

Water Sensitive Urban Design (WSUD) Strategy Report

Industrial Redevelopment

54-68 Ferndell Street

South Granville NSW 2142

PREPARED BY

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DATE 31st May 2019
ISSUE 001
REVISION 003

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Document Control

Revision	Date	Description	Prepared	Reviewed	Approved
1	30/11/18	Issued for Comment	BB	MW	
2	07/12/18	Issued for DA	BB	MW	BB
3	31/05/19	Reissued for DA	BB	SK	BB

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Introduction

Sparks & Partners Consulting Engineers have been engaged by Dexu Funds Management to undertake the concept civil engineering design for a proposed development at 54-68 Ferndell St, South Granville. The engineering services include the design and documentation of the stormwater drainage infrastructure and finished surface levels for the proposed development.

Cumberland Council is the approval authority and has recently been formed through the amalgamations of Auburn and Holroyd Councils, and the redefining of Local Government Area (LGA) boundaries with Parramatta Council. The site itself previously fell under Parramatta Council prior to the redefining of the LGA boundaries. This Water Sensitive Urban Design (WSUD) Strategy report has been prepared by taking into consideration the objectives and controls under the Parramatta City Council Stormwater Disposal Policy and Development Control Plan (DCP). In response to this requirement Sparks and Partners has undertaken modelling of the proposed WSUD measures and prepared this report to demonstrate that the proposed industrial redevelopment identifies and incorporates water conservation and stormwater management measures into its design and operation.

The current design incorporates on-site detention for all areas of the site not affected by overland flow from upstream properties. Refer to the Overland flow Flood Study Report also submitted with this development application (DA).

This report revision addressed comments on stormwater issues, and revised architectural layouts resulting from council's initial review of the development application.

Existing Site

The site has been previously used for pharmaceutical manufacturing and has several warehouses, office buildings, storage areas, carparking, circulation roadways and associated infrastructure such as storage tanks and pipelines. The existing site buildings have recently been demolished in preparation for redevelopment of the site. A south-west portion of the site is a biodiversity area that is undeveloped and contains an earth drainage channel. There are two 1800mm diameter stormwater drainage pipelines that run through the site from the channel in the biodiversity area to Ferndell Street and further downstream toward Duck River located to the east. The site is bounded by 74 Ferndell Street and 6, 8 & 10 Ferngrove Place on the southern boundary, Ferndell Street on the eastern boundary, 46 Ferndell Street and 10 Straits Avenue along the northern boundary and Campbell Hill Pioneer Reserve on the western boundary.

Proposed Development

The proposed development occupies a total area of 93,000m² and consists of four warehouse buildings, café, offices hardstand, car park pavement areas and landscaping. The buildings occupy 58,565m², the pavement area occupies 30,845m² and the landscaping occupies 3,590m². There is an existing undeveloped area in the south west corner of the site that is to remain largely unchanged, with regrading of the drainage channel eastern bank and works around an existing easement pipe headwall to occur. Detailed architectural plans have been prepared by Nettleton Tribe architects and are to be read in conjunction with this report.

Overland Flow

Existing twin 1800mm diameter pipes below the site have been assessed to determine the volume and extents of any associated overland flow. Currently, a large portion of the site is inundated during the 100 year Average Recurrence Interval (ARI) storm and runoff greater than the pipe capacity is conveyed through the site as overland flow. The proposed design eliminates the overland flow by

providing an overflow pipe to convey flows through the site that are in excess of the easement pipe capacity during the 100ARI storm whilst assuming 50% blockage at the headwall. The level of overland flow during the 100ARI storm and hydraulic grade line (HGL) of flows within the easement pipes has been accounted for in the design of the On-Site Detention (OSD) and stormwater drainage system. Upstream catchments that drain through the site bypass the OSD catchments. Drawings with the extents of overland flow are located in Appendix A. For further detailed information regarding the overland flow refer to the Sparks and Partners Overland Flow Flood Study Report.

Water Sensitive Urban Design (WSUD)

The objective of WSUD is to provide a strategy that brings together the different aspects of the water cycle as a whole rather than an ad hoc approach to water management. This includes the management aspects of freshwater, wastewater and stormwater. The following WSUD strategies have been considered and addressed for the proposed development:

- Employ an integrated water collection and recycling system for capturing and recycling roofwater;
- Control the quality of stormwater that is disposed from the site;
- Control the quantity of stormwater that is discharged for the site.

To demonstrate the above concept stormwater drainage plans and associated details have been prepared along with detailed modelling using the MUSIC software package. The concept stormwater drainage plans detail the location of the water management infrastructure including pits, pipes, Enviropods, Stormfilter Cartridges, OSD and rainwater tanks, and are included in Appendix A for reference.

Rainwater Reuse

Through the reuse of collected roofwater for non-potable reuse the proposed demand on potable water resources is reduced. The proposed development will capture roof water from part of each warehouse building roof area. This collected roofwater will be conveyed to a tank for storage and reuse throughout the development. Re-use purposes will primarily include irrigation uses. A water balance of the proposed reuse system is to be completed at the detailed design stage to model the effectiveness and efficiency of the system based upon the demand for irrigation.

Stormwater Quality

To ensure the quality of stormwater leaving the site is acceptable and meets WSUD requirements specific water quality treatment measures are to be employed. These treatment measures are to treat the collected stormwater runoff prior to discharge to the council drainage system. The treatment measures consist of Ocean Protect Oceanguards (formerly Stormwater 360 Enviropods) and PSorb Stormfilter Cartridges. The combination of these measures provides a treatment train approach to the treatment of stormwater runoff with Oceanguards providing primary treatment and the PSorb Stormfilters providing secondary treatment.

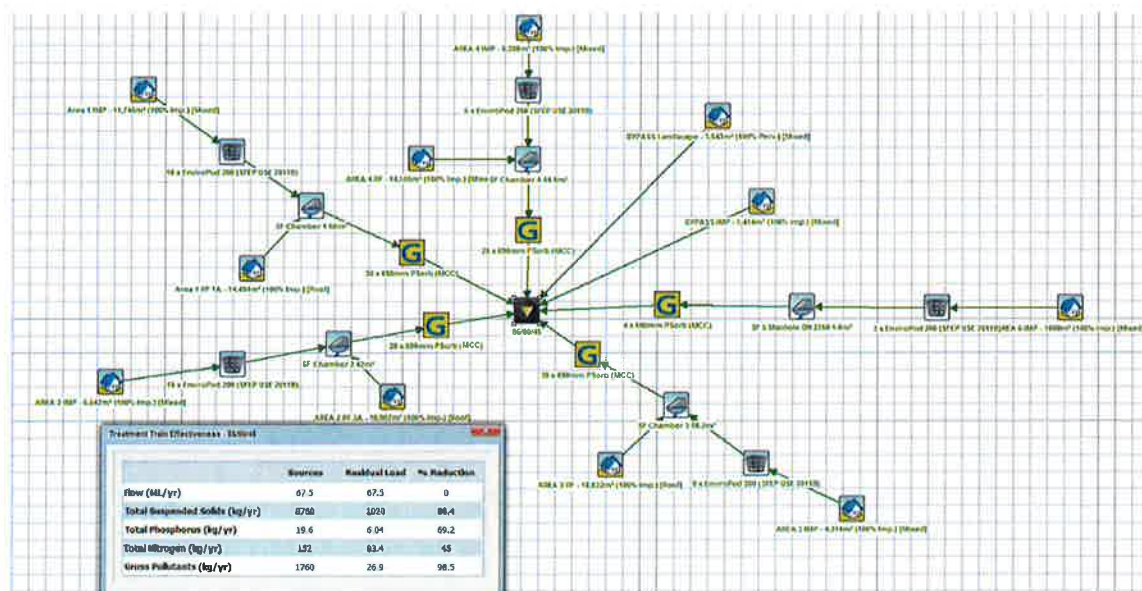
This development falls within the newly formed Cumberland Council in an area that was previously in the Parramatta LGA. The WSUD measures have been implemented to meet targets in accordance with the Parramatta City Council (PCC) DCP 2011.

Modelling of the proposed treatment measures has been undertaken using the MUSIC software package version 6. The pre-loaded source nodes in Parramatta MUSIC-link produce the same pollutant loads for all source surfaces, an approach which differs from the NSW MUSIC modelling guidelines. Previous advice from PCC engineers has allowed an approach to use pre-loaded Blacktown City Council nodes, which differentiate the pollutant loads from different sources such as roof and ground surfaces. This approach provides a more accurate model of the site pollutant loads. A catchment plan

has been prepared to differentiate the surface types and confirm which catchments are draining to which treatment measures. The WSUD catchment plan is located in Appendix A for reference. The modelling results of the water quality achieved for the site is detailed in Table 1 – MUSIC Model Results below, along with a figure of the prepared model. The results show that the proposed WSUD measures and treatment train approach ensures the development will meet the required pollutant reduction targets. Refer to the submitted MUSIC model for verification.

	Source Load	Residual Load	% Reduction Achieved	PCC % Reduction Requirement	Compliance with PCC Requirement
Total Suspended Solids (kg/yr)	8760	1020	88.4	85	Y
Total Phosphorus (kg/yr)	19.6	6.04	69.2	60	Y
Total Nitrogen (kg/yr)	152	83.4	45.0	45	Y
Gross Pollutants (kg/yr)	1760	26.9	98.5	90	Y

Table 1 - MUSIC Model Results



Stormwater Quantity

The proposed development requires the implementation of on-site detention (OSD) as per the PCC Engineering Guide for Development to control stormwater discharge from the site. The OSD has been designed in accordance with Parramatta City Council's Stormwater Disposal Policy and the Upper Parramatta River Catchment Trust (UPRCT) Handbook Revision 4. In accordance with previous advice from council, the undeveloped biodiversity area which is affected by overland flow, has not been included in the OSD catchment. Utilising surface ponding or partial surface ponding as OSD was considered during the design phase, however, is unfeasible due to the nature of operations within the proposed development, therefore the developed areas of the site will drain to below ground OSD tanks. The site area has been divided into four catchments each with their own OSD tanks and discharge points, with an area bypassing the OSD. The OSD tanks discharge to the easement and overflow pipes that dissect the site. Due to the existing easement pipes and large size of the site, each OSD has a separate discharge point. An OSD catchment plan of the proposed development is included in Appendix A. The OSD calculations allow for approximately 6.6% bypass within each catchment to account for the bypass area along the Ferndell Street frontage. Table 2 below provides a summary of the catchments within the site.

OSD	Catchment Area (m ²)	Percentage Bypassing OSD (%)	Total OSD Volume Required (m ³)
1	26,236	7.1	1,365
2	17,456	7.0	908
3	22,940	6.7	1,193
4	19,848	6.6	1,033

Table 2 – Site OSD Catchment Summary

PCC requires OSD to be designed using the UPRCT handbook. The UPRCT OSD summary sheet has been utilised to determine the required volume and discharge for the proposed development. The site is situated within the Duck River catchment and Table 3 contains the site storage requirement (SSR) and site reference discharge (SRD) rates that have been used in the design.

OSD	Primary Outlet SRD (L/s/ha)	Secondary Outlet SRD (L/s/ha)	Total SSR (m ³ /ha)	Notes
1	40	150	520	HED Configuration
2	40	150	520	Drowned Outlet – Non HED Configuration
3	40	150	520	HED Configuration
4	40	150	520	HED Configuration

Table 3 – OSD Design Parameters

The OSD summary sheets are located in the Appendix B for review and the completed UPRCT OSD checklist is located in Appendix C for review.

Maintenance and Monitoring

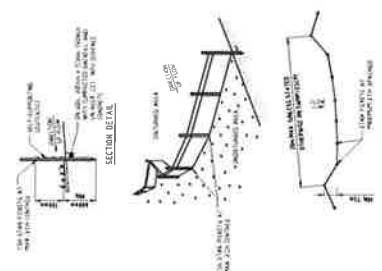
To ensure the continued efficient and correct operation of the proposed integrated water management infrastructure a 'maintenance and monitoring schedule' is included in the Appendix D of this plan. The schedule details the frequency of inspections, what is to be inspected and what rectifications to make if required for the water management infrastructure located within the proposed development. The schedule is to be implemented upon commissioning of the water management infrastructure and remain in place for the life of the development; with all records kept on site for inspection should the approval authority deem it necessary.

Conclusion

Based on the concept stormwater drainage plans & MUSIC modeling results, it is demonstrated that the principles of water sensitive urban design have been incorporated into the design and operation of the proposed development at 54-68 Ferndell Street South Granville in accordance with PCC Stormwater Disposal Policy. It is demonstrated that the proposed development will achieve reductions in potable water import by capturing rainwater on site and reusing this for non-potable uses including irrigation, achieves runoff pollution reduction targets set by council, and employs OSD for the control of stormwater discharge from the site in accordance with targets set by council. It is also demonstrated that the proposed development will continue to operate effectively and efficiently through the implementation and use of a monitoring and maintenance schedule, ensuring the integrity of the system is maintained.

Appendix A – Concept Drainage Plans





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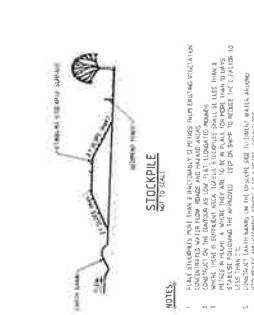


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SEDIMENT TRAP FOR DROP INLET
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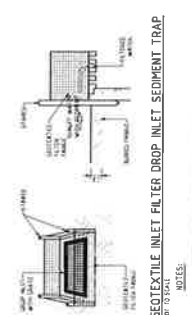
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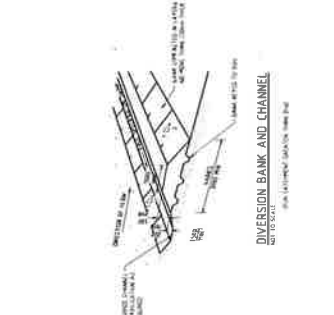
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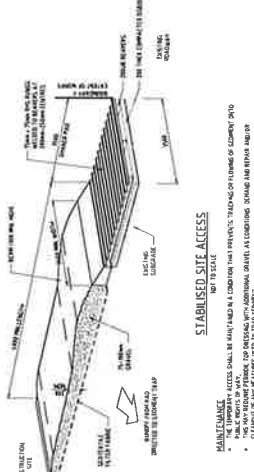
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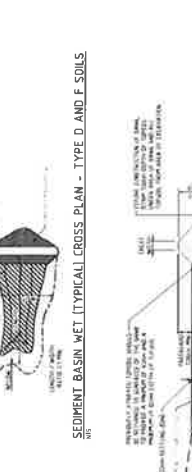
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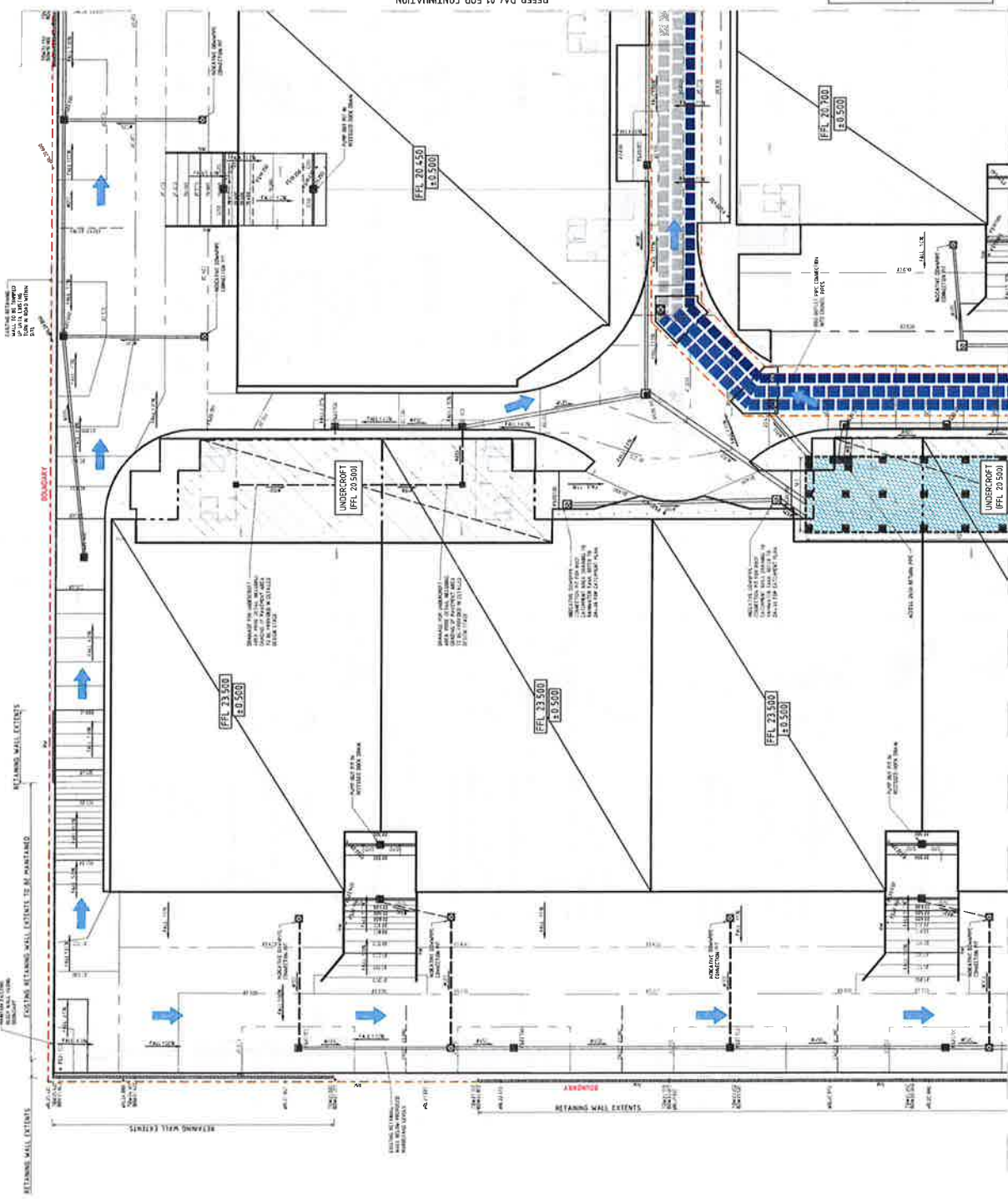
4. Explain the role of the contractor in the construction process.
5. Discuss the importance of communication in construction management.
6. Identify the key components of a construction contract.
7. Explain the role of the project manager in construction management.
8. Discuss the importance of risk management in construction management.
9. Identify the key components of a construction project plan.
10. Explain the role of the construction manager in the construction process.

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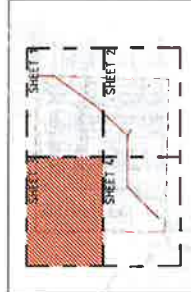


NOTES

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KEY PLAN
REVISION

PROJECT STRATEGY

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nettleton

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SPARKS+PARTNERS

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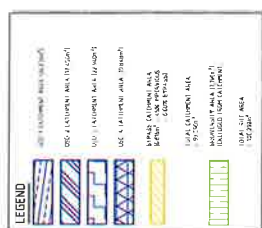
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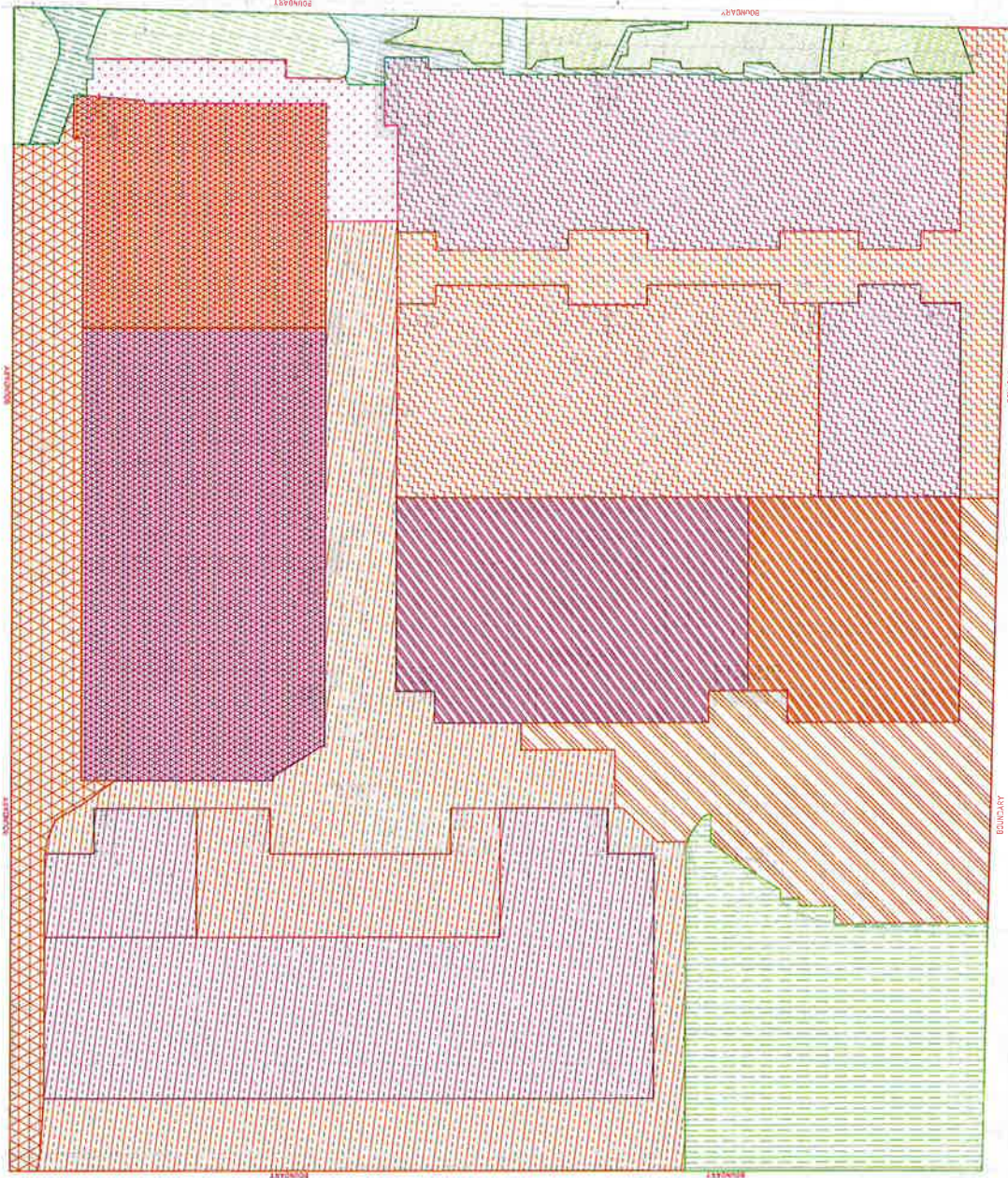
CONCEPT STORMWATER MANAGEMENT PLAN SHEET 3

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10	2019.08.24	REVISION			

Scale: 1" = 10'





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PROJECT

STRATEGY

ST. FENCIBLE ST. SOUTH GRANVILLE

SPARKS+PARTNERS

ARCHITECT

DATE: 03-11-2023

nettletribe

CONCEPT STORMWATER WOOD

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DATE: 03-11-2023

RE-ISSUED FOR DA

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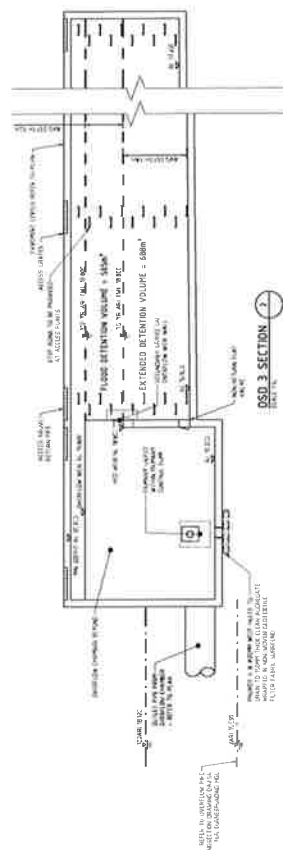
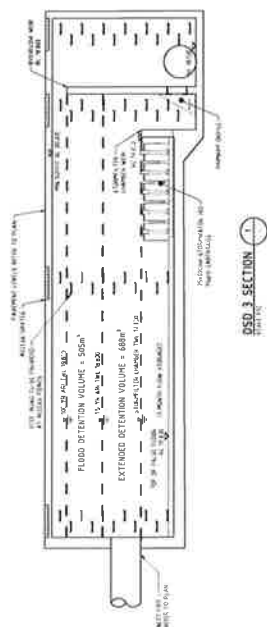
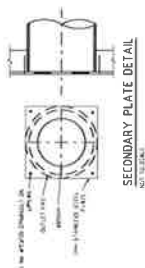


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OSD 3 STAGED DISCHARGE CONTROL SUMP AND WEIR LAYOUT

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NOTES & CALCULATIONS

54 FERDELL ST. SOUTH GRANVILLE

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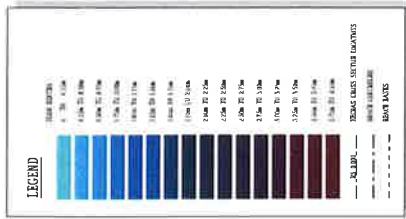
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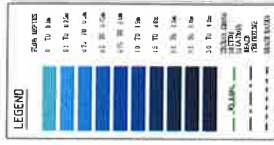
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Appendix B – UPRCT OSD Calculation Summary

**On-Site Detention Calculation Sheet for
Carctments outside Upper Parramatta River Catchment
HED Secondary Outlet**

Project:	DA OSD 1				
Site Address	54-68 FERNDILL STREET SOUTH GRANVILLE				
Job No:	18109				
Designer:	BB				
Telephone:	02 9891 5033				

Site Data					
OSD Area:	Duck River				
L.G.A	Parramatta City Council				
Site Area	2.6236	ha	26,236	m ²	
Total Roof Area	1.4495	ha	14,495	m ²	
Area of Site draining to OSD Storage	2.54	ha	25,400	m ²	Satisfactory
Residual Site Area (Lot Area - Roof Area)	1.174	ha			
Area Bypassing Storage	0.0836	ha			
Area Bypassing / Residual Site Area	7.1%				Satisfactory 30% Max
No. of Dwellings on Site	1				Satisfactory
Site Area per Dwelling	2.624	ha			
Roof Area per Dwelling	1.450	ha			

Basic OSD Parameters					
		Extended Detention		Detention	
Basic SSR Vols	Ext Detention Storage	300	m ³ /ha	Total Storage	520 m ³ /ha
Basic SRDs	Primary Outlet	40	L/s/ha	Secondary Outlet	150 L/s/ha

OSD Tank Bypass			
Residual Lot Capture in OSD Tank	93%		
Adjusted SRDs	38	L/s/ha	136 L/s/ha

OSD Calculations					
		Extended Detention		Detention	
Basic SSR Volume	Ext Detention Storage	787.08	m ³	Total Storage	1364.27 m ³
Total Rainwater Tank Credits		0.00	m ³		0.00 m ³
Storage Volume				Total	1364.27 m ³
Storage Volume	Ext Detention Storage	787.08	m ³	Flood Detention Storage	577.19 m ³
OSD Discharges	Primary Outlet	99.34	L/s	Secondary Outlet	356.16 L/s
RL of Top Water Level of Storage		18.750	m		19.800 m
RL of Orifice Centre-line		17.100	m		18.700 m
Number of Orifices		1			1
Estimated Downstream Flood Level		16.82	1.5 yr ARI		18.55 100 yr ARI
Downstream FL - RL of Orifice Centre-line		-0.28	Satisfactory		-0.15 m
Design Head to Orifice Centre		1.650	m	TWL Ext Detn Storage - RL Orifice	0.050 m
Calculated Orifice Diameter		192	mm		874 mm

Overflow Weir & Freeboard Calculation			
RL of Minimum Habitable Floor Level		20.450	m
RL of Minimum Garage Floor Level		20.450	m
Length of Overflow Weir		6.00	m
Site Runoff Coefficient	Parramatta City Council	0.75	
Storm Intensity (5 min 100 yr ARI)		206	mm/h
Peak Flow over Weir		1090.1	L/s
Depth of Flow over Weir		231	mm
Freeboard to Habitable Floor		419	mm
Freeboard to Garage Floor		419	mm

Rainwater Tank Calculations (per Dwelling)				
Only Complete this Section if a Rainwater Tank Airspace Credit is Claimed				
The calculations assume that the same size rainwater tank is installed on each dwelling				
% of Roof draining to Rainwater Tank	0.0%		Satisfactory	Min 0.0% Max 100%
Total Rainwater Tank Volume	0.00	kL	Minimum 0.0 kL	
Min Volume that triggers Top-up	0.00	kL	Note - Min Vol In Tank < 10% Total Tank Vol	
Total Tank Vol - Min Top-up Vol	0.00	kL		
Dedicated Airspace				
Dedicated Airspace	0.00	kL	Satisfactory	
Extended Detention		Detention		
Dedicated Airspace Credit	0.00	kL	0.00 kL	
Maximum Tank PSD	40	L/s/ha		
Maximum Tank Discharge	0.0	L/s		
Maximum Head to Centre of Tank Orifice	0.000	m	No Dedicated Airspace	
Calculated Orifice Diameter	0	mm	No Dedicated Airspace	
Dynamic Airspace				
Maximum Dynamic Storage (Nett Vol)	0.00	kL	Controls minimum % Roof to Rainwater Tank	
Daily Demand on Rainwater Tank	0.657	kL/d	Satisfactory	
Dynamic Airspace at start of Storm	0.00	kL		
Extended Detention		Detention		
Dynamic Airspace Credit	0.00	kL	0.00 kL	
Combined Rainwater Tank Credit	0.00	kL	0.00 kL	
Maximum Rainwater Tank Credit	0.00	kL	0.00 kL	
Rainwater Tank Credit per Dwelling	0.00	kL	0.00 kL	
Rainwater Tank Credit for the Site	0.00	m ³	0.00 m ³	

Signature: _____

Date: _____

On-Site Detention Calculation Sheet for
Catchments outside Upper Parramatta River Catchment
Non-HED Secondary Outlet
(Due to Elevated Downstream 100 yr ARI Flood Level)

Project:	DA - OSD 2				
Site Address	54-68 FERNEDELL STREET SOUTH GRANVILLE				
Job No:	18109				
Designer:	SK				
Telephone:	02 9891 5033				

Site Data					
OSD Area:	Duck river				
L.G.A	Parramatta City Council				
Site Area	1.7456	ha	17,456	m ²	
Total Roof Area	1.0905	ha	10,905	m ²	
Area of Site draining to OSD Storage	1.7	ha	17,000	m ²	Satisfactory
Residual Site Area (Lot Area - Roof Area)	0.655	ha			
Area Bypassing Storage	0.0456	ha			
Area Bypassing / Residual Site Area	7.0%				Satisfactory
No. of Dwellings on Site	1				Satisfactory
Site Area per Dwelling	1.746	ha			30% Max
Roof Area per Dwelling	1.091	ha			

Basic OSD Parameters					
		Extended Detention		Detention	
Basic SSR Vols	Ext Detention Storage	300	m ³ /ha	Total Storage (1.14 x SSR _{THER})	520 m ³ /ha
Basic SRDs	Primary Outlet	40	L/s/ha	Secondary Outlet	150 L/s/ha

OSD Tank Bypass					
Residual Lot Capture in OSD Tank	93%				
Adjusted SRDs	38	L/s/ha	136	L/s/ha	

OSD Calculations					
		Extended Detention		Detention	
Basic SSR Volume	Ext Detention Storage	523.68	m ³	Total Storage	907.71 m ³
Total Rainwater Tank Credits		0.00	m ³		0.00 m ³
Storage Volume				Total	907.71 m ³
Storage Volume	Ext Detention Storage	523.68	m ³	Flood Detention Storage	384.03 m ³
OSD Discharges	Primary Outlet	66.18	L/s	Secondary Outlet	237.54 L/s
RL of Top Water Level of Storage	18.800	m		19.800	m
RL of Orifice Centre-line	17.000	m		17.000	m
Number of Orifices	1			1	
Estimated Downstream Flood Level	16.30	1.5 yr ARI		20.03	100 yr ARI
Downstream FL - RL of Orifice Centre-line	-0.70	Satisfactory	Adopt non-HED Outlet	3.03	
Design Head to Orifice Centre	1.800	m	TWL Detn Storage - RL Orifice	2.800	m
Calculated Orifice Diameter	154	mm	Satisfactory	Satisfactory	261 mm

Overflow Weir & Freeboard Calculation					
RL of Minimum Habitable Floor Level			20.800	m	
RL of Minimum Garage Floor Level			20.800	m	
Length of Overflow Weir			6.00	m	
Site Runoff Coefficient	Parramatta City Council		0.75		
Storm Intensity (5 min 100 yr ARI)			206	mm/h	
Peak Flow over Weir			729.6	L/s	
Depth of Flow over Weir			177	mm	
Freeboard to Habitable Floor			Satisfactory	823	mm
Freeboard to Garage Floor			Satisfactory	823	mm

Rainwater Tank Calculations (per Dwelling)				
Only Complete this Section if a Rainwater Tank Airspace Credit is Claimed				
The calculations assume that the same size rainwater tank is installed on each dwelling				
			Min	Max
% of Roof draining to Rainwater Tank	0.0%		Satisfactory	0.0% 100%
Total Rainwater Tank Volume	0.00	kL	Minimum 0.0 kL	
Min Volume that triggers Top-up	0.00	kL	Note - Min Vol in Tank < 10% Total Tank Vol	
Total Tank Vol - Min Top-up Vol	0.00	kL		
Dedicated Airspace				
Dedicated Airspace	0.00	kL	Satisfactory	
	Extended Detention		Detention	
Dedicated Airspace Credit	0.00	kL	0.00	kL
Maximum Tank PSD	40	L/s/ha		
Maximum Tank Discharge	0.0	L/s		
Maximum Head to Centre of Tank Orifice	0.000	m	No Dedicated Airspace	
Calculated Orifice Diameter	0	mm	No Dedicated Airspace	
Dynamic Airspace				
Maximum Dynamic Storage (Nett Vol)	0.00	kL	Controls minimum % Roof to Rainwater Tank	
Daily Demand on Rainwater Tank	0.657	kL/d	Satisfactory	
Dynamic Airspace at start of Storm	0.00	kL		
	Extended Detention		Detention	
Dynamic Airspace Credit	0.00	kL	0.00	kL
Combined Rainwater Tank Credit	0.00	kL	0.00	kL
Maximum Rainwater Tank Credit	0.00	kL	0.00	kL
Rainwater Tank Credit per Dwelling	0.00	kL	0.00	kL
Rainwater Tank Credit for the Site	0.00	m ³	0.00	m ³

Signature: _____

Date: _____

On-Site Detention Calculation Sheet for
Carctments outside Upper Parramatta River Catchment
HED Secondary Outlet

Project:	DA - OSD3				
Site Address	54-68 FERNDILL STREET SOUTH GRANVILLE				
Job No:	18109				
Designer:	BB				
Telephone:	02 9891 5033				

Site Data					
OSD Area:	Duck River				
L.G.A	Parramatta City Council				
Site Area	2.294	ha	22,940	m ²	
Total Roof Area	1.8622	ha	18,622	m ²	
Area of Site draining to OSD Storage	2.265	ha	22,650	m ²	Satisfactory
Residual Site Area (Lot Area - Roof Area)	0.432	ha			
Area Bypassing Storage	0.029	ha			
Area Bypassing / Residual Site Area	6.7%				Satisfactory 30% Max
No. of Dwellings on Site	1				Satisfactory
Site Area per Dwelling	2.294	ha			
Roof Area per Dwelling	1.862	ha			

Basic OSD Parameters					
		Extended Detention		Detention	
Basic SSR Vols	Ext Detention Storage	300	m ³ /ha	Total Storage	520 m ³ /ha
Basic SRDs	Primary Outlet	40	L/s/ha	Secondary Outlet	150 L/s/ha

OSD Tank Bypass			
Residual Lot Capture in OSD Tank	93%		
Adjusted SRDs	38	L/s/ha	137 L/s/ha

OSD Calculations					
		Extended Detention		Detention	
Basic SSR Volume	Ext Detention Storage	688.20	m ³	Total Storage	1192.88 m ³
Total Rainwater Tank Credits		0.00	m ³		0.00 m ³
Storage Volume				Total	1192.88 m ³
Storage Volume	Ext Detention Storage	688.20	m ³	Flood Detention Storage	504.68 m ³
OSD Discharges	Primary Outlet	87.14	L/s	Secondary Outlet	313.29 L/s
RL of Top Water Level of Storage		18.750	m		19.800 m
RL of Orifice Centre-line		16.800	m		18.700 m
Number of Orifices		1			1
Estimated Downstream Flood Level		15.59	1.5 yr ARI		18.12 100 yr ARI
Downstream FL - RL of Orifice Centre-line		-1.21	Satisfactory		-0.58 Satisfactory
Design Head to Orifice Centre		1.950	m	TWL Ext Detn Storage - RL Orifice	0.050 m
Calculated Orifice Diameter		173	mm		819 Satisfactory

Overflow Weir & Freeboard Calculation			
RL of Minimum Habitable Floor Level		20.450	m
RL of Minimum Garage Floor Level		20.450	m
Length of Overflow Weir		6.80	m
Site Runoff Coefficient	Parramatta City Council	0.75	
Storm Intensity (5 min 100 yr ARI)		206	mm/h
Peak Flow over Weir		972.1	L/s
Depth of Flow over Weir		197	mm
Freeboard to Habitable Floor		453	mm
Freeboard to Garage Floor		453	mm

Rainwater Tank Calculations (per Dwelling)				
Only Complete this Section if a Rainwater Tank Airspace Credit is Claimed				
The calculations assume that the same size rainwater tank is installed on each dwelling				
			Min	Max
% of Roof draining to Rainwater Tank	0.0%		Satisfactory	0.0% 100%
Total Rainwater Tank Volume	0.00	kL	Minimum 0.0 kL	
Min Volume that triggers Top-up	0.00	kL	Note - Min Vol In Tank < 10% Total Tank Vol	
Total Tank Vol - Min Top-up Vol	0.00	kL		
Dedicated Airspace				
Dedicated Airspace	0.00	kL	Satisfactory	
	Extended Detention		Detention	
Dedicated Airspace Credit	0.00	kL	0.00 kL	
Maximum Tank PSD	40	L/s/ha		
Maximum Tank Discharge	0.0	L/s		
Maximum Head to Centre of Tank Orifice	0.000	m	No Dedicated Airspace	
Calculated Orifice Diameter	0	mm	No Dedicated Airspace	
Dynamic Airspace				
Maximum Dynamic Storage (Nett Vol)	0.00	kL	Controls minimum % Roof to Rainwater Tank	
Daily Demand on Rainwater Tank	0.657	kL/d	Satisfactory	
Dynamic Airspace at start of Storm	0.00	kL		
	Extended Detention		Detention	
Dynamic Airspace Credit	0.00	kL	0.00 kL	
Combined Rainwater Tank Credit	0.00	kL	0.00 kL	
Maximum Rainwater Tank Credit	0.00	kL	0.00 kL	
Rainwater Tank Credit per Dwelling	0.00	kL	0.00 kL	
Rainwater Tank Credit for the Site	0.00	m ³	0.00 m ³	

Signature: _____

Date: _____

On-Site Detention Calculation Sheet for
Carctments outside Upper Parramatta River Catchment
HED Secondary Outlet

Project:	DA OSD4			
Site Address	54-68 FERNEDELL STREET SOUTH GRANVILLE			
Job No:	18109			
Designer:	BB			
Telephone:	02 9891 5033			

Site Data				
OSD Area:	Duck River			
L.G.A	Parramatta City Council			
Site Area	1.9848	ha	19,848	m ²
Total Roof Area	1.455	ha	14,550	m ²
Area of Site draining to OSD Storage	1.95	ha	19,500	m ² Satisfactory
Residual Site Area (Lot Area - Roof Area)	0.530	ha		
Area Bypassing Storage	0.0348	ha		
Area Bypassing / Residual Site Area	6.6%			Satisfactory 30% Max
No. of Dwellings on Site	1			Satisfactory
Site Area per Dwelling	1.985	ha		
Roof Area per Dwelling	1.455	ha		

Basic OSD Parameters				
		Extended Detention		Detention
Basic SSR Vols	Ext Detention Storage	300	m ³ /ha	Total Storage 520 m ³ /ha
Basic SRDs	Primary Outlet	40	L/s/ha	Secondary Outlet 150 L/s/ha

OSD Tank Bypass			
Residual Lot Capture in OSD Tank	93%		
Adjusted SRDs	38	L/s/ha	137 L/s/ha

OSD Calculations				
		Extended Detention		Detention
Basic SSR Volume	Ext Detention Storage	595.44	m ³	Total Storage 1032.10 m ³
Total Rainwater Tank Credits		0.00	m ³	0.00 m ³
Storage Volume				Total 1032.10 m ³
Storage Volume	Ext Detention Storage	595.44	m ³	Flood Detention Storage 436.66 m ³
OSD Discharges	Primary Outlet	75.48	L/s	Secondary Outlet 271.65 L/s
RL of Top Water Level of Storage		18.200	m	19.500 m
RL of Orifice Centre-line		16.000	m	17.000 m
Number of Orifices		1		1
Estimated Downstream Flood Level		15.52	1.5 yr ARI	16.96 100 yr ARI
Downstream FL - RL of Orifice Centre-line		-0.48	Satisfactory	Satisfactory -0.04 m
Design Head to Orifice Centre		2.200	m	TWL Ext Detn Storage - RL Orifice 1.200 m
Calculated Orifice Diameter		156	mm	Satisfactory Satisfactory 345 mm

Overflow Weir & Freeboard Calculation			
RL of Minimum Habitable Floor Level		20.450	m
RL of Minimum Garage Floor Level		20.450	m
Length of Overflow Weir		6.00	m
Site Runoff Coefficient	Parramatta City Council	0.75	
Storm Intensity (5 min 100 yr ARI)		206	mm/h
Peak Flow over Weir		836.9	L/s
Depth of Flow over Weir		194	mm
Freeboard to Habitable Floor		Satisfactory 756	mm
Freeboard to Garage Floor		Satisfactory 756	mm

Rainwater Tank Calculations (per Dwelling)				
Only Complete this Section if a Rainwater Tank Airspace Credit is Claimed				
The calculations assume that the same size rainwater tank is installed on each dwelling				
			Min	Max
% of Roof draining to Rainwater Tank	0.0%		Satisfactory	0.0% 100%
Total Rainwater Tank Volume	0.00	kL	Minimum 0.0 kL	
Min Volume that triggers Top-up	0.00	kL	Note - Min Vol In Tank < 10% Total Tank Vol	
Total Tank Vol - Min Top-up Vol	0.00	kL		
Dedicated Airspace				
Dedicated Airspace	0.00	kL	Satisfactory	
	Extended Detention		Detention	
Dedicated Airspace Credit	0.00	kL		0.00 kL
Maximum Tank PSD	40	L/s/ha		
Maximum Tank Discharge	0.0	L/s		
Maximum Head to Centre of Tank Orifice	0.000	m	No Dedicated Airspace	
Calculated Orifice Diameter	0	mm	No Dedicated Airspace	
Dynamic Airspace				
Maximum Dynamic Storage (Nett Vol)	0.00	kL	Controls minimum % Roof to Rainwater Tank	
Daily Demand on Rainwater Tank	0.657	kL/d	Satisfactory	
Dynamic Airspace at start of Storm	0.00	kL		
	Extended Detention		Detention	
Dynamic Airspace Credit	0.00	kL		0.00 kL
Combined Rainwater Tank Credit	0.00	kL		0.00 kL
Maximum Rainwater Tank Credit	0.00	kL		0.00 kL
Rainwater Tank Credit per Dwelling	0.00	kL		0.00 kL
Rainwater Tank Credit for the Site	0.00	m ³		0.00 m ³

Signature: _____

Date: _____

Appendix C – UPRCT OSD Checklist

I.1 OSD Stormwater Concept Plan Submission – Short Form

This form is to be completed by the stormwater designer and submitted to Council together with the plan(s), any necessary **attachments and a completed OSD Calculation Sheet.**

PROJECT ADDRESS: 54-68 Ferndell Street, South Granville

OSD DESIGNER DETAILS:

Company Name: Sparks+Partners Consulting Engineers

Address: Level 1, 91 George Street, Parramatta

Telephone No.: 02 9891 5033

Fax No: N/A

Accreditation Organisation: EA

Accreditation Reference: NER 3300498

Name of designer: Benjamin Barrett

Date: 31/05/2018

(Print Name)

Council Reviewer's Name: _____

Date: _____

CHECKLIST

1. Flooding:

Is the site (whole or partly) below the 100 year ARI flood level?

If yes, does the OSD system reflect the flood affectation?

Have floodplain issues been addressed (eg storage, obstructed flow etc)?

2. External catchment: (refer Section 4.1.3)

Is there an external catchment draining into the site?

If Yes, have calculations of 100 year ARI flow been submitted & full area of catchment shown?

3. OSD Storage: (refer Sections 4.1.4, 4.1.5 & 6.5)

Was the storage volume calculated using the UPRCT Calculation Sheet?

Is the area bypassing the OSD storage less than 30% of the residual area?

Is there free discharge at the outlet or provision made for a drowned outlet?

Has the storage been located at the lowest point of the site to collect surface and roof gutter overflow

4. Site information:

Has the following information has been shown on the plans:

- scaled site layout showing all buildings, roadways and landscaped areas
- spot levels and contours (including adjoining properties)
- location, dimensions and extent of detention storages
- location of any floodways or flowpaths through the site
- location of any other constraints, e.g. easements, sewer and other services or Water Sensitive Urban Design (WSUD) features

5. OSD Calculation Sheet is attached

Complies to Handbook		Council Agrees	
Yes	No	Yes	No
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix D – Maintenance & Monitoring Schedule

STORMWATER DRAINAGE SYSTEM MONITORING AND MAINTENANCE SCHEDULE

Author Name & Signature: _____

Date: _____

54-68 Ferndell Street South Granville

General Notes:

- 1 - Maintenance is to be carried out with regard to relevant occupational health and safety guidelines and standards. This includes all confined space, traffic management, fall arrest and other requirements.
- 2 - Initial monitoring and inspections of the stormwater system post commissioning are to be carried out every 3 months for the first year of operation. The amount and type of debris is to be noted and recorded. This information shall be used to determine if modification of the frequency of inspections is required.
- 3 - The frequency of inspections shown in the stormwater maintenance schedule are the maximum periods. Inspection frequencies may be reduced upon completion of the initial monitoring and inspection program as noted in note 2.
- 4 - Blank copies of the maintenance schedule are to be made and filled out during each subsequent inspection with the details kept on site for future reference.

Inspected by: _____

Date of Inspection: _____

Date of Next Inspection: _____

Item to be Inspected	Frequency	Performed by:	Inspected Yes/No	Maintenance Required Yes/No	Maintenance Procedure	Maintenance Completed Date
General						
Eaves/Box Guttering System and Downpipes	Six Monthly/ After Major Storm	Owner / Maintenance Contractor			Inspect and remove any build up of sediment, debris, litter and vegetation within gutter system.	
Stormwater surface inlet and junction pits	Four Monthly/ After Major Storm	Owner / Maintenance Contractor			Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter and vegetation. (e.g. Vacuum/extractor truck) Inspect and ensure grate is clear of sediment, debris, litter and vegetation. Ensure flush placement of grate on fellment	
General inspection of complete stormwater drainage system (that's visible)	Biannually	Owner / Maintenance Contractor			Inspect all drainage structures noting any dilapidation, carry out required repairs.	
Runwater Tank						
First Flush Device	6 Monthly	Owner / Maintenance Contractor			Inspect first flush device to ensure correct operation. Remove accumulated litter & debris. If device is not functioning properly repair or replace.	
Internal Inspection	6 Monthly	Owner / Maintenance Contractor			Check for evidence of access by animals, birds or insects including the presence of mosquito larvae. If present, identify access point and close. If evidence of algal growth, find and close points of flight entry.	
Tank and tank roof	6 Monthly	Owner / Maintenance Contractor			Check structural integrity of tank including roof and access covers. Any dilapidation including holes or gaps are to be noted and repaired.	
WSP, Q1 Measures						
Ocean Protect Storm/Filter Cartridges	Refer Manufactures Manual	Maintenance / Specialised Contractor			Refer to manufactures operation and maintenance manual.	
Ocean Protect EnviroPods	Refer Manufactures Manual	Maintenance / Specialised Contractor			Refer to manufactures operation and maintenance manual.	
SSD and Stormwater Tanks						
Trash Screen	Six Monthly/ After Major Storm	Owner / Maintenance Contractor			Inspect trash screen to ensure correct operation. Remove accumulated litter & debris. If device is not functioning properly repair or replace.	
Tank and tank roof	6 Monthly	Owner / Maintenance Contractor			Check structural integrity of tank including roof and access covers. Any dilapidation including holes or gaps are to be noted and repaired.	

