



JCO CONSULTANTS

PREPARED FOR:

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PROPOSED SUBDIVISION

No.12-14 Gladys Avenue, Frenchs Forest

WSUD Strategy Report

PREPARED BY

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1 Introduction

This document outlines the Water Sensitive Urban Design (WSUD) Strategy for the proposed residential subdivision located at 12-14 Gladys Avenue, Frenchs Forest. This strategy looks at the principles, objectives and targets for WSUD, the opportunities and constraints to the implementation of WSUD, as well as the proposed WSUD measures to be implemented as part of the proposed works.

The Concept Plans prepared by RK Designs show proposed Residential Subdivision with associated concrete driveway area. The proposed development is illustrated in Figure 1.1 below.

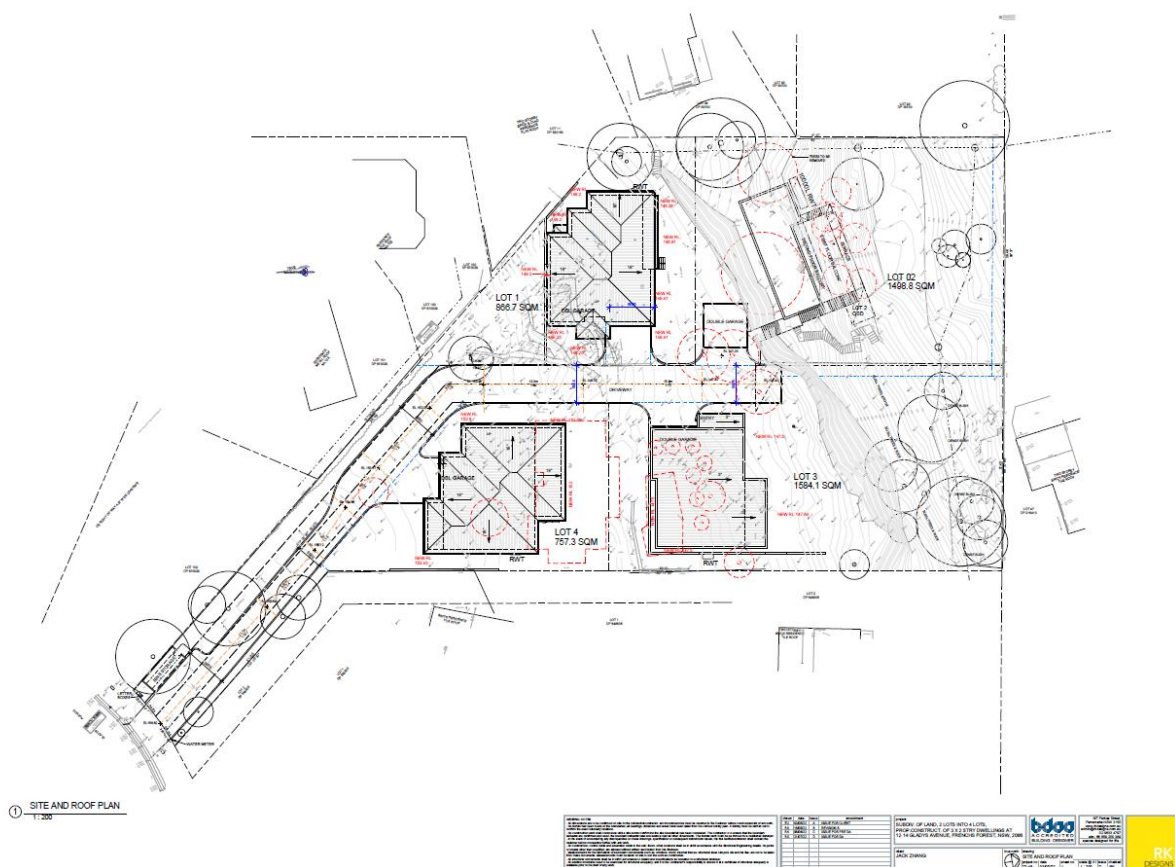


Figure 1.1 Site Plan

2 Water Sensitive Urban Design

2.1 Principles, Objectives and Targets

Northern Beaches Council has implemented a WSUD & MUSIC Modelling Guidelines. The aim of this policy is to respond to the growth of developable land within the Northern Beaches Council LGA and improve the water conservation, and the quality and quantity of stormwater runoff from both new land development, and redevelopment of existing properties as they are developed.

The objectives of this report are to:

- Assess the runoff quality for the untreated post developed scenario and identify stormwater quality controls likely to impact on runoff quality.
- Assess the stormwater quality for the post developed scenario including the measures proposed to meet the pollutant removal targets

The report is based on the application of music software (model for urban stormwater improvement conceptualisation). In this regard the model is defined as follows:

- A stormwater quality model to convert rainfall and evapotranspiration into runoff.
- Estimation of stormwater flow and pollution generation by simulating the performance of stormwater treatment devices individually and as part of a treatment train.

The model defines water quality profiles for both treated and untreated post developed scenarios. The treated post developed model includes parameters which represent the water quality measures.

The Policy is used to provide guidance for engineers and architects to ensure that developments mitigate their stormwater impacts on the natural environment.

The targets that Council has set as part of the WSUD & MUSIC Modelling Guidelines are as follows:

- 90% reduction of mean annual load of total gross pollutants
- 85% reduction of mean annual load of Total Suspended Solids (TSS)
- 65% reduction of mean annual load of Total Phosphorus (TP)
- 45% reduction of mean annual load of Total Nitrogen (TN)

Stormwater runoff modelling is carried out using the software called MUSIC (Model for Urban Stormwater Improvement Conceptualisation) using data from Council's WSUD Technical Guidelines.

2.2 Site Analysis

The proposed Right of Way falls towards the common OSD and Stormfilter tank at the low point of the driveway handle. The proposed drainage from Lot 1, Lot 3 and Lot 4 is draining back the Stormfilter Chamber in the OSD tank.

As a result, the proposed stormwater treatment train will treat the runoff from most of the site impervious area except for the impervious area in Lot 2. Such area was unable to be captured into the treatment system.

2.3 Treatment Train

The site consists of 1 x shared driveway, 4 x impervious roof areas, and pervious areas in each lot, which has various sub-catchments that collect pollutants at various rates. The MUSIC model adopts the



pollutant parameters from Council WSUD Technical Guidelines and Water NSW MUSIC Model Guidelines. The catchments are allocated as outlined in the following table.

Table 2.1 Catchment Area

Type	Area (m ²)	Fraction Impervious
Un-habitable roof area draining to Stormfilter tank via rainwater tank	886.7	100%
Un-habitable roof area (Lot 2) draining bypass Stormfilter tank	138.6	100%
Trafficable area draining to Stormfilter tank via Ocean Guard	610.8	100%
Pervious area to Stormfilter tank via Ocean Guard	950.2	0%
Bypass (Concrete or Deck)	96.7	100%
Bypass (Landscaping Areas)	1012 (half of the landscape bypass)	0%

It is proposed to meet Council’s stormwater quality improvement targets outlined in part 2 of this strategy with a combination of proprietary devices. The proposed stormwater quality improvement devices are outlined in the following table.

Table 2.2 Stormwater Quality Improvement Devices

Treatment Train	Description
Rainwater Tank	It is proposed to have 4 x 1500L rainwater tank to capture all the proposed roof areas. Connect the tank water to all toilets for re-use and at least 1 outdoor tap for irrigation.
Ocean Guard (Pit Basket)	This is a proprietary pit basket from Ocean Protect. The proposed device will remove pollutants down to 200microns. The inserts are located inside the inlet pits. A total of 17 Ocean Guards are proposed for the pits collecting the driveway runoff and surface runoff from external area of each lot.
StormFilter Cartridges	The StormFilter is a proprietary treatment system uses rechargeable, self-cleaning, media-filled cartridges to absorb and retain the pollutants from stormwater runoff including total suspended solids, hydrocarbons, nutrients, soluble heavy metals, and other common pollutants. A total of 11 x 690 Tall

	PSorb StormFilters is to be installed in the Stormfilter Chamber.
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MUSIC was used to model the proposed site drainage stormwater treatment train. The proposed treatment train on the development application documentation meets the objectives and targets of Northern Beaches Council's WSUD Technical Guidelines.

Water Conservation Measures

The rainwater tanks each included a reuse rate of 0.195kL/day(ea) for toilets and 55kL/yr(ea) for irrigation based on the following Water NSW excerpt. Each Dwelling to have **minimum 1500L** Rainwater Tank Storage.

Table 5.4: Water demands for rural and urban dwellings (adapted from Coombes et al. 2003)

	Rural dwelling rainwater tank sole water supply				Urban dwelling reticulated water supply			
	Annual internal use in kilolitres (kL/yr/dwelling)							
No. of bedrooms ¹	1 to 2	3	4	5	1 to 2	3	4	5
Toilet (25%)	31	44	57	71	46	66	86	106
Toilet + laundry (50%)	60	88	115	142	91	131	172	212
Toilet + laundry + hot water (90%)	110	159	206	256	164	237	309	384
Toilet + laundry + hot water + other (100%)	122	175	230	283	183	263	343	424
Daily internal use in kilolitres (kL/day/dwelling)								
No. of bedrooms ¹	1	2	3	4	1 to 2	3	4	5
Toilet (25%)	0.085	0.120	0.155	0.195	0.125	0.180	0.235	0.290
Toilet + laundry (50%)	0.165	0.240	0.315	0.390	0.250	0.360	0.470	0.580
Toilet + laundry + hot water (90%)	0.300	0.435	0.565	0.700	0.450	0.650	0.845	1.045
Toilet + laundry + hot water + other (100%)	0.335	0.480	0.630	0.775	0.500	0.720	0.940	1.160
External and commercial / industrial use								
External residential use eg gardens	For a typical urban lot - 0.15 kL/day/dwelling or 55 kL/yr/dwelling							
Commercial / Industrial Use	Indicative 0.1 kL/day/1000 m ² of roof area (internal use) & 20 kL/yr/1000 m ² (external use) - Development-specific data may provide better reuse values							

¹ Note - Where the number of bedrooms is unknown as for subdivisions, assume 4 bedrooms per dwelling

Figure 2.2 Water NSW Excerpt

Water Quality Measures

The following output summarizes the results from the MUSIC model. The system has been modelled to meet the Northern Beaches Council DCP target.

- 85% TOTAL SUSPENDED SOLIDS REDUCTION
- 70.5% TOTAL PHOSPHORUS REDUCTION
- 50% TOTAL NITROGEN REDUCTION
- 100% GROSS POLLUTANTS

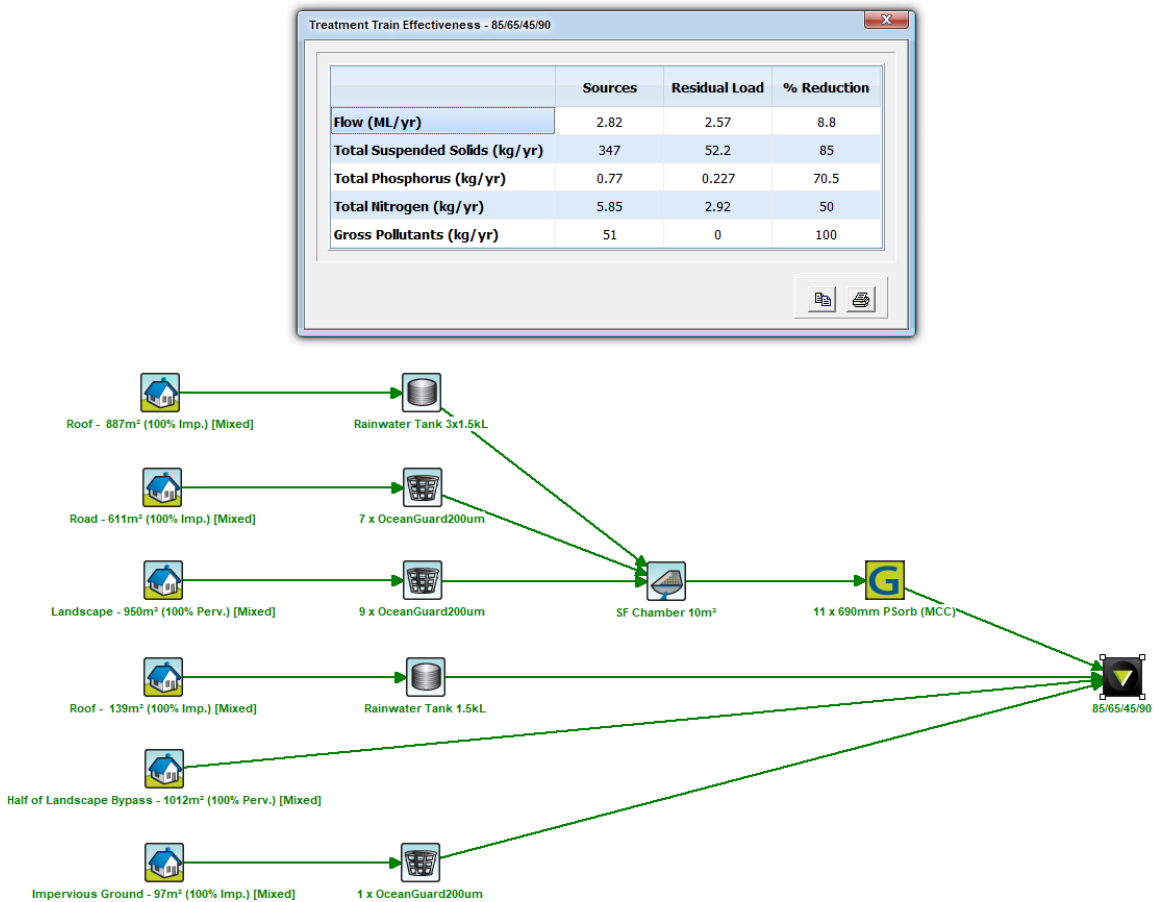


Figure 2.3 MUSIC Effectives Summary & MUSIC Model Setup

3 Draft Operations & Maintenance Schedule

3.1 General

The maintenance schedule covers all the stormwater quality measures adopted for the proposed development. The maintenance of some of these measures (proprietary products) is controlled by manufacturers’ requirements for mechanical devices and industry standards for environmental measures.

3.1.1 Ocean Guard

The maintenance frequency of the Ocean Guard is dependent on several variables, such as catchment area, surrounding land use, vegetation type, traffic loading and rainfall patterns. It is recommended that during the first year of operation the units should be monitored monthly, with maintenance as required.

To ensure that the units perform optimally, the material collected by the filter bag should be emptied when the level of material is approximately half to two thirds of the total bag depth or when there is evidence of material overflow.

Although the bag has greater storage area, it is recommended that it is not left to fill completely prior to emptying, for the following reasons:-

- The bags are capable of retaining a heavy mass of material (in excess of 50kg); material near the top of the bag can be resuspended during high to extreme rainfall events; and
- Blockage of the overflow sections can occur, when material is allowed to build up above the filter bag.

Maintenance frequency should be adjusted to accommodate variable rainfall patterns. Regions east of the Great Dividing Range typically are dominated by greater rainfall during summer and Autumn Months, as such more maintenance is typically required during these periods. It is recommended that biannual inspections be carried out in November and April, while quarterly inspections should be conducted in February, April, July and November.

It is also recommended that additional monitoring should be conducted following moderate to extreme rainfall events, in particular, when preceding months have had little to no rainfall. This monitoring is considered necessary to accommodate for higher volumes of runoff generated during major rainfall events, an anticipated greater accumulation of surface contamination during low rainfall periods and to ensure that the units have not been damaged due to high pipe velocities. Table 3.1 below indicates the recommended inspection and maintenance frequency.

Table 3.1 *Ocean Guard Maintenance Frequency*

ITEM	PERIOD	RESPONSIBILITY	MAINTENANCE PROCEDURE
Inspection – Minor Maintenance	– 3 monthly and after major storms	Maintenance Contractor	Follow recommended procedure set out in Ocean Protect “Operation and Maintenance Guidelines”
Inspection – Major Maintenance	2-6 years except in case of spill	Maintenance Contractor	Follow recommended procedure set out in Ocean Protect “Operation and Maintenance Guidelines”

Reference should be made to manufacturer’s specifications for inspection procedure, OHS, grates removal, cleaning methods, disposal of material and other procedures.

3.1.2 StormFilter

To ensure optimal performance, it is advisable that regular maintenance is performed. Typically, the StormFilter requires an inspection every 6 months with a minor service at 12 months. Additionally, as the StormFilter cartridges capture pollutants the media will eventually become occluded and require replacement (expected media life is 1-3 years).

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the StormFilter.

Table 3.1.2 StormFilter Maintenance Frequency

ITEM	PERIOD	RESPONSIBILITY	MAINTENANCE PROCEDURE
Inspection	6 monthly and after major storms	Maintenance Contractor	Follow recommended procedure set out in Ocean Protect “Operation and Maintenance Guidelines”
Minor Maintenance	12 monthly and after major storms	Maintenance Contractor	Follow recommended procedure set out in Ocean Protect “Operation and Maintenance Guidelines”
Major Maintenance	As required	Maintenance Contractor	Follow recommended procedure set out in Ocean Protect “Operation and Maintenance Guidelines”

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

4 Conclusions

An investigation of the proposed site and stormwater treatment train has been undertaken for 12-14 Gladys Avenue, Frenchs Forest.

A detailed MUSIC model was established for the site. The model was based on the parameters provided within the Northern Beaches Council WSUD Technical Guidelines and Water NSW MUSIC Modelling Guidelines. Using a combination of proprietary devices (**11 x Stormwater Filter & 17 x Ocean Guard**) and **4 x 1,500L Rainwater Tanks**, the proposed stormwater treatment train will meet the WSUD Targets adopted by Northern Beaches Council.

APPENDIX A

Stormwater Layout Plan

GROUND FLOOR

PIT SCHEDULE

PIT No.	GRATED INLET	PIT SIZE	SURFACE LEVEL	INVERT LEVEL
SP1	GRATED INLET (CLASS C) WITH OCEANGUARD	450 x 450	156.16	155.70
SP2	GRATED INLET (CLASS C) WITH OCEANGUARD	450 x 450	155.36	154.90
SP3	GRATED INLET (CLASS C) WITH OCEANGUARD	450 x 450	154.50	154.05
SP4	GRATED INLET (CLASS C) WITH OCEANGUARD	450 x 450	152.34	151.85
SP5	GRATED INLET (CLASS C) WITH OCEANGUARD	450 x 450	149.70	149.20
SP6	GRATED INLET (CLASS C) WITH OCEANGUARD	600 x 600	148.50	147.90
SP7	GRATED INLET (CLASS C) WITH OCEANGUARD	900 x 900	147.40	146.40
SP8	GRATED INLET (CLASS C)	900 x 900	147.40	145.90
SP9	GRATED INLET (CLASS B)	900 x 900	137.50	136.50
SP10	GRATED INLET (CLASS B)	900 x 900	133.50	132.70
SP11	GRATED INLET (CLASS B)	600 x 600	131.30	130.85 (IN) 130.50 (OUT)
SP12	GRATED INLET (CLASS B) WITH OCEANGUARD	450 x 450	153.50	153.05
SP13	GRATED INLET (CLASS B) WITH OCEANGUARD	450 x 450	153.10	152.65
SP14	GRATED INLET (CLASS B) WITH OCEANGUARD	900 x 900	150.20	148.20
SP15	GRATED INLET (CLASS B) WITH OCEANGUARD	450 x 450	148.40	148.60
SP16	GRATED INLET (CLASS B) WITH OCEANGUARD	450 x 450	147.10	146.65
SP17	GRATED INLET (CLASS B) WITH OCEANGUARD	450 x 450	149.50	149.05
SP18	GRATED INLET (CLASS B) WITH OCEANGUARD	900 x 900	150.50	148.80
SP19	GRATED INLET (CLASS B) WITH OCEANGUARD	450 x 450	148.95	148.50
SP20	GRATED INLET (CLASS B) WITH OCEANGUARD	450 x 450	148.40	147.95
SP21	GRATED INLET (CLASS B)	450 x 450	142.20	141.75
SP22	GRATED INLET (CLASS B)	450 x 450	141.95	141.50
SP23	GRATED INLET (CLASS B) WITH OCEANGUARD	900 x 900	138.50	137.00

NOTE

1. ALL OUTLET PIPES FROM OSD TANKS TO BE 150mm AT 1% FALL (MIN)
2. ALL DOWNPIPE PIPES TO RAINWATER TANK TO BE 100mm DIA (UNO). FINAL DOWNPIPE LOCATIONS TO BE DESIGN IN CC STAGE
3. ALL OUTLET PIPES FROM GRATED TRENCHES TO BE 100mm DIA (UNO)

LEGEND

- DRAINAGE PIPES VIA GRAVITY
 CHARGED DRAINAGE PIPES TO RWTO/OSD
 SUB SOIL DRAINAGE (AG. LINE)
 EXISTING DRAINAGE PIPE
- RDP
 - DP
 - DDO
 - RWO
 - BO
- Ø100mm ROOF DOWNPIPE
 Ø150mm DOWNPIPE
 100mm DIA DISH DRAIN OUTLET
 150mm DIA FLOOR WASTE
 100mm DIA FLOOR WASTE (BALCONY OUTLET)

OSD DESIGN SUMMARY

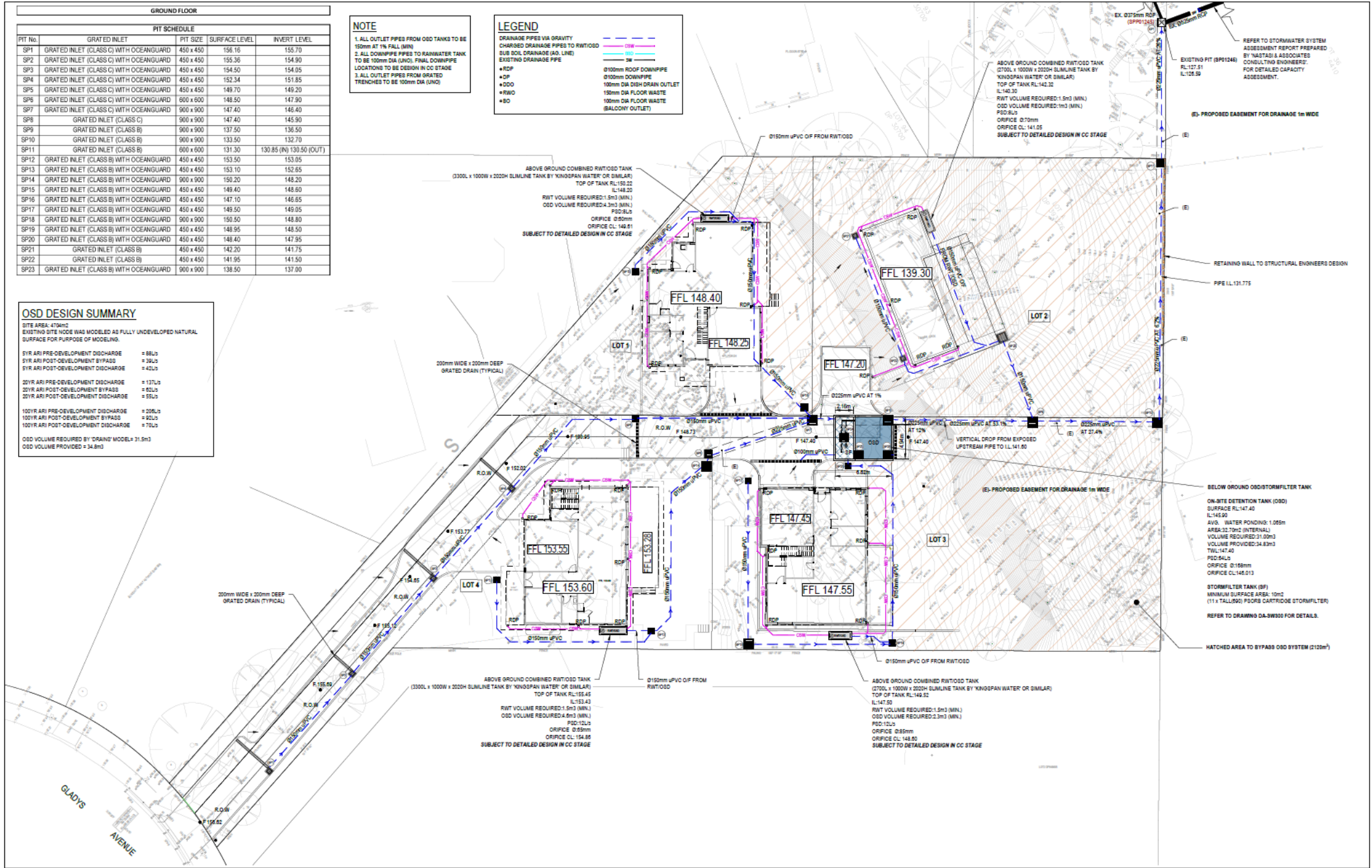
SITE AREA: 470m²
 EXISTING SITE NODE WAS MODELED AS FULLY UNDEVELOPED NATURAL SURFACE FOR PURPOSE OF MODELING.

5YR ARI PRE-DEVELOPMENT DISCHARGE = 88L/s
 5YR ARI POST-DEVELOPMENT BYPASS = 39L/s
 5YR ARI POST-DEVELOPMENT DISCHARGE = 42L/s

20YR ARI PRE-DEVELOPMENT DISCHARGE = 127L/s
 20YR ARI POST-DEVELOPMENT BYPASS = 62L/s
 20YR ARI POST-DEVELOPMENT DISCHARGE = 55L/s

100YR ARI PRE-DEVELOPMENT DISCHARGE = 206L/s
 100YR ARI POST-DEVELOPMENT BYPASS = 62L/s
 100YR ARI POST-DEVELOPMENT DISCHARGE = 70L/s

OSD VOLUME REQUIRED BY 'OSAN3' MODEL = 31.5m³
 OSD VOLUME PROVIDED = 34.8m³



REV	DATE	AMENDMENT	INT.	APP.
1	11/04/2022	ISSUED FOR REVIEW	J.L.	J.H.
2	15/05/2022	ISSUED FOR REVIEW	J.L.	J.H.
3	16/05/2022	ISSUED FOR REVIEW	J.L.	J.H.
4	15/05/2022	ISSUED FOR REVIEW	J.L.	J.H.
5	15/08/2022	ISSUED FOR DA	J.L.	J.H.

Client: **JACK ZHANG**
 Architect: **NKP ARCHITECTURE**
 Project: **JCO CONSULTANTS PTY LTD**
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Project: **PROPOSED SUBDIVISION**
 12-14 GLADYS AVENUE
 FRENCHS FOREST NSW 2030

Drawing Title: **STORMWATER MANAGEMENT CONCEPT PLAN - GROUND FLOOR**

Design: J.L. | Drawn: J.L. | Validate: J.H.

Job Number: **20220060**
 Scale: **1:200**
 Date: **15/08/2022**
 Drawing Number: **DA-SW200**
 Size: **A1**
 Datum: **A.H.D.**

Status: **DEVELOPMENT APPLICATION**
 NOT FOR CONSTRUCTION

Scale: **1:200**

North Point:

Date: 15 August 2022 2:52 PM