

CIVIL ENGINEERING REPORT FOR STATE SIGNIFICANT DEVELOPMENT APPLICATION

FIFTEENTH AVENUE COMMERCIAL PRECINCT (SSD 6407): CNR. FIFTEENTH AVENUE & TWENTY- SEVENTH AVENUE WEST HOXTON NSW

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TABLE OF CONTENTS

1	INTRODUCTION	5
2	SITE CHARACTERISTICS	6
2.1	Location	6
2.2	Topography & Description	7
2.3	Geotechnical and Geological Profile	7
2.4	Proposed Development	8
3	INFRASTRUCTURE SERVICES	9
3.1	Potable Water (drinking water)	9
3.2	Waste Water (sewer)	10
3.3	Power	10
3.4	Natural Gas	11
3.5	Telecommunications	11
4	ROADS AND TRANSPORTATION	12
4.1	Introduction	12
4.2	Road Widths	12
4.3	Road Alignments	13
4.4	Road Pavements	13
4.5	Pedestrian Facilities and Transportation	13
5	SITE WORKS	14
5.1	Bulk Earthworks	14
5.2	Embankment Stability	14
5.3	Supervision of Earthworks	14
5.4	Retaining Walls	15
6	STORMWATER MANAGEMENT	16
6.1	Hydrologic Modelling and Analysis	16

6.1.1	General Design Principles	16
6.1.2	Minor/ Major System Design	16
6.1.3	Rainfall Data	16
6.1.4	Runoff Models	16
6.2	Hydraulics	17
6.2.1	General Requirements	17
6.2.2	Freeboard	17
6.2.3	Public Safety	17
6.2.4	Inlet Pit Spacing	18
6.2.5	Overland Flow	18
6.3	Site Drainage	18
6.3.1	Existing Site Drainage	18
6.3.2	Proposed Site Drainage	18
6.3.3	Site Discharge	18
6.4	External Catchments and Flooding	19
6.5	Ecologically Sustainable Development	20
7	WATER QUANTITY MANAGEMENT	21
8	STORMWATER QUALITY CONTROLS	22
8.1	Regional Parameters	22
8.2	Proposed Stormwater Treatment System	22
8.3	Stormwater Quality Modelling	23
8.3.1	Introduction	23
8.3.2	Rainfall Data	23
8.3.3	Rainfall Runoff Parameters	23
8.3.4	Pollutant Concentrations& Source Nodes	24
8.3.5	Treatment Nodes	24
8.3.6	Results	25
8.3.7	Modelling Discussion	25
8.4	Stormwater Harvesting	25
8.5	Maintenance And Monitoring	26
9	EROSION & SEDIMENT CONTROL PLAN	31
9.1	General Conditions	31
9.2	Land Disturbance	31
9.3	Erosion & Sediment Control Conditions	32
9.4	Pollution Control Conditions	33

9.5	Waste Management Conditions	33
9.6	Site Inspection and Maintenance	33
10	CONCLUSION	36
11	REFERENCES	37

1 INTRODUCTION

Costin Roe Consulting Pty Ltd has been commissioned by The Western Sydney Parkland Trust (WSPT) to prepare this Engineering Report in support of a proposed development application to be lodged over the site.

The site is located on the northern side of Fifteenth Avenue and Twenty-Seventh Avenue, West Hoxton, NSW. The proposed development is for a commercial precinct which would help to facilitate the needs of the local community by providing essential commercial services which may include a service station, retail and food outlets and a childcare centre.

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

- Earthworks & Retaining Walls;
- Public Utilities and Infrastructure Servicing;
- Roads and Intersections;
- Stormwater Management including stormwater quantity and quality;
- Ecologically Sustainable Development (ESD); and
- Erosion & Sediment Control.

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

A set of drawings have been prepared to show the proposed finished levels, retaining walls, stormwater drainage layout and water quantity and quality requirements for the development. These drawings are for development approval only and subject to change during detail design.

The consent authority is The NSW Department of Planning & Environment as the proposal considered a State Significant Development (SSD). However as the subject site is located within Liverpool City Council (LCC) local government area, the engineering and policy requirements of LCC have also been considered in the design.

The NSW Department of Planning & Environment has provided Secretary's Environmental Assessment Requirements (SEAR's) dated 11 February 2015, Ref: SSD6407. In addition to providing a general summary of civil engineering aspects of the project, this report addresses the following relevant SEAR's:

- 5 Ecologically Sustainable Development (ESD);
- 9 Utilities;
- 11 Stormwater, Flooding and Water Management; and
- 12 Bulk Earthworks and Waste.

2 SITE CHARACTERISTICS

2.1 Location

The site is located within the West Hoxton Precinct of the Parklands which is predominantly characterised by residential, large lot rural residential and emerging industrial retail development.

The proposed development is located on Lot 2 of DP 307334 and 345 to 346 of DP 2475 in the suburb of West Hoxton on Fifteenth Avenue as shown in Figure 2.1.

The site fronts south onto Fifteenth Avenue and west onto Twenty-Seventh Avenue. The site is bounded on the north by Flynn Avenue and undeveloped rural land to the east (also owned by WSPT).

A Sydney Water controlled water supply channel is located on the western side of Twenty-Seventh Avenue and the land to the south of Fifteenth Avenue is predominately low density residential and retail development.

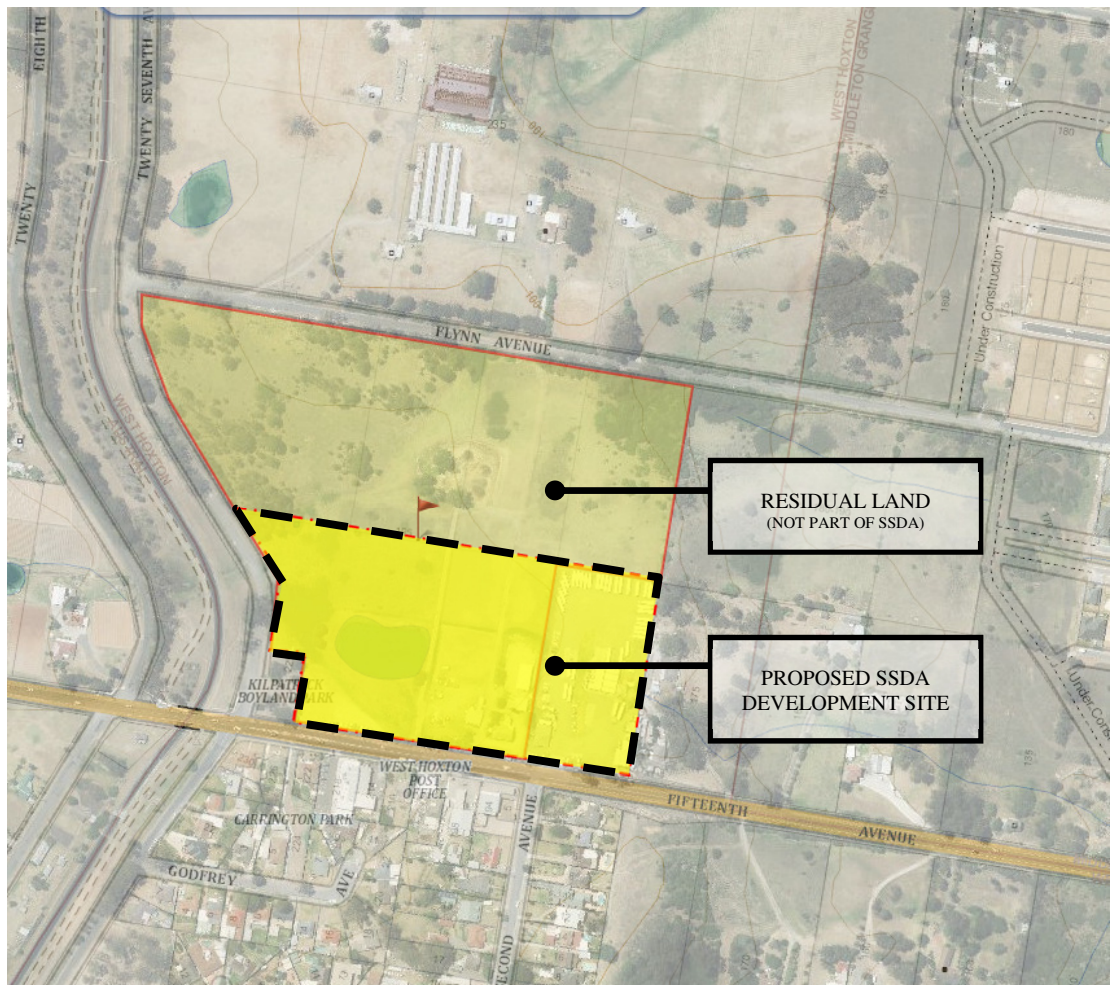


Figure 2.1. Locality Map (Source: Land and Property Information 2015)

2.2 Topography & Description

The site generally comprises undulating grassed rural land. Some light to moderate bushland vegetation is present to the north and north-west of the site. A single residence and light industry are present on the south-east corner of the site.

The highest level is RL 95.5 AHD at the north-east corner of the site and the lowest is RL 82.3m AHD on the western boundary.

The total property has an area of 10.15 Ha however development is currently proposed over the southern 4.3 Ha portion of the overall property. This will be the portion of land which fronts Fifteenth Avenue.

A gully extends from Flynn Avenue to the north of the site and traverses in a south-westerly direction to a low point and culvert on the western boundary. This gully acts as a natural drainage point during storm events and also drains stormwater from a small catchment upstream of Flynn Avenue.

A dam is present on the southern portion of the site. A 375mm R.C.P. also discharges on the site on the southern boundary emanating from a residential catchment on the southern side of Fifteenth Avenue. Stormwater from this catchment is conveyed through the site, on the southern side of the dam, via a small open channel to the low point and culvert system on the western boundary as described above.

2.3 Geotechnical and Geological Profile

Geotechnical investigations have been undertaken by Golder & Associates during 2015. The below provides a basic summary of the geotechnical profile however the Golder Report should be referred to for detailed information pertaining to geotechnical considerations (2x Geotechnical Reports provided).

The 1:25,000 scale Sydney Geological Map (S1 56-5) indicates the site is underlain by rocks belonging to the Bringelly Shale Formation which generally comprises shale with some sandstone beds. Outcrops of Potts Hill Sandstone are also shown in the north eastern portion of the site. These rocks would be expected to be overlain by residual clay soils and topsoil.

Site investigations generally confirm the above with a profile as below:

- **Unit 1 - Topsoil**
Generally comprised of silty clay and sandy clay to 0.2m to 0.4m in depth.
- **Unit 2 - Colluvium**
Colluvium comprising medium to highly plastic clay was found situated at higher elevations on the northern and eastern perimeters of the site.
- **Unit 3 - Residual Soils**
Residual clay soils of very stiff to hard consistency were found throughout the site. Clay layers were found to vary between 0.5-2.0m.
- **Unit 4 – Class V Shale**
Extremely weathered and extremely low strength shales were found with layer thicknesses in the order of 1.0-1.5m at depths varying between 2-3m.

- **Unit 5 – Class IV Shale**

Highly weathered low strength shales, with some medium strength bands were found with below the Unit 4 Shale. These were generally at depths of depths of around 3m and extended past the limits of the investigation.

2.4 Proposed Development

The proposed development is for a commercial precinct which would help to facilitate the needs of the local community by providing essential commercial services which may include a service station, retail and food outlets and a childcare centre. Due to market considerations development is currently proposed over the southern 4.3 Ha portion of the overall 10.15 Ha site.

3 INFRASTRUCTURE SERVICES

An overview of the existing and proposed infrastructure network layouts are outlined in the following sections. Reference to **Appendix E** should be made for Dial-Before-You-Dig information and correspondence for each particular service.

The assessment considers the supply and management of the following services and considerations for the development of the site:

- Potable Water (drinking water);
- Waste Water (sewer);
- Power;
- Natural Gas; and
- Telecommunications.

The information provided in this Report is intended to inform the Master Planners of the opportunities and constraints associated with the provision of infrastructure services to the site. Specifically the report provides the following information:

- Layout and capacity of existing service networks;
- Indicative utility demands for the current development proposals where available;
- Current service infrastructure delivery programs from the primary utility suppliers where available; and
- Service infrastructure assets required onsite.

3.1 Potable Water (drinking water)

Sydney Water is the servicing authority for potable water in the suburb of West Hoxton.

There is an existing potable water main adjacent to the site in Fifteenth Avenue. A 200mm diameter Cast Iron Cement Lined (CICL) water main runs along the entire length of the site on the southern side of Fifteenth Avenue. Western Sydney Parklands Trust obtained a Feasibility Letter (**Appendix E**) from Sydney Water in 2013 which confirmed that the existing water main would be suitable for connection.

The capacity of the existing system will need to be confirmed via a Section 73 Application to Sydney Water performed by a Sydney Water qualified Quickcheck agent. The strategy and design for the required extension of the system will need to be performed by a Sydney Water Service Coordinator.

A qualified Hydraulic Engineer shall design internal water and fire system water supply to service the proposed development sites. This will be investigated as part of the detailed design and assessed as part of future separate building development applications.

Notwithstanding the further investigations and applications required with Sydney Water, it is considered that water supply will be able to be provided to the development site.

3.2 Waste Water (sewer)

Sydney Water is the servicing authority for sewage disposal in the suburb of West Hoxton.

There is existing sewer infrastructure adjoining the site in Fifteenth Avenue. A 225mm PVC main and 280 PE main are available within the Fifteenth Avenue road reserve however Sydney Water have confirmed that these mains would not likely have capacity to service the proposed development. This was further confirmed within Sydney Water's Feasibility Letter (**Appendix E**).

Western Sydney Parklands Trust has met with Sydney Water representatives over the course of their Due Diligence and they provided concept plans for the Austral Precinct Gravity Wastewater. During these discussions it was noted that a 225mm gravity wastewater main will be constructed to Fifteenth Avenue – approximately 500m to the west of the proposed development. The proposed main will have sufficient capacity for the proposed development.

Sydney Water noted that the construction of the Austral Precinct Gravity Wastewater main is due for completion in June 2016 and should the proposed development proceed prior to the completion of these works a lead-in main could be constructed prior to or concurrently to these works. The complete requirements of Sydney Water will only be available when an application is lodged for a certificate under section 73 of the Sydney Water Act 1994.

Notwithstanding the further investigations and applications required with Sydney Water, it is considered that water supply will be able to be provided to the development site.

3.3 Power

Endeavour Energy (EE) is the servicing authority for power adjacent the site.

There is existing High Voltage electrical infrastructure in Fifteenth Avenue. A formal application will need to be made once the specific loads and building requirements have been confirmed.

Connect Infrastructure (Electrical Design Consultant) has made an informal supply application to EE to understand the likely servicing options. Informal advice (refer **Appendix B**) from Endeavour Energy has determined that the existing 11kV feeder 48196 "Fifteenth Avenue" ex Hinchinbrook ZS has sufficient capacity to cater for the proposed development. A formal Method of Supply application would need to be submitted and designs certified prior to Endeavour Energy reserving the capacity of the network.

Notwithstanding the further investigations and applications required with Endeavour Energy, it is considered that power supply will be able to be provided to the development site.

3.4 Natural Gas

Jemena is the servicing authority for gas supply adjacent the site.

Existing underground natural gas reticulation is available to the site via an existing 210kPa network main located within Flynn Avenue north east of the development.

Under standard provisioning for gas in subdivisions a joint trench arrangement will be adopted should Jemena agree to provide gas to this commercial development. Servicing of commercial and industrial development by Jemena with reticulated gas is only done by direct agreement with Jemena based on demand for the gas.

3.5 Telecommunications

Under Section 9 of the Telecommunications (Consumer Protection and Service Standards) Act 1999 (Cth), Telstra has an obligation (Universal Services Obligation) to ensure that the standard telephone service, payphones, prescribed carriage services and digital data services are reasonably accessible to all Australians on an equitable basis, wherever they reside or carry on business. Therefore it is the responsibility of Telstra to provide phone services to the proposed development area.

The adjoining urban area is presently serviced with overhead telecommunication cable; the extension of this to any proposed development is a relatively simple matter. In this respect the proposed development can be adequately serviced with telecommunications. NBN is currently available at the intersection of Fifteenth Avenue and Kingsford Smith Avenue (east) and at the intersection of Flynn Avenue and De Garis Avenue (north east). Installation of NBN broadband will be by negotiation at the time of service provisioning for the site.

While a basic phone service will be provided by Telstra, broadband services may be provided through the extension of the existing network by Telstra with the service dependent on exchange based infrastructure. This will be dependent on commercial arrangements between end users and service suppliers. Subject to timing of the development, and the rollout of the National Broadband Network, the provision of optic fibre facilities through the precinct will need further investigation.

4 ROADS AND TRANSPORTATION

4.1 Introduction

The proposed development will require the construction of an intersection and internal access road. The need and traffic movements relating to the intersection are discussed in a report by the Traffic Engineer, Transport and Urban Planning (TTPA). An allowance of 20m for the provision of future road widening and transport corridor along Fifteenth Avenue is also required. The allowance for the road widening is based on discussions with the NSW Road and Maritime Service (RMS) during late 2014 and early 2015.

A functional layout of the proposed roundabout has been produced for the development and is presented in drawing Co11995.00-SK01 and SK02 and these can be found **Appendix A**.

The internal road will be a privately owned road by Western Sydney Parklands with the intention that this road will allow for future extension to further Parkland Areas. The potential for the future extension is subject to future traffic studies and separate application.

4.2 Road Widths

The proposed internal road is to be constructed as a privately owned road.

Road Type & Traffic Volume	Carriageway	Verge (Footpath Pedestrian)	Total Road Reserve	Number of lanes
Private	11.5m (7.0m west & 4.5m east) Includes 2.0m median	3.0m west 5.5m east	20.0m	2 travel/ 1 parking lane

Table 4.1. Proposed Estate Road Cross Section

All roads will have concrete kerb and gutter and carriageway surface finished with asphaltic concrete. A typical road cross section is described in Table 4.1 above, and shown in Figure 4.1 below.

Integration with the broader transport strategy for the area will be required. This includes the provision of a roundabout at the Fifteenth Avenue and Twenty Second Avenue intersection. The roundabout will be constructed in accordance with RMS requirements.

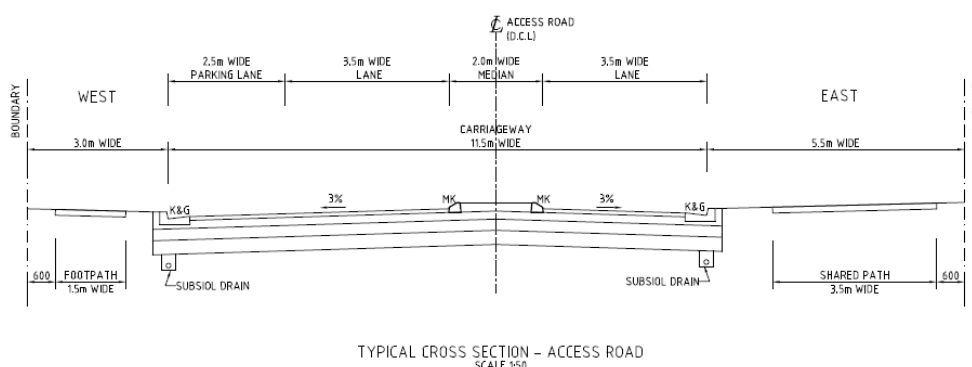


Figure 4.1. Proposed Estate Road Cross Section

4.3 Road Alignments

The proposed road alignments will need to be designed to meet Council requirements. The proposed road layout will incorporate best practice for both horizontal and vertical alignments with empathy to the landform. Priority has been given in the design for the safety of vehicles and pedestrians.

The Horizontal alignments will be designed to meet Council standards. Minimum horizontal radii in accordance with Council's engineering guidelines are to be provided.

In accordance with the Council standards, a minimum longitudinal grade of 1% and a maximum of 6% have been generally provided. Where change of grade is in excess of 0.6%, a vertical curve in accordance with the RMS Road Design Guide for a design speed of 60 km/h has been provided.

4.4 Road Pavements

The design for the proposed pavement for internal roads is to be based on *Austroads Pavement Design – A Guide to the Structural Design of Road Pavements*.

The pavement makeup will be subject to detail design. The expected makeup of the pavement will be for a flexible pavement with unbound granular base and bituminous wearing coarse layer.

4.5 Pedestrian Facilities and Transportation

A pedestrian path will be located on the western side of the access road and a shared footpath on the east.

Allowance for the relocation of the existing bus stop has been made in the intersection functional layout to allow for safe and efficient pedestrian movements in and around the precinct. A paved footpath is proposed to be constructed along the Fifteenth Avenue frontage including linking the existing pedestrian refuge island, the relocated bus stop and the crossing of the proposed access road.

5 SITE WORKS

5.1 Bulk Earthworks

Bulk earthworks will be undertaken to facilitate the construction of the development. The objective for the site is to reduce retaining walls and provide suitable site access and functionality of a commercial centre. Based on this scenario import of fill will be necessary.

An earthworks plan and cross sections have been prepared including a high level earthworks and volume estimate assessment has been completed for the development. This assessment can be found on drawings **Co11995.00-DA30** and **DA35**. The assessment has been made based on a general surface arrangement of building pads and falls throughout development lots; road boxing based on proposed finished road levels and excavation of the stormwater management basins. The earthworks analysis has been completed to a level of detail to enable general pad levels to be set and to obtain an order of magnitude cut and fill volume estimate. Detailed assessment of the earthworks level will be completed during detailed design stage.

The earthworks volume estimates are as follows:

Cut	-30,800m ³	
Detailed Ex./Services	- 4,300m ³	
Fill	+53,500m ³	
Balance	+18,400m ³	<i>(Import)</i>

Soil erosion and sediment control measures including sedimentation basins will also be provided for the development – please refer to the Soil and Water Management Plan in **Section 9** of this report.

Earthworks over the site will be minor and no impact on groundwater is expected as a result of these works.

5.2 Embankment Stability

To assist in maintaining embankment stability, permanent batter slopes will be no steeper than 3 horizontal to 1 vertical while temporary batters will be no steeper than 2 horizontal to 1 vertical. This is in accordance with the recommended maximum batter slopes for residual clays and shale which are present in the area.

Permanent batters will also be adequately vegetated or turfed which will assist in maintaining embankment stability.

Stability of batters and reinstatement of vegetation shall be in accordance with the submitted drawings and the Soil and Water Management Plan in Section 5.

5.3 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.

5.4 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.

Retaining walls will be minimal. Landscaped batters are proposed to limit retaining wall construction. Retaining is confined to the western boundary adjacent to Lot 5 and the proposed Stormwater Management Basin.

Location and indicative heights of retaining walls are shown on drawing **Co11995.00-DA40**.

6 STORMWATER MANAGEMENT

6.1 Hydrologic Modelling and Analysis

6.1.1 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, Liverpool City 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 Institution of Engineers, Australia publication “Australian Rainfall and Runoff” (1987 Edition), Volumes 1 and 2 (AR&R).

Storm events for the 2 to 100 Year ARI events have been assessed.

6.1.2 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 have also been provided which will limit major property damage and any risk to the public in the event of a piped system failure.

6.1.3 Rainfall Data

Rainfall intensity Frequency Duration (IFD) data used as a basis for DRAINS modelling for the 2 to 100 Year ARI events, was taken from The Bureau of Meteorology Online IFD Tool.

6.1.4 Runoff Models

In accordance with the recommendations and standards of Liverpool City Council, the calculation of the runoff from storms of the design ARI has been calculated with the catchment modelling software DRAINS.

The design parameters for the DRAINS model are to be based on the recommendations as defined by council and 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

6.2 Hydraulics

6.2.1 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.

6.2.2 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/ grate level, for the peak runoff from the Minor System runoff.

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/ development pads.

6.2.3 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.

6.2.4 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).

6.2.5 Overland Flow

Dedicated flow paths have been designed to convey all storms up to and including the 100-year ARI. These flow paths will convey stormwater from the site to the estate road system and to Estate Detention Basins.

6.3 **Site Drainage**

6.3.1 Existing Site Drainage

The property is currently undeveloped with no formal drainage located on site. As noted in earlier sections, a natural gully conveys stormwater through the northern portion of the site in a south-westerly direction to an existing 750mm RCP culvert in Twenty Seventh Avenue. The 750mm RCP culvert conveys stormwater from the site to an existing low point and drainage channel between the Sydney Water Catchment Channel and Twenty Seventh Avenue.

Stormwater flows from the residential catchment on the southern side of Fifteenth Avenue are conveyed via a small open channel around the southern flank of a large dam, also located in the southern portion of the site. Stormwater flows in this open channel are also conveyed to the 750mm RCP culvert discussed above.

6.3.2 Proposed Site Drainage

The proposed stormwater system consists of a major/ minor system which conveys surface water from the proposed development lots to in-ground drainage connection points to the estate infrastructure and combined water quality/ detention basin on the western boundary. Ultimate discharge from the development site is via the existing 750mm culvert system.

Water quality and quantity will be managed by a combined bio-retention and detention basin located adjacent to the site discharge point.

Further discussion on the Stormwater Management Strategy is provided in **Section 7** and **8** of this report. Reference to drawing **Co11995.00-DA40** shows the proposed drainage layout.

6.3.3 Site Discharge

Discharge from the site is proposed at one point on the western boundary of the development area. The proposed discharge points correspond to the existing 750mm RCP culvert under the Twenty Seventh Avenue as described in Section 6.3.1 above. Details of the proposed discharge point can be seen on drawing **Co12693.00-DA40**.

6.4 External Catchments and Flooding

Stormwater flows from two external catchments need to be managed as part of the proposed development.

Stormwater flows from an upstream rural catchment to the north are required to be drained through the development site. The catchment is located on the northern side of Flynn Avenue and is approximately 2.41 Ha. Land use for this catchment comprises rural uses. The 1 in 100 year flow from this upstream catchment is estimated at $0.4\text{m}^3/\text{s}$. It is proposed to provide an open channel to convey the overland flow from the catchment along the northern boundary of the site. Discharge will be via the existing 750mm RCP culvert on the western boundary. This stormwater will bypass the proposed Stormwater Management Basin for the development.

Stormwater flows from an upstream residential catchment from the south of Fifteenth Avenue are required to be diverted around the development site. The catchment is located on the southern side of Fifteenth Avenue and is approximately 3.5 Ha. Land use for this catchment comprises medium to low density residential development. The 1 in 100 year flow from this upstream catchment is estimated at $1.0\text{m}^3/\text{s}$ however given there is an existing 375mm RCP pipe which discharges onto the development site then the extension of the in-ground drainage will be made with pipe size consistent with the existing 375mm RCP. It is proposed to divert the flow around the development, along Fifteenth Avenue to the west and its intersection with Twenty Seventh Avenue. The diversion will comprise in-ground drainage to the intersection of Twenty Seventh Avenue, then an open channel in a northerly direction along Twenty Seventh Avenue to its junction with the existing 750mm RCP culvert. This stormwater will bypass the proposed Stormwater Management Basin.

Reference to **Figure 6.1** below shows the locations of the upstream catchments.

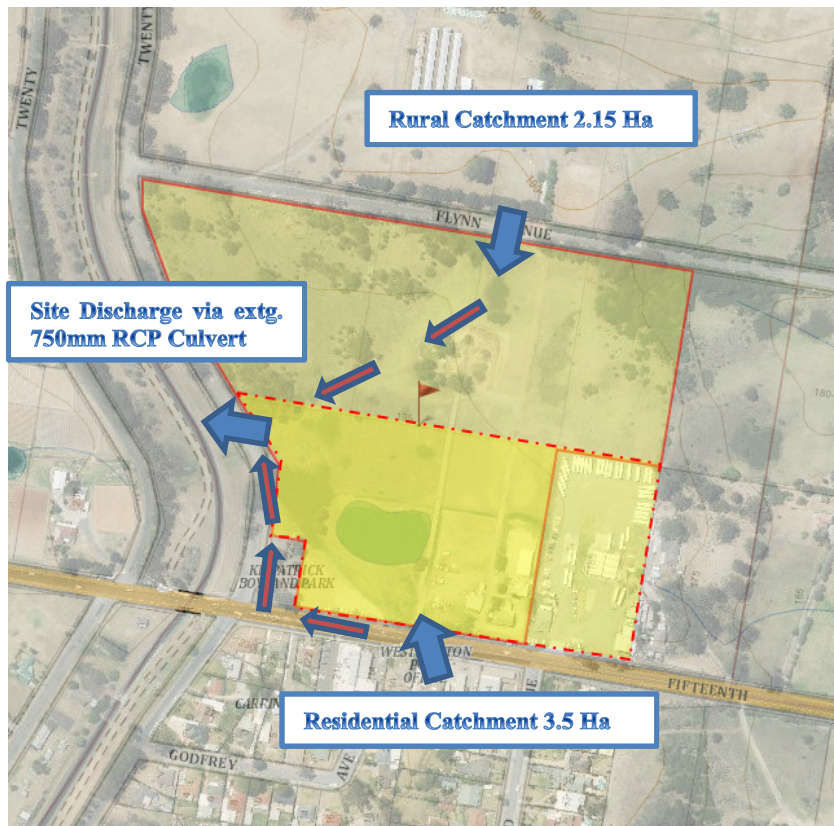


Figure 6.1. Upstream Catchments & Proposed Management

6.5 Ecologically Sustainable Development

Ecologically Sustainable Development (ESD) measures are proposed for the development. ESD Measures will comprise the following items:

- Water Quantity Management is provided in the form of a detention basin located in the south western corner of the development site. Refer to **Section 7** of this report for detailed discussion.
- Water Quality Management is provided in the form of a water quality treatment train comprising proprietary treatment via a gross pollutant trap which will remove sediments, litter, hydrocarbons and some nutrients. Final polishing of stormwater including coarse and fine sediments, nutrients and hydrocarbons will be made within the proposed bio-retention basin (rain-garden). Refer to **Section 8** of this report for detailed discussion.
- The future developments are proposed to implement rainwater reuse to reduce the demand on non-potable water supply for such uses as irrigation and toilet flushing. Further discussion on this component can be found in **Section 8.4** of this report.

7 WATER QUANTITY MANAGEMENT

Liverpool City Council requires water quantity management, or stormwater detention, to be provided to limit the runoff discharged from private property into the underground piped drainage system to pre-developed flow and to assist in mitigating the increased stormwater runoff generated by development.

Attenuation of stormwater runoff from the development is proposed to be managed via an above ground detention basin. The basin will be located on the north-western corner of the development area and will be closely aligned with the existing 750mm RCP culvert beneath Twenty Seventh Avenue. The basin will attenuate stormwater from the 4.3 Ha development site only with upstream catchments being diverted around the basin.

Sizing of the basin has been completed using DRAINS modelling software in accordance with the Liverpool City Council Policy for the 1 in 2 to 1 in 100 year ARI storm for various durations.

Table 7.1 below provides details for the pre and post development flows and storage for the basin. The critical storm duration for the 1 in 2 year, 1 in 20 year and 1 in 100 year ARI storms is 30 minutes and flows and storages are provided for this storm.

ARI	Pre-developed Flow (m ³ /s)	Post Developed Flow (m ³ /s)				Storage (m ³)	Depth (mm)
		Un-attenuated	Attenuated				
			Low Flow	High Flow	Total		
2	0.364	0.809	0.306	-	0.306	325	400
20	1.07	1.38	0.383	0.051	0.434	725	650
100	1.44	1.68	0.398	0.651	1.05	800	950

Table 7.1. Detention Basin Hydraulics

The modelling has shown that, with the provision of a storage volume of 800m³ that stormwater flows from the development will be attenuated to predevelopment flows. Detention storage will fully active and will be provided as above ground basins in open space and conservation areas. The proposed detention basin meets the policy requirements of Liverpool City Council.

The proposed location of the detention basin and details can be found on drawing **Co11955.00-DA40**.

8 STORMWATER QUALITY CONTROLS

8.1 Regional Parameters

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 Liverpool City Council.

Liverpool City Council have nominated, in *Section 6.4 of Part 1 of their DCP 2008*, the requirements for stormwater quality to be performed on a catchment wide basis. These are presented in terms of annual percentage pollutant reductions on a developed catchment and are as follows:

Gross Pollutants	90%
Total Suspended Solids	80%
Total Phosphorus	45%
Total Nitrogen	45%
Total Hydrocarbons	90%

8.2 Proposed Stormwater Treatment System

Developed impervious areas including roof, hardstand, car parking, roads and other extensive impervious areas are required to be treated by the Stormwater Treatment Measures (STM's). The STM's shall be sized according to the whole catchment area of the development. The STM's for the development shall be based on a treatment train approach to ensure that all of the objectives above are met.

Components of the treatment train for the development are as follows:

- Primary treatment to the development is to be performed via the provision of a proprietary vortech style GPT. Acceptable solutions for this would be Rocla CDS, Humeceptor or Stormwater360 Vortech. Pre-treatment of stormwater will assist in mitigating the potential for early onset sedimentation of the bio-retention system;
- Tertiary treatment is to be performed via a 300 m² bio-retention system. The proposed bio-retention system ;
- It is noted that stormwater from the upstream catchments will bypass treatment systems and undeveloped areas are not included in the modelling; and
- A portion of the future building roof will also provide a level of treatment via rainwater reuse and settlement within the rainwater tank. Given however that building layouts are not yet defined, allowance for rainwater tank within the model has not been made.

8.3 Stormwater Quality Modelling

8.3.1 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 km² and utilises a continuous simulation approach to model water quality.

By simulating the performance of stormwater management systems, MUSIC can be used to predict 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 Part R of BCC's DCP2006 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 "11995.00 15th Ave_Rev1.sqz" was set up to examine the effectiveness of the water quality treatment train and to predict if council requirements have been achieved. The layout of the MUSIC model is presented in **Appendix B**.

8.3.2 Rainfall Data

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

Input	Data Used
Rainfall Station	67035 Liverpool (Whitlam)
Rainfall Period	1 January 1967 – 31 December 1976 (10 years)
Mean Annual Rainfall (mm)	857
Evapotranspiration	Sydney Monthly Areal PET
Model Timestep	6 minutes

8.3.3 Rainfall Runoff Parameters

Parameter	Value
Rainfall Threshold	1.40
Soil Storage Capacity (mm)	170
Initial Storage (% capacity)	30
Field Capacity (mm)	70
Infiltration Capacity Coefficient a	210
Infiltration Capacity exponent b	4.7
Initial Depth (mm)	10
Daily Recharge Rate (%)	50
Daily Baseflow Rate (%)	4
Daily Seepage Rate (%)	0

8.3.4 Pollutant Concentrations & Source Nodes

Pollutant concentrations for source nodes are not available from Liverpool City Council. The source nodes used are based on the land use parameters defined by the nearby Blacktown City Council and are shown as per the **Table 8.1**:

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	1.20	0.17	-0.85	0.19	0.11	0.12
	Roads	1.20	0.17	-0.85	0.19	0.11	0.12
	Landscaping	1.2	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
	Landscaping	2.15	0.32	-0.6	0.25	0.30	0.19

Table 8.1. Pollutant Concentrations

The MUSIC model has been setup with a treatment train approach based on the pollutant concentrations in **Table 7.1** above and the catchments shown on drawing **Co11995.00-DA41** in **Appendix A**.

8.3.5 Treatment Nodes

Bio-retention and Gross Pollutant Trap treatment nodes have been used in the modelling of the development.

There is one proposed bio-retention basin which will be provided in accordance with industry best practice and the guidelines of the Monash University Facility for Advancing Water Bio-filtration with the following parameters:

Bioretention system

Parameter	Value
<u>Storage Properties</u>	
Extended Detention Depth	300 mm
Storage Surface Area	300 m ² (minimum)
<u>Filter and Media Properties</u>	
Filtration Area	300** m ²
Saturated Hydraulic Conductivity	100 mm/hr
Filter Depth	500 mm

** Nominated filtration area excludes all pits, scour protection and other structures which may be present in bio-retention basins.

Gross Pollutant Trap

Parameter	Value
Treatable Flow	0.375 m ³ /s (approx. 3-6 month ARI flow)
<u>Pollutant Reductions</u>	
TSS	70 %
TP	30 %
TN	0 %
GP's	100 %

8.3.6 Results

Table 8.3 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	Target Met
Total Suspended Solids (kg/yr)	8750	819	90.6	Y
Total Phosphorus (kg/yr)	14.9	4.32	71.1	Y
Total Nitrogen (kg/yr)	60.4	33	45.4	Y
Gross Pollutants (kg/yr)	674	0	100	Y

Table 8.3. MUSIC analysis results

The model results indicate that, through the use of the STM's in the treatment train, pollutant load reductions for Total Suspended Solids, Total Phosphorous, Total Nitrogen and Gross Pollutants will meet the requirements of Part 1 of Liverpool City Councils DCP 2008 on an overall catchment basis.

8.3.7 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 Part 1 of Councils DCP 2008 have been met.

The MUSIC modelling has shown that the proposed treatment train of STM's will provide stormwater treatment which will meet council requirements in an effective and economical manner.

Hydrocarbon removal cannot easily be modelled with MUSIC software. The proposed distribution/ storage facility would be expected to produce low source loadings of hydrocarbons. Potential sources of hydrocarbons would be limited to leaking engine sumps or for accidental fuel spills/leaks and leaching of bituminous pavements (car parking only). The potential for hydrocarbon pollution is low and published data from the CSIRO indicates that average concentrations from Industrial sites are in the order of 10mg/L and we would expect source loading from this site to be near to or below this concentration. Hydrocarbon pollution would also be limited to surface areas which will be treated via bio-retention swales which are predicted to achieve a 90% reduction of this pollutant.

Given the expected low source loadings of hydrocarbons and removal efficiencies of the treatment devices we consider that the requirements of the Liverpool City Council have been met.

8.4 Stormwater Harvesting

Stormwater harvesting refers to the collection of stormwater from the developments internal stormwater drainage system for re-use in non-potable applications. Stormwater

from the stormwater drainage system can be classified as either rainwater where the flow is from roof areas only, or stormwater where the flow is from all areas of the development.

Rainwater harvesting will be required for the development in order to meet Liverpool Council Policy with the aim being to reduce overall demand by providing re-use for non-potable applications. Internal uses include such applications as toilet flushing while external applications will be used for irrigation.

As building and development layouts have not been defined as part of this application, sizing of rainwater tanks has not been undertaken. These would be defined in future detail design and development applications.

In general terms the rainwater harvesting system will be an in-line tank for the collection and storage of rainwater. At times when the rainwater storage tank is full rainwater can pass through the tank and continue to be discharged via gravity into the stormwater drainage system. Rainwater from the storage tank will be pumped for distribution throughout the development in a dedicated non-potable water reticulation system. This however would be, as noted, subject to future detail design and development applications.

8.5 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 8.5** 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 8.5. Indicative Maintenance Schedule

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
SWALES/ 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
Inspect swale for excessive litter and sediment build up	Six monthly	Maintenance Contractor	Remove sediment and litter and dispose in accordance with local authorities' requirements.
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.
Inspect swale surface for erosion	Six Monthly	Maintenance Contractor	Replace top soil in eroded area and cover and secure with biodegradable fabric. Cut hole in fabric and revegetate.
BIO-RETENTION BASIN			
Check all items nominated for SWALES/ LANDSCAPED AREAS above	Refer to SWALES/ LANDSCAPED AREAS section above	Refer to SWALES/ LANDSCAPED AREAS section above	Refer to SWALES/ LANDSCAPED AREAS section above
Check for sediment accumulation at inflow points	Six monthly/ After Major Storm	Maintenance Contractor	Remove sediment and dispose in accordance with local authorities' requirements.
Check for erosion at inlet or other key structures.	Six monthly/ After Major Storm	Maintenance Contractor	Reinstate eroded areas so that original, designed profile is maintained

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
Check for evidence of dumping (litter, building waste or other).	Six monthly	Maintenance Contractor	Remove waste and litter and dispose in accordance with local authorities' requirements.
Check condition of vegetation is satisfactory (density, weeds, watering, replating, mowing/ slashing etc)	Six monthly	Maintenance Contractor	Replant and/or fertilise, weed and water in accordance with landscape consultant specifications
Check for evidence of prolonged ponding, surface clogging or clogging of drainage structures	Six monthly/ After Major Storm 10-15 years	Maintenance Contractor	Remove sediment and dispose in accordance with local authorities' requirements. Replace filter media & planting – refer to appropriately qualified engineer or stormwater specialist
Check stormwater pipes and pits	Six monthly/ After Major Storm	Maintenance Contractor	Refer to INLET/ JUNCTION PIT section below.
OSD BASIN			
Check all items nominated for SWALES/ LANDSCAPED AREAS above	Refer to SWALES/ LANDSCAPED AREAS section above	Refer to SWALES/ LANDSCAPED AREAS section above	Refer to SWALES/ LANDSCAPED AREAS section above
Inspect and remove any blockage from orifice	Six Monthly	Maintenance Contractor/ Owner	Remove grate and screen to inspect orifice.
Inspect trash screen and clean	Six Monthly	Maintenance Contractor/ Owner	Remove grate and screen if required to clean it.
Inspect flap valve and remove any blockage.	Six Monthly	Maintenance Contractor/ Owner	Remove grate. Ensure flap valve moves freely and remove any blockages or debris.

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
Inspect pit sump for damage or blockage.	Six Monthly	Maintenance Contractor/ Owner	Remove grate & screen. Remove sediment/ sludge build up and check orifice and flap valve is clear.
Inspect storage areas and remove debris/ mulch/ litter etc likely to block screens/ grates.	Six Monthly	Maintenance Contractor/ Owner	Remove debris and floatable materials.
Check attachment of orifice plate and screen to wall of pit	Annually	Maintenance Contractor	Remove grate and screen. Ensure plate or screen mounted securely, tighten fixings if required. Seal gaps if required.
Check orifice diameter is correct and retains sharp edge.	Five yearly	Maintenance Contractor	Compare diameter to design (see Work-as-Executed) and ensure edge is not pitted or damaged.
Check screen for corrosion	Annually	Maintenance Contractor	Remove grate and screen and examine for rust or corrosion, especially at corners or welds.
Inspect overflow weir and remove any blockage	Six monthly	Maintenance Contractor/ Owner	Ensure weir is free of blockage.
Inspect walls for cracks or spalling	Annually	Maintenance Contractor	Remove grate to inspect internal walls, repair as necessary.
Check step irons	Annually	Maintenance Contractor	Ensure fixings are secure and irons are free from corrosion.
RAINWATER TANK			
Check for any clogging and blockage of the first flush device	Monthly	Maintenance Contractor	First flush device to be cleaned out
Check for any clogging and blockage of the tank inlet - leaf/litter screen	Six monthly	Maintenance Contractor	Leaves and debris to be removed from the inlet leaf/litter screen

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
Check the level of sediment within the tank	Every two years	Maintenance Contractor	Sediment and debris to be removed from rainwater tank floor if sediment level is greater than the maximum allowable depth as specified by the hydraulic consultant
INLET & JUNCTION PITS			
Inside of pits	Six Monthly	Maintenance Contractor	Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter.
Outside of pits	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.

9 EROSION & SEDIMENT CONTROL PLAN

An erosion and sediment control plan (ESCP) is included in drawings **Co11995.00-DA20 and DA25**. These plans show the works can proceed without polluting receiving waters. A detailed plan will be prepared after development consent is granted and before works commence.

9.1 General Conditions

1. The ESCP is to be read in conjunction with the engineering plans, and any other plans or written instructions that may be issued by the site manager, council inspector or other authorised representative in relation to development at the subject site.
2. Contractors will ensure that all soil and water management works are undertaken as instructed in this report and constructed following the guidelines stated in Managing Urban Stormwater, Soils and Construction (1998) and Liverpool Council's specifications.
3. All subcontractors will be informed by the site manager of their responsibilities in minimising the potential for sedimentation and soil erosion.

9.2 Land Disturbance

1. Where practicable, the soil erosion hazard on the site will be kept as low as possible and as recommended in Table 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.
Temporary construction access	Limited to a maximum width of 5 metres	The site manager will determine and mark the location of these zones onsite. All site workers will comply with these restrictions.
Remaining lands	Entry prohibited except for essential management works	

Table 9.1. Limitations to access

9.3 Erosion & Sediment Control Conditions

1. Clearly visible barrier fencing shall be installed as shown on drawing **Co11995.00-DA20** 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.
2. 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 (landscaped areas only) remain on the surface at the completion of works.
3. The construction program should be scheduled so that period of time from starting land disturbance to stabilisation is minimised.
4. 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.
5. 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.
6. Where practical, foot and vehicular traffic will be kept away from all recently established areas
7. 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 metres
 - 2.5H:1V where slope length is between 7 and 10 metres
 - 3H:1V where slope length is between 10 and 12 metres
 - 4H:1V where slope length is between 12 and 18 metres
 - 5H:1V where slope length is between 18 and 27 metres
 - 6H:1V where slope length is greater than 27 metres
8. All earthworks, including waterways/drains/spillways and their outlets, will be constructed to be stable in at least the design storm event of 1 in 2 year ARI (Q2).
9. 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.

9.4 Pollution Control Conditions

1. Stockpiles will not be located within 5 metres of hazard areas, including likely areas of high velocity flows such as waterways, paved areas and driveways.
2. Sediment fences will:
 - a) 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.
 - b) Have a catchment area not exceeding 720 square metres, a storage depth (including both settling and settled zones) of at least 0.6 metres, and internal dimensions that provide maximum surface area for settling, and
 - c) Provide a return of 1 metre 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.
3. Sediment removed from any trapping device will be disposed of in locations where further erosion and consequent pollution to down slope lands and waterways will not occur.
4. 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.
5. Temporary soil and water management structures will be removed only after the lands they are protecting are fully stabilised.

9.5 Waste Management Conditions

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

9.6 Site Inspection and Maintenance

1. A self-auditing program will be established based on a check sheet (refer **Appendix D**). A site inspection using the check sheet will be made by the site manager:
 - At least weekly;
 - Immediately before site closure; and
 - 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; and

- Forwarding a signed duplicate of the completed Check Sheet to the project manager/developer for their recording.
2. In addition, the site manager 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 to the superintendent. The responsible person will ensure that:
 - The plan is being implemented correctly;
 - Repairs are undertaken as required; and
 - Essential modifications are made to the plan if and when necessary.

The report shall include a certificate that works have been carried out in accordance with the plan.

3. Waste bins will be emptied as necessary. Disposal of waste will be in a manner approved by the Site Superintendent.
4. 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 fill and 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 and installing additional diversion upslope; and
 - Blockages are cleared (these might occur because of sediment pollution, sand/soil/spoil being deposited in or too close to them, breached by vehicle wheels, etc.).
5. Sand/soil/spoil materials placed closer than 2 metres from hazard areas will be removed. Such hazard areas include areas of high velocity water flows (e.g. waterways and gutters), paved areas and driveways.
6. Recently stabilised lands will be checked to ensure that erosion hazard has been effectively reduced. Any repairs will be initiated as appropriate.
7. Excessive vegetation growth will be controlled through mowing or slashing.
8. All sediment detention systems will be kept in good working condition. In particular, attention will be given to:
 - a) Recent works to ensure they have not resulted in diversion of sediment laden water away from them;
 - b) Degradable products to ensure they are replaced as required; and
 - c) Sediment removal, to ensure the design capacity remains in the settling zone.
9. 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.
10. 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.

11. Erosion and sediment control measures will be maintained in a functioning condition until all earthwork activities are completed and the site fully stabilised.
12. Litter, debris and sediment will be removed from the gross pollutant traps and trash racks as required.

10 CONCLUSION

This Civil Engineering Details Report has been prepared to support the application for a proposed commercial and retail development on Fifteenth Avenue, West Hoxton.

A civil engineering strategy for the site has been developed which provides a best practice solution within the constraints of the existing landform and proposed development layout. Within this strategy a stormwater quantity and quality management strategy has been developed to reduce both peak flows and pollutant loads in stormwater leaving this site. The stormwater management for the development has been designed in accordance with Liverpool City Council's Part 1 of DCP2008.

The hydrological assessment proves local post development flows from the site will be less than pre-development flows and demonstrates that the site discharge would not adversely affect any land, drainage system or watercourse as a result of the development. An stormwater detention basin comprising active storage of 800m³ is proposed to attenuate developed stormwater flows to pre-developed flows.

During the construction phase, a Sediment and Erosion Control Plan will be in place to ensure the downstream drainage system and receiving waters are protected from sediment laden runoff.

During the operational phase of the development, a treatment train incorporating the use Stormwater Treatment Measures (STM's) comprising a proprietary vortech style gross pollutant trap and a bio-retention basin system have been proposed to mitigate the increase in stormwater pollutant loads generated by the development. MUSIC modelling results indicate that the proposed STM are effective in reducing pollutant loads from the stormwater discharging from the site and that the provided treatment meet the requirements of Council's pollution reduction targets. Best management practices have been applied to the development to ensure that the quality of stormwater runoff is not detrimental to the receiving environment.

It is recommended the management strategies in this report be approved and incorporated into the future detailed design.

11 REFERENCES

- Managing Urban Stormwater: Harvesting and Reuse – 2006 (NSW DEC);
- Managing Urban Stormwater: Source Control – 1998 (NSW EPA);
- Managing Urban Stormwater: Treatment Techniques – 1997 (NSW EPA);
- Managing Urban Stormwater: Soils & Construction – 2004(LANDCOM);
- Liverpool City Council – DCP 2008 (Part 1); and
- Water Sensitive Urban Design – “Technical Guidelines for Western Sydney” by URS Australia Pty Ltd, May 2004

Appendix A

DRAWINGS BY COSTIN ROE CONSULTING

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.

- SILT FENCES AND SILT FENCE RETURNS SHALL BE ERECTED CONVEX TO THE CONTOUR TO POND WATER.
- 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.
- 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.
- CLEAR WATER IS TO BE DIVERTED AWAY FROM DISTURBED GROUND AND INTO THE DRAINAGE SYSTEM.
- THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING AND PROVIDING ON GOING ADJUSTMENT TO EROSION CONTROL MEASURES AS REQUIRED DURING CONSTRUCTION.
- 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.
- ALL FINAL EROSION PREVENTION MEASURES INCLUDING THE ESTABLISHMENT OF GRASSING ARE TO BE MAINTAINED UNTIL THE END OF THE DEFECTS LIABILITY PERIOD.
- ALL EARTHWORKS AREAS SHALL BE ROLLED ON A REGULAR BASIS TO SEAL THE EARTHWORKS.
- 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.
- ALL CUT AND FILL SLOPES ARE TO BE SEEDED AND MULCHED WITHIN 10 DAYS OF COMPLETION OF FORMATION.
- 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.
- ALL TOPSOIL STOCKPILES ARE TO BE SUITABLY COVERED TO THE SATISFACTION OF THE CONTRACT ADMINISTRATOR TO PREVENT WIND AND WATER EROSION.
- 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.
- ALL STOCKPILE SITES SHALL BE SITUATED IN AREAS APPROVED FOR SUCH USE BY THE CONTRACT ADMINISTRATOR. 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.
- ACCESS AND EXIT AREAS SHALL INCLUDE SHAKE-DOWN OR OTHER METHODS APPROVED BY THE CONTRACT ADMINISTRATOR FOR THE REMOVAL OF SOIL MATERIALS FORM MOTOR VEHICLES.
- 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.
- 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.
- THE CONTRACTOR SHALL INCORPORATE THE MEASURES ON THIS PLAN WITHIN THE CONTRACTORS CONSTRUCTION MANAGEMENT PLAN.

SEDIMENTATION BASIN NOTE:

SEDIMENTATION BASIN SIZING BASED ON RECOMMENDATIONS OF 'SOILS AND CONSTRUCTION, MANAGING URBAN STORMWATER-THE BLUE BOOK'. CAPACITY BASED UPON 5 DAY RAINFALL DEPTH AT 80th PERCENTILE INTENSITY (24.4mm).

APPROXIMATE AREA OF SITE = 3.8ha

REQUIRED SETTLING ZONE VOLUME = 464m³
 REQUIRED SEDIMENT STORAGE ZONE VOLUME = 232m³

TOTAL REQUIRED BASIN VOLUME = 695m³

SEDIMENTATION BASIN DIMENSIONS:

BASE DIMENSIONS (L X B) = 44.5m x 11.5m
 TOP DIMENSIONS (L X B) = 50.5m x 17.5m
 MAX SIDE SLOPE = 1V:3H
 DEPTH = 1.0m
 TOTAL VOLUME PROVIDED = 716m³

SEDIMENTATION BASIN TO BE CONSTRUCTED TO DIMENSIONS AS SPECIFIED ABOVE AND TO BE FENCED.

SEDIMENTATION BASIN TO COLLECT RUN-OFF IN EXTREME RAINFALL EVENTS. COLLECTED RUN-OFF TO BE ASSESSED BY A QUALIFIED LABORATORY FOR DOUSING RATES OF ALUM OR GYPSUM TO ENSURE COAGULATION OF SEDIMENTS PRIOR TO WATER BEING DISCHARGED TO COUNCIL STORMWATER SYSTEM.

BASIN IS TO HAVE SEDIMENT MARKER PLACED AS PER DETAIL ON DRG DA25 TO INDICATE WHEN SEDIMENT IS TO BE REMOVED. REMOVED SEDIMENT IS TO BE CLASSSED AND DEWATERED PRIOR TO REMOVAL FROM SITE.

ALLOWANCE IS TO BE MADE DURING BENCHING OF SITE & THROUGHOUT THE DURATION OF WORK TO ENSURE RUN-OFF IS DIRECTED TO SEDIMENTATION BASIN.

LEGEND:

PROVIDE 1m RETURNS TO SILT FENCE AT 30m MAX. INTERVALS. TYPICAL (N.S.O.P.)

- - - - - SILT FENCE ONLY
- . - . - . SILT FENCE WITH CATCH DRAIN
- + + + + + DIVERSION DRAIN

FOR DEVELOPMENT APPLICATION

ISSUED FOR DEVELOPMENT APPLICATION	19.06.15	D	
ISSUED FOR INFORMATION	18.05.15	C	
ISSUED FOR INFORMATION	18.03.15	B	
ISSUED FOR INFORMATION	25.02.15	A	
AMENDMENTS	DATE	ISSUE	AMENDMENTS

ARCHITECT **LFA** LANDSCAPE ARCHITECTURE
 LFA LANDSCAPE ARCHITECTURE PTY LIMITED
 1/100 WINDMILL STREET, WILAH BAY, SYDNEY NSW 2000
 Tel: (02) 9551-7889 Fax: (02) 9551-3731
 email: mail@costinroe.com.au ©

CLIENT **Western Sydney Parklands Trust**
 WESTERN SYDNEY PARKLANDS TRUST
 LEVEL 4, 10 VALENTINE AVE
 PARRAMATTA NSW 2150

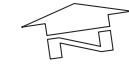
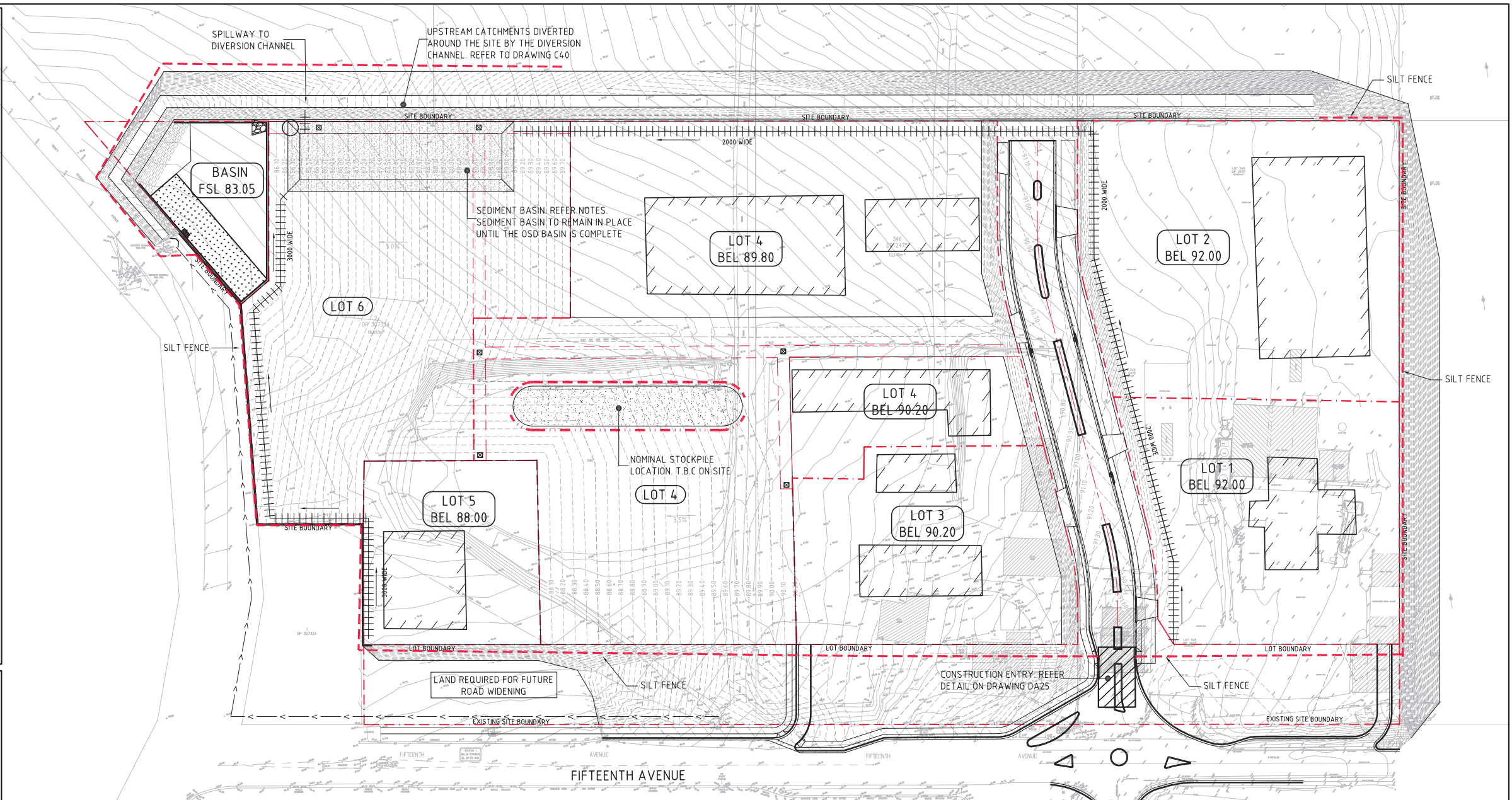
PROJECT **PROPOSED DEVELOPMENT**
 FIFTEENTH AVENUE
 WEST HOXTON NSW

DESIGNED DRAWN DATE CHECKED SIZE SCALE CAD REF:
 B1 AS SHOWN Cst11995.000A20

COSTIN ROE CONSULTING AUSTRALIA
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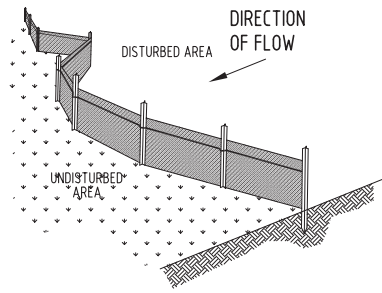
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DRAWING TITLE **EROSION AND SEDIMENT CONTROL PLAN**
 DRAWING No **C011995.00- DA20** ISSUE **D**

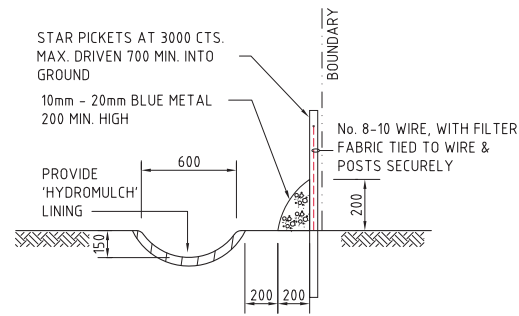


EROSION AND SEDIMENT CONTROL PLAN
 SCALE 1:500

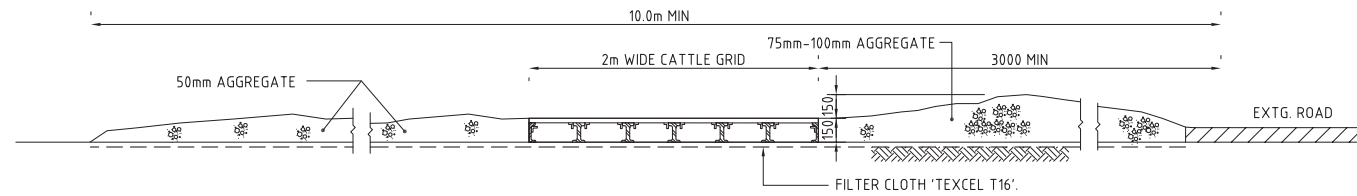




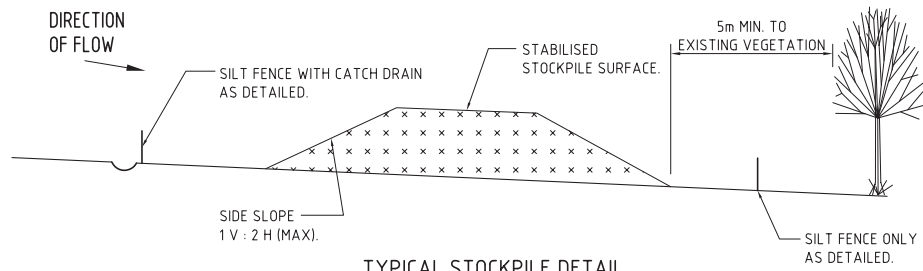
TYPICAL SILT FENCE DETAIL
N.T.S.
PROVIDE 1m RETURNS AT 30m INTERVALS.
TYPICAL



TYPICAL OPEN DRAIN & SILT FENCE
SCALE 1:20



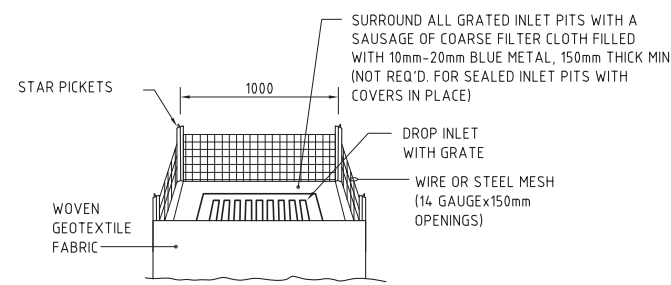
SECTION 1: STABILISED CONSTRUCTION ENTRANCE 'TRUCK SHAKER'



TYPICAL STOCKPILE DETAIL
N.T.S.

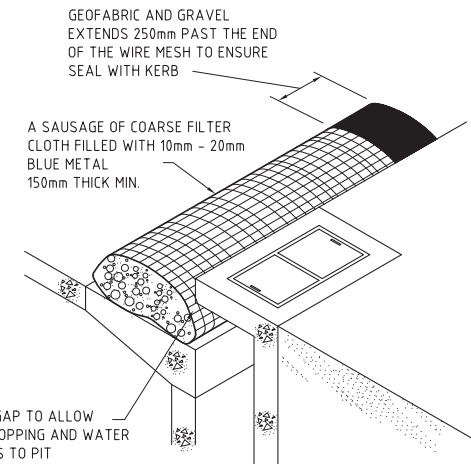
STOCKPILE NOTES

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.

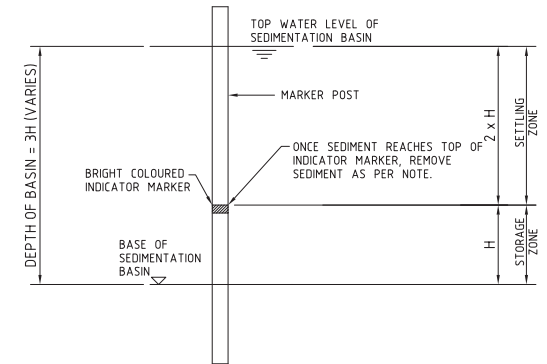


GRATED INLET PIT FILTER DETAIL
N.T.S.

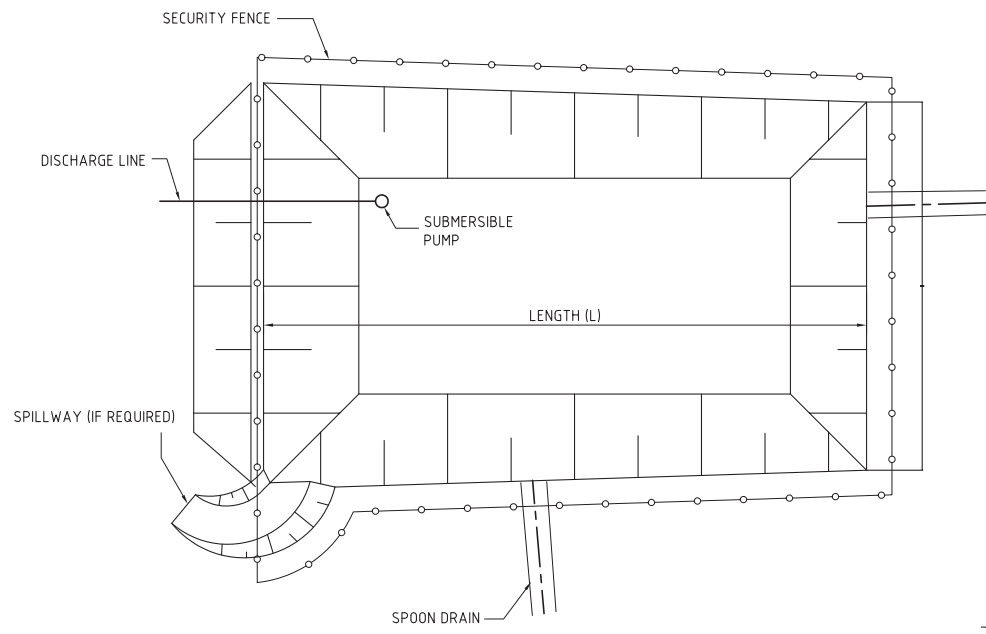
NOTE: ADOPT ABOVE DETAILS AROUND ALL PITS WITHIN AREA ENCOMPASSED BY SILT FENCE & TO PITS ON THE ROAD ADJACENT TO SITE BOUNDARY.



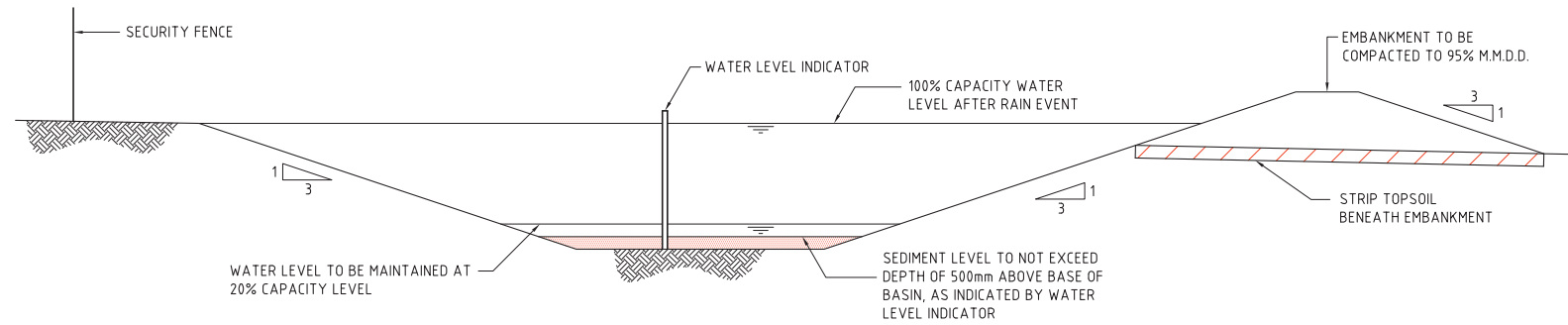
KERB INLET PIT CONTROL
N.T.S.



SEDIMENT STORAGE MARKER
SCALE 1:20

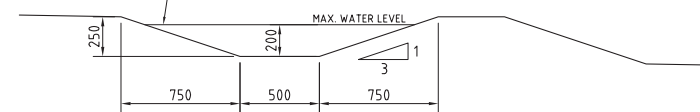


TYPICAL SEDIMENT CONTROL POND PLAN
SCALE 1:250



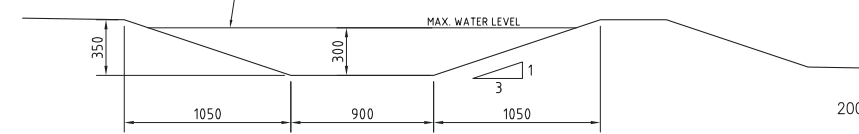
TYPICAL SEDIMENT CONTROL BASIN SECTION
SCALE 1:50

DIVERSION CHANNEL CAPACITY
Q = 135 L/s (A=1.4ha MAX.) BASED ON 5 DAY RAINFALL DEPTH AT 85TH PERCENTILE INTENSITY (32.2mm).
MANNINGS n = 0.04, MIN SLOPE = 1.0%
CANNEL CAPACITY (d = 200mm) = 137 L/s + 50 mm FREEBOARD
VELOCITY = 0.62 m/s < 1.0 m/s THEREFORE NO SCOUR PROTECTION REQUIRED.

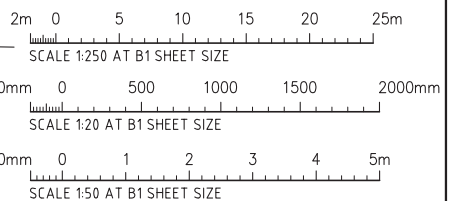


2000 WIDE DIVERSION DRAIN SECTION
SCALE 1:20

DIVERSION CHANNEL CAPACITY
Q = 435 L/s (A=4.5ha MAX.) BASED ON 5 DAY RAINFALL DEPTH AT 85TH PERCENTILE INTENSITY (32.2mm).
MANNINGS n = 0.04, MIN SLOPE = 1.0%
CANNEL CAPACITY (d = 300mm) = 451 L/s + 50 mm FREEBOARD
VELOCITY = 0.84 m/s < 1.0 m/s THEREFORE NO SCOUR PROTECTION REQUIRED.



3000 WIDE DIVERSION DRAIN SECTION
SCALE 1:20



FOR DEVELOPMENT APPLICATION

ISSUED FOR DEVELOPMENT APPLICATION	19.06.15	D	ARCHITECT	LFA (LIFEFORMS) PTY LIMITED	CLIENT	Western Sydney Parklands Trust	PROJECT	PROPOSED DEVELOPMENT FIFTEENTH AVENUE WEST HOXTON NSW	DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:	Costin Roe Consulting Pty Ltd. Consulting Engineers Level 1, 8 Windmill Street Wahia Bay, Sydney NSW 2000 Tel: (02) 9551-7000 Fax: (02) 9541-3731 email: mail@costinroe.com.au ©	DRAWING TITLE	EROSION AND SEDIMENT CONTROL DETAILS
ISSUED FOR INFORMATION	18.05.15	C																
ISSUED FOR INFORMATION	18.03.15	B																
ISSUED FOR INFORMATION	25.02.15	A																
AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE												DRAWING No	C011995.00- DA25

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SITE PREPARATION NOTES:

- ALL EARTHWORKS SHALL BE COMPLETED GENERALLY IN ACCORDANCE WITH THE GUIDELINES SPECIFIED BY THE GEOTECHNICAL REPORT 147622023-001-R-RevA PROVIDED BY GOLDER ASSOCIATES DATED 21.07.14.
- EXISTING LEVELS ARE BASED ON INFORMATION PROVIDED BY TOTAL SURVEYING SOLUTIONS TITLED 15060_A DATED 09.02.15.
- STRIP ANY TOP SOIL OR DELETERIOUS MATERIAL AND DISPOSE OF FROM SITE OR STORE AS DIRECTED.
- 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.
- PREPARE STEEP BATTERS TO RECEIVE FILL BY CONSTRUCTING BENCHING TO FACILITATE FILL PLACEMENT AND COMPACTION.
- 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.
- SITE WON FILL TO BE PLACED IN MAXIMUM 300mm LOOSE LAYERS AND COMPACTED TO 100% STANDARD AND WITHIN 2% OF OPTIMUM MOISTURE CONTENT.
- IMPORTED FILL SHALL BE PLACED IN MAXIMUM 300mm LOOSE LAYERS AND COMPACTED TO 100% STANDARD AND WITHIN 2% OF OPTIMUM MOISTURE CONTENT.
- MAXIMUM PARTICLE SIZE TO BE THE SMALLER OF 150mm OR HALF THE (LOOSE) LAYER THICKNESS AND/OR TWO THIRDS THE LAYER THICKNESS AFTER COMPACTION.
- ALL EARTHWORKS SHALL BE COMPLETED UNDER LEVEL 1 CONTROL IN ACCORDANCE WITH AS 3798-2007.
- PRIOR TO ANY EARTHWORKS, EROSION CONTROL AS OUTLINED IN THE EROSION AND SEDIMENTATION CONTROL PLAN SHALL BE COMPLETED.
- EXISTING ROCK, IF ANY, SHALL BE REMOVED BY HEAVY ROCK BREAKING OR RIPPING.
- MATCH EXISTING LEVELS AT BATTER INTERFACE.
- 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.

EARTHWORKS VOLUMES

VOLUMES:

CUT	= -30 800 m ³
FILL	= +53 500 m ³
DETAILED EXCAVATION (1200m ³ /Ha)	= -4 300 m ³
BALANCE	= +18 400 m ³ (IMPORT)

EARTHWORK VOLUMES ARE APPROXIMATE ONLY & ARE CALCULATED ASSUMING 100mm TOPSOIL STRIP. NO ALLOWANCE HAS BEEN MADE FOR EROSION AND SEDIMENT CONTROL, BULKING, COMPACTION OF FILLED SOILS.

REFER TO DRAWING DA20 FOR EROSION AND SEDIMENT CONTROL PLAN.

THE EXISTING SURFACE IS BASED ON SURVEY & DESIGN INFORMATION PROVIDED. THIS SURVEY IS MOST CURRENT HOWEVER IT MAY NOT ACCURATELY REFLECT ACTUAL GROUND LEVELS OR STOCKPILES ETC ON SITE. IT IS THE CONTRACTORS RESPONSIBILITY TO CONFIRM VOLUMES AND ALLOWANCES FOR EARTHWORKS.

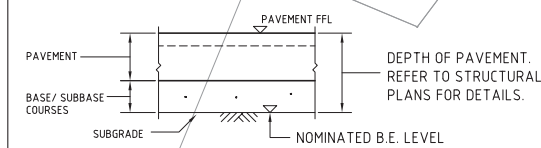
POND DEWATERING NOTES:

- DRAIN PONDS OF WATER & DISCHARGE CLEAN WATER TO STORMWATER DRAINAGE SYSTEM (AS PER NOTES 2 & 3) - REFER TO PLAN FOR LOCATIONS.
- DEWATERING TO BE PERFORMED IN SUCH A MANNER AS TO REMOVE CLEAN WATER WITHOUT REMOVING OR DISTURBING SILT, SEDIMENT OR OTHER ORGANIC MATERIAL FROM THE BASE OF THE PONDS.
- DISCHARGE OF WATER FROM PONDS TO HAVE A PH RANGE OF 6.5-8.5 AND TSS < 50mg/L. PONDS TO BE DOSED WITH GYPSUM (APPROX. 30mg PER CUBIC METRE) TO ACCELERATE SETTLEMENT OF SUSPENDED SOLIDS.
- REMOVE ALL SILT, ORGANIC AND WATER LOGGED MATERIAL FROM BASE OF POND (NOM. DEPTH 0.5-1.0m) AND DISPOSE OF IN ACCORDANCE WITH THE NSW DEPT. OF ENVIRONMENT CLIMATE CHANGE AND WATER REQUIREMENTS.
- EXPOSE NATURAL SITE SOILS AND COMPACT SUBGRADE IN ACCORDANCE WITH THE SITE PREPARATION NOTES REMOVING ANY SOFT ZONES AS REQ'D.
- PLACE AND COMPACT FILL AS PER SITE PREPARATION NOTES.

LEGEND

LEVELS DATUM IS AHD.
EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY TOTAL SURVEYING SOLUTIONS REF#: 15060_A DATED 09.02.15.

- 60 - EXISTING CONTOUR
- EXISTING SPOT HEIGHT
- 30.50 - B.E.L. CONTOUR (MAJOR - 0.5m)
- 30.40 - B.E.L. CONTOUR (MINOR - 0.1m)



NOMINATED B.E.L. DETAIL
N.T.S.

FOR DEVELOPMENT APPLICATION

ISSUED FOR DEVELOPMENT APPLICATION	19.06.15	D
ISSUED FOR INFORMATION	18.05.15	C
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AMENDMENTS	DATE	ISSUE

ARCHITECT
LFA
LFA (LIVING) PTY LIMITED
MASTERPLANNING, URBAN DESIGN, ARCHITECTURE, LANDSCAPE ARCHITECTURE, INTERIORS

CLIENT
NSW
WESTERN SYDNEY PARKLANDS TRUST
LEVEL 4, 10 VALENTINE AVE
PARRAMATTA NSW 2150

PROJECT
PROPOSED DEVELOPMENT
FIFTEENTH AVENUE
WEST HOXTON NSW

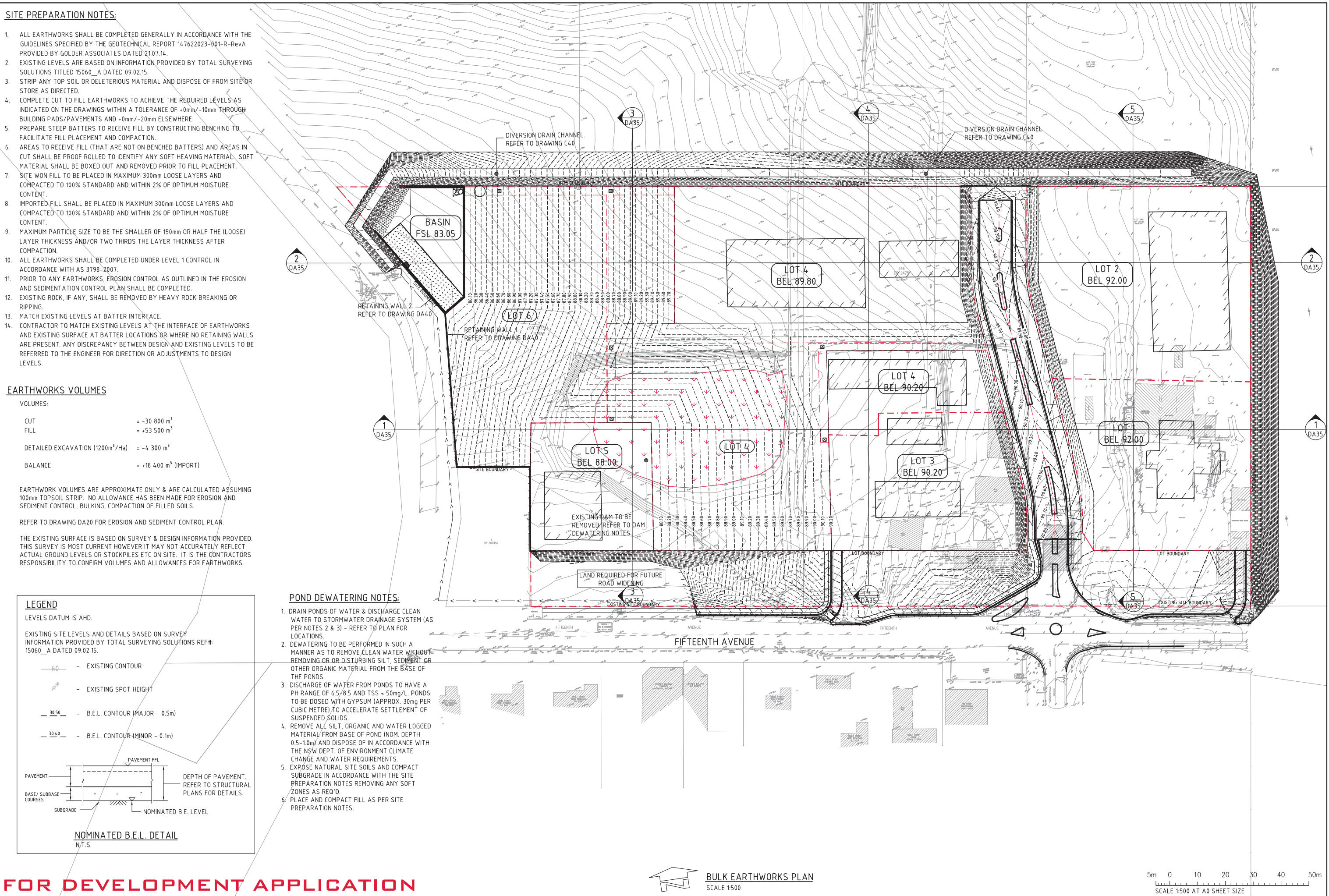
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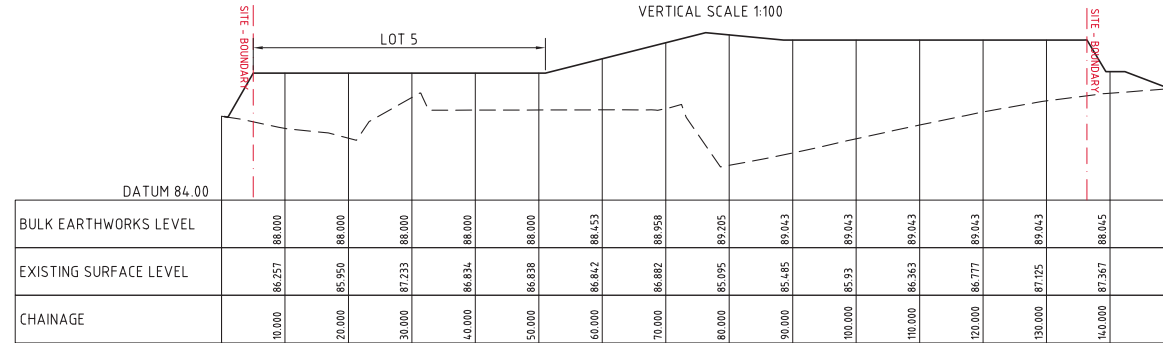
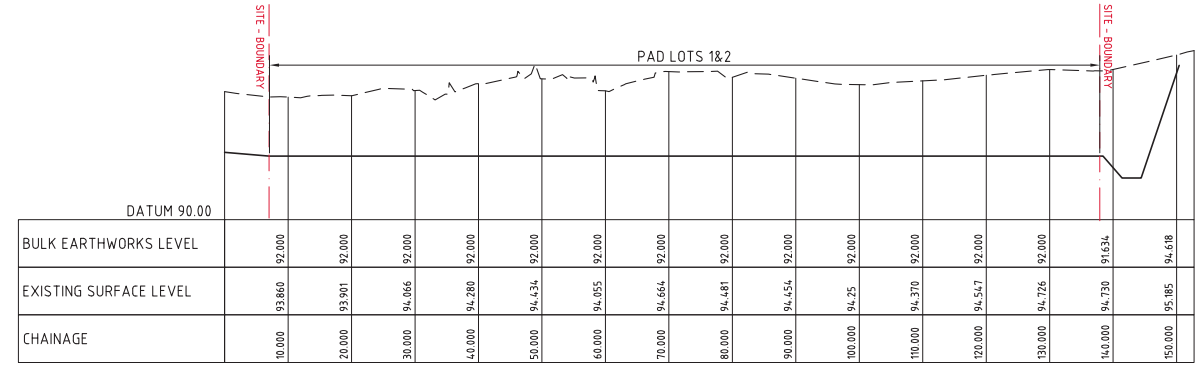
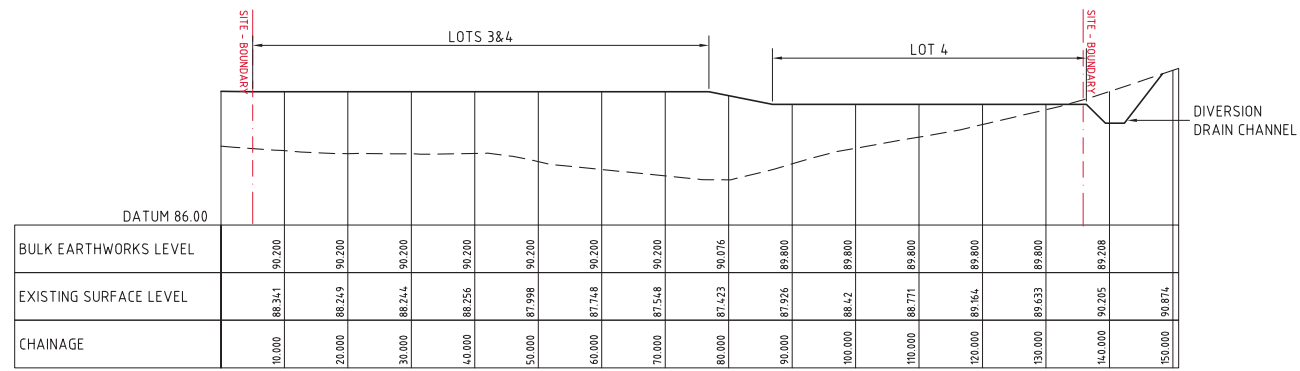
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DRAWING TITLE
BULK EARTHWORKS PLAN

DRAWING No. **C011995.00- DA30** ISSUE **D**

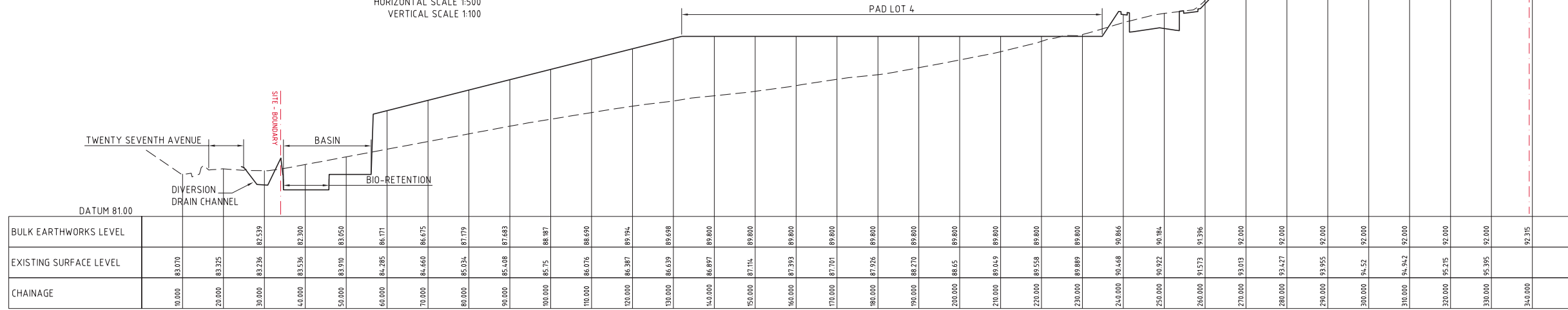




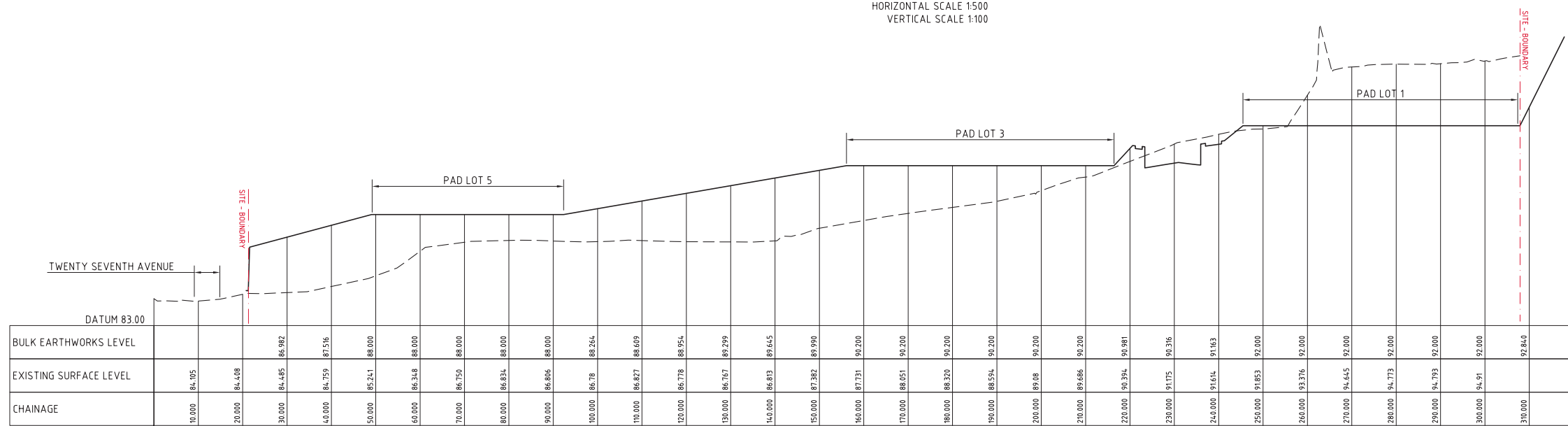
BULK EARTHWORKS SECTION 5
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100

BULK EARTHWORKS SECTION 4
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100

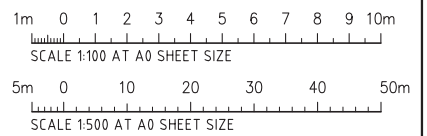
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HORIZONTAL SCALE 1:500
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BULK EARTHWORKS SECTION 2
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



BULK EARTHWORKS SECTION 1
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



FOR DEVELOPMENT APPLICATION

ISSUED FOR DEVELOPMENT APPLICATION	19.06.15	D
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AMENDMENTS	DATE	ISSUE

ARCHITECT **LFA** LFA (ARCHITECT) PTY LIMITED
 MASTERPLANNING, URBAN DESIGN, ARCHITECTURE, LANDSCAPE ARCHITECTURE, INTERIORS

CLIENT **NSW** WESTERN SYDNEY PARKLANDS TRUST
 LEVEL 4, 10 VALENTINE AVE, PARRAMATTA NSW 2150

PROJECT **PROPOSED DEVELOPMENT**
 FIFTEENTH AVENUE
 WEST HOXTON NSW

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DRAWING TITLE **BULK EARTHWORKS SECTIONS**
 DRAWING No **C011995.00- DA35** ISSUE **D**

FINISHED LEVELS PLAN NOTES:

- LEVELS DATUM IS A.H.D.
- ALL CONTOUR LINES & SPOT LEVELS INDICATE FINISHED PAVEMENT LEVELS U.N.O. ON PLAN.
- THE MAJOR CONTOUR INTERVAL IS 0.5m
- THE MINOR CONTOUR INTERVAL IS 0.1m.
- MINIMUM PAVEMENT GRADE IS TO BE 1:100 (1%).
- MAXIMUM PAVEMENT GRADE IS TO BE 1:20 (5%) IN CARPARKING AREAS AND 1:25 (4%) ELSEWHERE.
- MAXIMUM RAMP GRADES ARE TO BE 1:12 (8.3%) U.N.O. ON PLAN
- PROVIDE MINIMUM 3.0m LONG TRANSITION WHERE CHANGES GRADE EXCEED 1:20 (5%).
- PERMANENT BATTER SLOPES ARE TO HAVE A MAXIMUM GRADE OF 1V:3H.
- 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.
- ALL FOOTPATHS ARE TO FALL AWAY FROM THE BOUNDARY AT 2.5% NOMINAL GRADE.

STORMWATER DRAINAGE NOTES:

- ALL STORMWATER WORKS TO BE COMPLETED IN ACCORDANCE WITH AUSTRALIAN STANDARD AS3500.3:2003 PLUMBING AND DRAINAGE, PART 3: STORMWATER DRAINAGE.
- 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.
- ALL FINISHED PAVEMENT LEVELS SHALL BE AS INDICATED ON FINISHED LEVELS PLAN DA40
- PIT SIZES SHALL BE AS INDICATED IN THE SCHEDULE WHILE PIPE SIZES AND DETAILS ARE PROVIDED ON PLAN.
- EXISTING STORMWATER PIT LOCATIONS AND INVERT LEVELS TO BE CONFIRMED BY SURVEY PRIOR TO COMMENCING WORKS ON SITE.
- ALL STORMWATER PIPES ≥ 375 OR GREATER SHALL BE CLASS 2 REINFORCED CONCRETE WITH RUBBER RING JOINTS UNLESS NOTED OTHERWISE.
- ALL PIPES UP TO AND INCLUDING $\phi 300$ TO BE uPVC GRADE SN8 UNO.
- PIPE CLASS NOMINATED ARE FOR IN-SERVICE LOADING CONDITIONS ONLY. CONTRACTOR IS TO MAKE ANY NECESSARY ADJUSTMENTS REQUIRED FOR CONSTRUCTION CONDITIONS.
- 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.
- IN ADDITION TO ITEM 6 ABOVE, ALL CONCRETE PITS GREATER THAN 3000mm DEEP SHALL HAVE WALLS AND BASE THICKNESS INCREASED TO 200mm.
- 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.
- WHERE PIPE LINES ENTER PITS, PROVIDE 2m LENGTH OF STOCKING WRAPPED SLOTTED $\phi 100$ uPVC TO EACH SIDE OF PIPE.
- ALL SUBSOIL DRAINAGE LINES SHALL BE $\phi 100$ 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.
- ALL PIPE GRADES 1 IN 100 MINIMUM UNO.
- PROVIDE STEP IRONS IN PITS DEEPER THAN 1000mm.
- MIN. 600 COVER TO PIPE OBVERT BENEATH ROADS & MIN. 400 COVER BENEATH LANDSCAPED AND PEDESTRIAN AREAS.
- 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.
- PROVIDE CLEANING EYES (RODDING POINTS) TO PIPES AT ALL CORNERS AND T-JUNCTIONS WHERE NO PITS ARE PRESENT.
- 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.

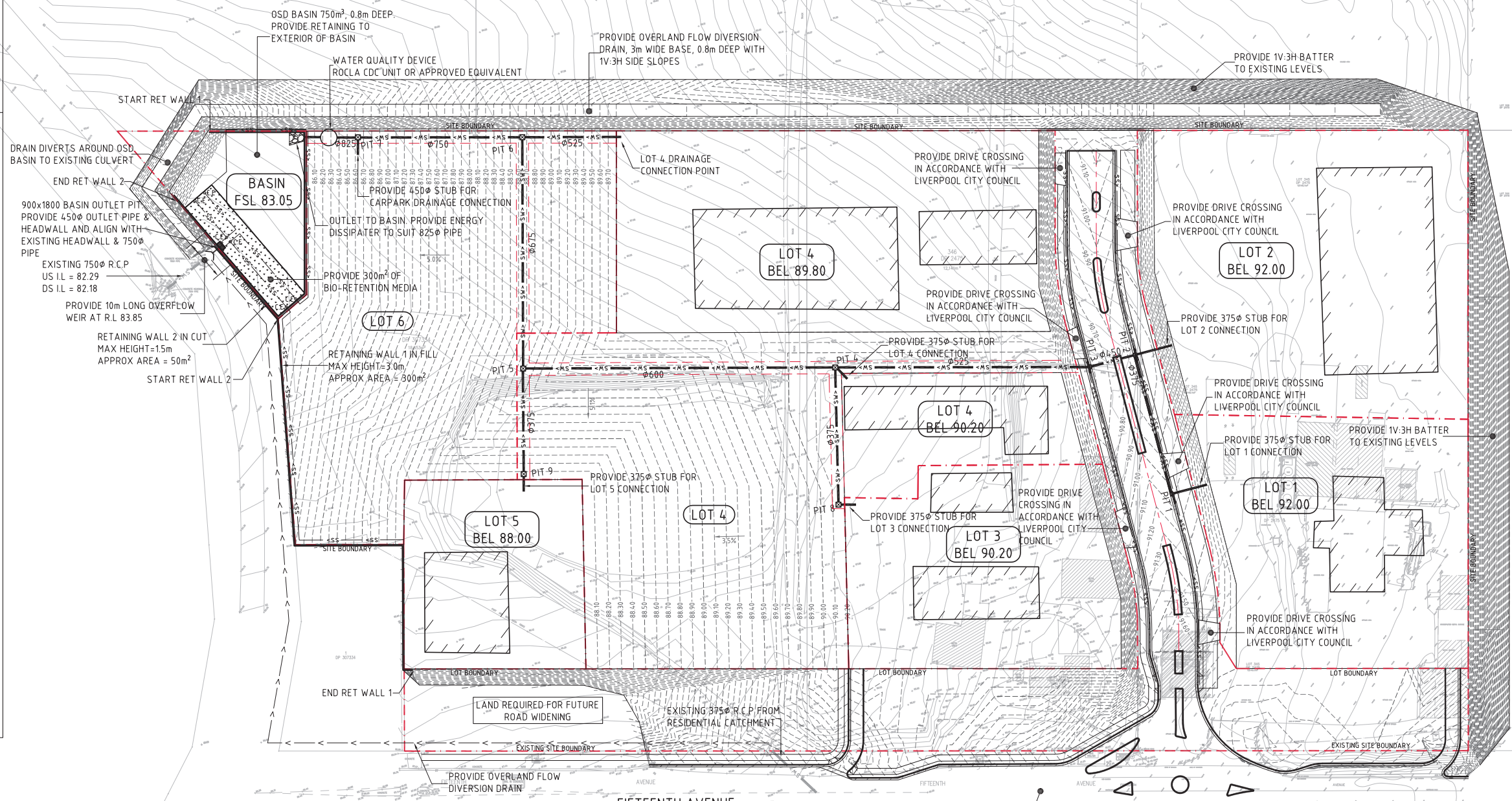
LEGEND:

LEVELS DATUM IS AHD.
EXISTING SITE LEVELS AND DETAILS BASED ON SURVEY INFORMATION PROVIDED BY TOTAL SURVEYING SOLUTIONS REF#: 15060_A DATED 09.02.15.

- SJP, SEALED JUNCTION PIT
- KIP, KERB INLET PIT
- DRAINAGE LINE
- SUBSOIL LINE
- OVERLAND FLOW PATH
- DENOTES CLEANOUT EYE
- FINISHED PAVEMENT SPOT HEIGHT
- FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- EXISTING SURFACE CONTOUR
- EXISTING SURFACE SPOT HEIGHT

PIT SCHEDULE

PIT No.	TYPE	SIZE (LxB)	COMMENT
PIT 1	KIP	900x600	2400 LINTEL
PIT 2	KIP	900x900	2400 LINTEL
PIT 3	KIP	900x900	2400 LINTEL
PIT 4	SJP	900x900	
PIT 5	SJP	900x900	
PIT 6	SJP	1200x1200	
PIT 7	SJP	1200x1200	
PIT 8	SJP	900x900	
PIT 9	SJP	900x900	



FOR DEVELOPMENT APPLICATION



CONCEPT CIVIL WORKS PLAN
SCALE 1:500



ISSUED FOR DEVELOPMENT APPLICATION	19.06.15	D
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ARCHITECT **LFA** LANDSCAPE ARCHITECTURE
LFA LANDSCAPE ARCHITECTURE PTY LIMITED
MAKING THE URBAN ENVIRONMENT BETTER
LANDSCAPE ARCHITECTURE
PRACTICES

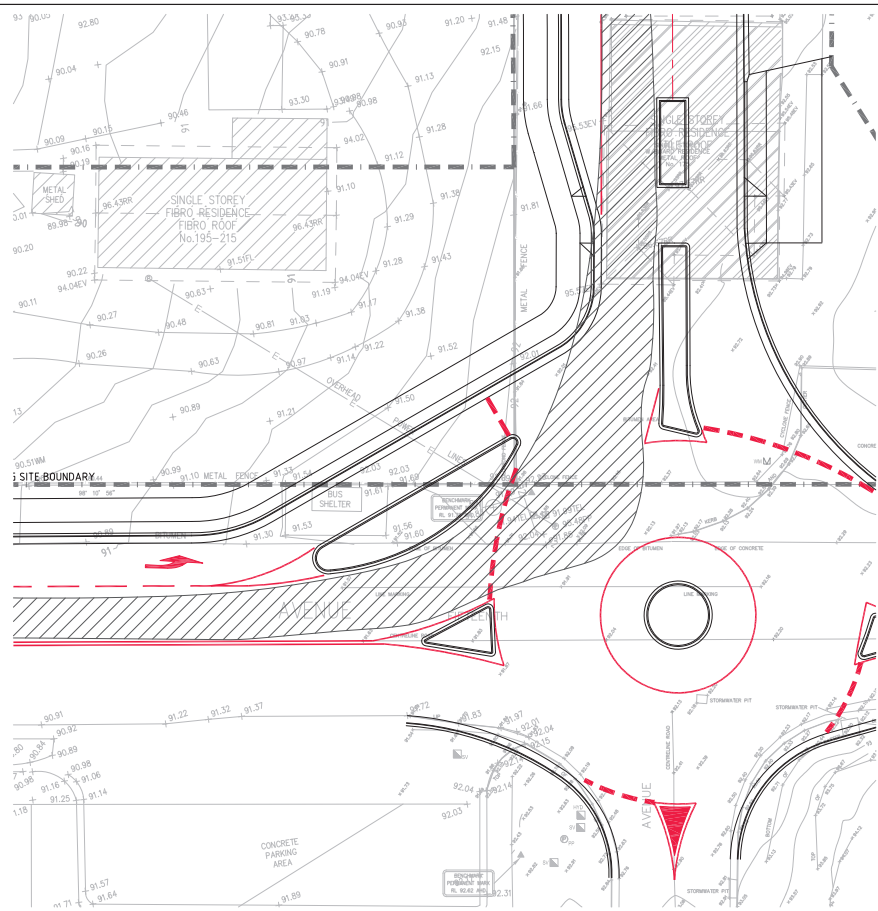
CLIENT **Western Sydney Parklands Trust**
WESTERN SYDNEY PARKLANDS TRUST
LEVEL 4, 10 VALENTINE AVE
PARRAMATTA NSW 2150

PROJECT **PROPOSED DEVELOPMENT**
FIFTEENTH AVENUE
WEST HOXTON NSW

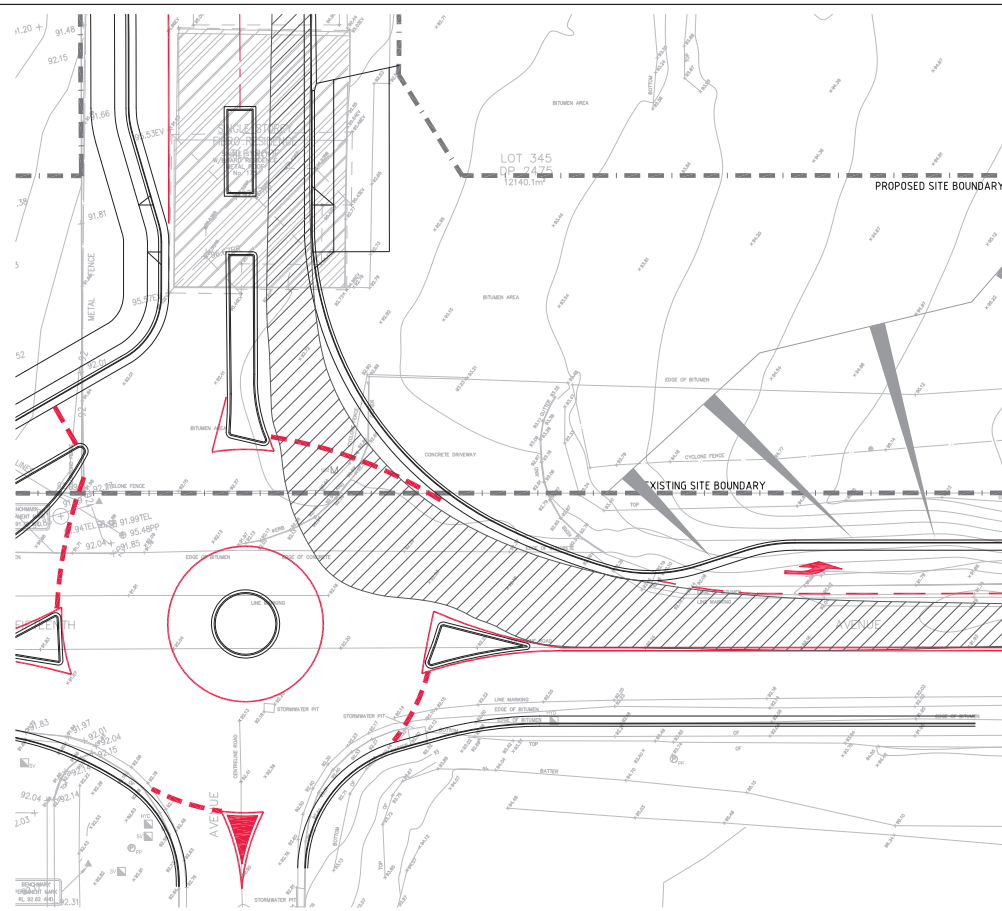
DESIGNED DRAWN DATE CHECKED SIZE SCALE CAD REF:
B1 AS SHOWN Cst1995.000A40

Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 8 Windmill Street
Wahah Bay, Sydney NSW 2000
Tel: (02) 9551-7000 Fax: (02) 9551-3731
email: mail@costinroe.com.au ©

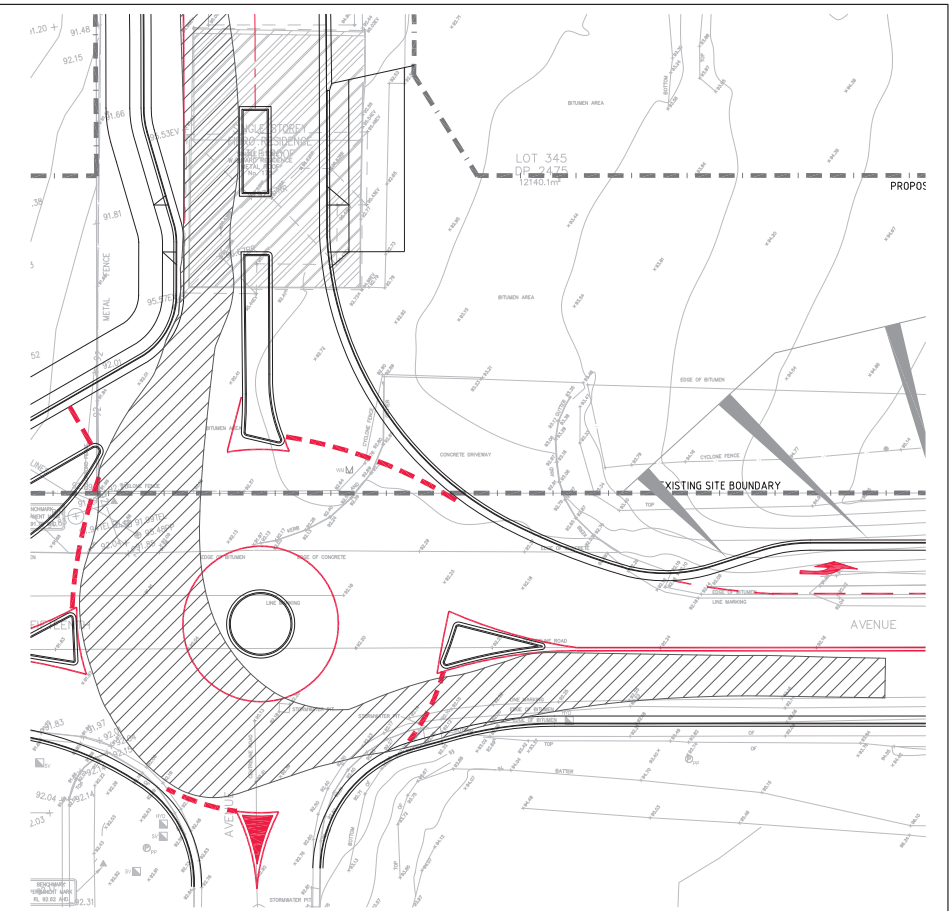
CostinRoe
Value in Engineering and Management
DRAWING TITLE **CONCEPT CIVIL WORKS PLAN**
DRAWING No **C011995.00- DA40** ISSUE **D**



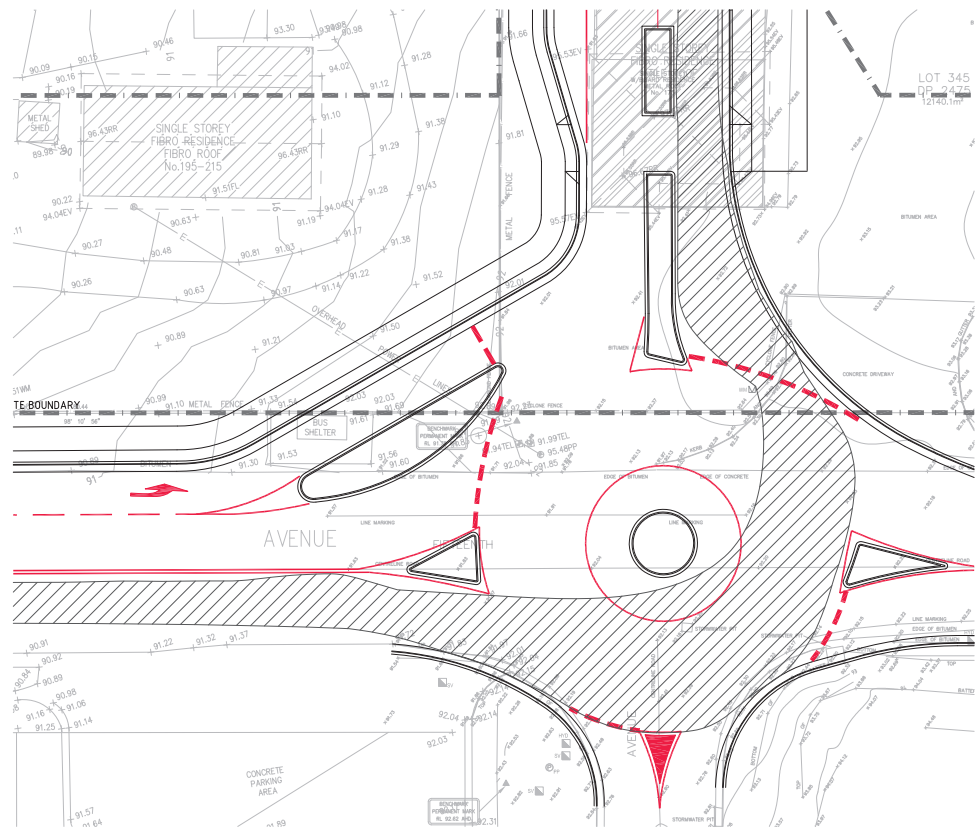
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SCALE 1:200



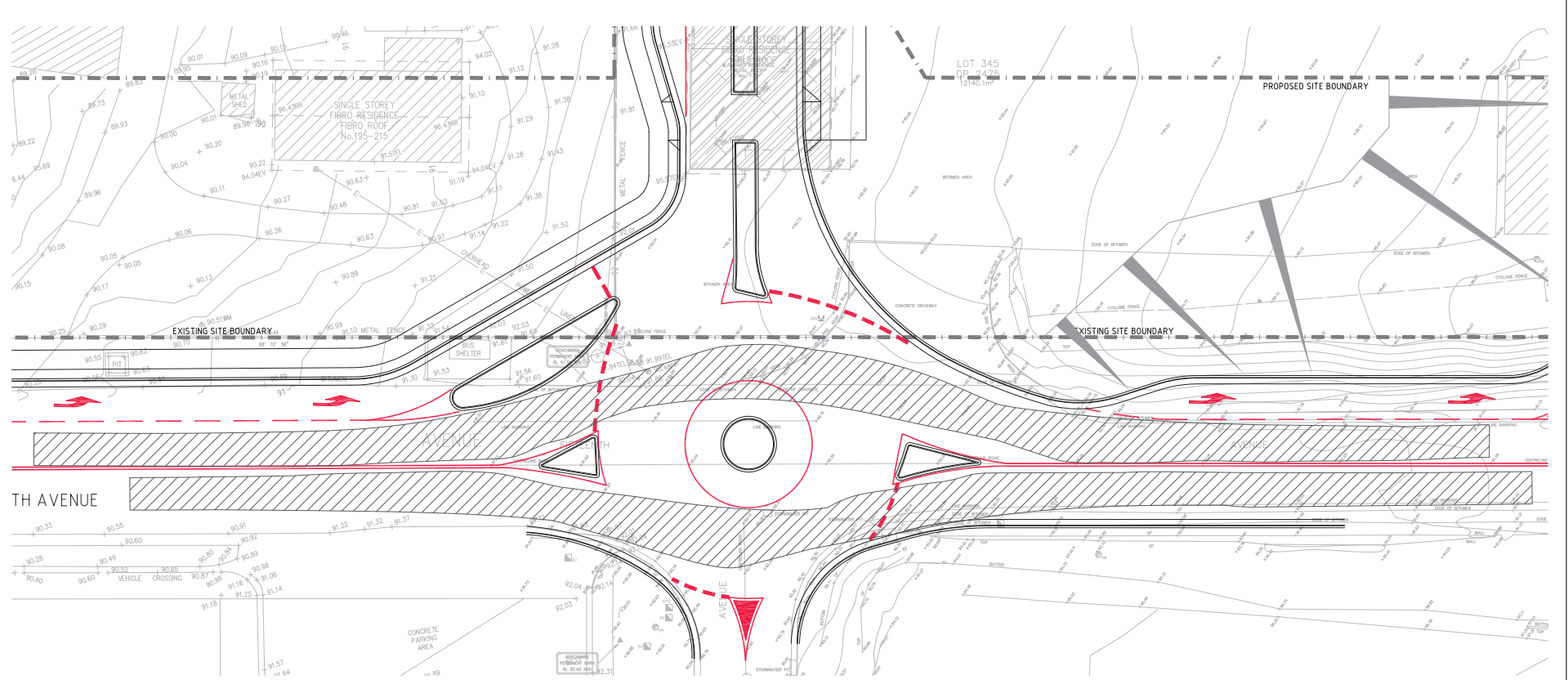
TURNING PATH - LEFT TURN OUT
SCALE 1:200



TURNING PATH - RIGHT TURN IN
SCALE 1:200



TURNING PATH - RIGHT TURN OUT
SCALE 1:200



TURNING PATH - STRAIGHT THROUGH
SCALE 1:200

TURNING PATHS ARE SHOWN FOR 19m SEMI. TURNING PATHS BASED ON TTPA DESIGN. REFER TO TTPA DRAWINGS FOR ORIGINAL TURNING PATHS



FOR APPROVAL

ISSUED FOR APPROVAL	19.06.15	E	
ISSUED FOR APPROVAL	13.05.15	D	
ISSUED FOR INFORMATION	11.05.15	C	
ISSUED FOR INFORMATION	04.05.15	B	
ISSUED FOR INFORMATION	30.04.15	A	
AMENDMENTS	DATE	ISSUE	AMENDMENTS

ARCHITECT **LFA (LFA) PTY LIMITED**

LFA LANDSCAPE ARCHITECTURE

MASTERSPLANNING
URBAN DESIGN
ARCHITECTURE
LANDSCAPE ARCHITECTURE
INTERIORS

LEVEL 4, 10 VALENTINE AVE
PARRAMATTA NSW 2150

CLIENT **Western Sydney Parklands Trust**

WESTERN SYDNEY PARKLANDS TRUST
LEVEL 4, 10 VALENTINE AVE
PARRAMATTA NSW 2150

PROJECT **PROPOSED DEVELOPMENT FIFTEENTH AVENUE WEST HOXTON NSW**

DESIGNED DRAWN DATE CHECKED SIZE SCALE AS SHOWN CAD REF: C611995-00-SK04

COSTIN ROE CONSULTING AUSTRALIA

Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 8 Windmill Street
Wahbah Bay, Sydney NSW 2000
Tel: (02) 8551-7000 Fax: (02) 9241-3741
email: mail@costinroe.com.au ©

CostinRoe

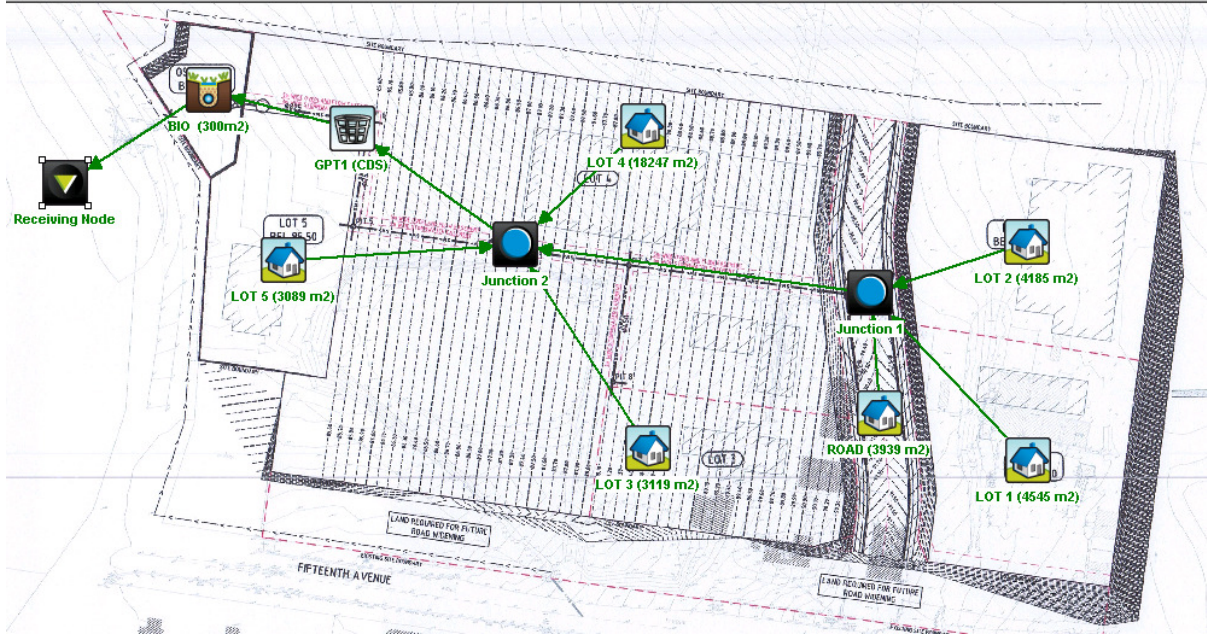
Value in Engineering and Management

DRAWING TITLE **TURNING PATHS PLAN**

DRAWING No **C011995.00- SK04** ISSUE **E**

Appendix B

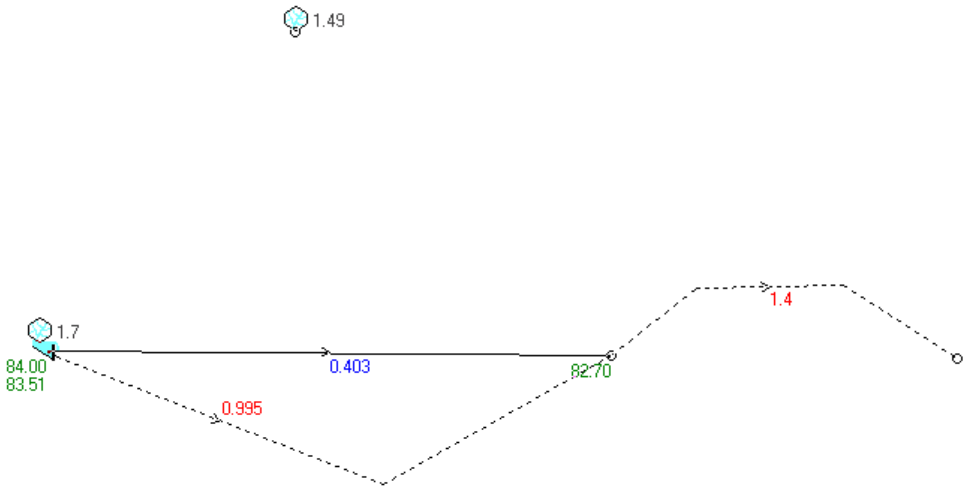
MUSIC MODEL CONFIGURATION



	Sources	Residual Load	% Reduction
Flow (ML/yr)	25.3	24.9	1.4
Total Suspended Solids (kg/yr)	8750	819	90.6
Total Phosphorus (kg/yr)	14.9	4.32	71.1
Total Nitrogen (kg/yr)	60.4	33	45.4
Gross Pollutants (kg/yr)	674	0	100

Appendix C

DRAINS MODEL CONFIGURATION



Appendix D
EROSION CONTROL CHECK SHEET

**EROSION AND SEDIMENT CONTROL
WEEKLY SITE INSPECTION SHEET**

LOCATION

INSPECTION OFFICER **DATE**.....

SIGNATURE

Legend: ✓ OK ✗ Not OK N/A Not applicable

Item	Consideration	Assessment
1	Public roadways clear of sediment.	.....
2	Entry/exit pads clear of excessive sediment deposition.	.....
3	Entry/exit pads have adequate void spacing to trap sediment.	.....
4	The construction site is clear of litter and unconfined rubbish.	.....
5	Adequate stockpiles of emergency ESC materials exist on site.	.....
6	Site dust is being adequately controlled.	.....
7	Appropriate drainage and sediment controls have been installed prior to new areas being cleared or disturbed.	.....
8	Up-slope “clean” water is being appropriately diverted around/through the site.	.....
9	Drainage lines are free of soil scour and sediment deposition.	.....
10	No areas of exposed soil are in need of erosion control.	.....
11	Earth batters are free of “rill” erosion.	.....
12	Erosion control mulch is not being displaced by wind or water.	.....
13	Long-term soil stockpiles are protected from wind, rain and stormwater flow with appropriate drainage and erosion controls.	.....
14	Sediment fences are free from damage.	.....
15	Sediment-laden stormwater is not simply flowing “around” the sediment fences or other sediment traps.	.....
16	Sediment controls placed up-slope/around stormwater inlets are appropriate for the type of inlet structure.	.....
17	All sediment traps are free of excessive sediment deposition.	.....
18	The settled sediment layer within a sediment basin is clearly visible through the supernatant prior to discharge such water.	.....
19	All reasonable and practicable measures are being taken to control sediment runoff from the site.	.....
20	All soil surfaces are being appropriately prepared (i.e. pH, nutrients, roughness and density) prior to revegetation.	.....
21	Stabilised surfaces have a minimum 70% soil coverage.	.....
22	The site is adequately prepared for imminent storms.	.....
23	All ESC measures are in proper working order.	.....

Appendix E

SERVICES & PUBLIC UTILITY INFORMATION

7 June 2013

WESTERN SYDNEY PARKLANDS TRUST
c/- ROSE ATKINS RIMMER

FEASIBILITY LETTER

Developer: WESTERN SYDNEY PARKLANDS TRUST
Your reference: 21/23051
Development: Lot 306 DP2475 195-215 FIFTEENTH AVE, West Hoxton
Development Description: 2 Staged Neighbourhood Retail Centre
Your application date: 2 May 2013

Dear Applicant

This Feasibility Letter (Letter) is a guide only. It provides general information about what Sydney Water's requirements could be if you applied to us for a Section 73 Certificate (Certificate) for your proposed subdivision. **The information is accurate at today's date only.**

If you obtain development consent for that subdivision from your consent authority (this is usually your local Council) they will require you to apply to us for a Section 73 Certificate. You will need to submit a new application (and pay another application fee) to us for that Certificate by using your current or another Water Servicing Coordinator (Coordinator).

Sydney Water will then send you either a:

- Notice of Requirements (Notice) and Developer Works Deed (Deed) or
- Certificate.

These documents will be the definitive statement of Sydney Water's requirements.

There may be changes in Sydney Water's requirements between the issue dates of this Letter and the Notice or Certificate. The changes may be:

- if you change your proposed development eg the development description or the plan/site layout, after today, the requirements in this Letter could change when you submit your new application; and
- if you decide to do your development in stages then you must submit a new application

(and pay another application fee) for each stage.

What You Must Do To Get A Section 73 Certificate In The Future.

To get a Section 73 Certificate you must do the following things. You can also find out about this process by visiting www.sydneywater.com.au > Building and Developing > Developing Your Land.

1. **Obtain Development Consent from the consent authority for your subdivision proposal.**
2. **Engage a Water Servicing Coordinator (Coordinator).**

You must engage your current or another authorised Coordinator to manage the design and construction of works that you must provide, at your cost, to service your subdivision. If you wish to engage another Coordinator (at any point in this process) you must write and tell Sydney Water.

For a list of authorised Coordinators, either visit www.sydneywater.com.au > Building and Developing > Developing Your Land or call **13 20 92**.

The Coordinator will be your point of contact with Sydney Water. They can answer most questions that you might have about the process and developer charges and can give you a quote or information about costs for services/works (including Sydney Water costs).

3. **Developer Works Deed**

After the Coordinator has submitted your new application, they will receive the Sydney Water Notice and Developer Works Deed. You and your accredited Developer Infrastructure Providers (Providers) will need to sign and lodge both copies of the Deed with your nominated Coordinator. After Sydney Water has signed the documents, one copy will be returned to the Coordinator.

The Deed sets out for this project:

- your responsibilities;
- Sydney Water's responsibilities; and
- the Provider's responsibilities.

You must do all the things that we ask you to do in that Deed. This is because lots in your subdivision do not have sewer services and you must construct and pay for the following works extensions under this Deed to provide these services.

Note: The Coordinator must be fully authorised by us for the whole time of the agreement.

4. **Water and Sewer Works**

4.1 **Water**

Each lot in your subdivision must have a frontage to a water main that is the right size and can be used for connection.

Sydney Water has assessed your application and found that:

- The drinking water main available for connection is the 200mm main on the southern side of Fifteenth Avenue.

4.2 Sewer

Each lot in your subdivision must have a sewer main that is the right size and can be used for connection. That sewer must also have a connection point within each lot's boundaries.

Sydney Water has assessed your application and found that:

The proposed development is located adjacent to the existing West Hoxton un-sewered development area. The subject site topographical conditions indicate that the area could be considered within the future wastewater servicing of the development proposed within the South West Growth Sector. The closest existing sewer is located approximately 1 km east of the subject site within Middleton Grange. Therefore, preliminary investigation indicates two possible scenarios for provision of wastewater services to the subject site.

Scenario 1: A detailed planning study for the servicing of the Austral development area (part of South West Growth Sector) is in progress. The anticipated delivery of infrastructure to service this area is mid-2016. Although the subject site is not part of the investigation area, the proposed infrastructure planned for Austral could accommodate this development. Subject to the timing of the wastewater services required to service the site the developer would be able to connection to the future sewers when they become available. (see the connection point in figure 2.)

Scenario 2: If the proposed development proceeds earlier than the delivery of services to Austral development area, preliminary investigation shows that the area could be serviced by a new pump to sewer connecting to the 450mm gravity main located near Cowpasture Road (between Sixteenth and Seventeenth Avenue, Hoxton Park). (See the possible connection point in figure 2.)

The developer would be required to engage a hydraulic consultant to carry out detailed wastewater investigation considering both scenarios and submit the proposed servicing strategy to Sydney Water for approval

Figure 2 – Development location and sewer connection point



5. Ancillary Matters

5.1 Asset adjustments

After Sydney Water issues this Notice (and more detailed designs are available), Sydney Water may require that the water main/sewer main/stormwater located in the footway/your property needs to be adjusted/deviated. If this happens, you will need to do this work as well as the extension we have detailed above at your cost. The work must meet the conditions of this Notice and you will need to complete it **before we can issue the Certificate**. Sydney Water will need to see the completed designs for the work and we will require you to lodge a security. The security will be refunded once the work is completed.

5.2 Entry onto neighbouring property

If you need to enter a neighbouring property, you must have the written permission of the relevant property owners and tenants. You must use Sydney Water's **Permission to Enter** form(s) for this. You can get copies of these forms from your Coordinator or the Sydney Water website. Your Coordinator can also negotiate on your behalf. Please make sure that you address all the items on the form(s) including payment of compensation and whether there are other ways of designing and constructing that could avoid or reduce their impacts. You will be responsible for all costs of mediation involved in resolving any disputes. Please allow enough time for entry issues to be resolved.

5.3 Costs

Construction of these **future** works will require you to pay project management, survey, design and construction costs **directly to your suppliers**. Additional costs payable to Sydney Water may include:

- water main shutdown and disinfection;
- connection of new water mains to Sydney Water system(s);

- design and construction audit fees;
- contract administration, Operations Area Charge & Customer Redress prior to project finalisation;
- creation or alteration of easements etc; and
- water usage charges where water has been supplied for building activity purposes prior to disinfection of a newly constructed water main.

Note: Payment for any Goods and Services (including Customer Redress) provided by Sydney Water will be required prior to the issue of the Section 73 Certificate or release of the Bank Guarantee or Cash Bond.

Your Coordinator can tell you about these costs.

OTHER THINGS YOU MAY NEED TO DO

Shown below are other things you need to do that are NOT a requirement for the Certificate. They may well be a requirement of Sydney Water in the future because of the impact of your development on our assets. You must read them before you go any further.

Stamping and approval of your building plans

Please note that your building plans must be stamped and approved. This can be done at a Quick Check agency. For an agency list visit www.sydneywater.com.au > Building and Developing > Quick Check or call 13 20 92.

This is not a requirement of the Certificate but the approval is needed because construction/building works may impact on existing Sydney Water assets (e.g. water and sewer mains). In any case, these works MUST NOT commence until Sydney Water has granted approval.

Your Coordinator can tell you about the approval process including:

- Possible requirements;
- Costs; and
- Timeframes.

Note: You must obtain our written approval before you do any work on Sydney Water's systems. Sydney Water will take action to have work stopped on the site if you do not have that approval. We will apply Section 44 of the *Sydney Water Act 1994*.

Disused Sewerage Service Sealing

Please do not forget that you must pay to disconnect all disused private sewerage services and seal them at the point of connection to a Sydney Water sewer main. This work must meet Sydney Water's standards in the NSW Code of Practice for Plumbing and Drainage (the Code) and be done by a licensed drainer. The licensed drainer must arrange for an inspection of the work by a NSW Fair Trading Plumbing Inspection Assurance Services (PIAS) officer. After that officer has looked at the work, the drainer can issue the Certificate of Compliance. The Code requires this.

Soffit Requirements

Please be aware that floor levels must be able to meet Sydney Water's soffit requirements for property connection and drainage.

Requirements for Business Customers for Commercial and Industrial Property Developments

If this property is to be developed for Industrial or Commercial operations, it may need to meet the following requirements:

Trade Wastewater Requirements

If this development is going to generate trade wastewater, the property owner must submit an application requesting permission to discharge trade wastewater to Sydney Water's sewerage system. You must wait for approval of this permit before any business activities can commence.

The permit application should be emailed to Sydney Water's Business Customer Services at businesscustomers@sydneywater.com.au

It is illegal to discharge Trade Wastewater into the Sydney Water sewerage system without permission.

A **Boundary Trap** is required for all developments that discharge trade wastewater where arrestors and special units are installed for trade wastewater pre-treatment.

If the property development is for Industrial operations, the wastewater may discharge into a sewerage area that is subject to wastewater reuse. Find out from Business Customer Services if this is applicable to your development.

Backflow Prevention Requirements

Backflow is when there is unintentional flow of water in the wrong direction from a potentially polluted source into the drinking water supply.

All properties connected to Sydney Water's supply must install a testable **Backflow Prevention Containment Device** appropriate to the property's hazard rating. Property with a high or medium hazard rating must have the backflow prevention containment device tested annually. Properties identified as having a low hazard rating must install a non-testable device, as a minimum.

Separate hydrant and sprinkler fire services on non-residential properties, require the installation of a testable double check detector assembly. The device is to be located at the boundary of the property.

Before you install a backflow prevention device:

1. Get your hydraulic consultant or plumber to check the available water pressure versus the property's required pressure and flow requirements.
2. Conduct a site assessment to confirm the hazard rating of the property and its services. Contact PIAS at NSW Fair Trading on **1300 889 099**.

For installation you will need to engage a licensed plumber with backflow accreditation who can be found on the Sydney Water website:

<http://www.sydneywater.com.au/Plumbing/BackflowPrevention/>

Water Efficiency Recommendations

Water is our most precious resource and every customer can play a role in its conservation. By working together with Sydney Water, business customers are able to reduce their water consumption. This will help your business save money, improve productivity and protect the environment.

Some water efficiency measures that can be easily implemented in your business are:

- Install water efficiency fixtures to help increase your water efficiency, refer to WELS (Water Efficiency Labelling and Standards (WELS) Scheme, <http://www.waterrating.gov.au/>
- Consider installing rainwater tanks to capture rainwater runoff, and reusing it, where cost effective. Refer to <http://www.sydneywater.com.au/Water4Life/InYourBusiness/RWTCalculator.cfm>
- Install water-monitoring devices on your meter to identify water usage patterns and leaks.
- Develop a water efficiency plan for your business.

It is cheaper to install water efficiency appliances while you are developing than retrofitting them later.

Contingency Plan Recommendations

Under Sydney Water's [customer contract](#) Sydney Water aims to provide Business Customers with a continuous supply of clean water at a minimum pressure of 15meters head at the main tap. This is equivalent to 146.8kpa or 21.29psi to meet reasonable business usage needs.

Sometimes Sydney Water may need to interrupt, postpone or limit the supply of water services to your property for maintenance or other reasons. These interruptions can be planned or unplanned.

Water supply is critical to some businesses and Sydney Water will treat vulnerable customers, such as hospitals, as a high priority.

Have you thought about a **contingency plan** for your business? Your Business Customer Representative will help you to develop a plan that is tailored to your business and minimises productivity losses in the event of a water service disruption.

For further information please visit the Sydney Water website at: <http://www.sydneywater.com.au/OurSystemsandOperations/TradeWaste/> or contact Business

Customer Services on **1300 985 227** or businesscustomers@sydneywater.com.au

Fire Fighting

Definition of fire fighting systems is the responsibility of the developer and is not part of the Section 73 process. It is recommended that a consultant should advise the developer regarding the fire fighting flow of the subdivision and the ability of Sydney Water's system to provide that flow in an emergency. Sydney Water's Operating Licence directs that Sydney Water's mains are only required to provide domestic supply at a minimum pressure of 15 m head.

A report supplying modelled pressures called the Statement of Available pressure can be purchased through any Quickcheck agent and may be of some assistance when defining the fire fighting system. The Statement of Available pressure, may advise flow limits that relate to system capacity or diameter of the main and pressure limits according to pressure management initiatives. If mains are required for fire fighting purposes, the mains shall be arranged through the water main extension process and not the Section 73 process.

Large Water Service Connection

A water main are available to provide your subdivision with a domestic supply. The size of your subdivision means that you will need a connection larger than the standard domestic 20 mm size.

To get approval for your connection, you will need to lodge an application with a Quick Check Agent. You, or your hydraulic consultant, may need to supply the following:

- A plan of the hydraulic layout;
- A list of all the fixtures/fittings within the property;
- A copy of the fireflow pressure inquiry issued by Sydney Water;
- A pump application form (if a pump is required);
- All pump details (if a pump is required).

You will have to pay an application fee.

Sydney Water does not consider whether a water main is adequate for fire fighting purposes for your development. We cannot guarantee that this water supply will meet your Council's fire fighting requirements. The Council and your hydraulic consultant can help.

Disused Water Service Sealing

You must pay to disconnect all disused private water services and seal them at the point of connection to a Sydney Water water main. This work must meet Sydney Water's standards in the NSW Code of Practice for Plumbing and Drainage (the Code) and be done by a licensed plumber. The licensed plumber must arrange for an inspection of the work by a NSW Fair Trading Plumbing Inspection Assurance Services (PIAS) officer. After that officer has looked at

the work, the drainer can issue the Certificate of Compliance. The Code requires this.

Other fees and requirements

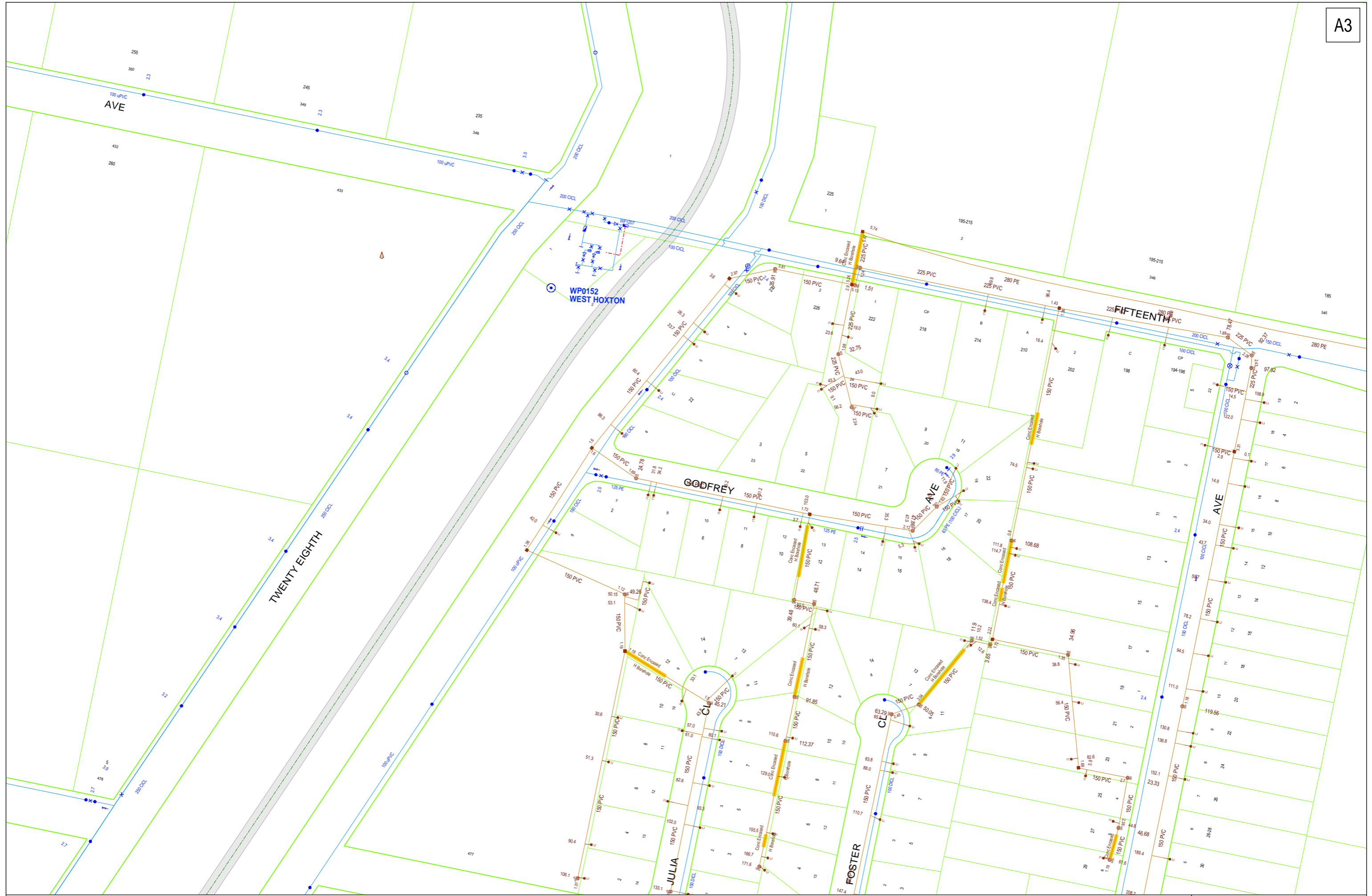
The requirements in this Notice relate to your Certificate application only. Sydney Water may be involved with other aspects of your development and there may be other fees or requirements.

These include:

- plumbing and drainage inspection costs;
- the installation of backflow prevention devices;
- trade waste requirements;
- large water connections and
 - council fire fighting requirements. (It will help you to know what the fire fighting requirements are for your subdivision as soon as possible. Your hydraulic consultant can help you here.)

No warranties or assurances can be given about the suitability of this document or any of its provisions for any specific transaction. It does not constitute an approval from Sydney Water and to the extent that it is able, Sydney Water limits its liability to the reissue of this Letter or the return of your application fee. You should rely on your own independent professional advice.

END



Tim Ireson

From: Greg Saunders <GSaunders@connecteng.com.au>
Sent: Thursday, 9 April 2015 9:30 AM
To: Tim Ireson
Subject: FW: ENL2435 - Supply Enquiry | Lot 346 DP 2475, Fifteenth Street WEST HOXTON

Tim,
See below

Regards,

Greg Saunders | Principal Design Consultant

Connect Infrastructure Pty Ltd “*Work Right – Home Tonight*”

| 0412 597 620 | t: 02 9733 3333 | f: 02 9733 3330 | PO Box 484, Casula Mall 2170 |
gsaunders@connecteng.com.au | www.connecteng.com.au



COLLABORATE | INNOVATE | DELIVER | POWER SOLUTIONS

From: David Ho [mailto:David.Ho@endeavourenergy.com.au]
Sent: Thursday, 9 April 2015 9:20 AM
To: Greg Saunders
Cc: Brendon Hince
Subject: RE: ENL2435 - Supply Enquiry | Lot 346 DP 2475, Fifteenth Street WEST HOXTON

Hi Greg,

At present, 11kV feeder 48196 “Fifteenth Avenue” ex Hinchinbrook ZS has sufficient capacity to cater for your declared load 670kVA.

Supply Arrangements and conditions will be as follows:-

1. Establish a 1000kVA PM Sub with 2 x FDR RMU on site.
2. Install 240mm² Al XLPE 11kV cable from Pole 774832 to new Sub.
3. Provide Type 24 ducts across the frontage of the development.
4. Provide Type 24 road crossing.

Regards,
David

From: Greg Saunders [<mailto:GSaunders@connecteng.com.au>]
Sent: Tuesday, 7 April 2015 5:27 PM
To: David Ho
Cc: Brendon Hince
Subject: FW: ENL2435 - Supply Enquiry | Lot 346 DP 2475, Fifteenth Street WEST HOXTON

David,

With reference to your e-mail below, more details are now available on potential usage and therefore the loads which are estimated:

- 250m² Service Station- 50kVA
- 500m² Child Care- 50kVA

- 1,500m² LFR – 150kVA
- 1,200m² Specialty Retail / Small Business- 120kVA
- 1,500m² Supermarket- 150kVA
- 400m² Fast Food Pad site- 150kVA

Total = 670kVA

Could you please call me to discuss at your earliest opportunity

Regards,

Greg Saunders | Principal Design Consultant

Connect Infrastructure Pty Ltd *“Work Right – Home Tonight”*

| 0412 597 620 | t: 02 9733 3333 | f: 02 9733 3330 | PO Box 484, Casula Mall 2170 |

gsaunders@connecteng.com.au | www.connecteng.com.au



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