH ROADS & MIN. 400 COVER BENEATH LANDSCAPED AND PEDESTRIAN AREAS.
17. PIT COVERS IN TRAFFICABLE PAVEMENT SHALL BE CLASS D 'HEAVY DUTY', THOSE LOCATED IN NON-TRAFFICABLE AREAS SHALL BE CLASS B 'MEDIUM DUTY' U.N.O.
18. PROVIDE CLEANING EYES (RODDING POINTS) TO PIPES AT ALL CORNERS AND T-JUNCTIONS WHERE NO PITS ARE PRESENT.
19. DOWN PIPES (DP) TO BE AS PER HYDRAULIC ENGINEERS DETAILS WITH CONNECTOR TO MATCH DP SIZE U.N.O. ON PLAN. PROVIDE CLEANING EYE AT GROUND LEVEL.
20. PIPE LENGTHS NOMINATED ON PLAN OR LONGSECTIONS ARE MEASURED FROM CENTER OF PITS TO THE NEAREST 0.5m AND DO NOT REPRESENT ACTUAL LENGTH. THE CONTRACTOR IS TO ALLOW FOR THIS.

NOTE:

DEVELOPMENT APPROVAL DOCUMENTS TO BE READ IN CONJUNCTION WITH ENGINEERING REPORT Co9759.02-02.rpt

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
UPDATED DRAWING LIST	22.03.18	C
ISSUED FOR DEVELOPMENT APPLICATION	15.03.18	B
ISSUED FOR INFORMATION	26.02.18	A

ARCHITECT

CLIENT
DEXUS PROPERTY GROUP

PROJECT
LAKES BUSINESS PARK - SOUTH PRECINCT
11-13 LORD STREET
BOTANY, NSW 2019

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
MW	IO	14.02.18		A1	AS SHOWN	C09759.02 - DA10

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Costin Roe Consulting

PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
DRAWING LIST & GENERAL NOTES

DRAWING No C09759.02 - DA10

ISSUE C

TO MILL POND

DETENTION BASIN TO ACT AS SEDIMENTATION BASIN.
TEMPORARILY PLUG EXISTING OUTLET TO ACHIEVE SEDIMENTATION STORAGE DURING CONSTRUCTION WORKS

LORD STREET

SITE BOUNDARY
152.805 SURVEY
152.81 TITLE

STABILIZED CONSTRUCTION ENTRY. REFER TO DETAIL ON DRAWING DA25

EXISTING BLOCK A
FFL 6.60m

EXISTING BLOCK B
FFL 6.90m

PIT FILTER
REFER DETAIL
TYPICAL

PROPOSED PEDESTRIAN MALL

BOORALEE PARK

NOMINAL STOCKPILE LOCATION
T.B.C ON SITE

PROPOSED BLOCK C
FFL 6.30m ±500mm

EXISTING BLOCK B
FFL 6.90m

SILT FENCE ONLY

SILT FENCE ONLY

SILT FENCE ONLY

ALL SITE RUNOFF TO BE DIRECTED TO SEDIMENT BASIN. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ON-SITE ADJUSTMENT TO ESC MEASURES ARE MADE & SITE RUNOFF IS DIRECTED TO SEDIMENT BASINS

EXISTING INDUSTRIAL DEVELOPMENT

EXISTING RESIDENTIAL DEVELOPMENT

DAPHNE STREET

DANIEL STREET

D P 717692

D P 717692

LEGEND:
LEVELS DATUM IS AHD.

- SILT FENCE ONLY
- SILT FENCE WITH CATCH DRAIN
- OVERLAND FLOW PATH

EROSION & SEDIMENT CONTROL PLAN
1:500 SCALE

EROSION & SEDIMENT CONTROL NOTES:
REFER DA10 FOR EROSION & SEDIMENT CONTROL NOTES

5m 0 10 20 30 40 50m
SCALE 1:500 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
REVISED AS CLOUDED	22.03.18	C
ISSUED FOR DEVELOPMENT APPLICATION	15.03.18	B
ISSUED FOR INFORMATION	26.02.18	A

ARCHITECT

CLIENT
DEXUS PROPERTY GROUP

PROJECT
LAKES BUSINESS PARK - SOUTH PRECINCT
11-13 LORD STREET
BOTANY, NSW 2019

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
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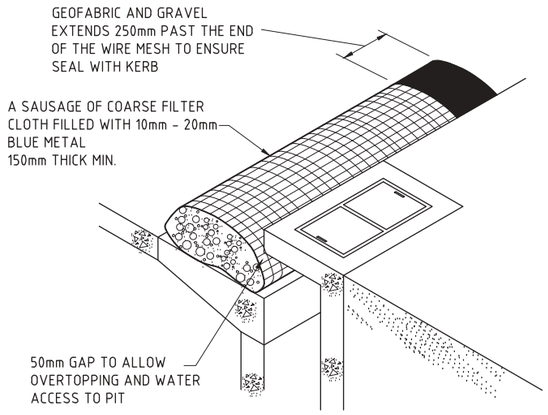
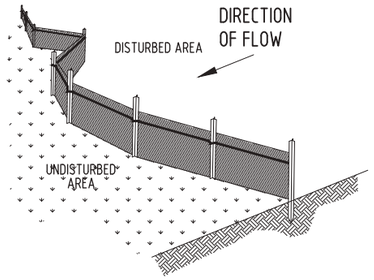
DRAWING TITLE
EROSION & SEDIMENT CONTROL PLAN

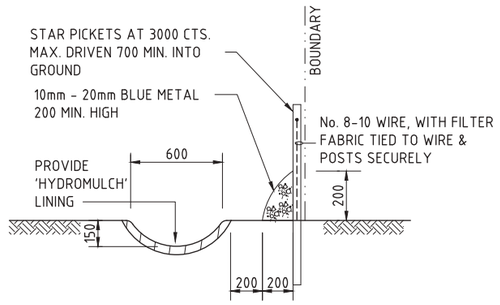
DRAWING No C09759.02 - DA20
ISSUE C



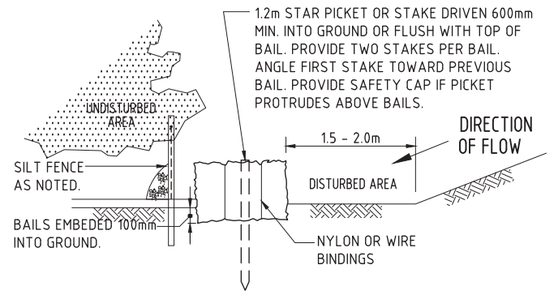
KERB INLET PIT CONTROL
N.T.S



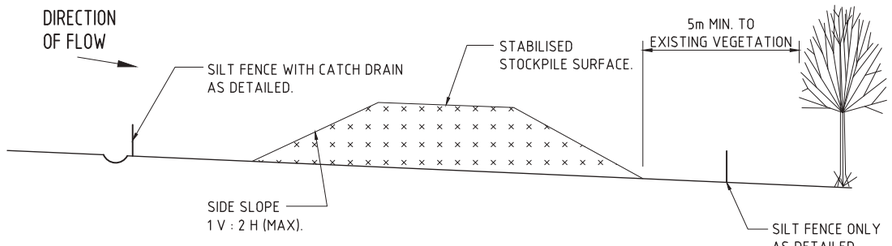
TYPICAL SILT FENCE DETAIL
N.T.S.
PROVIDE 1m RETURNS AT 30m INTERVALS.
TYPICAL



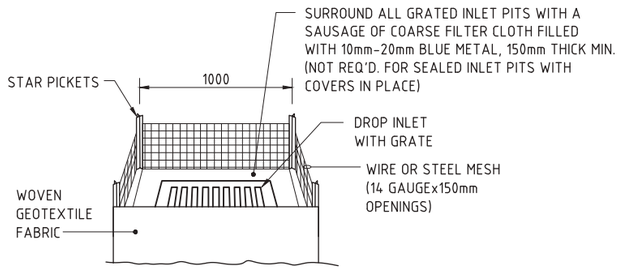
TYPICAL OPEN DRAIN & SILT FENCE
SCALE 1:20



SILT FENCE WITH HAY BAIL DETAIL
N.T.S.



TYPICAL STOCKPILE DETAIL
N.T.S.

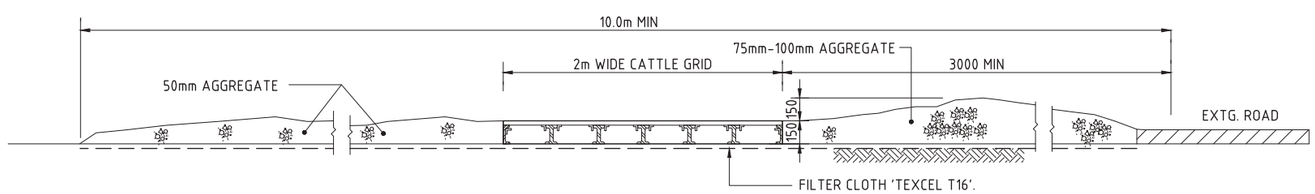


GRATED INLET PIT FILTER DETAIL
N.T.S

NOTE : ADOPT ABOVE DETAILS AROUND ALL PITS WITHIN AREA ENCOMPASSED BY SILT FENCE & TO PITS ON THE ROAD ADJACENT TO SITE BOUNDARY.

STOCKPILE NOTES

1. PLACE ALL STOCKPILES IN LOCATIONS MORE THAN 5m FROM EXISTING VEGETATION, ROADS & HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT ELONGATED MOUNDS. SIDE SLOPE TO BE 1 V: 2 H MAX.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
4. WHERE STOCKPILES ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE USING WOOD CHIP MULCH - 16 TONNE/Ha.
5. CONSTRUCT SILT FENCE WITH CATCH DRAIN ON UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES & SILT FENCE ONLY 1 TO 2m DOWNSLOPE AS SHOWN.



SECTION 1:20 (1/-) : STABILISED CONSTRUCTION ENTRANCE 'TRUCK SHAKER'

FOR DEVELOPMENT APPLICATION

200mm 0 500 1000 1500 2000mm
SCALE 1:20 AT A1 SIZE SHEET

ISSUED FOR	DATE	ISSUE
ISSUED FOR DEVELOPMENT APPLICATION	15.03.18	B
ISSUED FOR INFORMATION	26.02.18	A
AMENDMENTS	DATE	ISSUE

ARCHITECT

CLIENT
DEXUS
PROPERTY GROUP

PROJECT
LAKES BUSINESS PARK - SOUTH PRECINCT
11-13 LORD STREET
BOTANY, NSW 2019

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
MW	IO	14.02.18		A1	AS SHOWN	C09759.02 - DA25

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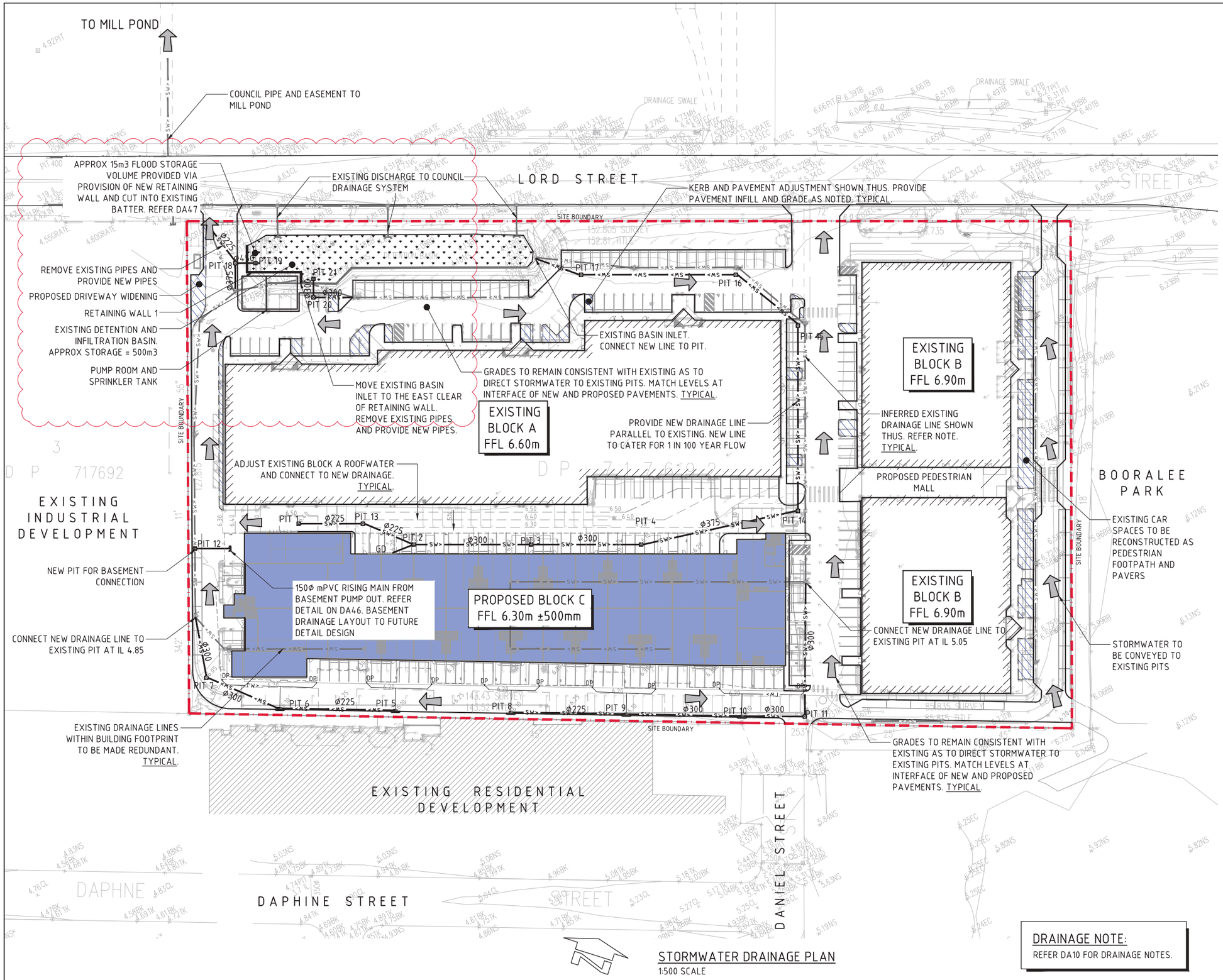
DRAWING TITLE
EROSION & SEDIMENT
CONTROL DETAILS

DRAWING No C09759.02 - DA25
ISSUE B



LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY REALSERVE DATED 17/07/2006.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- EXISTING PIT
- DRAINAGE LINE
- INFERRED EXISTING DRAINAGE LINE
- ROOFWATER LINE
- ROOFWATER DOWNPIPE (INDICATIVE)
- FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- DIRECTION OF FLOW
- INDICATES ADJUSTMENT TO EXISTING PAVEMENT

PIT SCHEDULE

PIT No.	GRATE RL	TYPE	SIZE	COMMENT
PIT 1	6.10	S.G.G.P	600x600	
PIT 2	6.10	S.G.G.P	900x900	
PIT 3	6.10	S.G.G.P	900x900	
PIT 4	6.10	S.G.G.P	900x900	
PIT 5	6.10	K.I.P	900x900	
PIT 6	6.10	K.I.P	900x900	
PIT 7	6.05	S.J.P	900x900	
PIT 8	6.10	K.I.P	900x900	
PIT 9	6.10	K.I.P	900x900	
PIT 10	6.10	K.I.P	900x900	
PIT 11	6.30	S.J.P	900x900	
PIT 12	6.15	S.J.P	900x900	
PIT 13	6.40	S.J.P	900x900	
PIT 14	6.30	S.J.P	900x900	
PIT 15	6.15	S.J.P	900x900	
PIT 16	5.95	S.J.P	900x900	
PIT 17	6.00	S.J.P	900x900	
PIT 18	4.90	S.J.P	900x900	
PIT 19	4.30	S.G.G.P	900x900	
PIT 20	6.15	S.J.P	900x900	
PIT 21	4.30	S.G.G.P	900x900	

EXISTING DRAINAGE NOTE:

LOCATION OF EXISTING SITE DRAINAGE LINES ARE SHOWN TO INFERRED LOCATIONS BASED ON SURVEYED PIT INFORMATION. LOCATION AND PIPE LAYOUTS AS SUITABLE FOR CONCEPT DA PURPOSES ONLY.
ALL PIPES TO BE CONFIRMED BY SURVEY PRIOR TO DETAIL DESIGN PHASE.

LEVELS NOTE:

LEVELS SHOWN TO BE +/-500mm FROM THOSE SHOWN. FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS, ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL EARTHWORKS BALANCE OVER THE PROPERTY.

DRAINAGE NOTE:

REFER DA10 FOR DRAINAGE NOTES.

STORMWATER DRAINAGE PLAN

1:500 SCALE

5m 0 10 20 30 40 50m

SCALE 1:500 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

AMENDMENTS	DATE	ISSUE
REVISED AS CLOUDED	22.03.18	C
ISSUED FOR DEVELOPMENT APPLICATION	15.03.18	B
ISSUED FOR INFORMATION	26.02.18	A

ARCHITECT

CLIENT: DEXUS PROPERTY GROUP

PROJECT: LAKES BUSINESS PARK - SOUTH PRECINCT
11-13 LORD STREET
BOTANY, NSW 2019

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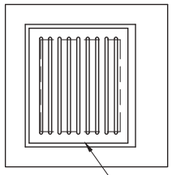
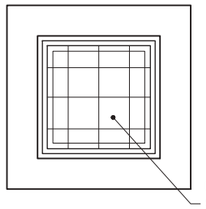
DRAWING TITLE: STORMWATER DRAINAGE PLAN

DRAWING No: C09759.02 - DA40

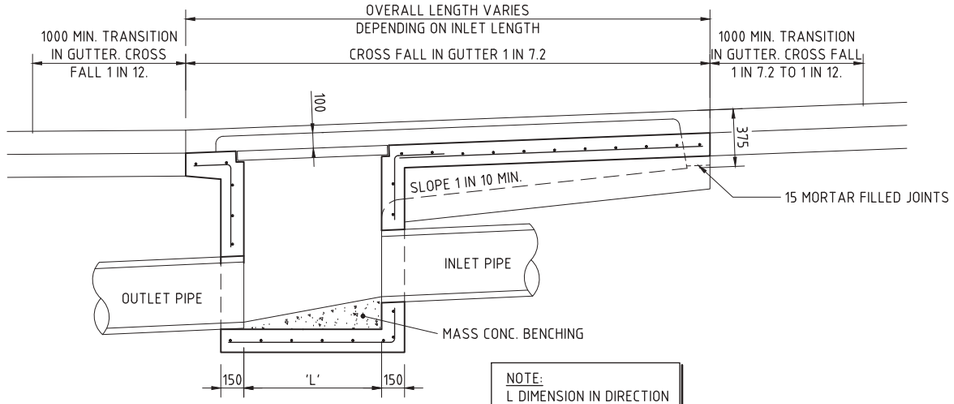
ISSUE: C



PLAN
SCALE 1:20

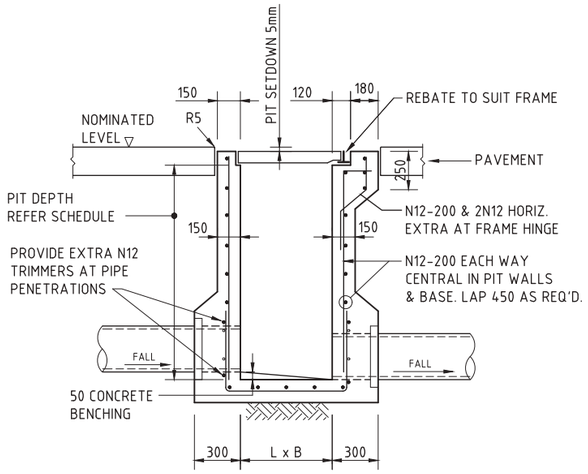


PLAN
1:20



NOTE:
L DIMENSION IN DIRECTION
OF DOWNSTREAM PIPE

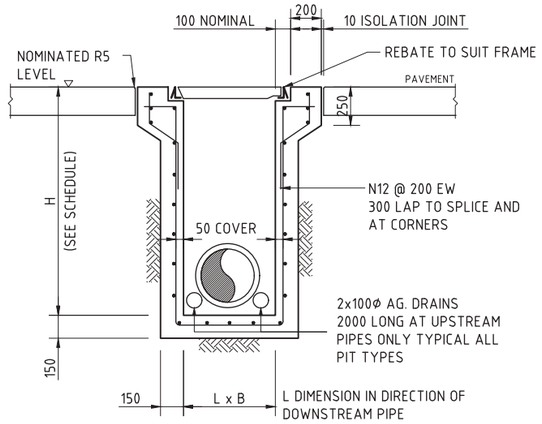
LONG SECTION.
SCALE 1:20



SEE SCHEDULE
L DIMENSION IN DIRECTION OF DOWNSTREAM PIPE

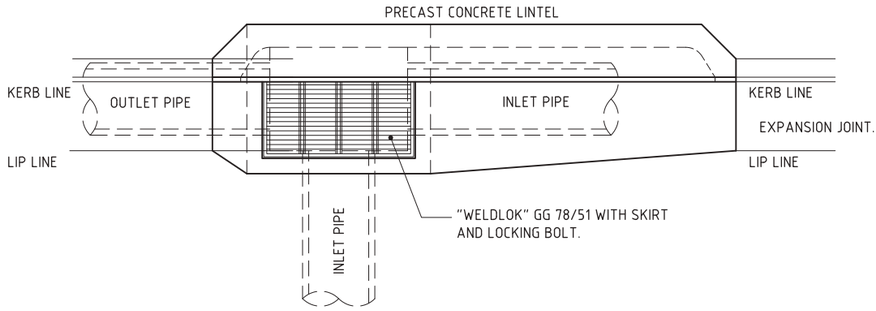
SECTION
SCALE 1:20

SINGLE GRATED GULLY PIT - SGGP

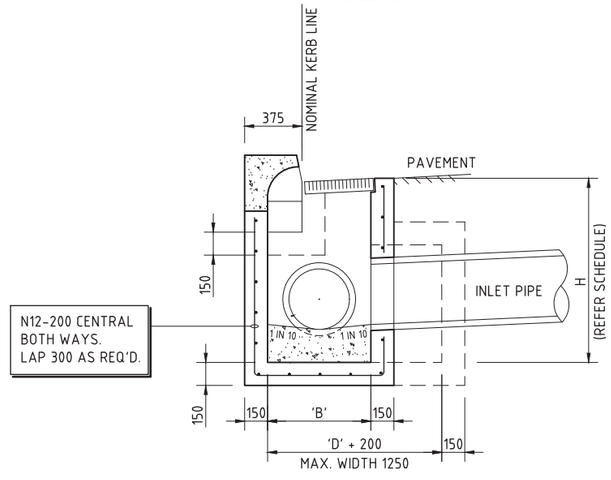


SECTION
SCALE 1:20

SEALED PIT - SP



PLAN
SCALE 1:20



CROSS SECTION.
SCALE 1:20

KERB INLET PIT - KIP

CONCRETE QUALITY					
ELEMENT	SLUMP	AGGREGATE (MAX. SIZE)	CEMENT TYPE	ADMIXTURE	F'c (MPa)
PIT	80	20	GP	NIL	25

NOTES:

1. WHERE GULLY PIT IS LOCATED ON KERB RETURNS OR BULB OF CUL-DE-SACS PROVIDE CURVED PRECAST CONCRETE LINTELS.
2. SAG PITS SHALL HAVE LINTEL PLACED CENTRALLY ABOUT THE GRATE.
3. ALL REINFORCING TO HAVE 30 MIN. CLEAR CONCRETE COVER.
4. FOR PITS DEEPER THAN 1200mm CLIMB RAILS SHALL BE PROVIDED.

FOR DEVELOPMENT APPLICATION

200mm 0 500 1000 1500 2000mm
SCALE 1:20 AT A1 SIZE SHEET

AMENDMENTS	DATE	ISSUE
ISSUED FOR DEVELOPMENT APPLICATION	15.03.18	B
ISSUED FOR INFORMATION	26.02.18	A

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CLIENT
DEXUS PROPERTY GROUP

PROJECT
LAKES BUSINESS PARK - SOUTH PRECINCT
11-13 LORD STREET
BOTANY, NSW 2019

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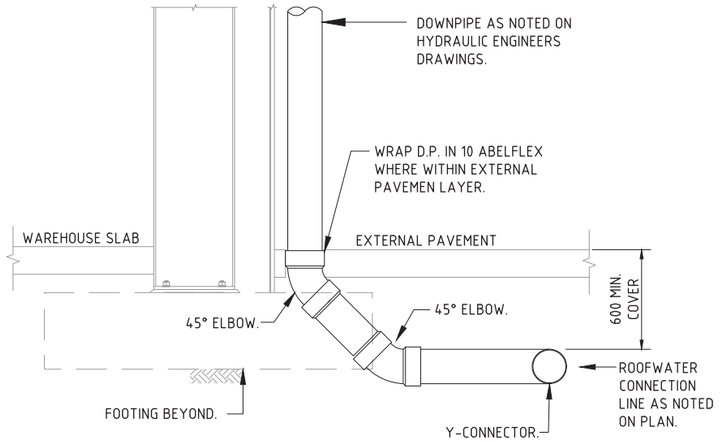
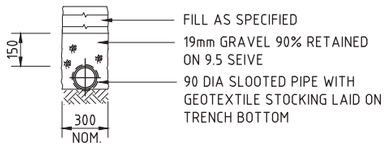
DRAWING TITLE
STORMWATER DRAINAGE DETAILS
SHEET 1

DRAWING No C09759.02 - DA45
ISSUE B

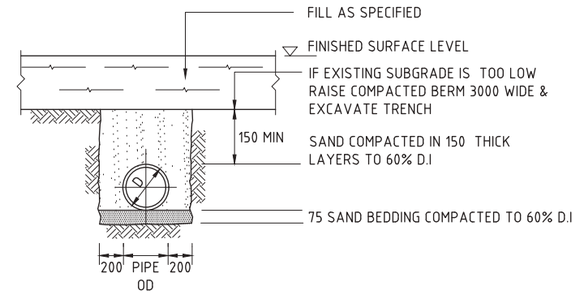


DOWNPIPE TURN-UP DETAIL

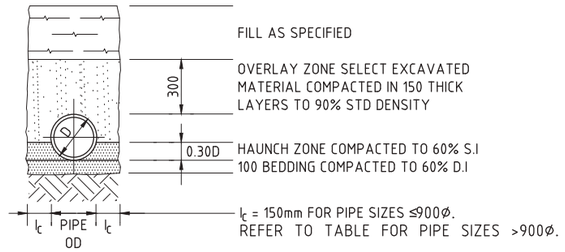
(CLEAR OF FOOTING)
SCALE 1:20



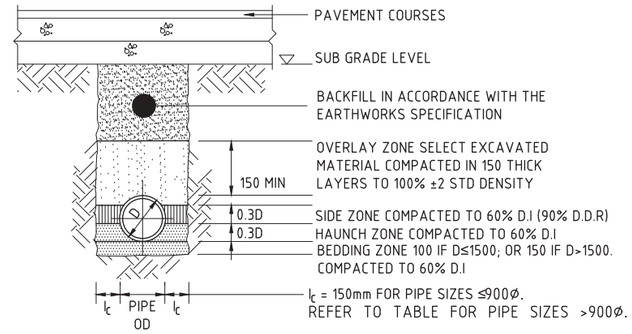
SUPPORT TO AG. DRAIN



SUPPORT TO uPVC PIPES

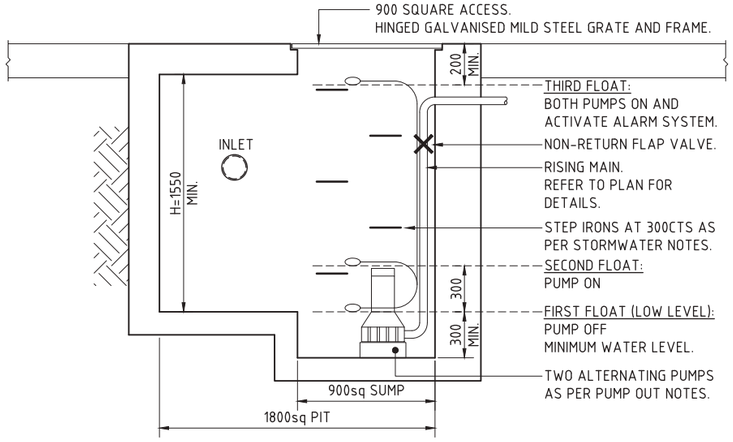


TYPE H1 SUPPORT TO CONCRETE PIPES AT LANDSCAPED AREAS



TYPE HS2 SUPPORT TO CONCRETE PIPES UNDER PAVEMENT

D≤ 1350, MAX FILL = 4.0m
D> 1350, MAX FILL = 3.0m



PUMP OUT PIT DETAIL

SCALE 1:20
REFER TYPICAL PIT DETAILS
FOR ALL ITEMS NOT LABELED.

BASEMENT PUMP OUT NOTES:

PUMP SYSTEM IS TO CONSIST OF DUAL ALTERNATING PUMPS. THE PUMP OUT SYSTEM SHALL BE DESIGNED TO BE OPERATED IN THE FOLLOWING MANNER:

Q PUMP = 25 L/s VOLUME = 5.0 m^3 (MIN.)
THE PUMPS SHALL BE PROGRAMMED TO WORK ALTERNATIVELY SO AS TO ALLOW BOTH PUMPS TO HAVE AN EQUAL OPERATION LOAD AND PUMP LIFE.

A LOW LEVEL FLOAT SHALL BE PROVIDED TO ENSURE THAT THE MINIMUM REQUIRED WATER LEVEL IS MAINTAINED WITHIN THE SUMP AREA OF THE PIT . IN THIS REGARD THIS FLOAT WILL FUNCTION AS AN OFF SWITCH FOR THE PUMPS.

A SECOND FLOAT SHALL BE PROVIDED AT A HIGHER LEVEL, APPROXIMATELY 300mm ABOVE THE MINIMUM WATER LEVEL, WHEREBY ONE OF THE PUMPS WILL OPERATE AND DRAIN THE PIT TO THE LEVEL OF THE LOW-LEVEL FLOAT.

A THIRD FLOAT SHALL BE PROVIDED AT A HIGH LEVEL, WHICH IS APPROXIMATELY THE TOP LEVEL OF THE PIT. THIS FLOAT SHOULD START THE OTHER PUMP THAT IS NOT OPERATING AND ACTIVATE THE ALARM.

AN ALARM SYSTEM SHALL BE PROVIDED WITH A FLASHING STROBE LIGHT AND A PUMP FAILURE WARNING SIGN WHICH ARE TO BE LOCATED AT THE ENTRANCE TO THE BASEMENT LEVEL. THE ALARM SYSTEM SHALL BE PROVIDED WITH A BATTERY BACK-UP IN CASE OF POWER FAILURE.

BEDDING & HAUNCH MATERIAL GRADING	
SIEVE SIZE	WEIGHT PASSING(%)
19	100
2.36	100 TO 50
0.60	90 TO 20
0.30	60 TO 10
0.15	25 TO 0
0.075	10 TO 0

SIDE ZONE MATERIAL GRADING	
SIEVE SIZE	WEIGHT PASSING(%)
75	100
9.5	100 TO 50
2.36	100 TO 30
0.60	50 TO 15
0.075	25 TO 0

SELECT FILL MATERIAL IN ACCORDANCE WITH TABLE 1 AS 3725

SIDE ZONE WIDTH	
PIPE SIZE	l_t (mm)
≤900ø	150
1050ø	175
1200ø	200
1350ø	225
1500ø	250
1650ø	275
1800ø	300

REFER TO ENGINEER FOR TRENCH WIDTHS FOR PIPE SIZES GREATER THAN 1800ø

PIPE LAYING DETAILS

SCALE 1:20

FOR DEVELOPMENT APPLICATION

200mm 0 500 1000 1500 2000mm
SCALE 1:20 AT A1 SIZE SHEET

AMENDMENTS	DATE	ISSUE
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ISSUED FOR INFORMATION	26.02.18	A

ARCHITECT

CLIENT
DEXUS PROPERTY GROUP

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LAKES BUSINESS PARK - SOUTH PRECINCT
11-13 LORD STREET
BOTANY, NSW 2019

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DRAWING TITLE
STORMWATER DRAINAGE DETAILS SHEET 2

DRAWING No C09759.02 - DA46
ISSUE B

LORD STREET

SITE BOUNDARY

EXISTING DETENTION AND INFILTRATION BASIN.
APPROX STORAGE = 500m3

EXISTING DISCHARGE TO COUNCIL DRAINAGE SYSTEM

EXISTING DISCHARGE TO COUNCIL DRAINAGE SYSTEM

EXISTING DISCHARGE TO COUNCIL DRAINAGE SYSTEM

APPROX 15m3 FLOOD STORAGE
COMPENSATION VOLUME.
CUT INTO EXISTING BATTER AND
PROVIDE 1.2m HIGH MAX
RETAINING WALL

REMOVE EXISTING PIPES AND PROVIDE
NEW PIPES TO BASIN INLET PIT

PROVIDE NEW BASIN INLET PIT

MOVE BASIN INLET PIT
CLEAR OF RETAINING WALL

DETENTION BASIN

EXISTING BASIN INLET.
CONNECT NEW LINE TO PIT.

EXISTING BASIN RETAINING WALL

LOST FLOOD STORAGE
APPROX 15m3

REMOVE EXISTING PIPES AND PROVIDE NEW
PIPES TO BASIN INLET PIT

SPRINKLER TANK AND PUMP ROOM
FFL = 15.30m

SITE BOUNDARY

EXISTING
BLOCK A
FFL 6.60m

DETENTION BASIN PLAN
1:200 SCALE

LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY REALSERVE DATED 17/07/2006.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- EXISTING PIT
- DRAINAGE LINE
- INFERRED EXISTING DRAINAGE LINE
- EXISTING DRAINAGE LINE TO BE REMOVED

NOTE:

ALL PREDEVELOPED FLOW IS MAINTAINED AS PER COUNCIL REQUIREMENTS

2m 0 5 10 15 20m
SCALE 1:200 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

ISSUED FOR DEVELOPMENT APPLICATION	22.03.18	A
AMENDMENTS	DATE	ISSUE

ARCHITECT

CLIENT
DEXUS PROPERTY GROUP

PROJECT
LAKES BUSINESS PARK - SOUTH PRECINCT
11-13 LORD STREET
BOTANY, NSW 2019

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
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DRAWING TITLE
DETENTION BASIN PLAN

DRAWING No C09759.02 - DA47

ISSUE A

TO MILL POND

LORD STREET

START WALL 1. CONNECT TO EXISTING WALL AND MAKE GOOD

KERB AND PAVEMENT ADJUSTMENT SHOWN THUS. PROVIDE PAVEMENT INFILL AND GRADE AS NOTED. TYPICAL.

SITE BOUNDARY

152.805 SURVEY
152.81 AHD

END WALL 1

PROPOSED DRIVEWAY WIDENING

RETAINING WALL 1
MAX H = 1.20m
SURFACE AREA = 15m2

EXISTING WALL AROUND BASIN

GRADES TO REMAIN CONSISTENT WITH EXISTING AS TO DIRECT STORMWATER TO EXISTING PITS. MATCH LEVELS AT INTERFACE OF NEW AND PROPOSED PAVEMENTS. TYPICAL.

EXISTING BLOCK A
FFL 6.60m

EXISTING BLOCK B
FFL 6.90m

EXISTING CAR SPACES TO BE RECONSTRUCTED AS PEDESTRIAN FOOTPATH AND PAVERS

PROPOSED PEDESTRIAN MALL

BOORALEE PARK

EXISTING INDUSTRIAL DEVELOPMENT

WESTERN FACE OF BUILDING C
STEP DOWN 100mm MAX

PROPOSED BLOCK C
FFL 6.30m ±500mm

EXISTING BLOCK B
FFL 6.90m

LEVELS TO DIRECT STORMWATER TO EXISTING PITS

SITE BOUNDARY

GRADES TO REMAIN CONSISTENT WITH EXISTING AS TO DIRECT STORMWATER TO EXISTING PITS. MATCH LEVELS AT INTERFACE OF NEW AND PROPOSED PAVEMENTS. TYPICAL.

EXISTING RESIDENTIAL DEVELOPMENT

STREET

DRAINAGE SWALE

LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY REALSERVE DATED 17/07/2006.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- EXISTING PIT
- 50.00 – FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- 50.10 – FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- INDICATES ADJUSTMENT TO EXISTING PAVEMENT

FINISHED LEVELS PLAN

1:500 SCALE

LEVELS NOTE:

REFER DA10 FOR LEVELS NOTES

LEVELS SHOWN TO BE +/-500mm FROM THOSE SHOWN. FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS, ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL EARTHWORKS BALANCE OVER THE PROPERTY.

5m 0 10 20 30 40 50m
SCALE 1:500 AT A1 SIZE SHEET

FOR DEVELOPMENT APPLICATION

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DEXUS PROPERTY GROUP

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LAKES BUSINESS PARK - SOUTH PRECINCT
11-13 LORD STREET
BOTANY, NSW 2019

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DRAWING TITLE
FINISHED LEVELS PLAN

DRAWING No. C09759.02 - DA50

ISSUE C

Appendix B

FLOOD REPORT – WMA WATER

REF: 115008

MAY 2015

DEXUS
PROPERTY GROUP

LAKES BUSINESS PARK PLANNING PROPOSAL - FLOOD ASSESSMENT

FINAL DRAFT

wma water

MAY 2015

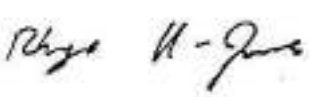
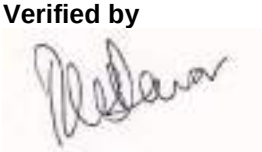
Level 2, 160 Clarence Street
Sydney, NSW, 2000

Tel: 9299 2855
Fax: 9262 6208
Email: wma@wmawater.com.au
Web: www.wmawater.com.au

LAKES BUSINESS PARK PLANNING PROPOSAL – FLOOD ASSESSMENT

FINAL

MAY, 2015

Project **Lakes Business Park Planning Proposal – Flood Assessment**	**Project Number** **115008**
Client DEXUS	**Client's Representative** James Mah-Chut
Author Dan Morgan Rhys Hardwick Jones	**Prepared by** 
Date 14 May 2015	**Verified by** 

Revision	Description	Date
1	Final	May 2015

LAKES BUSINESS PARK PLANNING PROPOSAL – FLOOD ASSESSMENT

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF DIAGRAMS

LIST OF PHTOGRAPHS

LIST OF TABLES

LIST OF FIGURES

TERMINOLOGY USED IN REPORT

Australian Rainfall and Runoff have produced a set of draft guidelines for appropriate terminology when referring to the probability of floods. In the past, AEP has generally been used for those events with greater than 10% probability of occurring in any one year, and ARI used for events more frequent than this. However, the ARI terminology is to be replaced with a new term, EY.

Annual Exceedance Probability (AEP) is expressed using percentage probability. It expresses the probability that an event of a certain size or larger will occur in any one year, thus a 1% AEP event has a 1% chance of being equalled or exceeded in any one year. For events smaller than the 10% AEP event however, an annualised exceedance probability can be misleading, especially where strong seasonality is experienced. Consequently, events more frequent than the 10% AEP event are expressed as X Exceedances per Year (EY). Statistically a 0.5 EY event is not the same as a 50% AEP event, and likewise an event with a 20% AEP is not the same as a 0.2 EY event. For example an event of 0.5 EY is an event which would, on average, occur every two years. A 2 EY event is equivalent to a design event with a 6 month average recurrence interval where there is no seasonality, or an event that is likely to occur twice in one year.

While AEP has long been used for larger events, the use of EY is to replace the use of ARI, which has previously been used in smaller magnitude events. The use of ARI, the Average Recurrence Interval, which indicates the long term average number of years between events, is now discouraged. It can incorrectly lead people to believe that because a 100-year ARI (1% AEP) event occurred last year it will not happen for another 99 years. For example there are several instances of 1% AEP events occurring within a short period, for example the 1949 and 1950 events at Kempsey.

The PMF is a term also used in describing floods. This is the Probable Maximum Flood that is likely to occur. It is related to the PMP, the Probable Maximum Precipitation.

This report has adopted the approach of the ARR draft terminology guidelines and uses % AEP for all events greater than the 10% AEP and EY for all events smaller and more frequent than this.

FOREWORD

The NSW State Government's Flood Policy provides a framework to ensure the sustainable use of floodplain environments. The Policy is specifically structured to provide solutions to existing flooding problems in rural and urban areas. In addition, the Policy provides a means of ensuring that any new development is compatible with the flood hazard and does not create additional flooding problems in other areas.

Under the Policy, the management of flood liable land remains the responsibility of local government. The State Government provides funding for flood studies, floodplain risk management plans and works to alleviate existing problems, to undertake the necessary technical studies to identify and address the problem and provides specialist technical advice to assist Councils in the discharge of their floodplain management responsibilities. The Federal Government may also provide funding in some circumstances.

The Policy provides for technical and financial support by the Government through four sequential stages:

1. ***Flood Study***
   Determines the nature and extent of the flood problem
2. ***Floodplain Risk Management Study***
   Evaluates management options for the floodplain in respect of both existing and proposed development
3. ***Floodplain Risk Management Plan***
   Involves formal adoption by Council of a plan of management for the floodplain
4. ***Implementation of the Plan***
   Construction of flood mitigation works to protect existing development, use of Local Environmental Plans to ensure new development is compatible with the flood hazard

The Draft Mascot, Rosebery and Eastlakes Flood Study constitutes the first stage of the management process for the Botany Wetlands catchment. This study has been prepared by WMAwater for the City of Botany Bay and was undertaken to provide the basis for future management of flood liable lands within the study area.

1. INTRODUCTION

1.1. Overview

DEXUS Property Group property is managing a rezoning submission for mixed use redevelopment of and 11-13 Lord St Botany (the site), which encompasses Lot 2 on DP717692 (see Diagram 1). This assessment relates only to rezoning of the southern precinct of the existing Lakes Business Park, i.e. 11-13 Lord St Botany.

Diagram 1 - Site Location Plan

WMAwater has been engaged to undertake a flood assessment of the site in order to determine flooding behaviour. The flooding behaviour determines what flood-related development controls will need to be applied as outlined in the City of Botany Bay DCP, 2013.

1.2. Scope of Work

The report is solely concerned with determining the Flood Planning Level (minimum floor levels) and identifying whether the development has potential to cause adverse flood impacts on the surrounding areas.

Section 2 of this report contains relevant background information, including a description of the site, available data and relevant studies. Section 3 details existing flooding behaviour at the site, and Section 4 identifies the applicable flood-related development controls. Sections 5 and 6 describe the modelling approach and modelling outcomes, with conclusions in Section 7.

2. BACKGROUND

2.1. Study Area

The site is located in the City of Botany Bay Local Government Area. The site is bordered by Lord Street to the north, Booralee Park to the east, 5-9 Lord Street to the west, and residential properties fronting Daphne Street to the south.

Stormwater from the site drains northwards across the northern precinct of the Lakes Business Park into Mill Pond, which forms part of a chain of swamps and lakes known collectively as the Botany Wetlands.

WMAwater is presently undertaking a catchment-wide Flood Study of the Mascot, Rosebery and Eastlakes areas (MRE Flood Study), which includes the Botany Wetlands (Reference 1). At the time of writing, the MRE Flood Study is at Final Draft stage but has not yet been formally adopted by Council.

2.2. Relevant Documents and Site Plans

WMAwater relied on the following documents for this assessment:

- Mascot, Roseberry and Eastlakes Draft Flood Study (Reference 1);
- Development Control Plan (DCP) City of Botany Bay (Reference 2);
- *Plan of Details and Levels at No 11-13 Lord Street Botany*, Linker Surveying, dated 16/4/2015.
- *Lakes Business Park South Precinct – Planning Proposal Master Plan,* Tony Caro Architecture, Drawing No SK_002, dated 12/5/15; and
- *Lakes Business Park South Precinct – Ground Floor Plan,* Tony Caro Architecture, Drawing No SK_003, dated 12/5/15; and
- Concept Stormwater Layout, Costin Roe Consulting, Drawing No CO9759.01-SKC01, dated 30/4/15.

2.3. Topographic and Stormwater Survey

The topographic datasets used to develop the flood modelling were:

- Digital Elevation Model (DEM) – The basis of the DEM is airborne Light Detection and Ranging (LiDAR) survey of the study area collected by the NSW Department of Lands and Property Information.
- The LiDAR was supplemented by detailed survey of the site and adjacent areas including detention basins, roads, gutters and embankments.
- Pit and pipe stormwater asset data was provided by Linker Surveying with additional information relating to pipe size collected by WMAwater during site inspections

3. FLOOD BEHAVIOUR

The site is affected by flooding from two mechanisms:

- Mainstream flooding through the Botany Wetland system, arising from rain in the Centennial Park, Kensington, Daceyville and Eastlakes areas. Heavy rain over this broad catchment area could cause the level in Mill Pond to rise and cause backwater flooding Lord Street.
- Local overland flooding resulting from very intense rainfall in the immediate vicinity of the site, exceeding the local drainage system capacity, collecting in the sag point in Lord Street, and resulting in overland flow towards Mill Pond.

3.1. Mainstream Flooding

Modelling for the Draft MRE Flood Study has indicated that for a range of flood events up to and including the 1% AEP flood, the level for Mill Pond is not high enough to overflow and produce significant inundation of the Lakes Business Park area (north and south).

3.2. Local overland Flow

Flooding in the Lake Business Park South Precinct up to and including the 1% AEP event will be primarily as a result of local overland flow, when runoff from the local catchment exceeds the capacity of the sub-surface stormwater drainage network. The developments on the southern side of Lord Street from Botany Road to Booralee Park drain to a low point in Lord Street adjacent to the site, as does part of the developments on the north side of Lord Street. Runoff to the Lord Street low point discharges to Mill pond through the underground drainage system. Site inspections indicate that this system is susceptible to blockage. When flow exceeds the capacity of the pipe system to Mill Pond, flooding of the low point will occur and flood levels will rise until they overtop the high point in the northern precinct and drain to Mill Pond.

This flooding mechanism will generally be the primary consideration for development control requirements. Controls relating to the PMF will need to include consideration of overflow from the Mill Pond system (i.e. the mainstream flood mechanism).

4. FLOOD - RELATED DEVELOPMENT CONTROLS

The site is subject to flood-related development controls as specified in:

- The Botany Bay Local Environment Plan 2013 – Sections 6.3, 6.4 & 6.6 (Reference);
- The Botany Bay Development Control Plan 2013 (DCP), Part 3G Stormwater Management; and
- The Stormwater Management Technical Guidelines (SMTG), an attachment to the DCP, in particular Section 8 – Finished Floor Levels, and Section 11 – Flood Study or Overland Flow Path Assessment.

Other sections of the SMTG will apply but are not specifically flood-related, and are not addressed in this assessment.

As part of any development proposal, a detailed Flood Study will be required with future submission of a Development Application (DA). Required aspects of the study may include:

- Flood model of the 1% Annual Exceedance Probability (AEP) design storm events and Probable Maximum Flood (PMF) with the predicated impacts of Climate Change;
- Two-dimensional (2D) flood modelling (such as TUFLOW) to be used for the where the contributing catchment area is greater than 20 Ha.
- Scaled maps, including 0.2 m contour lines showing full upstream catchment area;
- Scaled maps showing the flood extent, flood contour, flood depth and velocity of pre-development and post-development 1% AEP and PMF flood; and
- Detailed scaled plan view showing the pre-development and post-development 1% AEP and PMF flood extent and levels on the subject property.

Modelling and mapping of existing flood behaviour at the site has been completed as part of this assessment (see Section 6).

4.1. Floor Levels

The SMTG specifies different floor level requirements depending on the upstream catchment area of the site, and whether the site is a designated Council flood area or overland flow route. As discussed in Section 2, Council has not yet adopted the Flood Study. WMAwater considers that the minimum Flood Planning Levels (FPLs) that apply to the site would be as follows (from Section 8 of the SMTG):

- Habitable Room Floor Level : FPL of 1% AEP + 0.5 m
- Non-Habitable Floor Level: FPL of 1% AEP + 0.3 m

Note that commercial premised can be considered “habitable rooms” under the definitions provided in Reference 4.

Please note that WMAwater understands Council is planning to review the stormwater-related aspects of the DCP, and introduce a floodplain management policy, which would potentially supersede the current FPL provisions by the time a DA submission is made at the site. It would be prudent to assume that a minimum level of the 1% AEP flood level plus 0.5 m will apply for all finished building levels and basement entry points across the site.

4.2. Filling of Floodplain Storage Areas

Council requires that a development has no adverse impacts on flood levels or flood behaviour in the surrounding areas of the site. The SMTG states that:

- the proposed development must not impede the passage of overland flow to cause a rise (afflux) in the water level upstream and/or increase the downstream velocities of flow;
- No structures and/or fillings are permitted over the 1% AEP flow path unless suitable flood mitigation measures are to be implemented. Such measures would require assessment and approval from Council.

Generally, any net infill of flood affected portions of the site would cause a rise in flood levels elsewhere. This aspect of the proposal is discussed in detail in Section 7.2.

5. MODELLING APPROACH

Hydraulic modelling undertaken by WMAwater for this study was conducted in accordance with methodology recommended in:

- Australian Rainfall and Runoff (AR&R, Reference 5); and
- a guideline document for two-dimensional (2D) modelling of urban and rural floodplains produced as part of the upcoming AR&R revision (Reference 6).

The estimation of flood behaviour in a catchment was undertaken as a two-stage process, consisting of:

1. hydrologic modelling to convert rainfall estimates to overland flow runoff; and
2. hydraulic modelling to estimate overland flow distributions, flood levels and velocities.

The broad approach adopted for this study was to use hydrologic modelling (DRAINS) to create local inflow boundary conditions for input into a two-dimensional unsteady flow hydraulic model (TUFLOW).

5.1. DRAINS Modelling

The total catchment represented by the DRAINS model is 0.279 km^2 (28 ha). This area has been represented by a total of 34 sub-catchments giving an average sub-catchment size of approximately 0.8 ha. The sub-catchment delineation ensures that where hydraulic controls exist that these are accounted for and able to be appropriately incorporated into hydraulic routing. The sub-catchment layout is shown in Figure 2.

The land use categories and their corresponding impervious surface area is outlined Table 1. The proportion of each land-use category within a sub-catchment was determined based upon 2011 aerial photography provided by CBB

Table 1: Impervious Percentage per Land-use

Land-use Category	Impervious Percentage
Residential property	70% impervious
Commercial property	95% impervious
Vacant land	5% impervious
Vegetation (such as public parks)	5% impervious
Pavement and car parks	100% impervious
Roadway	100% impervious

Methods for modelling the proportion of rainfall that is “lost” to infiltration are outlined in AR&R (Reference 5). The rainfall loss parameters that were adopted for the DRAINS model are outlined in Table 2. Although soils in the catchment are generally sandy, the catchment is highly urbanised, and experience with previous studies suggests real infiltration rates are lower than

would be expected for sand in an undeveloped catchment. The soil type was therefore set to have low infiltration capacity.

Table 2: Adopted DRAINS hydrologic model parameters

RAINFALL LOSSES	
Paved Area Depression Storage (Initial Loss)	1.0 mm
Grassed Area Depression Storage (Initial Loss)	5.0 mm
SOIL TYPE	**4**
High Runoff Potential	
ANTECEDENT MOISTURE CONDITONS (AMC)	**3**
Description	Rather wet
Total Rainfall in 5 Days Preceding the Storm	12.5 to 25 mm

5.2. TUFLOW Modelling

A grid cell size of 2 m by 2 m was used, as it provided an appropriate balance between providing sufficient detail for roads and overland flow paths, while still resulting in workable computational run-times. The model grid was established by sampling from a 1 m by 1 m DEM. This DEM was generated from a triangulation of filtered ground points from the LiDAR dataset obtained from LPI. This DEM is shown in

The TUFLOW hydraulic model is bounded by Southern Cross Drive, the Railway line, Myrtle Street and the alignment of the southern boundary of Lakes Business Park. The total area included in the 2D model is 0.35 km^2. The extents of the TUFLOW model are shown in Figure 3.

For local sub-catchments within the TUFLOW model domain, local runoff hydrographs were extracted from the DRAINS model (see Section 5.1). These were applied to the downstream end of the sub-catchments within the 2D domain of the hydraulic model, typically corresponding with the receiving inlet stormwater pit for the sub-catchment.

Tailwater conditions in Mill Pond were set by using inflow and downstream water level boundaries from the Botany Wetlands hydraulic model (Reference 1).

The following inflow boundary conditions were taken from the Botany Wetlands model:

1. Mill Pond beneath the railway line
2. Eastlake Golf Course over a low point in the railway line embankment (only in PMF)
3. Southern Cross Drive east of Botany Road (only in PMF)
4. Southern Cross Drive at intersection with Botany Road (only in PMF)

There are several downstream boundaries in the model. The Mill Pond Boundary is located upstream of Bay Street and the subsequent levels were taken from (Reference 1). Outflow boundary conditions for overland flow were located in Booralee Park and at the southern

boundary of the RMS site on Lord Street.

The following hydraulic structures were defined in the model:

- Buildings – were modelled as impermeable obstructions to the floodwaters.
- Bridges – the bridge over Mill Pond at Botany Road was modelled in the 2D domain for the purpose of maintaining continuity in the model.
- Basins – topography and outlet pipes/weirs based on detailed survey of the site
- Subsurface Drainage Network - The major components of the sub-surface drainage network were included in the model based on the detailed survey of the precinct and site inspection. Any pipes less than 300mm in diameter were assumed blocked and not included in the model. The modelled drainage network is shown in Figure 3.

Blockage of the sub-surface drainage network was modelled at 50% in accordance with the City of Botany Bay Council Development Control Plan (Reference 2).

6. DESIGN EVENT MODELLING

6.1. Overview

Design flood levels in the catchment are a combination of flooding from rainfall over the local catchment, as well as elevated tailwater levels in Mill Pond which is part of the Botany Wetlands system. This study determined flooding behaviour in the Lakes Business Park catchment for the 1% AEP event and the PMF.

The site contains a stormwater detention basin. There is a small bund between the basin and the street, however during large events such as the 1% AEP storm, the flood level will be higher than the bund and the basin will become a contiguous part of the Lord Street low point (see Photo 1)

Photo 1: Existing Stormwater Detention Basin

6.2. Critical Duration – Local Overland Flow

To determine the critical storm duration for various parts of the catchment (i.e. produce the highest flood level), modelling of the 1% AEP event was undertaken for a range of design storm durations from 25 minutes to 2 hours, using temporal patterns from AR&R (Reference 5). An envelope of the model results was created, and the storm duration producing the maximum flood level was determined for each grid point within the study area.

It was found that the 2 hour design storm was critical for the Lake Business Park catchment for the 1% AEP and the 1 hour design storm was critical for the PMF event (using the methodology from Reference 7).

6.3. Design Flood Results

The results from this study are presented for combined local catchment and Mill Pond flooding as:

- Peak flood depths and spot levels in; Figure 4 and Figure 5
- Peak flood velocities in; Figure 6 and Figure 7
- Provisional hydraulic hazard in; Figure 8 and Figure 9

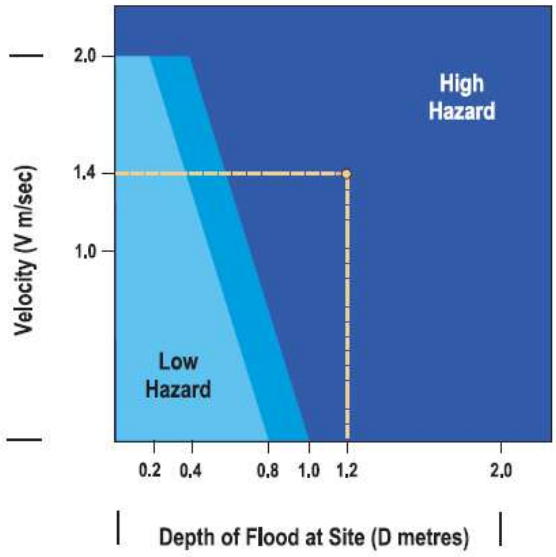
The peak flood levels in the Lord Street low point for the 1% AEP and PMF events are shown in Table 3.

Table 3: Peak Flood Levels

Event	Level
1% AEP	5.4 mAHD
PMF	5.6 mAHD

Provisional hazard categories were determined in accordance with Appendix L of the NSW Floodplain Development Manual (Reference 4), the relevant section of which is shown in Diagram 2. For the purposes of this report, the transition zone presented in Diagram 2 was considered to be high hazard.

Diagram 2: (L2) Provisional Hydraulic Hazard Categories



7. CONCLUSIONS

7.1. Finished Floor Levels

The Flood Planning Level for the site, based on the 1% AEP peak flood level in Lord Street plus 0.5 m freeboard, is **5.9 mAHD**. WMAwater recommends that this level apply to residential and commercial floors, and basement entry points (including ramps, air vents, lift wells, fire stairs, etc.).

7.2. Floodplain Storage

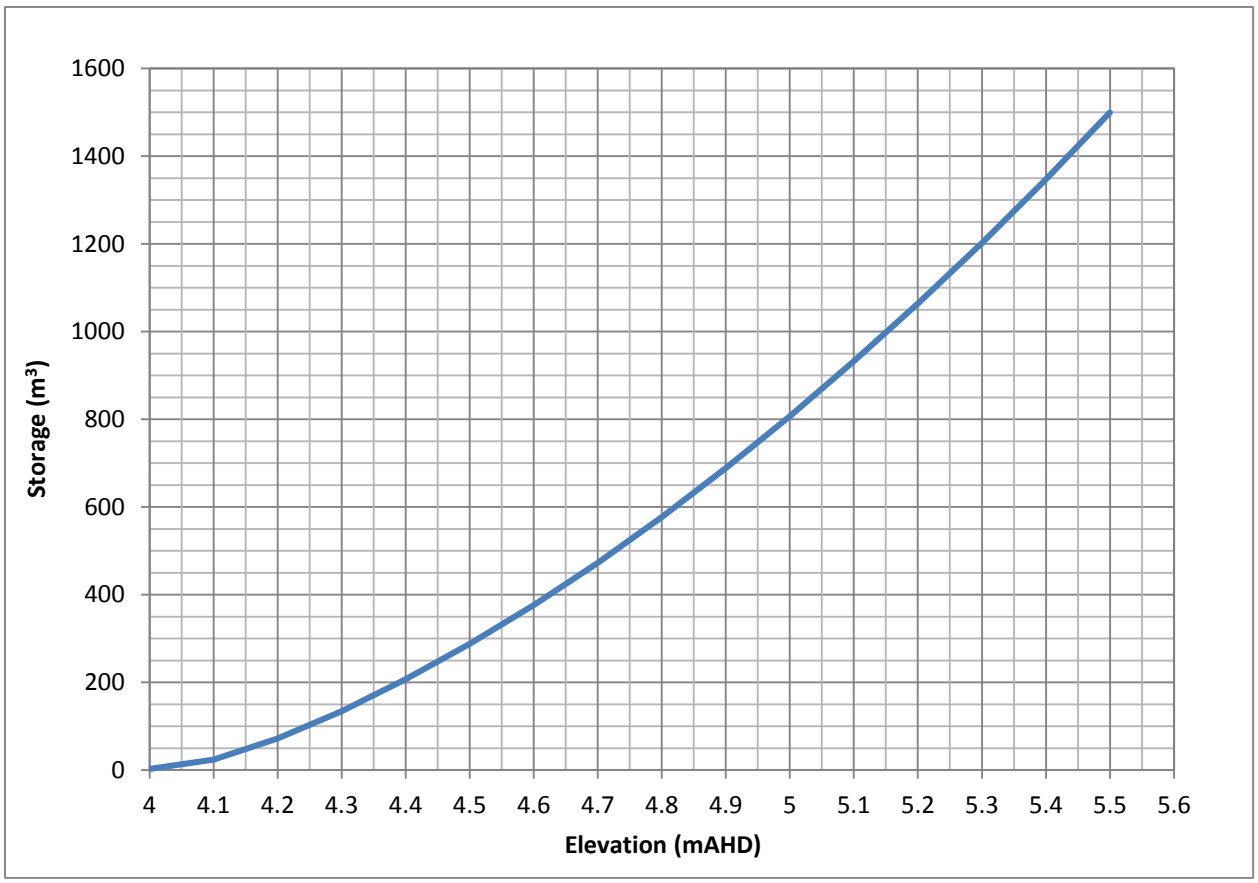
The proposed building and driveway footprint of the proposed development encroaches on existing areas of temporary floodplain storage (such as an existing detention basin and low lying parts of the site frontage. The proposed building footprint will require partial filling of these storage areas. This has the potential to increase flood levels in the Lord St low point (adversely affecting neighbouring development), unless compensatory flood storage is provided to mitigate the filling.

That is, it will be necessary for the proposal to ensure no net filling of the low point to prevent an increase in peak flood levels on existing developments. The detention basins must equal the flood storage of the existing development up to the 1% AEP level, as quantified in the storage/elevation relationship in Table 4 and
Diagram 3. The proposed development must provide equivalent or greater storage at each point on the curve.

Table 4 - Storage Requirements

Elevation (mAHD)	Storage (m^3)
3.9	0
4	3
4.1	24
4.2	72
4.3	134
4.4	207
4.5	289
4.6	377
4.7	473
4.8	577
4.9	689
5	808
5.1	933
5.2	1064
5.3	1202
5.4	1348

Diagram 3 - Elevation v Storage requirements



This could potentially be achieved by:

- Providing open swale or stormwater detention areas along the Lord Street frontage;
- Providing storage tanks (provided the invert of the tank is high enough to drain under gravity through the existing stormwater network, and low enough to accept inflow from the Lord Street sag point); and/or
- Lower portions of the driveway network to be below the 1% AEP flood level.

The civil plan prepared by Costin Roe (see Appendix B) identifies areas for provision of floodplain storage. As part of a future Development Application (DA), the proposed development including the proposed detention basins will need to be modelled in detail using a 2D hydraulic model to confirm the impact on peak flood levels.

8. REFERENCES

1. City of Botany Bay Council
Mascot, Roseberry and Eastlakes Flood Study (DRAFT)
WMAwater, 2015

2. City of Botany Bay Council
Development Control Plan
2013

3. City of Botany Bay Council
Local Environment Plan
2013

4. **Floodplain Development Manual**
NSW Government, April 2005

5. Pilgrim H (Editor in Chief)
Australian Rainfall and Runoff – A Guide to Flood Estimation
Institution of Engineers, Australia, 1987

6. Institution of Engineers Australia
Australian Rainfall and Runoff Revision Project 15 – Two-Dimensional Modelling in Urban and Rural Floodplains
November, 2012

7. Bureau of Meteorology
The Estimate of Probable Maximum Precipitation in Australia: Generalised Short Duration Method
June 2003

8. TUFLOW User Manual
Version 2013-12-AC
BMT WBM, 2011

Figures

FIGURE 1
STUDY AREA

Mill Pond

DP 1035345

Botany Road

Lord Street

DP 717692

N

Development Extent
Proposed South Precinct Development

0 25 50 100 150 200
m

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FIGURE 2
HYDROLOGICAL MODEL LAYOUT

BW_1
BW_2
N_13
N_9
N-15
N_12
N_6
N_14
N_8
N_11
N_4
N_10
P_2
N_5
P_3
N_7
P_1
N_2
N_3
F_1
P_4
N_1
R_4
S_7
F_2
R_3
R_2
S_6
R_1
S_5
S_4
S_3
S_2
S_1

N

Contours 0.25m
Subcatchments

0 25 50 100 150 200
m

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FIGURE 3
HYDRAULIC MODEL LAYOUT

N

Pits
Pipes
Boudary Conditions
Basins
Model Boundary
DEM
High : 36.248
Low : -0.795

0 25 50 100 150 200
m

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FIGURE 4
PEAK FLOOD LEVELS AND DEPTHS
1% AEP EVENT

Mill Pond

Botany Road

Lord Street

Major Contours (0.4m intervals)
Minor Contours (0.2m intervals)
Model Boundary
Development Extent

Depths (m)
< 0.15
0.15 to 0.3
0.3 to 0.5
0.5 to 1.0
1.0 to 2.0
> 2.0

0 25 50 100 150 200 m

N

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FIGURE 5
PEAK FLOOD LEVELS AND DEPTHS
PMF EVENT

Mill Pond

Botany Road

Lord Street

Major Contours (0.4m intervals)
Minor Contours (0.2m intervals)
Development Extent
Model Boundary

Depth (m)
< 0.15
0.15 to 0.3
0.3 to 0.5
0.5 to 1.0
1.0 to 2.0
> 2.0

0 25 50 100 150 200 m

N

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FIGURE 6
PEAK VELOCITIES
1% AEP EVENT

Mill
Pond

Botany Road

Lord Street

N

Development Extent
Model Boundary
Velocity (m/s)
0 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
>2.00

0 25 50 100 150 200
m

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FIGURE 7
PEAK VELOCITIES
PMF EVENT

Mill Pond

Botany Road

Lord Street

N

Development Extent
Model Boundary
Velocity (m/s)
0 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
>2.00

0 25 50 100 150 200 m

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FIGURE 8
PROVISIONAL HYDRAULIC HAZARD
1% AEP EVENT

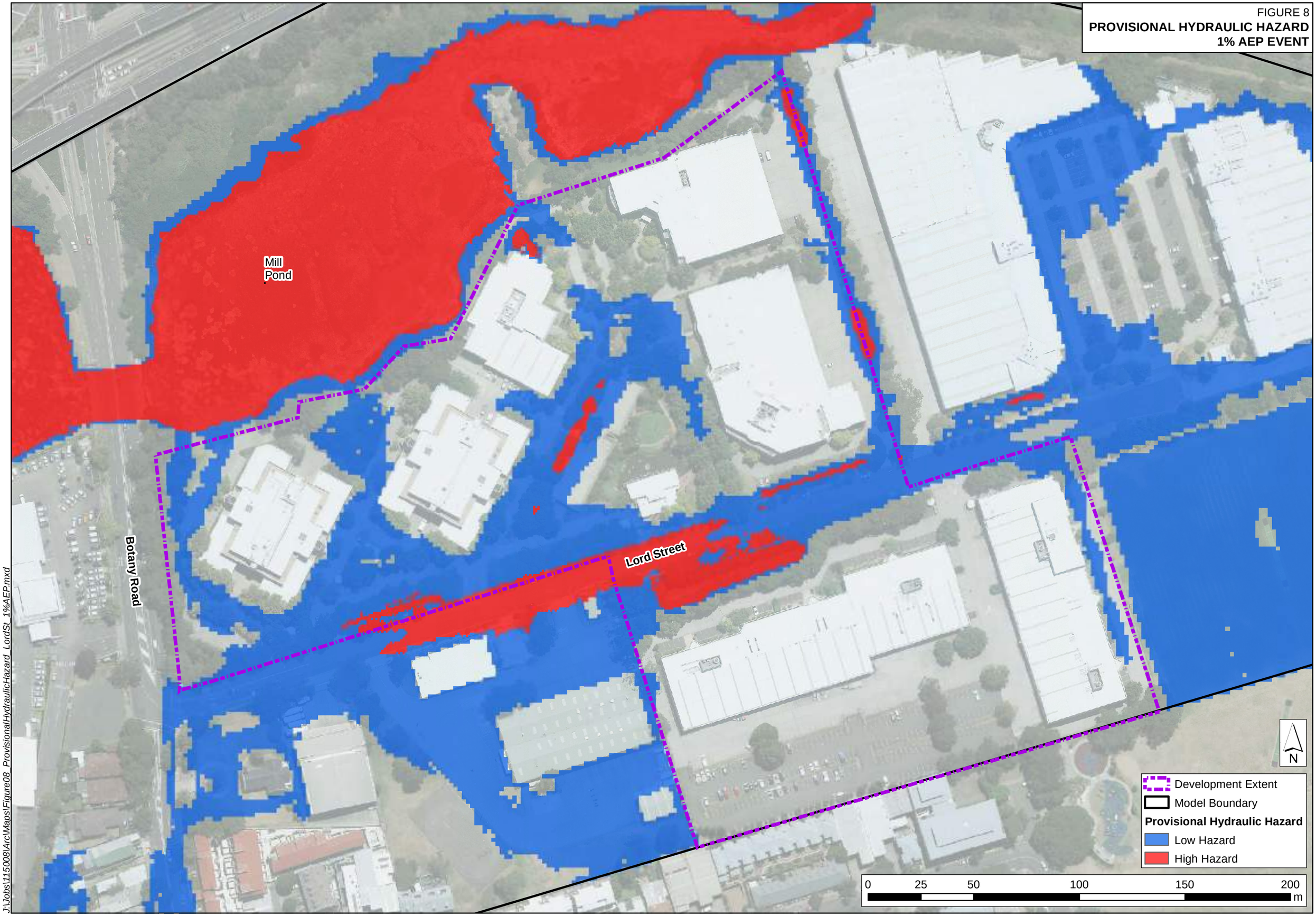

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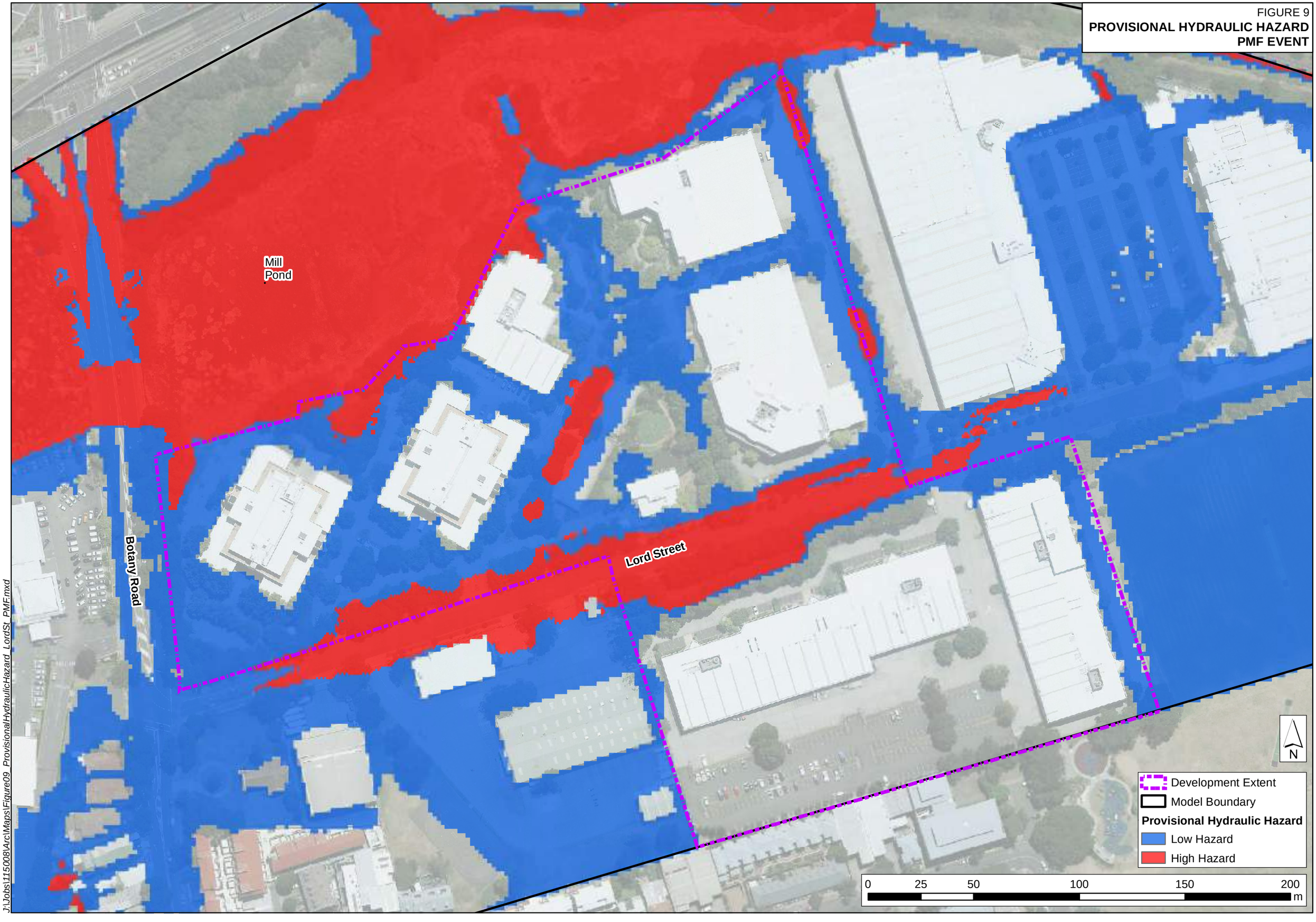
FIGURE 9
PROVISIONAL HYDRAULIC HAZARD
PMF EVENT



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Appendix A

APPENDIX A: GLOSSARY of TERMS

Taken from the Floodplain Development Manual (April 2005 edition)

acid sulfate soils	Are sediments which contain sulfidic mineral pyrite which may become extremely acid following disturbance or drainage as sulfur compounds react when exposed to oxygen to form sulfuric acid. More detailed explanation and definition can be found in the NSW Government Acid Sulfate Soil Manual published by Acid Sulfate Soil Management Advisory Committee.
Annual Exceedance Probability (AEP)	The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. For example, if a peak flood discharge of 500 m^3/s has an AEP of 5%, it means that there is a 5% chance (that is one-in-20 chance) of a 500 m^3/s or larger event occurring in any one year (see ARI).
Australian Height Datum (AHD)	A common national surface level datum approximately corresponding to mean sea level.
Average Annual Damage (AAD)	Depending on its size (or severity), each flood will cause a different amount of flood damage to a flood prone area. AAD is the average damage per year that would occur in a nominated development situation from flooding over a very long period of time.
Average Recurrence Interval (ARI)	The long term average number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods with a discharge as great as, or greater than, the 20 year ARI flood event will occur on average once every 20 years. ARI is another way of expressing the likelihood of occurrence of a flood event.
caravan and moveable home parks	Caravans and moveable dwellings are being increasingly used for long-term and permanent accommodation purposes. Standards relating to their siting, design, construction and management can be found in the Regulations under the LG Act.
catchment	The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.
consent authority	The Council, Government agency or person having the function to determine a development application for land use under the EP&A Act. The consent authority is most often the Council, however legislation or an EPI may specify a Minister or public authority (other than a Council), or the Director General of DIPNR, as having the function to determine an application.
development	Is defined in Part 4 of the Environmental Planning and Assessment Act (EP&A Act). **infill development:** refers to the development of vacant blocks of land that are generally surrounded by developed properties and is permissible under the current zoning of the land. Conditions such as minimum floor levels may be imposed on infill development. **new development:** refers to development of a completely different nature to that associated with the former land use. For example, the urban subdivision of an area previously used for rural purposes. New developments involve rezoning and typically require major extensions of existing urban services, such as roads, water supply, sewerage and electric power. **redevelopment:** refers to rebuilding in an area. For example, as urban areas age, it may become necessary to demolish and reconstruct buildings on a relatively large scale. Redevelopment generally does not require either rezoning or major extensions to urban services.
disaster plan (DISPLAN)	A step by step sequence of previously agreed roles, responsibilities, functions, actions and management arrangements for the conduct of a single or series of

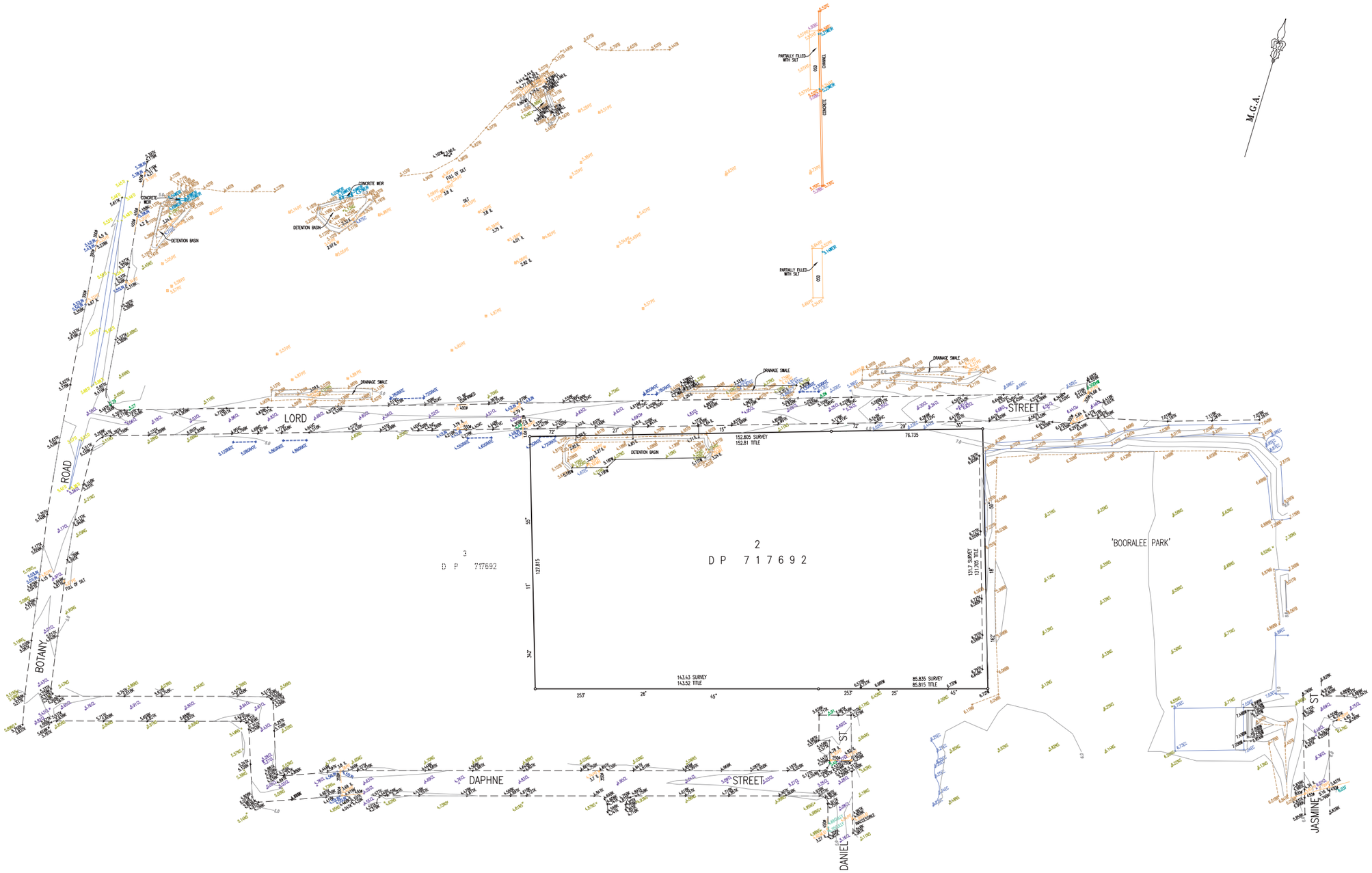
	connected emergency operations, with the object of ensuring the coordinated response by all agencies having responsibilities and functions in emergencies.
discharge	The rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second (m^3/s). Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving for example, metres per second (m/s).
ecologically sustainable development (ESD)	Using, conserving and enhancing natural resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be maintained or increased. A more detailed definition is included in the Local Government Act 1993. The use of sustainability and sustainable in this manual relate to ESD.
effective warning time	The time available after receiving advice of an impending flood and before the floodwaters prevent appropriate flood response actions being undertaken. The effective warning time is typically used to move farm equipment, move stock, raise furniture, evacuate people and transport their possessions.
emergency management	A range of measures to manage risks to communities and the environment. In the flood context it may include measures to prevent, prepare for, respond to and recover from flooding.
flash flooding	Flooding which is sudden and unexpected. It is often caused by sudden local or nearby heavy rainfall. Often defined as flooding which peaks within six hours of the causative rain.
flood	Relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunami.
flood awareness	Flood awareness is an appreciation of the likely effects of flooding and a knowledge of the relevant flood warning, response and evacuation procedures.
flood education	Flood education seeks to provide information to raise awareness of the flood problem so as to enable individuals to understand how to manage themselves an their property in response to flood warnings and in a flood event. It invokes a state of flood readiness.
flood fringe areas	The remaining area of flood prone land after floodway and flood storage areas have been defined.
flood liable land	Is synonymous with flood prone land (i.e. land susceptible to flooding by the probable maximum flood (PMF) event). Note that the term flood liable land covers the whole of the floodplain, not just that part below the flood planning level (see flood planning area).
flood mitigation standard	The average recurrence interval of the flood, selected as part of the floodplain risk management process that forms the basis for physical works to modify the impacts of flooding.
floodplain	Area of land which is subject to inundation by floods up to and including the probable maximum flood event, that is, flood prone land.
floodplain risk management options	The measures that might be feasible for the management of a particular area of the floodplain. Preparation of a floodplain risk management plan requires a detailed evaluation of floodplain risk management options.
floodplain risk management plan	A management plan developed in accordance with the principles and guidelines in this manual. Usually includes both written and diagrammatic information describing how particular areas of flood prone land are to be used and managed to achieve defined objectives.

flood plan (local)	A sub-plan of a disaster plan that deals specifically with flooding. They can exist at State, Division and local levels. Local flood plans are prepared under the leadership of the State Emergency Service.
flood planning area	The area of land below the flood planning level and thus subject to flood related development controls. The concept of flood planning area generally supersedes the "flood liable land" concept in the 1986 Manual.
Flood Planning Levels (FPLs)	FPL's are the combinations of flood levels (derived from significant historical flood events or floods of specific AEPs) and freeboards selected for floodplain risk management purposes, as determined in management studies and incorporated in management plans. FPLs supersede the "standard flood event" in the 1986 manual.
flood proofing	A combination of measures incorporated in the design, construction and alteration of individual buildings or structures subject to flooding, to reduce or eliminate flood damages.
flood prone land	Is land susceptible to flooding by the Probable Maximum Flood (PMF) event. Flood prone land is synonymous with flood liable land.
flood readiness	Flood readiness is an ability to react within the effective warning time.
flood risk	Potential danger to personal safety and potential damage to property resulting from flooding. The degree of risk varies with circumstances across the full range of floods. Flood risk in this manual is divided into 3 types, existing, future and continuing risks. They are described below. **existing flood risk:** the risk a community is exposed to as a result of its location on the floodplain. **future flood risk:** the risk a community may be exposed to as a result of new development on the floodplain. **continuing flood risk:** the risk a community is exposed to after floodplain risk management measures have been implemented. For a town protected by levees, the continuing flood risk is the consequences of the levees being overtopped. For an area without any floodplain risk management measures, the continuing flood risk is simply the existence of its flood exposure.
flood storage areas	Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation. Hence, it is necessary to investigate a range of flood sizes before defining flood storage areas.
floodway areas	Those areas of the floodplain where a significant discharge of water occurs during floods. They are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flows, or a significant increase in flood levels.
freeboard	Freeboard provides reasonable certainty that the risk exposure selected in deciding on a particular flood chosen as the basis for the FPL is actually provided. It is a factor of safety typically used in relation to the setting of floor levels, levee crest levels, etc. Freeboard is included in the flood planning level.
habitable room	**in a residential situation:** a living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom. **in an industrial or commercial situation:** an area used for offices or to store valuable possessions susceptible to flood damage in the event of a flood.
hazard	A source of potential harm or a situation with a potential to cause loss. In relation to this manual the hazard is flooding which has the potential to cause damage to the community. Definitions of high and low hazard categories are provided in the

	Manual.
hydraulics	Term given to the study of water flow in waterways; in particular, the evaluation of flow parameters such as water level and velocity.
hydrograph	A graph which shows how the discharge or stage/flood level at any particular location varies with time during a flood.
hydrology	Term given to the study of the rainfall and runoff process; in particular, the evaluation of peak flows, flow volumes and the derivation of hydrographs for a range of floods.
local overland flooding	Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.
local drainage	Are smaller scale problems in urban areas. They are outside the definition of major drainage in this glossary.
mainstream flooding	Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam.
major drainage	Councils have discretion in determining whether urban drainage problems are associated with major or local drainage. For the purpose of this manual major drainage involves: • the floodplains of original watercourses (which may now be piped, channelised or diverted), or sloping areas where overland flows develop along alternative paths once system capacity is exceeded; and/or • water depths generally in excess of 0.3 m (in the major system design storm as defined in the current version of Australian Rainfall and Runoff). These conditions may result in danger to personal safety and property damage to both premises and vehicles; and/or • major overland flow paths through developed areas outside of defined drainage reserves; and/or • the potential to affect a number of buildings along the major flow path.
mathematical/computer models	The mathematical representation of the physical processes involved in runoff generation and stream flow. These models are often run on computers due to the complexity of the mathematical relationships between runoff, stream flow and the distribution of flows across the floodplain.
merit approach	The merit approach weighs social, economic, ecological and cultural impacts of land use options for different flood prone areas together with flood damage, hazard and behaviour implications, and environmental protection and well being of the State's rivers and floodplains. The merit approach operates at two levels. At the strategic level it allows for the consideration of social, economic, ecological, cultural and flooding issues to determine strategies for the management of future flood risk which are formulated into Council plans, policy and EPIs. At a site specific level, it involves consideration of the best way of conditioning development allowable under the floodplain risk management plan, local floodplain risk management policy and EPIs.
minor, moderate and major flooding	Both the State Emergency Service and the Bureau of Meteorology use the following definitions in flood warnings to give a general indication of the types of problems expected with a flood: **minor flooding:** causes inconvenience such as closing of minor roads and the submergence of low level bridges. The lower limit of this class of flooding on the reference gauge is the initial flood level at which landholders and townspeople begin to be flooded. **moderate flooding:** low-lying areas are inundated requiring removal of stock

	and/or evacuation of some houses. Main traffic routes may be covered. **major flooding:** appreciable urban areas are flooded and/or extensive rural areas are flooded. Properties, villages and towns can be isolated.
modification measures	Measures that modify either the flood, the property or the response to flooding. Examples are indicated in Table 2.1 with further discussion in the Manual.
peak discharge	The maximum discharge occurring during a flood event.
Probable Maximum Flood (PMF)	The PMF is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation, and where applicable, snow melt, coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain. The extent, nature and potential consequences of flooding associated with a range of events rarer than the flood used for designing mitigation works and controlling development, up to and including the PMF event should be addressed in a floodplain risk management study.
Probable Maximum Precipitation (PMP)	The PMP is the greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year, with no allowance made for long-term climatic trends (World Meteorological Organisation, 1986). It is the primary input to PMF estimation.
probability	A statistical measure of the expected chance of flooding (see AEP).
risk	Chance of something happening that will have an impact. It is measured in terms of consequences and likelihood. In the context of the manual it is the likelihood of consequences arising from the interaction of floods, communities and the environment.
runoff	The amount of rainfall which actually ends up as streamflow, also known as rainfall excess.
stage	Equivalent to “water level”. Both are measured with reference to a specified datum.
stage hydrograph	A graph that shows how the water level at a particular location changes with time during a flood. It must be referenced to a particular datum.
survey plan	A plan prepared by a registered surveyor.
water surface profile	A graph showing the flood stage at any given location along a watercourse at a particular time.
wind fetch	The horizontal distance in the direction of wind over which wind waves are generated.

Appendix B



NOTE: UNDERGROUND DETENTION TANKS INACCESSIBLE

ISSUE	DATE	AMENDMENT	BY

TYPICAL NOTES:

1. ORIGIN OF LEVELS PSM 29.591, R.L.4.416 (A.H.D.)
2. BEARINGS ARE ON MGA NORTH
3. RELATIONSHIP OF IMPROVEMENTS AND DETAIL TO BOUNDARIES IS DIAGRAMMATIC ONLY AND SPECIFIC DETAILS, IF CRITICAL, WILL REQUIRE FURTHER SURVEY.
4. SERVICES SHOWN ARE BASED ON VISIBLE SURFACE INDICATORS EVIDENT AT THE DATE OF SURVEY AND THE RELEVANT SERVICE DIAGRAMS OF THE VARIOUS AUTHORITIES. ALL SERVICE MUST BE VERIFIED ON SITE PRIOR TO ANY WORK BEING UNDERTAKEN. LINKER SURVEYING PTY LTD BEAR NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THE SERVICES SHOWN HEREON.
5. KERB, EAVE, & GUTTER HEIGHTS HAVE BEEN OBTAINED BY AN INDIRECT METHOD AND ARE ACCURATE FOR PLANNING PURPOSES ONLY.
6. ADJOINING BUILDINGS AND DWELLINGS HAVE BEEN PLOTTED FOR DIAGRAMMATIC PURPOSES ONLY AND SPECIFIC DETAILS, IF CRITICAL, WILL REQUIRE FURTHER SURVEY.
7. THE DIAMETER (Ø), SPREAD (S) & HEIGHT (H) OF EACH TREE IS INDICATIVE ONLY AND SPECIFIC DETAILS, IF CRITICAL, WILL REQUIRE FURTHER SURVEY.
8. CONTOURS ARE AN INDICATION OF THE TOPOGRAPHY ONLY. SPOT LEVELS SHOULD BE USED IF DETAILED DESIGN IS TO BE UNDERTAKEN.
9. CONTOUR INTERVAL 0.5 METRE.

LEGEND OF TYPICAL CODES

AE	– ARCHITECTURAL EMBELLISHMENT	NS	– NATURAL SURFACE
AP	– ALIGNMENT PIN	OPT	– OPTUS
AWN	– AWNING	PC	– PRAM CROSSING
BLD	– BUILDING	PED	– PEDESTRIAN CROSSING
BALC	– BALCONY	PERG	– PERGOLA
BB	– BOTTOM OF BANK	PM	– PERMANENT MARK
BDY	– BOUNDARY	PP	– POWER POLE
BC	– BOTTOM OF CHANNEL	RLWY	– RAILWAY
BT	– BITUMEN	ROCK	– ROCK
BK	– BOTTOM OF KERB	RM	– REFERENCE MARK
BM	– BENCH MARK	RR	– ROOF RIDGE
BOL	– BOLLARD	RSN	– CONCRETE NAIL
BOR	– BOTTOM OF ROCK	SEW	– SEWER
BRK	– BRICK	SLH	– SEWER LAMP HOLE
BRW	– BOTTOM OF RETAINING WALL	SHR	– SHRUB
BS	– BOTTOM OF STEPS	SMH	– SEWER MANHOLE
BW	– BOTTOM OF WALL	SP	– SIGN POST
BWIN	– BOTTOM OF WINDOW	SSM	– STATE SURVEY MARK
CL	– CENTRELINE	SV	– STOP VALVE
CLD	– CONCRETE LID	SW	– STORM WATER
COL	– COLUMN	TB	– TOP OF BANK
CONC	– CONCRETE	TC	– TOP OF CHANNEL
CPORT	– CARPORT	TEL	– TELSTRA
D	– DOOR	TELP	– TELSTRA PILLAR
DD	– DISH DRAIN	TF	– TOP OF FENCE
DH	– DRILL HOLE	TG	– TOP OF GUTTER
DHW	– DRILL HOLE & WINGS	TI	– TRAFFIC LIGHT
DWY	– DRIVEWAY	TK	– TOP OF KERB
EB	– EDGE OF BITUMEN	TL	– TRAFFIC LIGHT
EBOX	– ELECTRICITY BOX	TP	– TOP OF PARAPET
EC	– EDGE OF CONCRETE	TR	– TREE
EG	– EDGE OF GARDEN	TRF	– TOP OF ROOF
EP	– EDGE OF PATH	TRK	– TOP OF ROCK
ER	– EDGE OF ROAD	TRW	– TOP OF RETAINING WALL
ELEC	– ELECTRICITY PIT	TS	– TOP OF STEPS
FCE	– FENCE	TW	– TOP OF WALL
FL	– FLOOR LEVEL	TWIN	– TOP OF WINDOW
GD	– GLASS DOOR	UE	– UNDERSIDE
GM	– GAS METER	USE	– UNDERSIDE OF EAVE
HPG	– HIGH POWERED GAS	USG	– UNDERSIDE OF GUTTER
HR	– HANDRAIL	USA	– UNDERSIDE OF AWNING
HYD	– HYDRANT	USB	– UNDERSIDE OF BEAM
IL	– INVERT LEVEL	USC	– UNDERSIDE OF CEILING
IP	– INSPECTION PIT	V	– VENT
K	– KERB	VC	– VEHICLE CROSSING
LP	– LAMP POST	W	– WINDOW
MH	– MANHOLE	WM	– WATER METER
MLID	– METAL LID		

LEGEND OF TYPICAL SERVICES

CWP	– CERAMIC STORMWATER PIPE	RW	– RECYCLED WATER
E	– UNDERGROUND ELECTRICITY CABLES	RM	– RISING MAIN
AE AO	– UNDERGROUND ELECTRICITY & OPTUS CABLES	RTA	– ROADS & MARITIME PIT
		S	– SEWER
FS	– FIRE SERVICE	SO	– SEWER OUTFALL
G	– GAS LINE	ST	– TANKED TRENCH
GE	– GAS LINE & ELECTRICITY CABLES	SW	– STORM WATER
NG	– NATURAL GAS LINE	SWC	– STORMWATER CREEK
OH	– OVERHEAD CABLES	T	– TELSTRA CABLES
OPT	– OPTUS CABLE	TC	– TELSTRA & C&W CABLES
PE	– PRIVATE ELECTRICITY	U	– UNKNOWN SERVICE
PS	– PRIVATE SEWER	V	– VERIZON CABLES
PW	– PRIVATE WATER	W	– WATER SUPPLY
		WM	– WATER MAIN

1. ALL UNDERGROUND SERVICE INFORMATION INCLUSIVE OF GENERAL POSITION AND SURFACE COVER DEPTHS NOTED ON THE PLAN ARE APPROXIMATELY ONLY.
2. ALL UNDERGROUND SERVICE INFORMATION HAS BEEN COMPILED FROM SERVICE AUTHORITY PLANS PROVIDED BY THE AUTHORITIES.
3. THE LOCATION OF SERVICES BETWEEN SURVEYED POINTS (AS INDICATED) HAVE BEEN SHOWN DIAGRAMMATICALLY ONLY USING THE SERVICE DIAGRAMS AS PROVIDED. THE EXACT LOCATION OF THESE SERVICES BETWEEN THE SURVEYED POINTS MUST BE VERIFIED PRIOR TO ANY EXCAVATION OR PILING. NO WARRANTY IS GIVEN AGAINST THE POSSIBILITY OF THE EXISTENCE OF FURTHER UNCHARTED SERVICES.
4. ALL CONTRACTORS, TRADESMEN, BUILDING & PROJECT CONSULTANTS MUST CONTACT THE VARIOUS AUTHORITIES, IN ACCORDANCE WITH STANDARD "DIAL BEFORE YOU DIG" PROCEDURES PRIOR TO UNDERTAKING ANY WORKS WITHIN THE VICINITY OF THE SERVICE LINES TO IDENTIFY THE POSITION OF THE SERVICE LINES.

Liability limited by a scheme approved under Professional Standards Legislation

REDUCTION RATIO 1 : 750

0 10 20 30 40 50

LENGTHS ARE IN METRES

CLIENT: DEXUS PROPERTY GROUP

TITLE No: 2/717692	REF: 160336
DATUM: A.H.D.	ISSUE: 1
DATE OF SURVEY: 7.04.15	ISSUE DATE: 16.04.15
SURVEYOR: MA	SHEET SIZE: A1
DRAFTER: PH	SHEET 1 OF 1 SHEETS

PLAN OF DETAIOL & LEVELS AT No 11-13 LORD STREET BOTANY

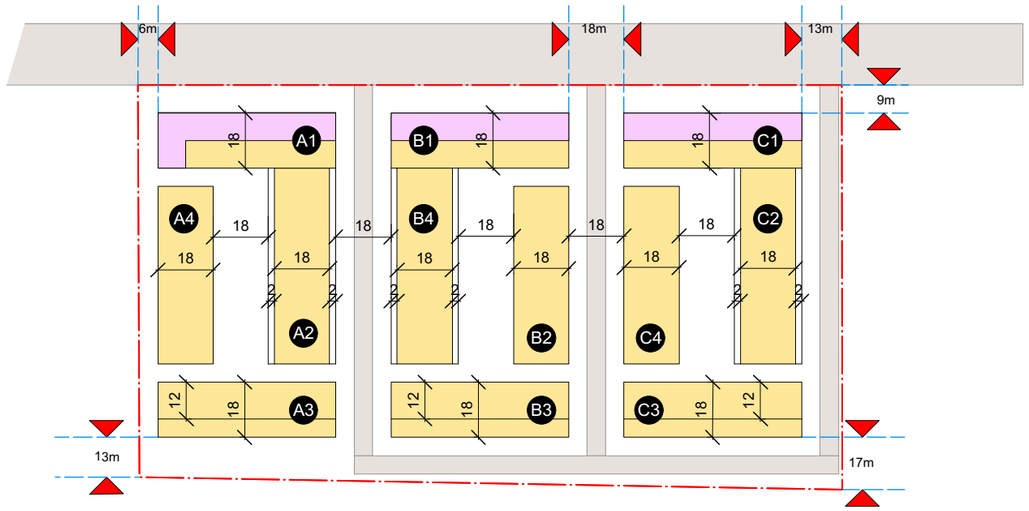
LINKER SURVEYING

Suite 301, Level 3, 55 Holt Street
Surry Hills NSW 2012
PO Box 1807
Strawberry Hills NSW 2012
t: (02) 9212 4655
f: (02) 9212 5254
email: linker@linkersurveying.com.au
web site: www.linkersurveying.com.au

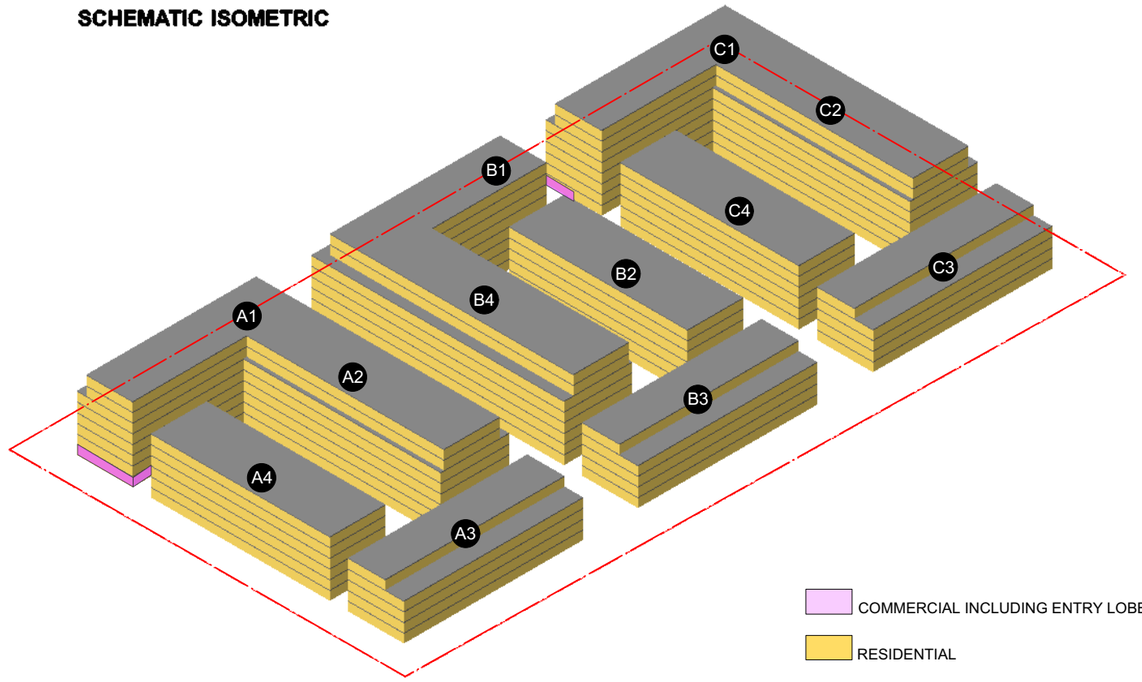
X:\SURVEY\160336 11-13 LORD ST BOTANY\160336_DETAIL.DWG

PLANNING PROPOSAL MASTERPLAN (12/05/2015)

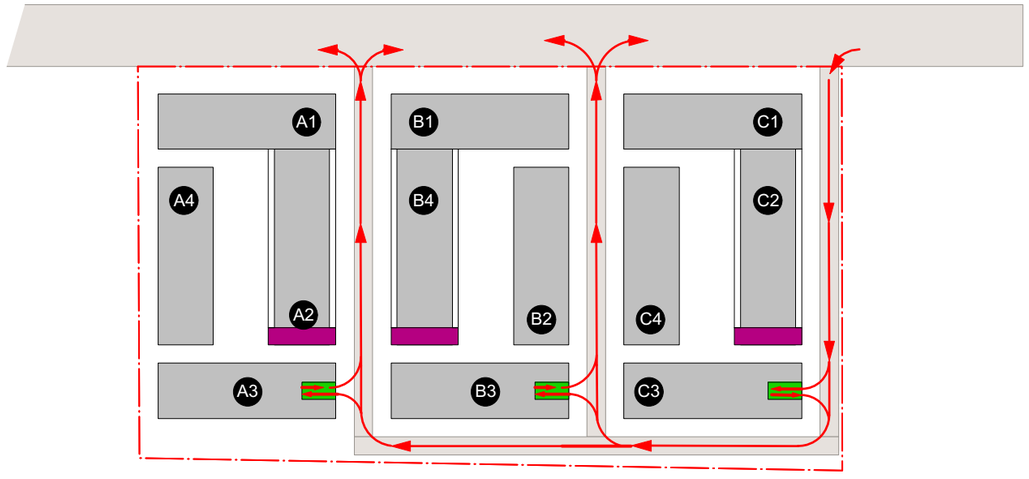
SCHEMATIC CONCEPT PLAN



SCHEMATIC ISOMETRIC



VEHICULAR CIRCULATION DIAGRAM



MASTERPLAN DETAILS

TOTAL GFA: 62,912 m^2

SITE AREA: 29,770 m^2

FSR: 2.11:1

NOTES

- MIXED USE
- CASA HEIGHT COMPLIANT
- BUILDING HEIGHTS COMPLY WITH MAX RL=AHD 33.00

TONY CARO ARCHITECTURE PTY LTD
LEVEL 1, 2 GLEN ST MILSONS POINT
NSW 2061 SYDNEY AUSTRALIA
T 99649100 F 99649133
WWW.TONYCAROARCHITECTURE.COM.AU

TONYCAROARCHITECTURE

LAKES BUSINESS PARK SOUTH PRECINCT

DEXUS

PLANNING PROPOSAL MASTERPLAN

DWG NO.	**SK_002**
PROJECT No.	**1503**
PLOT DATE	**12/5/15**
SCALE	**1:2000 @ A3**

PLANNING PROPOSAL MASTERPLAN (12/05/2015)

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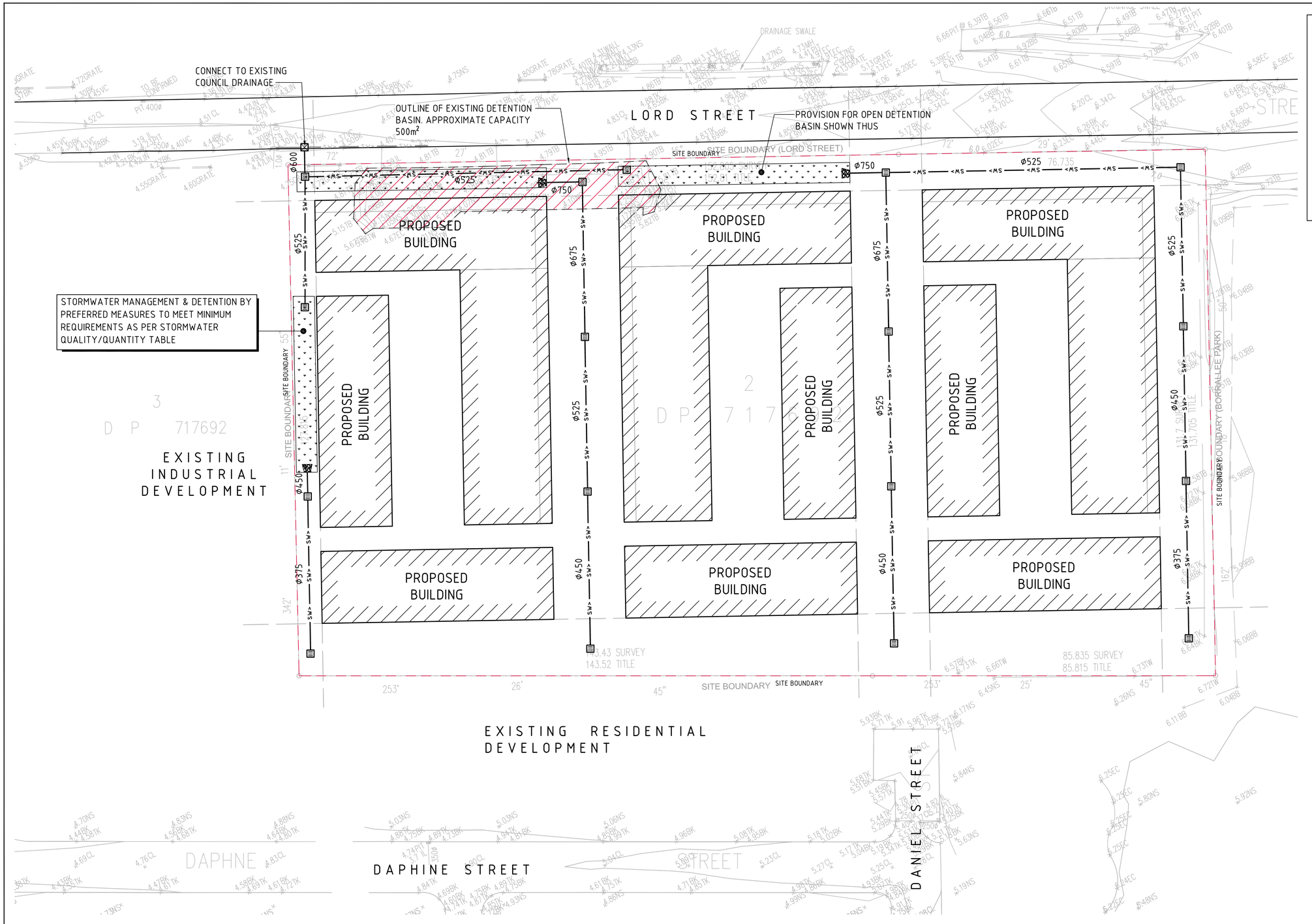
TONYCAROARCHITECTURE

LAKES BUSINESS PARK SOUTH PRECINCT

DEXUS

GROUND FLOOR PLAN

DWG NO.	**SK_003**
PROJECT No.	**1503**
PLOT DATE	**12/5/15**
SCALE	**1:1000**



CONCEPT STORMWATER LAYOUT
SCALE 1:500

LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY LINKER SURVEYING DATED 16.04.15

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- SW> DRAINAGE LINE
- DENOTES STORMWATER MANAGEMENT BASIN AREA

STORMWATER MANAGEMENT REQUIREMENTS

STORMWATER QUALITY

GROSS POLLUTANTS	90%
TOTAL SUSPENDED SOLIDS (TSS)	80%
TOTAL PHOSPHOROUS (TP)	55%
TOTAL NITROGEN (TN)	40%

REDUCTIONS ARE PRESENTED IN TERMS OF ANNUAL PERCENTAGE POLLUTANT REDUCTIONS ON THE DEVELOPED CATCHMENT.

STORMWATER QUANTITY

STORMWATER RUNOFF GENERATED FOR ALL STORM DURATIONS UP TO AND INCLUDING THE 100 YEAR ARI WILL BE DETAINED TO THE PRE-DEVELOPED 5 YEAR ARI STORM FLOW.
CAPACITY OF EXISTING DETENTION BASIN & LANDSCAPE STORAGE TO BE PROVIDED IN NEW OPEN DETENTION BASIN TO ENSURE NO CHANGE IN THE OVERLAND FLOW OR FLOODING FOLLOWING DEVELOPMENT AS PER THE BELOW STORAGE TABLE.

STORAGE TABLE

ELEVATION (m AHD)	STORAGE (m^3)
3.9	0
4.0	3
4.1	24
4.2	72
4.3	134
4.4	207
4.5	289
4.6	377
4.7	473
4.8	577
4.9	689
5.0	808
5.1	933
5.2	1064
5.3	1202
5.4	1348

NOTE:

DRAWINGS TO BE READ IN CONJUCTION WITH REPORT C09759.01-03.rpt BY COSTIN ROE CONSULTING.
THESE DRAWINGS ARE CONCEPTUAL IN NATURE & PREPARED FOR THE SOLE PURPOSE OF DEMONSTRATING THAT STORMWATER MANAGEMENT FOR A PROPOSED MIXED USE DEVELOPMENT IS ACHIEVABLE.

5m 0 10 20 30 40 50m
SCALE 1:500 AT A1 SHEET SIZE

FOR INFORMATION

AMENDMENTS	DATE	ISSUE
ISSUED FOR INFORMATION	11.05.15	D
DRAWING REVISED AS CLOUDED	30.04.15	C
DRAWING REVISED AS CLOUDED	24.04.15	B
ISSUED FOR REVIEW	22.04.15	A

ARCHITECT
TONY CARO ARCHITECTURE
LEVEL 1, 2 GLEN STREET
MILSONS POINT, NSW 2061

CLIENT
DEXUS PROPERTY GROUP

PROJECT
LAKES BUSINESS PARK - SOUTH PRECINCT
LORD STREET
BOTANY, NSW 2019

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
MW	RB	21.04.15		A1	AS SHOWN	C09759.01 - SKC01

Costin Roe Consulting Pty Ltd.
Consulting Engineers ACN 003 696 448
Level 1, 8 Windmill Street
Walsh Bay, Sydney NSW 2000
Tel: (02) 9251-7699 Fax: (02) 9241-3731
email: mail@costinroe.com.au ©

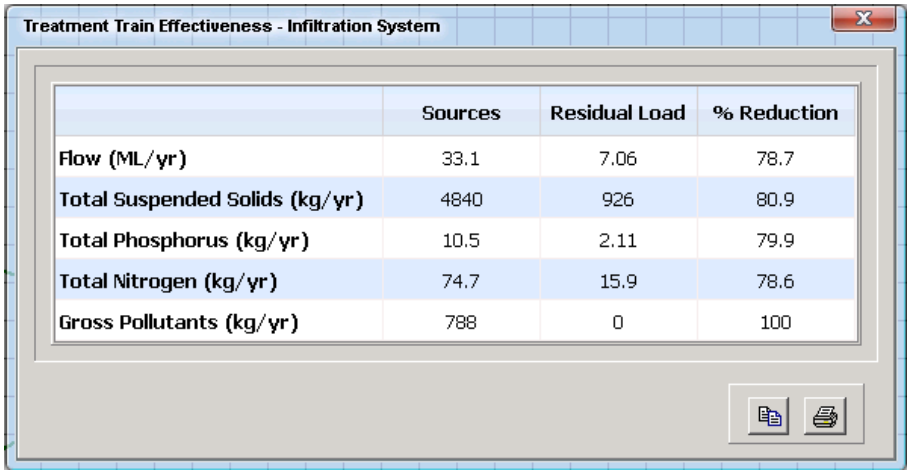
CostinRoe Consulting
Value in Engineering and Management

DRAWING TITLE
CONCEPT STORMWATER LAYOUT

DRAWING No C09759.01 - SKC01
ISSUE D

Appendix C

MUSIC Model Results



	Sources	Residual Load	% Reduction
Flow (ML/yr)	33.1	7.06	78.7
Total Suspended Solids (kg/yr)	4840	926	80.9
Total Phosphorus (kg/yr)	10.5	2.11	79.9
Total Nitrogen (kg/yr)	74.7	15.9	78.6
Gross Pollutants (kg/yr)	788	0	100

Appendix D

Bayside Council Pre-DA Minutes

15 March 2018

15 March 2018

Bayside Council
Serving Our Community

Dexus Projects
Jonathan Herb
264-278 George Street
Sydney NSW 2000

Dear Jonathan,

PREMISES: 11-13 LORD STREET, BOTANY

PROPOSAL: Mixed Use Development

PRE-DEVELOPMENT APPLICATION MEETING

We refer to the Pre-Development Application Meeting (Pre-DA) held on 23 February 2018, when a proposal for a development at the above property was discussed with Council staff.

The proposed development is for the proposed commercial, light industrial, food and drink premises, childcare, indoor recreation and neighbourhood shops.

Based on a preliminary assessment of the plans and information submitted, the following comments are provided:

(1) PLANNING CONTROLS

The proposal will need to comply with all the relevant controls, and in particular, the provisions contained within:

- Environmental Planning and Assessment Act 1979
- State Environmental Planning Policy (Infrastructure) 2007
- Botany Bay Local Environmental Plan (BBLEP) 2013
- Botany Bay Development Control Plan (BBDCP) 2013

Environmental Planning and Assessment Act 1979

Designated Development - Applications for breweries and distilleries are designated development where the development will produce alcohol or alcohol products:

(a) that have an intended production capacity of more than 30 tonnes per day or 10,000 tonnes per year, or

(b) that are located within 500 metres of a residential zone and are likely, in the opinion of the consent authority, to significantly affect the amenity of the neighbourhood by reason of odour, traffic or waste, or

(c) that release effluent or sludge:
(i) in or within 100 metres of a natural waterbody or wetland, or
(ii) in an area of high watertable, highly permeable soils or acid sulphate, sodic or saline soils.

Botany Bay Local Environmental Plan (BBLEP) 2013

a) Zoning

The proposal seeks consent for a mixed development including commercial, light industrial, childcare, food and drink premises, retail, boutique brewery and an indoor recreation facility. The site is located within the B7 Business Park zone.

Retail premises are prohibited in the zone. We note industrial retail outlets must only relate to only any item made on site.

b) Height of the Building

The maximum height for the subject site is 22 metres under the BBLEP 2013.

The building will comply as it is approximately 12.1 metres.

c) Floor Space Ratio

The maximum FSR for the subject site is 1:1 under the BBLEP 2013.

The FSR calculations provided in the statement indicate compliance however a detailed floor space area calculation diagram would be needed as part of any application.

d) ANEF

The site is affected by Aircraft Noise of 20-25 and 25-30, the change in contour is in proximity to the proposed childcare centre. An aircraft noise report is required to be submitted with any future application identifying each of the uses adopting the higher level of aircraft noise exposure.

Sydney Airports – The site is located in an area where buildings over 15 metres require a wind turbulence report to ensure that the development does not impact on the safe operation of the airport.

e) Contamination

The site is undergoing a change of use on a portion of the site that will be used as a child care centre. A risk based assessment that reflects any change of use to a more sensitive exposure and the area of the new building and basement excavation is required. It is expected that intrusive sampling of soil and/or groundwater will be undertaken to allow a clear conclusion of site suitability at the DA assessment stage.

f) Acid Sulfate Soils

The site is within Class 4 Acid Sulfate Soils Area. It is noted that there will be excavation for a basement level proposed on the development that is greater than 2 metres from ground level as such an Acid Sulfate Soils Management Plan is warranted.

g) Groundwater

The site is located within a groundwater management zone. Therefore, any excavation may intrude the groundwater and will require construction dewatering and relevant permits from

Water NSW. As excavation is proposed, a geotechnical investigation is required to be submitted to determine the depth of groundwater on the site.

Points of Interest

Traffic and Parking

Traffic generation – is likely to be key issue with this application. Identification of each of the uses and associated traffic generation and generation times will be beneficial to the assessment.

Vehicle access to Daniel Street - supported in principle dependent upon impacts to surrounding neighbourhood being acceptable. The Daniel Street connection will need to consider traffic and pedestrian safety and traffic calming devices will be required further towards Daniel and Daphne Street, this is particularly important if the connection is used for ingress and egress. Access will be restricted to passenger vehicles, subject to further assessment by the Local Traffic Committee.

Cumulative Impacts of other users need to be considered – including the impact on the intersection of Lord Street and Botany Road.

Parking - On Street parking availability on weekends will support likely peak periods.

Additional spaces on Dexus Land on the northern side of Lord Street may be considered for surplus parking outside of normal business hours.

Plan of Management is required to address use/shift/demand for spaces.

Height Bulk and Scale

Roof Form - The extent of the roof form creates a visual impact from the broader catchment, break up the roof with various roof forms to provide relief and better articulation and reduce the dominance of the structure. In other regards it is noted that the height and FSR are commensurate with the current development standards for the site.

Shadow and Solar Analysis – Consideration of approved masterplan overshadowing, maintain 50% of communal open space – Guided by the Planning principle and control for solar access to neighbours – Compare to existing shadowing.

Trees – The trees provide immediate amelioration – removal will need to be supported by an Arborist report, recommend any removal is compensated with large specimens as replacement planting.

The use and scale of retail components

Retail uses – whilst not being permissible appear to be of an extent that it can be categorised as Neighbourhood shops, industrial retail etc, noting LEP requirements for the definition.

Industrial unit sizes – offices to remain ancillary use, otherwise there is likely to be an issue with parking and/or permissibility

Brothel – being located 500 metres from residential is a trigger for designated development where in the opinion of the consent authority, the development significantly affects the amenity of the neighbourhood by reason of odour, traffic or waste, need to demonstrate how the development does not meet these triggers.

Industrial Retail - showrooms must be for goods manufactured on site which involves some kind of process undertaken on site.

Interface with residential development along the southern boundary of the site

Well setback, need to be cognitive of light spill at night and noise, otherwise the interface has been considered in previous discussion.

Interface with Boralee Park

To provide pedestrian connectivity – involves works on Council land to which strategic planning and Property departments should be consulted. In this regard please contact the Manager of Property moving forward in consideration of formal works on Council's land. If lodgement of an application is imminent it is recommended that any works on Councils land form separate discussions.

Reports

In addition to the reports listed in your letter an odour report is require. Traffic reports and noise reports should specifically address the uses proposed in particular that of the child care centre. A wind report is required in consideration of wind turbulence impacts on the Airport operations.

It is noted that any positive recommendation is to include a hazardous materials assessment.

Botany Bay Development Control Plan

Consideration of the following Parts of the DCP are relevant in this instance –

3A – Car Parking

3G Stormwater Management

3H Sustainable Design

3I Crime Prevention, Safety & Security

3J Aircraft Noise & OLS

3K Contamination

3L Landscaping & Tree Management

3M Natural Resources

3N Waste Minimisation & Management

6 – Employment Zones - Lord Street Business Park Precinct and general provisions

7C – Child Care facilities and SEPP Child Care

7G Licensed & Late-night Trading Premises

7H Neighbourhood Shops

7J Uses Involving the Preparation & Storage of Food

8 – Character precincts – Noting the development site falls within the Botany catchment

Development Engineering

The whole development must comply with Botany DCP Part 3A for all vehicle, bicycle and motor cycle parking, the current requirements are as follows:

Land Use	Required spaces
Light Industry	2 spaces; or 1 space / 65m² GFA, whichever is greater; plus 1 space / 40m² GFA of ancillary office
Food and drink premises- cafe	For developments with a gross floor area greater than 100m2, the parking provision is to be provided as follows: 1 space / 2 employees; plus 1 space / 3 seats (internal and external), or 1 space / 10m² GFA, whichever is greater For developments with a gross floor area less than 100m2, the parking provision recommended above is desirable, however applicants can take into account car parking available in adjacent parking areas, including on-street and its time of usage. Alternatively a parking assessment based on survey of similar sized developments can be utilised.

Food and drink premises- brewery (pub)	1 space / 2 employees, plus 1 space / 5m² GFA
Office premises (commercial)	1 space / 40m² GFA
Storage units (warehouse)	2 spaces; or 1 space / 300m² GFA, whichever is greater; plus 1 space / 40m² GFA of ancillary office
Recreation facilities (indoor)	a) Squash court 3 spaces / court b) Indoor swimming pool 1 space / 10m² pool area; plus 1 space / 2 employees c) Gymnasium *Within 400m radius of railway station or 200m radius of a public bus-stop (minimum frequent two bus routes);* 1 space / 25m² GFA *Any other locations.* 1 space / 10m² GFA d) Bowling alley 3 space / alley e) Dance Studio 1 space/ 25m² GFA f) Others Parking Assessment based on survey of similar developments is required.
Child care	Parking Assessment based on survey of similar developments is required. However, as a minimum: 1 space / 2 employees; plus 1 space / 5 children; plus 1 pick-up and set-down space / 20 children

Retail (Industrial outlet)	1 space / 40m² GFA

Loading and unloading facilities are must comply with Botany DCP Part 3A (Table 2) as follows:

Land Use	Minimum number of service bays required				
Business premises, Office premises	GFA (m²)	For Courier Van	For SRV	For MRV	
	0 - 999	1	-	-	
	1,000 – 2,499	1	-	1	
	2,500 – 3,999	2	-	1	
	4,000 – 5,999	3	1	1	
	6,000 – 7,999	4	1	1	
	8,000 – 9,999	4	2	1	
	10,000 – 14,999	4	2	2	
	15,000 – 19,999	5	2	3	
	20,000 and over	6	2	3 + 1 / 8,000 m² GFA	
Retail premises	*GFA (m²)*	*For Courier Van*	*For SRV*	*For MRV*	*For AV*
	0 - 199	-	1	-	-
	200 – 599	1	-	1	-
	600 – 999	1	1	1	-
	1,000 – 1,499	2	1	1	-
	1,500 – 1,999	2	2	1	-
	2,000 – 2,799	2	2	2	-
	2,800 – 3,599	2	2	2	1
	3,600 – 4,399	3	2	2	1
	4,400 – 6,499	3	2	2	2
	6,500 – 8,499	4	2	2	2
	8,500 – 11,499	4	3	2	2
	11,500 – 14,749	5	3	3	2
	14,750 – 17,999	5	3	3	2
	18,000 – 20,999	6	3	3	2

	21,000 – 23,999	6	9	3	3
Industrial	a) < 8000 m² GFA 1 service bay (for MRV or larger) / 800 m² GFA b) 8000 m² GFA and above 10 service bays (for MRV or larger); plus 1 service bay (for MRV or larger) / 1,000 m² GFA (Note: Subject to the largest vehicle accessing the site, the service bays shall be designed to accommodate the largest vehicle accessing the site)				

Any deviation from these required parking number must be supported by sound arguments and justification within the traffic report.

In relation to the design of the waste collection truck parking area, the design is to ensure that the waste collection truck can access and exit the site in a forward direction. The swept path analysis of the garbage truck shall be provided.

Parking facilities shall be designed in accordance with Australian Standard AS/NZS 2890.1, AS/NZS 2890.2 & AS2890.6, except as varied by Council's technical specifications for design of parking facilities.

The following information must be provided to fully assess the parking numbers for the development:

- Specified use of each of the areas along with GFA and any internal dual use space.
- Number of children and staff for the child care facility.
- Clearly numbered vehicle bays.
- Cross section of all ramps with dimensions, grades and height clearances shown.

TRAFFIC

The following information is required;

- A Traffic engineer shall prepare a traffic report and shall include the following but not limited to:
    - Details of site access, road signs, pedestrian safety etc
    - Signal/warning system and passing bay requirement (if required)
    - Parking & manoeuvring of vehicles. The report should address adequacy of site and parking layout for the largest vehicle to be accessing the site.
    - Traffic consultant shall certify the design and layout of the car parking area complies with the Australian Standard.
    - Construction traffic management concept plan.

- Details of the Traffic consultant and author of the report must be included in the traffic report

- Swept path analysis (using Autoturn software or similar) shall be provided (for B85 vehicle) for all parking spaces and demonstrate areas required to manoeuvre vehicles in and out from the site and parking spaces in a forward direction. A 300mm clearance shall be provided either side of the turning path.
- A certificate from a qualified traffic engineer shall be provided demonstrating compliance with Australian Standard for parking layout and access to the site.
- A longitudinal profile of the driveway shall be provided incorporating the driveway ramp crest level protecting the basement from flooding as per any flood advice letter.
- A traffic study is required to be undertaken for the development to assess the traffic impacts of the development. The study shall be undertaken in accordance with the RTA *Guide to Traffic Generating Developments* and shall include, but not be limited to, the following topics:

    - Existing site conditions
    - Route assignment, traffic flows and traffic generation (existing & future)
    - Intersection performance and levels of service (existing and future)
    - Traffic safety
    - Parking demand.
    - The peak parking impact from demand as listed in the RTA Guide to Traffic Generating Development.
    - Access requirements – details shall be provided for existing access and proposed access for maximum safety of pedestrian and vehicles
    - Traffic and parking survey shall be done on peak period (not in school holidays) – two/Three typical days
    - Traffic report shall also include cumulative traffic and parking impact of all other adjacent schools and childcare facilities.
    - Traffic engineer to certify the parking layout, access and visibility requirement for the proposed basement in accordance with AS/NZS2890.1:2004 & AS2890.6:2009.
    - Impact of the use of Danial Street for access to/from the development.

STORMWATER DRAINAGE

The development will need to provide on-site infiltration and/or on-site detention (OSD) system and must comply with Botany DCP Part 3G and Part 10 - Stormwater Management Technical Guidelines

The following must be provide with the submitted documents:

- A detailed Stormwater Management Plan and design certification which must be prepared by an accredited professional. The following is considered to be acceptable accreditation for the purpose of the stormwater design and certification:
    - Professional Civil Engineer (MIEAust) (Engineers Australia);
    - NPER in Civil Engineering;

- Surveyors Certificate of Accreditation in On-Site Detention and Drainage Design (Institute of Surveyors NSW and the Association of Consulting Surveyors NSW);
- Stormwater Register (Association of Hydraulic Services Consultants Australia);
- Accreditation as a certifier under the Environmental Planning and Assessment Act 1979 in the relevant discipline.

- Geotechnical information in accordance with Botany DCP Part 10 Section 5 for any on-site infiltration system;
- Detailed calculations and parameters used to define the storage volumes and discharge rates of each on-site infiltration and/or on-site detention (OSD) system;
- Calculations showing capacity of the internal drainage systems; overflow structures and overland flow paths/ floodway (if applicable); Location of any Council's drainage easement and/or drainage system within and adjacent to the site;
- Structural certification of the on-site infiltration and/or OSD systems;
- Design plans and details including:
  - Site layout;
  - Existing site contours and final design levels;
  - Catchment area draining to each on-site infiltration and /or OSD system;
  - Finished floor levels and footprints of the proposed development/ structures;
  - Location and size of the internal and external drainage systems, rainwater re-use system, on-site infiltration and/or OSD systems;
  - Levels and location of discharge points for each infiltration and /or OSD system;
  - Maximum water surface levels in each storage;
  - Overflow structures and surcharge/overflow paths;
  - Locations and details of each discharge control unit (if any);
  - Locations and details of the pump-out system (if any);
  - Location and extent of any overland flow path/ floodway through the site (if any);
  - Location and type of pollution control devices; and
  - Cross–sections details of the rainwater tanks, on-site infiltration and/or OSD systems

WATER QUALITY

The site is sufficiently large to warrant the use of a Water Sensitive Urban Design Approach (WSUD) to the design of the drainage system. Botany DCP requires significant developments to conform the targets for the stormwater pollution reduction and to justify the target by an analysis using MUSIC. The Botany DCP also outlines the stormwater reduction targets for Commercial Development as followed:

Stormwater Pollutants	Commercial Development
Gross Pollutant	90%
Total suspended solids (TSS)	80%
Total Phosphorus (TP)	55%
Total Nitrogen (TN)	40%

Generally, WSUD involves recognition of a need to:

a. Protect and enhance natural water systems within urban developments.
b. Integrate stormwater treatment into the landscape.
c. Protect water quality. (runoff from carparking area)
d. Reduce runoff and peak flows.
e. Conserve water by reducing demand on potable water supplies.

FLOODING

Council mapping information shows that the site is affected by the 1% flooding event.

Further enquiries should be directed to Council's Flood Engineer.

Any correspondence showing the 1% flood level is to be included in the documentation. This level is to be incorporate in the design of the development along with any Botany DCP controls and requirements pertaining to flood affected developments.

GEOTECHNICAL

There are built structures, (including public assets) which may be in the zone of influence of the proposed works and excavations on this site. A qualified practicing geotechnical engineer must prepare a geotechnical report demonstrating that the proposed excavation & construction method and the configuration of the buil structures wil have no adverse impact on any surrounding property and infrastructure.

The report must include an investigation to determine the design parameters appropriate to the specific development and site. This would typically include:

- Locaton & level of nearby foundations/footings (site and neighbouring)
- Proposed method of excavation
- Permanent and temporary support measures for excavation
- Potential settlements affecting footings/foundations
- Ground-water levels & site classification
- Batter slopes
- Potential vibration caused by method of excavation
- Tanking and waterproofing the basement structures
- De-watering including seepage and offsite disposal rate (if any), site drainage issue (if any)
- The geotechnical engineer to comment on proposed stormwater drainage design for the basement area, mainly on AGG line connections / permanent dewatering and a tanked basement structure.
- Any development application involving a building structure that is below ground level, such as a basement or below ground garage, will require a borehole to locate the water table level.

WASTE COLLECTION

The waste collection services to be provided to the premises in accordance with Council's Technical Specification - Waste minimisation and management.

Depending on Council's agreement on the waste collection services to be provided to the premises, if onsite waste collection is to be carried out, arrangement has to be made for the garbage collection vehicle to be completely within the site while doing so and to be able to leave in a forward direction. Please refer to Council's Technical Specification Waste minimisation and management for more details.

Section 94A Contributions

The proposal is a direct form of development that will trigger the payment of Section 94 Contributions in accordance with the City of Botany Bay Section 94A Plan 2016.

Design Review Panel

It is noted that the application will be required to be assessed by Councils Design Review Panel. You have indicated that you seek this to be undertaken as part of the DA Process. This can add additional time to the assessment of the application. Please provide relevant documentation and fees as part of the lodgement of the application.

(2) CONCLUSION

Based on the above, Council can see the quality and benefits of the proposed development and careful consideration of the traffic generation and operational issues to avoid or minimise impacts on the neighbourhood are required.

DISCLAIMER

The aim of Pre-Development Application meeting is to provide a service to people who wish to obtain the views of Council staff about the various aspects of a preliminary proposal, prior to lodging a development application (DA). The advice can then be addressed, or at least known, prior to lodging a DA. This has the following benefits:-

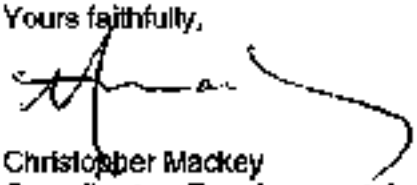
- *Allowing a more informed decision about whether to proceed with lodging a DA; and*
- *Allowing matters and issues to be addressed, especially issues of concern, prior to lodging a DA. This could then save time and money once the revised DA is lodged.*
  All efforts are made to identify issues of relevance and likely concern with the preliminary proposal. However, the comments and views in this letter are based only on the plans and information submitted for preliminary assessment and discussion at the pre-development application meeting. You are advised that:-
- *The views expressed may vary once detailed plans and information are submitted and formally assessed in the development application process, or as a result of issues contained in submissions by interest parties;*
- *Amending one aspect of the proposal could result in changes which would create a different set of impacts from the original plans and therefore*

require further assessment and advice; and

- *The comments do not bind Council officers, the elected Council members or other bodies beyond Council, in any way whatsoever.*

Should you have any questions, please contact Lincoln Lawler on 9562 1730 during business hours.

Yours faithfully,



Christopher Mackey
Coordinator, Development Assessment
CITY FUTURES