

PAD 4 STORMWATER CONCEPT PLAN EASTERN LANDS ERSKINE PARK













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PAD 4 STORMWATER CONCEPT PLAN EASTERN LANDS, ERSKINE PARK

FOR CSR LIMITED

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LIST OF ABBREVIATIONS

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARI	Average Recurrence Interval
ARR	Australian Rainfall and Runoff
DIPNR	Department of Infrastructure, Planning and Natural Resources
DLWC	Department of Land and Water Conservation NSW
DNR	Department of Natural Resources
DEM	Digital Elevation Model
DTM	Digital Terrain Model
FPDM	Floodplain Development Manual
FPL	Flood Planning Level
FPMM	Floodplain Management Manual
FPRMS	Floodplain Risk Management Study
FSL	Flood Surface Level
GIS	Geographic Information System
ha	Hectare (Area = $10,000m^2$)
LEP	Local Environmental Plan
LGA	Local Government Area
MGA	Map Grid Australia
m ³ /s	Cubic meters per second
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
RCP	Reinforced Concrete Pipe
RCBC	Reinforced Concrete Box Culvert
RTA	Roads and Traffic Authority of NSW
SEPP	State Environmental Planning Policy
SMP	Stormwater Management Plan
TIN	Triangular Irregular Network



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PAD 4 STORMWATER CONCEPT PLAN EASTERN LANDS

ERSKINE PARK

FOR CSR LIMITED

1 INTRODUCTION

Brown Consulting has been commissioned to develop a stormwater concept plan for a proposed industrial development on CSR's property located within the Erskine Park Employment Area, see **Figure 1.1**. This concept plan covers stormwater quality and quantity management issues to support the project application for the earthworks, subdivision and associated infrastructure works to create a building pad, followed by the construction of a warehouse, car parks and truck parking areas forming the industrial development on Building Pad 4.

This report should be read in conjunction with the following reports:

- Brown Consulting (2006). *South Eastern Creek Realignment Hydrology and Hydraulics, CSR Eastern Lands Erskine Park*, for CSR Limited. (Report Nº. W03033.12-05B)
- Brown Consulting (2006). Stormwater Concept Plan, Eastern Lands Erskine Park, for CSR Limited. (Report No. W03033.12-04B)

These reports have been submitted with the project application.

1.1 OBJECTIVES

The Stormwater Masterplan for the development has considered the objectives of the Development Control Plan for the Erskine Park Employment Area. To meet the objectives of the DCP, this report:

• Describes the operation of the stormwater management for Pad 4.

- Provides a concept sizing for an on-site detention (OSD) system to reduce the developed peak flows off the proposed development site at Pad 4 to ensure no increase in the flows downstream of the development.
- Provides a conceptual stormwater management system that will reduce the postdeveloped pollutant loads to meet the requirements of the DCP for the area.
- Describes the management of major and minor overland flows from the development.
- Provides a concept sediment and erosion control plan for the bulk earthworks.



1.2 DESCRIPTION OF STUDY AREA

The land to which the applications relate is located off Lenore Lane at Erskine Park, within the Penrith City Council local government area. The land is described as Pad 4 in proposed Lot 23, see **Appendix A** for lot plan. Pad 4 is located in the western half of proposed Lot 23.

The development area on Pad 4 will occupy an area of approximately 8.65 Ha. The associated creekworks spread onto the adjoining Crown road reserve to the south of the site (refer to report *South Eastern Creek Realignment* (Brown Consulting 2006)).

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1.3 **PREVIOUS STUDIES**

The following studies have been undertaken for the site and adjoining properties. These studies have been reviewed as part of the preparation of this Plan.

- Boyden & Partners (1999). *Review of Stormwater Drainage & Water Management Systems Erskine Park Employment Area,* for Penrith City Council.
- Robinson GRC Consulting (2001). Erskine Park Industrial Subdivision Drainage Requirements, for CSR Limited.
- Buckton Lysenko (2002). *Stormwater Management Plan Comprising Creek Realignment Proposal for the Stramit Warehouse and Office Development at Corner Erskine Park Road and Mamre Road, Erskine Park,* for McRoss Developments Pty Ltd.
- Buckton Lysenko (2003). Flood Study for Watercourse "A" for Industrial Development at Corner Erskine Park Road and Mamre Road, Erskine Park Incorporating Bridge Structure, for Walker Corporation.
- WP Brown & Partners (2004). *Stormwater Masterplan*, for CSR Limited.
- Brown Consulting (2004). *Concept Stormwater Management Plan, Proposed Industrial Development Lot 93 Lenore Lane, Erskine Park,* for CSR Limited.
- Brown Consulting (2005). *Concept Stormwater Management Plan, Proposed Warehouse and Distribution Facility, Erskine Park,* for Walker Corporation.
- Brown Consulting (2005). *Stormwater Concept Plan, Proposed Woolworths Distribution Centre, CSR Lands Erskine Park,* for Australand.
- Brown Consulting (2006). *Stormwater Concept Plan, Eastern Lands Erskine Park*, for CSR Limited. (Report No. W03033.12-04B)

2 MANAGEMENT OF MINOR AND MAJOR FLOWS

The concept stormwater management plan for Pad 4 is shown in the drawings in **Appendix A**. The site has been divided into 7 main sub-catchments and the management of the discharges varies between sub-catchments. The sub-catchments generally refer to the proposed building roof area and to the drainage of the car and truck parking areas, which have been kept separate.

Council's DCP for the area allows for the water collected from the roof to be discharged from the site to the creeks without treatment. Flows from the developed site do need to be attenuated however to ensure post-developed flows do not exceed pre-developed flows. As such, roof runoff will be directed to the on-site detention tank, whilst all other runoff will be directed first to a water quality improvement device (such as an infiltration basin or biofiltration swale), then to the detention tank or direct to the western swale.

The runoff from the site will be discharged to the swale to the west of the site, which itself discharges to the creek system at the southern boundary of the site. The peak flow discharged from the site does not exceed the existing rate from the site as detailed in **Section 3**.

2.1 MINOR FLOW MANAGEMENT

Runoff from the Pad 4 development area for storms up to the 20 year ARI will be collected by the following systems:

- For the truck parking/ manoeuvring areas, and the overflow car park area, a combination pit and pipe system discharging to the bio-retention basin;
- For the car parking areas to the east of the warehouse, a combination pit and pipe system discharging initially to two bio-filtration swales within the car park area, then to the OSD tank beneath the overflow car park;
- The roof water will be directed to the OSD tank at the south-western corner of the site.

The runoff from the site will be discharged to the swale to the west of the site, which itself discharges to the creek system at the southern boundary of the site.

Details of the proposed drainage system are shown in **Appendix A**.

2.2 MAJOR FLOW MANAGEMENT

Major flows are considered those flows in excess of the 20 year ARI peak flow. Such flows from the truck parking and manoeuvring areas will be directed by pipe and overland to the western corner of the truck area. A sag point at this corner will allow water to pond and enter the pipe system before being conveyed to the bio-retention basin, where detention is provided to help reduce the total site peak flows to pre-development levels, and where water quality improvement occurs.

Major flows from the car parking areas to the east of the warehouse will be directed by pipe and overland using the internal access-way along the southern boundary to the OSD tank, where detention is provided to reduce the peak flows to pre-development levels. The potential exists for these overland flows in the largest events to also be directed to the bio-retention basin. Major flows from the overflow car park area would similarly be directed to the bio-retention basin that lies adjacent to it, and could also be directed to the underlying OSD tank in the largest events. Both the tank and basin will attenuate flows from the site.

Stormwater flows from the roof areas will be directed to the OSD tank in the south-west corner of the site. The downpipes and drainage network for this system will need to be sized to convey the 100 year ARI flows to the tank.

It is proposed to provide a reconstructed creek system for the part of the overall development site (pads 4, 5 and 7 and the road drainage) draining to the southern boundary of the site. This is covered in detail in the report *South Eastern Creek Realignment, Erskine Park* by Brown Consulting.

3 CONCEPT OSD SYSTEM DESIGN

3.1 PRE-DEVELOPED FLOWS

The pre-developed site flows for Pad 4 have been determined using the *DRAINS* computer package with RAFTS type hydrology. These flows were established to enable comparison between existing and developed site flows.

Table 3.1 below summarises the pre-development catchment characteristics adopted to determine these flows.

Table 3.1Pre-Development Catchment Characteristics

Variable	Pad 4
Area (ha)	7.76
Slope (%)	1.9
% Imp	5
Manning 'n'	0.035

Table 3.2 below summarises the peak flows from Pad 4 for the pre-development scenario.

ARI (Years)	Flow (m³/s)
5	0.84
20	1.24
100	1.89

Table 3.2Pre-Development Peak Flows

3.2 POST-DEVELOPED FLOWS

For the post-developed scenario the same pad area adopted for the pre-developed flows was adopted, however the fraction impervious was increased to 90% impervious as per Table 4 of the "Penrith City Council Guidelines for Engineering Works for Subdivision and Developments." The slope was also reduced to 1% as this is the estimated finished grade on all pipes and surfaces for the post-development scenario, and the roughness was reduced to 0.015.

Table 3.3 below summarises the peak flow of the site for the post-developed scenario. The results of the *DRAINS* run have been attached in **Appendix C**.

Table 3	.3 Post-De	velopment Peal	k Flows
	ARI (Years)	Flow (m³/s)	-
	5	2.62	
	20	3.48	
	100	4.32	

As the post-development peak flows exceed the pre-developed flows, On-Site Stormwater Detention will need to be provided.

3.3 POST-DEVELOPED FLOWS WITH OSD SYSTEM

All runoff from non-roof areas will be directed to a water quality device before being discharged from the site. The truck parking and overflow car park areas will drain to the bio-retention basin in the south-west of the site, whilst the other car park areas will drain to central bio-filtration swales then to the OSD tank. The bio-retention basin will store small storm volumes (up to 1 year ARI), with the stored water passing through a bio-filtration medium before being released to the drainage swale to the west of the site. Any flows in excess of the volume of this water quality basin will pass through a high level overflow pipe into Swale 2 to the west of the site.

All roof area runoff will be conveyed directly to the OSD tank. This OSD tank will be equipped with a high early discharge chamber, and both the tank and the bio-retention basin will form the OSD for the site.

The proposed OSD has been designed to limit the post-developed flows to the pre-development flows summarised in **Table 3.2**. This design was undertaken in the DRAINS program.

Table 3.4 below summarises the design characteristics adopted for the OSD tank, whilst **Table 4.2** summarises the design characteristics of the basin. The *DRAINS* results for the basin

are attached in Appendix B, and the peak flows for the 5, 20, and 100 year ARI are summarised in Table 3.5.

Tab	le 3.4 Pad 4 OSD Ta	nk Characterist
	Variable	Detention
	Base RL	45.50
	Low Level Outlet RL	45.50
	Orifice Diameter (mm)	600
	Top RL	47.00
	Base Area (m ²)	866
	Tank Vol (m ³)	1300

Table 3.5 demonstrates that the proposed OSD tank and basin will satisfactorily reduce the post-developed flows to the pre-developed flows.

le 3.5	Post-Develop	ment Peak Flows	wi
	ARI (Years)	Flow (m³/s)	
	5	0.78	
	20	0.82	
	100	1.45	

Tabl th OSD

4 STORMWATER TREATMENT

4.1 STORMWATER QUALITY OBJECTIVES

The stormwater treatment objectives for the proposed bio-retention basin have been adopted from the "Erskine Park Employment Area" DCP. The identified target pollutant removal efficiencies from this document are summarised below in Table 4.1.

Nutrient	Pollutant Removal Criteria
	(%)
Total Phosphorous	45
Total Nitrogen	45
Total Suspended Solids	80

Table 4.1 Pollutant Removal Objectives

4.2 STORMWATER TREATMENT STRATEGY

The stormwater treatment strategy for the site includes; bio-retention basins, litter pits and biofiltration swales. In addition, stormwater reuse will be undertaken to reduce potable water demand. This will take the form of rainwater tanks that will be allocated to the site for potential use for irrigation, toilet flushing and other non-potable uses, possibly such as truck washing.

The clean water from the roof area of the Pad 4 site will be directed to the OSD tank rather than the water quality basin. All other runoff from Pad 4 will be directed to water quality devices before being discharged.

4.3 PAD 4 WATER QUALITY BASIN

The proposed water quality basin has been sized using the MUSIC water quality program. The model data and results have been attached in **Appendix C** and a summary of the designed basin details is shown below in **Table 4.2**.

Parameter	
Basin Base Area (m ²)	520
Bio-filter Area (m ²)	520
Base Level (m AHD)	45.5
Depth of Ponding (m) when overflow begins	1.3
Volume 1 Year ARI (m ³)	600
Peak Flow 1 Year ARI (m ³ /s)	0.38
Volume of Filtration Basin (m ³) at Overflow Level	700
Filter Depth (m)	0.6

Table 4.2Pad 4 Bio-Filtration Basin Details

The basin has been designed to store greater than the 1 Year ARI storm event and drain this via a subsoil drainage system under the bio-filter layer. All flows which exceed the 1 Year ARI will overflow to the grass buffer strip to the west, then across the buffer strip to the swale.

The basin has been run through the *MUSIC* program to assess whether the design will meet the requirements spelled out in the "Erskine Park Employment Area – Development Control Plan" shown in **Table 4.1**. The input data and results of this model have been attached in **Appendix C. Table 4.3** below compares the post-treatment annual pollutant loads with the pre-treatment pollutant loads calculated in the *MUSIC* model, and the calculated removal efficiency these represent.

Develope	d Site from the MU	SIC Model	
Site		Loads (kg/y)	
	TSS	TP	TN
Pre-treatment	1620	4.3	31.8
Post-treatment	132	0.88	11.3
Removal Efficiency	91.8%	79.8%	64.5%

Table 4.3Comparison of Pre-treatment and Post-treatment Pollutant Loads for the
Developed Site from the MUSIC Model

Table 4.3 above demonstrates that the treatment train designed will adequately meet the requirements of the Erskine Park Employment Area DCP, and reduce the post-development pollutant loads by more than the amounts shown in **Table 4.1**.

5 SOIL & WATER MANAGEMENT DURING CONSTRUCTION

Sedimentation and erosion controls will be constructed prior to commencement of any work to minimise the discharge of sediment from the site. The controls will be designed and installed in accordance with the requirements of the NSW Department of Housing 'Soils & Construction' manual.

5.1 TEMPORARY SEDIMENT & EROSION CONTROLS

The engineering bulk earthworks drawings show the concept sediment and erosion control plan for the development.

- A single all weather access way at the front of the property consisting of 50-75mm aggregate or similar material at a minimum thickness of 150mm, laid over geo-fabric and constructed prior to commencement of works.
- A shaker pad will be used at the entrance to the site to remove clay from vehicles leaving the site so as to maintain public roads in a clean condition.
- This sediment control basin should be located where the proposed water quality basin is to be constructed immediately to the west of the site. Once the majority of the site has been constructed the basin should then be converted to its ultimate use as a water quality control basin.
- Disturbed areas will be rehabilitated with indigenous plant species, landscaped and treated by approved methods of erosion mitigation such as mulching, revegetation with native grasses or other suitable stabilising processes within fifteen days of the completion of works.
- All runoff and erosion controls will be installed before any works are carried out at the site.
- Upslope clean surface runoff will be diverted via diversion drains and sediment fencing around the disturbed areas.
- Installing *SoilLocker* at the down-slope of the disturbed areas to capture sediment and debris escaping from the site.



- Topsoil stockpiling stripped from the construction site shall be diverted away from drainage lines, stormwater inlets and be suitably covered by impervious membrane material and screened by sediment fencing.
- Sediment end erosion controls shall be inspected weekly or after each storm event for litter, sediment, and organic waste accumulation. All sediment/debris shall be removed within two (2) working days.

5.2 SEDIMENT BASIN CONCEPT DESIGN

The sediment basin has been designed to capture the first 25mm runoff from the 75th percentile, 5-day rainfall event, as per the NSW Department of Housing Guidelines. An additional 50% capacity has been provided for storage of sediment.

The concept design is based on the equation: $V = 10.C_v.A.R_{5day 75th\% ile}$

As recommended by the *NSW Department of Housing (1998),* a volumetric runoff coefficient (C_v) of 0.5 has been adopted for the construction phase. The outlet to each of the basins will be a slow control discharge. A spillway will be incorporated into the basin design for an overflow.

5.3 SEDIMENT BASIN FLOCCULATION & DISCHARGE WATER QUALITY CRITERIA

Runoff captured in the sediment basin will be treated with an approved flocculating agent before discharging water, as the catchment contains soils that are classified as fine dispersible, which do not readily settle from suspension. The flocculation should ensure that discharges contain no more than 50 mg/L of suspended solids or 30 NTU before being discharged. Furthermore, dewatering should preferably be over existing stable, grassed areas and not directly into the creek.

6 CONCLUSION

This Stormwater Concept Plan describes the management of stormwater within Pad 4. The report sets out the basic stormwater parameters that need to be met by the future development of the site.

The proposal satisfies the requirements for stormwater quality and quantity control identified by Penrith Council in the DCP for the area.

7 **REFERENCES**

Boyden & Partners (1999). Review of Stormwater Drainage & Water Management Systems Erskine Park Employment Area.

Brisbane City Council (2003). Guidelines for Pollutant Export Modelling in Brisbane Version 7.

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8 APPENDICES

Appendix A	Drawings
Appendix B	Post-Development Flows with Detention - Pad 4
Appendix C	Water Quality Results Pad 4



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APPENDIX A

DRAWINGS



APPENDIX B

Post-Development Flows with Detention Pad 4



Prepared for CSR LIMITED



DRAINS MODEL FOR DEVELOPED SITE WITH BASIN AND OSD TANK



100 YEAR ARI RESULTS

Prepared for CSR LIMITED



20 YEAR ARI RESULTS



5 YEAR ARI RESULTS

DRAINS DATA

1

															1		1		1
PIT / NODE DE			Version 9		<u> </u>														ļ
Name	Туре	Family	Size	Ponding	Pressure		Max Pond		Blocking	X	У	Bolt-down	Id	Part Full					
				Volume	Change Coeff. Ku	Elev (m)	Depth (m)		Factor			lid		Shock Los	S				
N4	Node			(cu.m)	Coell. Ku	46.5		(cu.m/s) 4.45		295828.8	6256007		130						
	Node					40.5		4.45		295813.7			129						
	Node					40		0		295783.2			38293						
	OnGrade	UNLIMITED			1.5			0		296617.4				1 x Ku					
FIRE SWALE					1.5			0			6255769			1 x Ku					
	OnGrade	UNLIMITED			1.5			0						1 x Ku				+	
	Sag	UNLIMITED					0.2	0		296127.6				1 x Ku				+	
	OnGrade	UNLIMITED			1.5			0		296265.6				1 x Ku					
		UNLIMITED			1.5			0		296138.9			1801972					+	
	Oligiade	UNLIMITEL	UNLIMITE		1.0	40.0		0	0	290130.9	0255657	NU	1001972	I X Ku				+	
	BASIN DETAILS	3																	
	Elev		Init Vol. (cu	Outlet Typ	K	Dia(mm)	Centre RI	Pit Family	Pit Type	x	v	HED	Crest RL	Crest Lenc	id			1	·
OSD Tank	45.5	0		Orifice	<u> </u>	600		r it r army	i it type	295924.4	6255757		46.5	3					
	46.5	866												-					
	47	1300																	
WQ BASIN	45.5	0000	0	Culvert	0.5					296016.9	6255810	No		1	126			1	
	46.5	540			0.0							+ ·				1			
	47	810			1											1		1	
					1									1		1		1	1
SUB-CATCHM	MENT DETAILS			1	1	1		1						1		1		1	1
Name	Pit or	Total	Impervious	Avg	Hydrologic	al													
	Node	Area	Area	Slope(%)										1		1		1	
A CARPK	CARPARK	0.783	73.3		EP RAFTS	5								1					
A FSWALE	FIRE SWALE	0.306	90	0.5	EP RAFTS	;								1				1	
A TRUCK1	TRUCK1	0.7122	95	0.5	EP RAFTS	5								1					
A TRUCK 2	TRUCK2	0.9978	95	0.5	EP RAFTS	5													
A Basin	WQ BASIN	0.1	10	0.5	EP RAFTS	5													
A ROOF	ROOF	4.4577	100	2	EP RAFTS	5													
A Car Park 4	Car Park 4	0.31	95	0.5	EP RAFTS	;													
PIPE DETAILS																ļ			
Name	From	То	Length	U/S IL	D/S IL		Туре	Dia		Rough	Pipe Is	No. Pipes	Chg From		Chg	RI	Chg	RL	etc
			(m)	(m)	(m)	(%)		(mm)	(mm)			ļ			(m)	(m)	(m)	(m)	(m)
		FIRE SWAL	250				Concrete,	525	525		New		CARPARK						ļ
	FIRE SWALE		250				Concrete,	600 675		0.3	NewFixed		FIRE SWA						
		N3	25	45	44.875								OSD Tank						
	TRUCK1 TRUCK2	TRUCK2					Concrete,				NewFixed								1
			185		47.6	0.5	Concrete,	600	600	0.3	New	1	TRUCK1	0					
		WQ BASIN	185	47.525	47.6 46.6	0.5 0.5	Concrete, Concrete,	600 600	600 600	0.3 0.3	New NewFixed	1	TRUCK1 TRUCK2	0					
	WQ BASIN	WQ BASIN N3	185 50	47.525 46.8	47.6 46.6 43.5	0.5 0.5 6.6	Concrete, Concrete, Concrete,	600 600 600	600 600 600	0.3 0.3 0.3	New NewFixed NewFixed	1 1 1	TRUCK1 TRUCK2 WQ BASIN	0 0 0					
P ROOF	WQ BASIN ROOF	WQ BASIN N3 OSD Tank	185 50 50	47.525 46.8 46.5	47.6 46.6 43.5 46	0.5 0.5 6.6 1	Concrete, Concrete, Concrete, Concrete,	600 600 600 1500	600 600 600 1524	0.3 0.3 0.3 0.3	New NewFixed NewFixed NewFixed	1 1 1	TRUCK1 TRUCK2 WQ BASIN ROOF	0 0 0 0					
P ROOF	WQ BASIN ROOF	WQ BASIN N3	185 50	47.525 46.8 46.5	47.6 46.6 43.5 46	0.5 0.5 6.6 1	Concrete, Concrete, Concrete,	600 600 600	600 600 600 1524	0.3 0.3 0.3 0.3	New NewFixed NewFixed	1 1 1	TRUCK1 TRUCK2 WQ BASIN	000000000000000000000000000000000000000					
P ROOF P CarPk 4	WQ BASIN ROOF Car Park 4	WQ BASIN N3 OSD Tank WQ BASIN	185 50 50 50	47.525 46.8 46.5	47.6 46.6 43.5 46	0.5 0.5 6.6 1	Concrete, Concrete, Concrete, Concrete,	600 600 600 1500	600 600 600 1524	0.3 0.3 0.3 0.3	New NewFixed NewFixed NewFixed	1 1 1	TRUCK1 TRUCK2 WQ BASIN ROOF	0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE	WQ BASIN ROOF Car Park 4 ERVICES CRO	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE	185 50 50 50	47.525 46.8 46.5 47.5	47.6 46.6 43.5 46 47	0.5 0.5 6.6 1	Concrete, Concrete, Concrete, Concrete, Concrete,	600 600 600 1500 450	600 600 1524 450	0.3 0.3 0.3 0.3 0.3	New NewFixed NewFixed NewFixed	1 1 1	TRUCK1 TRUCK2 WQ BASIN ROOF	0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE Bottom	185 50 50 50 50 50 8 Height of S	47.525 46.8 46.5 47.5 Chg	47.6 46.6 43.5 46 47 Bottom	0.5 0.5 6.6 1 Height of S	Concrete, Concrete, Concrete, Concrete, Concrete, Concrete,	600 600 1500 450 Bottom	600 600 1524 450 Height of S	0.3 0.3 0.3 0.3 0.3 0.3 etc	New NewFixed NewFixed NewFixed	1 1 1	TRUCK1 TRUCK2 WQ BASIN ROOF	0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE	185 50 50 50	47.525 46.8 46.5 47.5	47.6 46.6 43.5 46 47	0.5 0.5 6.6 1 Height of S	Concrete, Concrete, Concrete, Concrete, Concrete,	600 600 600 1500 450	600 600 1524 450	0.3 0.3 0.3 0.3 0.3 0.3 etc	New NewFixed NewFixed NewFixed	1 1 1	TRUCK1 TRUCK2 WQ BASIN ROOF	0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m)	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE Bottom	185 50 50 50 50 50 8 Height of S	47.525 46.8 46.5 47.5 Chg	47.6 46.6 43.5 46 47 Bottom	0.5 0.5 6.6 1 Height of S	Concrete, Concrete, Concrete, Concrete, Concrete, Concrete,	600 600 1500 450 Bottom	600 600 1524 450 Height of S	0.3 0.3 0.3 0.3 0.3 0.3 etc	New NewFixed NewFixed NewFixed	1 1 1	TRUCK1 TRUCK2 WQ BASIN ROOF	0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe CHANNEL DE	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m) TAILS	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE Bottom Elev (m)	185 50 50 50 50 50 ES Height of S (m)	47.525 46.8 46.5 47.5 Chg (m)	47.6 46.6 43.5 46 47 Bottom Elev (m)	0.5 0.5 6.6 1 1 Height of S (m)	Concrete, Concrete, Concrete, Concrete, Concrete, Concrete, (m)	600 600 1500 450 Bottom Elev (m)	600 600 1524 450 Height of S (m)	0.3 0.3 0.3 0.3 0.3 0.3 etc etc	New NewFixed NewFixed NewFixed	1 1 1 1 1	TRUCK1 TRUCK2 WQ BASIN ROOF Car Park 4	0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe CHANNEL DE	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m) TAILS	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE Bottom Elev (m)	185 50 50 50 50 50 8 Height of S	47.525 46.8 46.5 47.5 Chg (m)	47.6 46.6 43.5 46 43.5 46 47 Bottom Elev (m)	0.5 0.5 6.6 1 Height of S (m)	Concrete, Concrete, Concrete, Concrete, Concrete, Chg (m) Slope	600 600 1500 450 Bottom Elev (m) Base Widt	600 600 1524 450 Height of S (m)	0.3 0.3 0.3 0.3 0.3 0.3 etc etc etc	New NewFixed NewFixed NewFixed	1 1 1 1 1 1 2 0 0 0 0 0 0 0 0 0 0	TRUCK1 TRUCK2 WQ BASIN ROOF	0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe CHANNEL DE Name	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m) TAILS From	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE Bottom Elev (m) To	185 50 50 50 50 50 ES Height of S (m)	47.525 46.8 46.5 47.5 Chg (m)	47.6 46.6 43.5 46 47 Bottom Elev (m)	0.5 0.5 6.6 1 1 Height of S (m)	Concrete, Concrete, Concrete, Concrete, Concrete, Concrete, (m)	600 600 1500 450 Bottom Elev (m)	600 600 1524 450 Height of S (m)	0.3 0.3 0.3 0.3 0.3 0.3 etc etc etc R.B. Slope (1:?)	New NewFixed NewFixed NewFixed	1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0	TRUCK1 TRUCK2 WQ BASIN ROOF Car Park 4 Roofed	0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe CHANNEL DE Name SWALE 2	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m) TAILS From N4	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE Bottom Elev (m) To N3	185 50 50 50 ES Height of S (m) Type	47.525 46.8 46.5 47.5 Chg (m) Length (m)	47.6 46.6 43.5 46 47 Bottom Elev (m) U/S IL (m) 43.55	0.5 0.5 6.6 1 1 Height of S (m) D/S IL (m) 43.05	Concrete, Concrete, Concrete, Concrete, Concrete, Concrete, Chg (m) Slope (%) 0.5	600 600 1500 450 Bottom Elev (m) Base Widt	600 600 1524 450 Height of S (m) L.B. Slope (1:?)	0.3 0.3 0.3 0.3 0.3 0.3 etc etc etc R.B. Slope (1:?)	New NewFixed NewFixed NewFixed MewFixed	1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0	TRUCK1 TRUCK2 WQ BASIN ROOF Car Park 4 Roofed No	0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe CHANNEL DE Name SWALE 2 outlet	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m) TAILS From N4 N3	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE Bottom Elev (m) To N3 N36	185 50 50 50 ES Height of S (m) Type Prismatic	47.525 46.8 46.5 47.5 Chg (m) Length (m) 100	47.6 46.6 43.5 46 47 Bottom Elev (m) U/S IL (m) 43.55	0.5 0.5 6.6 1 1 Height of S (m) D/S IL (m) 43.05	Concrete, Concrete, Concrete, Concrete, Concrete, Concrete, Chg (m) Slope (%) 0.5	600 600 1500 450 Bottom Elev (m) Base Widt	600 600 1524 450 Height of S (m) L.B. Slope (1:?) 4	0.3 0.3 0.3 0.3 0.3 0.3 etc etc etc R.B. Slope (1:?) 4	New NewFixed NewFixed NewFixed NewFixed Manning n 0.05	1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0	TRUCK1 TRUCK2 WQ BASIN ROOF Car Park 4 Roofed No	0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe CHANNEL DE Name SWALE 2 outlet	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m) TAILS From N4	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE Bottom Elev (m) To N3 N36	185 50 50 ES Height of S (m) Type Prismatic Prismatic	47.525 46.8 46.5 47.5 Chg (m) Length (m) 100 100	47.6 46.6 43.5 46 5 46 47 47 8 5 8 5 8 5 43 5 5 43.05 43.05	0.5 0.5 6.6 1 1 Height of S (m) D/S IL (m) 43.05 43	Concrete, Concrete, Concrete, Concrete, Concrete, Concrete, Chg (m) Slope (%) 0.5	600 600 1500 450 Bottom Elev (m) Base Widt (m) 3 3	600 600 1524 450 Height of S (m) L.B. Slope (1:?) 4	0.3 0.3 0.3 0.3 0.3 0.3 0.3 R.B. Slope (1:?) 4 4	New NewFixed NewFixed NewFixed Manning n 0.05 0.05	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 4 1.4	TRUCK1 TRUCK2 WQ BASIN ROOF Car Park 4 Roofed No	0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe CHANNEL DE Name SWALE 2 outlet OVERFLOW R	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m) TAILS From N4 N3	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE Bottom Elev (m) To N3 N36	185 50 50 50 ES Height of S (m) Type Prismatic	47.525 46.8 46.5 47.5 Chg (m) Length (m) 100	47.6 46.6 43.5 46 47 Bottom Elev (m) U/S IL (m) 43.55	0.5 0.5 6.6 1 1 Height of S (m) D/S IL (m) 43.05	Concrete, Concrete, Concrete, Concrete, Concrete, Concrete, Chg (m) Slope (%) 0.5	600 600 1500 450 Bottom Elev (m) Base Widt (m) 3 3	600 600 1524 450 Height of S (m) L.B. Slope (1:?) 4	0.3 0.3 0.3 0.3 0.3 0.3 0.3 R.B. Slope (1:?) 4 4	New NewFixed NewFixed NewFixed NewFixed Manning n 0.05	1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0	TRUCK1 TRUCK2 WQ BASIN ROOF Car Park 4 Roofed No	0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe CHANNEL DE Name SWALE 2 outlet OVERFLOW R	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m) TAILS From N4 N3 ROUTE DETAIL	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE Bottom Elev (m) To N3 N36 S S To	185 50 50 ES Height of S (m) Type Prismatic Prismatic	47.525 46.8 46.5 47.5 Chg (m) Length (m) 100 100	47.6 46.6 43.5 46 5 46 47 47 8 5 8 5 8 5 43 5 5 43.05 43.05	0.5 0.5 6.6 1 1 Height of S (m) D/S IL (m) 43.05 43 Weir	Concrete, Concrete, Concrete, Concrete, Concrete, Concrete, Chg (m) Slope (%) 0.5 0.5	600 600 1500 450 Bottom Elev (m) Base Widt (m) 3 3 Safe Deptl	600 600 1524 450 Height of S (m) L.B. Slope (1:?) 4	0.3 0.3 0.3 0.3 0.3 0.3 0.3 etc etc etc etc (1:?) 4 4 5afe	New NewFixed NewFixed NewFixed Manning n 0.05 0.05	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 4 1.4	TRUCK1 TRUCK2 WQ BASIN ROOF Car Park 4 Roofed No No						
P ROOF P CarPk 4 DETAILS of SE Pipe CHANNEL DE Name SWALE 2 outlet OVERFLOW R Name	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m) TAILS From N4 N3 ROUTE DETAIL From	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE Bottom Elev (m) To N3 N3 N3 S S To	185 50 50 50 50 Fill Meight of S (m) Type Prismatic Prismatic	47.525 46.8 46.5 47.5 Chg (m) Length (m) 100 100 100 Spill	47.6 46.6 43.5 46.6 46.7 47 Bottom Elev (m) U/S IL (m) 43.55 43.05	0.5 0.5 6.6 1 1 Height of S (m) D/S IL (m) 43.05 43 Weir	Concrete, Concrete, Concrete, Concrete, Concrete, Chg (m) Slope (%) 0.5 0.5 Cross Section	600 600 1500 450 Bottom Elev (m) Base Widt (m) 3 3 Safe Deptt Major Stor (m)	600 600 1524 450 Height of S (m) L.B. Slope (1:?) 4 4 4 SafeDepth Minor Stori (m)	0.3 0.3 0.3 0.3 0.3 0.3 etc etc etc etc (1:?) 4 4 4 Safe DxV (sq.m/sec)	New NewFixed NewFixed NewFixed Manning n 0.05 0.05 Bed	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	TRUCK1 TRUCK2 WQ BASIN ROOF Car Park 4 Roofed No No No 9	0 0 0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe CHANNEL DE SWALE 2 outlet OVERFLOW R Name O CARPK	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m) TAILS From N4 N3 ROUTE DETAIL From CARPARK	WQ BASIN N3 OSD Tank OSD Tank WQ BASIN SSING PIPE Bottom Elev (m) To N3 N36 S S To FIRE SWAL	185 50 50 50 ES Height of S (m) Type Prismatic Prismatic Travel Time	47.525 46.8 46.5 47.5 Chg (m) Length (m) 100 100 100 Spill Level	47.6 46.6 43.5 46 47 Bottom Elev (m) U/S IL (m) 43.55 43.05 Crest Length	0.5 0.5 6.6 1 1 Height of S (m) D/S IL (m) 43.05 43 Weir	Concrete, Concrete, Concrete, Concrete, Concrete, Chg (m) Slope (%) 0.5 0.5 Cross Section Dummy us	600 600 1500 450 Bottom Elev (m) Base Widt (m) 3 3 Safe Deptt Major Stor (m) 0.2	600 600 1524 450 (m) L.B. Slope (1:?) 4 SafeDepth Minor Storr (m) 0.05	0.3 0.3 0.3 0.3 0.3 0.3 0.3 etc etc etc etc etc etc etc etc etc etc	New NewFixed NewFixed NewFixed NewFixed Manning n 0.05 0.05 Bed Slope	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	TRUCK1 TRUCK2 WO BASIN ROOF Car Park 4 Roofed No No 9	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe CHANNEL DE Name SWALE 2 outlet OVERFLOW R Name O CARPK O SWALE	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m) TAILS From N4 N3 ROUTE DETAIL From CARPARK FIRE SWALE	WQ BASIN N3 OSD Tank OSD Tank WQ BASIN SSING PIPE Bottom Elev (m) To N3 N36 S S To FIRE SWAL	185 50 50 50 Tope Prismatic Prismatic Prismatic Travel Time (min) 1	47.525 46.8 46.5 47.5 Chg (m) Length (m) 100 10 Spill Level (m)	47.6 46.6 43.5 46 8 47 8 8 8 8 8 9 4 8 9 4 8 9 4 3.05 4 3.05 4 3.05 4 3.05 4 3.05 4 3.05 4 3.05 4 3.05 4 3.05 4 3.5 5 4 3.5 5 4 5 6 6 8 5 6 6 6 8 7 7 7 7 8 7 8 7 8 7 8 7 8 7 8 7	0.5 0.5 6.6 1 1 Height of S (m) D/S IL (m) 43.05 43 Weir Coeff. C	Concrete, Concrete, Concrete, Concrete, Concrete, Chg (m) Slope (%) 0.5 0.5 Cross Section	600 600 1500 450 Bottom Elev (m) Base Widt (m) 3 3 Safe Dept! Major Stor (m) 0.2 0.2	600 600 600 1524 450 Height of S (m) LLB. Slope (1:?) 4 4 5afeDepth Minor Storr (m) 0.05 0.05	0.3 0.3 0.3 0.3 0.3 0.3 etc etc etc (1:?) 4 4 4 Safe DxV (sq.m/sec) 0.6 0.6	New NewFixed NewFixed NewFixed NewFixed Manning n 0.05 0.05 Bed Slope (%)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	TRUCK1 TRUCK2 WQ BASIN ROOF Car Park 4 Roofed No No	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe CHANNEL DE Name OVERFLOW R Name O CARPK O SWALE D SPILL	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m) TAILS From N4 N3 ROUTE DETAIL From CARPARK FIRE SWALE OSD Tank	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE Bottom Elev (m) To N3 N36 S To FIRE SWAL OSD Tank N3	185 50 50 50 Tope Prismatic Prismatic Travel Time (min) 1	47.525 46.8 46.5 47.5 Chg (m) Length (m) 100 10 Spill Level (m)	47.6 46.6 43.5 46 8 47 8 8 8 8 8 9 4 8 9 4 8 9 4 3.05 4 3.05 4 3.05 4 3.05 4 3.05 4 3.05 4 3.05 4 3.05 4 3.05 4 3.5 5 4 3.5 5 4 5 6 6 8 5 6 6 6 8 7 7 7 7 8 7 8 7 8 7 8 7 8 7 8 7	0.5 0.5 6.6 1 1 Height of S (m) D/S IL (m) 43.05 43 Weir Coeff. C	Concrete, Concrete, Concrete, Concrete, Concrete, Chg (m) Slope (%) 0.5 0.5 Cross Section Dummy us	600 600 1500 450 Bottom Elev (m) Base Widt (m) 3 3 Safe Deptt Major Stor (m) 0.2 0.2	600 600 1524 450 Height of S (m) L.B. Slope (1:?) 4 4 5afeDepth Minor Storr (m) 0.05 0.05	0.3 0.3 0.3 0.3 0.3 0.3 0.3 etc etc etc etc etc etc etc etc etc etc	New NewFixed NewFixed NewFixed Manning n 0.05 0.05 Bed Slope (%) 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	TRUCK1 TRUCK2 WQ BASIN ROOF Car Park 4 Roofed No No	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe CHANNEL DE SWALE 2 outlet OVERFLOW R Name O CARPK O SWALE DET SPILL O TRUCK1	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m) TAILS From N4 N3 ROUTE DETAIL From CARPARK FIRE SWALE OSD Tank TRUCK1	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE Bottom Elev (m) To N3 N3 S S To S FIRE SWAL OSD Tank N3 TRUCK2	185 50 50 50 ES Height of S Type Prismatic Travel Time (min) 1 1 0.5	47.525 46.8 46.5 47.5 Chg (m) Length (m) 100 100 100 100 100 100 100 100 100 10	47.6 46.6 43.5 46 8 47 8 8 8 8 8 9 4 8 9 4 8 9 4 3.05 4 3.05 4 3.05 4 3.05 4 3.05 4 3.05 4 3.05 4 3.05 4 3.05 4 3.5 5 4 3.5 5 4 5 6 6 6 5 4 7 7 6 6 6 6 7 7 7 7 7 8 7 8 7 7 8 7 8 7	0.5 0.5 6.6 1 1 Height of S (m) D/S IL (m) 43.05 43 Weir Coeff. C	Concrete, Concrete, Concrete, Concrete, Concrete, Chg (m) Slope (%) 0.5 0.5 Cross Section Dummy us Dummy us	600 600 1500 450 Elev (m) Base Widt (m) 3 3 Safe Depti Major Stor (m) 0.2 0.2 0.2	600 600 1524 450 (m) (L.B. Slope (1:?) 4 4 SafeDepth Minor Stort (m) 0.05 0.05	0.3 0.3 0.3 0.3 0.3 0.3 etc etc etc (1:?) 4 4 4 Safe DxV (sq.m/sec) 0.6 0.6	New NewFixed NewFixed NewFixed NewFixed Manning n 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	TRUCK1 TRUCK2 WO BASIN ROOF Car Park 4 Roofed No No 9	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe CHANNEL DE Name SWALE 2 outlet OVERFLOW R Name O CARPK O SWALE DET SPILL O TRUCK1 O TRUCK1 O TRUCK1	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m) TAILS From N4 N3 ROUTE DETAIL From CARPARK FIRE SWALE OSD Tank TRUCK1 TRUCK2	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE Bottom Elev (m) To N3 N36 S To FIRE SWAL OSD Tank N3 FIRE SWAL OSD Tank N3 RUCK2	185 50 50 50 50 70 70 70 70 70 70 70 70 70 70 70 70 70	47.525 46.8 46.5 47.5 Chg (m) Length (m) 100 100 100 100 100 100 100 100 100 10	47.6 46.6 43.5 46.6 43.5 46 47 Elev (m) U/S IL (m) 43.55 43.05 43.05 43.05	0.5 0.5 6.6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 5 1L (m) 43.05 43 43 Weir Coeff. C	Concrete, Concre	600 600 1500 800 800 800 800 800 800 800 800 800	600 600 1524 450 Height of S (m) L.B. Slope (1:?) 4 4 5afeDepth Minor Storr (m) 0.05 0.05 0.05	0.3 0.3 0.3 0.3 0.3 0.3 etc tc tc tc tc tc tc tc tc tc tc tc tc t	New NewFixed NewFixed NewFixed NewFixed Manning n 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	TRUCK1 TRUCK2 WQ BASIN ROOF Car Park 4 Roofed No No 9	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe CHANNEL DE Name SWALE 2 outlet OVERFLOW R Name O CARPK O SWALE DET SPILL O TRUCK1 O TRUCK1	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m) TAILS From N4 N3 ROUTE DETAIL From CARPARK FIRE SWALE OSD Tank TRUCK1 TRUCK2 WQ BASIN	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE Bottom Elev (m) To To SSING PIPE Bottom Fire SWAL OSD Tank N3 FIRE SWAL OSD Tank N3 N3 N3 N3 N3 N3 N3 N3 N3 N3	185 50 50 50 70 70 70 70 70 70 70 70 70 70 70 70 70	47.52E 46.8 46.5 47.5 Chg (m) Length (m) 100 100 100 100 100 100 100 100 100 10	47.6 46.6 43.5 46.6 43.5 46 47 Elev (m) U/S IL (m) 43.55 43.05 43.05 43.05	0.5 0.5 6.6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 5 1L (m) 43.05 43 43 Weir Coeff. C	Concrete, Concre	600 600 1500 450 Bottom Elev (m) Base Widt (m) 3 3 Safe Deptl Major Stor (m) 0.2 0.2 0.2 0.2 0.2	600 600 1524 450 Height of S (m) L.B. Slope (1:?) 4 4 SafeDepth Minor Storr (m) 0.05 0.05 0.05 0.05	0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	New NewFixed NewFixed NewFixed NewFixed Manning n 0.05 0.05 0.05 Bed Slope (%) 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	TRUCK1 TRUCK2 WO BASIN ROOF Car Park 4 Roofed No No 9	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
P ROOF P CarPk 4 DETAILS of SE Pipe CHANNEL DE SWALE 2 outlet OVERFLOW R Name O CARPK O SWALE DET SPILL O TRUCK2 WQ SPILL O ROOF	WQ BASIN ROOF Car Park 4 ERVICES CRO Chg (m) TAILS From N4 N3 ROUTE DETAIL From CARPARK FIRE SWALE OSD Tank TRUCK1 TRUCK2 WQ BASIN ROOF	WQ BASIN N3 OSD Tank WQ BASIN SSING PIPE Bottom Elev (m) To N3 N36 S To FIRE SWAL OSD Tank N3 FIRE SWAL OSD Tank N3 RUCK2	185 50 50 50 50 70 70 70 70 70 70 70 70 70 70 70 70 70	47.525 46.8 46.5 47.5 Chg (m) Length (m) 100 10 10 10 10 10 47 2 47.2	47.6 46.6 43.5 46.6 43.5 46 47 Elev (m) U/S IL (m) 43.55 43.05 43.05 43.05	0.5 0.5 6.6 1 1 1 1 1 1 1 0/S IL (m) 43.05 43 43 Weir Coeff. C 1.7 1.7	Concrete, Concre	600 600 1500 450 Elev (m) Base Widt (m) 3 3 Safe Deptl Major Stor (m) 0.2 0.2 0.2 0.2 0.2 0.2 0.2	600 600 1524 450 (m) L.B. Slope (1:?) 4 4 SafeDepth Minor Stor (m) 0.05 0.05 0.05 0.05	0.3 0.3 0.3 0.3 0.3 0.3 etc tc tc tc tc tc tc tc tc tc tc tc tc t	New NewFixed NewFixed NewFixed NewFixed Manning n 0.05 0.05 Bed Slope (%) 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	TRUCK1 TRUCK2 WO BASIN ROOF Car Park 4 Roofed No No 9	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					

DRAINS 100YR RESULTS

PIT / NODE D		1		Version 8			1	1	1		1		
	of concentration of the concen	May Dand	May Surfa	Max Pond	Min	Overflow	Constraint						
Name	Max HGL	HGL	Flow Arrivi				Constraint						
		INGL	(cu.m/s)	(cu.m)	Freeboard	(cu.m/s)							
N4	44.32			(cu.m)	(m)								
N3	44.32		0										
N36	43.57		0										
CARPARK	49.95		0.385		0	0.045	Outlet Sys	l tom					
FIRE SWALE			0.189		0		Outlet Sys						
TRUCK1	49.66		0.353		0.27		None						
TRUCK2	49.12	49.12	0.495	44.7	-0.12		Outlet Sys	l					
ROOF	47.7	40.12	2.24		0.12		None						
Car Park 4	47.95		0.155		0.55		None						
Carran 4	47.35		0.135		0.00	0	NONE						
SUB-CATCH		All S											
Name	Max	Due to Sto	rm										
i tunic	Flow		1										
	(cu.m/s)												
A CARPK		AR&R 100	vear 2 ho	urs storm, a	verage 44	3 mm/h 70	ne 1						
A FSWALE				urs storm, a									
A TRUCK1				urs storm, a									
A TRUCK 2				urs storm, a									
A Basin				urs storm, a									
A ROOF				urs storm, a									
A Car Park 4				urs storm, a									
, Gai Faik 4	0.135	, avai 100	yoar, 2 110	aro otorri, d	voiage 44.	5 mm/11, 20							
l •													
	c							· · · · ·					
PIPE DETAIL		Max V	Max U/S	Max D/S	Duo to St-	rm							
Name	Max Q	Max V			Due to Sto								
DCADDIC	(cu.m/s)	(m/s)	HGL (m)	HGL (m)		WOOD OF	uro oto	1	2 mm/	L			
P CARPK	0.361	1.7	49.762				urs storm, a						
P FSWALE	0.53		48.431				urs storm, a						
LOW FLOW	0.849	2.5	45.696				urs storm, a						
P TRUCK1	0.353	1.2	49.545				urs storm, a						
P TRUCK 2	0.669	2.4	48.701				urs storm, a						
P Bas Oflow	0.24						urs storm, a						ļ
P ROOF	2.24	3.9	47.036				urs storm, a						
P CarPk 4	0.155	2.1	47.71	47.281	AR&R 100	year, 2 ho	urs storm, a	verage 44.	3 mm/h, Zo	ne 1			
													l
CHANNEL D													
Name	Max Q	Max V	Chainage	Max	Due to Sto	rm							
	(cu.m/s)	(m/s)	(m)	HGL (m)									
SWALE 2	4.45	1.8			AR&R 100	year, 2 ho	urs storm, a	verage 44.	3 mm/h, Zo	ne 1			
outlet	5.901	2			AR&R 100	year, 2 ho	urs storm, a	verage 44.	3 mm/h, Zo	ne 1			
											1		
OVERFLOW	ROUTE DE	TAILS											
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Sto	rm				
O CARPK	0.045	0.045	7.665	0.026	0.01	8.83	0.38	AR&R 100	year, 2 ho	urs storm, a	verage 44.	3 mm/h, Zo	ne 1
O SWALE	0	0	7.665	0	0	0	0						
DET SPILL	0	0	7.665	0	0	0	0						
O TRUCK1	0	0	7.665	0	0	0	0						
O TRUCK2	0	0	7.665	0	0	0	0						
WQ SPILL	0.392	0.392	7.665	0.06	0.04	15.94	0.73	AR&R 100	year, 2 ho	urs storm, a	verage 44.	3 mm/h, Zo	ne 1
O ROOF	0	0	7.665	0	0	0	0		· · · · · · · · · · · · · · · · · · ·		I		
O CarPk 4	0			0	0	0					1		[
DETENTION	BASIN DE	TAILS	1										
Name			Max Q	Max Q	Max Q								
		 	Total	Low Level							1		
OSD Tank	47.04	1272.7	0.849		0						1		
WQ BASIN	47.28			0.24	0.392								
				1									
CONTINUITY	CHECK fo	r AR&R 10	0 year. 2 ho	ours storm	average 44	.3 mm/h. Z	one 1						
Node	Inflow	Outflow		Difference	3	, -	-				1		
	(cu.m)	(cu.m)	(cu.m)	%									
N4		49394.85											[
N3		55114.18											
N36		55114.18											
CARPARK	655.98		0										
FIRE SWALE													
OSD Tank	4814.21												
TRUCK1			{					· · · · ·					
	618.78												
TRUCK2	1485.24												
WQ BASIN	1824.02												
ROOF	3895.71		0										
Car Park 4	269.47	269.47	0	0									
		L	l	L <u></u>		L		L					ļ
Run Log for F	ad 4 Deve	oped Basin	July 06 ba	sin pipe ove	ertlow.drn i	un at 11:30):44 on 5/7/	2006					
No water upw													ļ
Freeboard wa	as less than	0.15m at T	RUCK2, FI	RE SWALE	, CARPAR	К							
To see more	detailed res	sults select	the Edit/Co	py Results t	o Spreads	neet menu	item, and pa	aste them in	nto a sprea	dsheet.			

DRAINS 20YR RESULTS

			1	Versien 0	1						1		
PIT / NODE DE		ļ <u></u>		Version 8									
Name	Max HGL			Max Pond		Overflow	Constraint						
		HGL	Flow Arrivi		Freeboard	(cu.m/s)							
			(cu.m/s)	(cu.m)	(m)								
N4	44.31		0										
N3	43.79		0										
N36	43.53		0										
CARPARK	49.74		0.314		0.21	0	None						
FIRE SWALE	48.58		0.123		0.12	0	None						
TRUCK1	49.39		0.289		0.54	0	None						
TRUCK2	49.03		0.404		-0.03		Outlet Syst	tem					
ROOF	47.57		1.825		0.93		None	1					
Car Park 4	47.89		0.127		0.61		None						
Cal Faik 4	47.05		0.127		0.01		INUTIE						
SUB-CATCHM													
			L										
Name	Max	Due to Sto	rm										
	Flow												
	(cu.m/s)												
A CARPK	0.314	AR&R 20)	/ear, 2 hou	rs storm, av	erage 33.6	mm/h, Zon	e 1						
A FSWALE	0.123	AR&R 20	/ear, 2 hou	rs storm, av	erage 33.6	mm/h, Zon	e 1						
A TRUCK1	0.289	AR&R 20	/ear, 2 hour	rs storm, av	erage 33.6	mm/h, Zon	e 1						
A TRUCK 2				rs storm, av									
A Basin				rs storm, av									
A ROOF				rs storm, av									
A Car Park 4	0.127	INCON 20	/oai, ∠ 1100	rs storm, av	5.aye 33.0								
						L						ļ	
PIPE DETAILS													
Name	Max Q	Max V			Due to Sto	rm							
	(cu.m/s)	(m/s)		HGL (m)									
P CARPK	0.314	1.6	49.505	48.583	AR&R 20 y	ear, 2 hou	rs storm, av	erage 33.6	mm/h, Zon	e 1			
P FSWALE	0.437	2	48.223	46.973	AR&R 20 \	ear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	e 1			
LOW FLOW	0.817	2.5	45.661				s storm, av						
P TRUCK1	0.289	1	49.316				rs storm, av						
P TRUCK 2	0.652	2.3					s storm, av						
P Bas Oflow	0.002	4.7					s storm, av						
P ROOF	1.825	3.7	46.976										
							rs storm, av						
P CarPk 4	0.127	2	47.688	47.202	AR&R 20 J	/ear, 2 noui	rs storm, av	erage 33.6	mm/n, Zon	e 1			
CHANNEL DE													
Name	Max Q	Max V	Chainage	Max	Due to Sto	rm							
	(cu.m/s)	(m/s)	(m)	HGL (m)									
SWALE 2	4.45	1.8			AR&R 20 y	ear, 2 hou	rs storm, av	erage 33.6	mm/h, Zon	e 1			
outlet	5.267	1.9			AR&R 20	ear, 2 hour	rs storm, av	erage 33.6	mm/h, Zon	e 1			
							[1					
OVERFLOW F	OUTE DET	TAILS											
		Max Q D/S	Safe O	Max D	Max DxV	Max Width	Max V	Due to Sto	rm				
O CARPK	0	0				0	0						
	0					0				· · · · · · · · · · · · · · · · · · ·			
		0		0									
O SWALE			0.256		0		0				•••••		
DET SPILL	0	0	0.256 0.256	0	0	0	0						
DET SPILL O TRUCK1	0	0	0.256 0.256 0.256	0	0	0	0 0						
DET SPILL O TRUCK1 O TRUCK2	0 0 0	0 0 0	0.256 0.256 0.256 0.256	0 0 0	0 0 0	0 0 0	0 0 0						
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL	0	0	0.256 0.256 0.256 0.256 0.256	0 0 0.007	0 0 0 0	0	0 0 0		/ear, 2 hour	s storm, av	erage 33.6	mm/h, Zone	e 1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF	0 0 0.001 0	0 0 0.001 0	0.256 0.256 0.256 0.256 0.256 0.256	0 0 0.007 0	0 0 0 0 0	0 0 0 2.25 0	0 0 0.15 0	AR&R 20 ر	/ear, 2 hour	s storm, av	erage 33.6	mm/h, Zone	ə 1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL	0 0 0.001	0 0 0.001 0	0.256 0.256 0.256 0.256 0.256 0.256	0 0 0.007 0	0 0 0 0	0 0 0 2.25	0 0 0.15	AR&R 20 ر	/ear, 2 hour	s storm, av	erage 33.6	mm/h, Zono	e 1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF	0 0 0.001 0	0 0 0.001 0	0.256 0.256 0.256 0.256 0.256 0.256	0 0 0.007 0	0 0 0 0 0	0 0 0 2.25 0	0 0 0.15 0	AR&R 20 ر	/ear, 2 hour	s storm, av	erage 33.6	mm/h, Zono	e 1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF	0 0 0.001 0	0 0 0.001 0	0.256 0.256 0.256 0.256 0.256 0.256	0 0 0.007 0	0 0 0 0 0	0 0 0 2.25 0	0 0 0.15 0	AR&R 20 ر	/ear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	ə 1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF	0 0 0.001 0	0 0 0.001 0 0	0.256 0.256 0.256 0.256 0.256 0.256	0 0 0.007 0	0 0 0 0 0	0 0 0 2.25 0	0 0 0.15 0	AR&R 20 ر	/ear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	ə 1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E	0 0 0.001 0 0 0	0 0 0.001 0 0 AILS	0.256 0.256 0.256 0.256 0.256 0.256 0.256	0 0 0.007 0 0	0 0 0 0 0	0 0 0 2.25 0	0 0 0.15 0	AR&R 20 ر	rear, 2 hour	s storm, av	erage 33.6	mm/h, Zono	e 1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E	0 0 0.001 0 0 0	0 0 0.001 0 0	0.256 0.256 0.256 0.256 0.256 0.256 0.256 Max Q	0 0 0.007 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 2.25 0	0 0 0.15 0	AR&R 20 ر	rear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	e 1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name	0 0 0.001 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0.001 0 0 0 AILS MaxVol	0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 Max Q	0 0 0.007 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 2.25 0	0 0 0.15 0	AR&R 20 ر	/ear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	ə 1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank	0 0 0.001 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0.001 0 0 AILS MaxVol	0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256	0 0 0.007 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 Max Q High Level 0	0 0 0 2.25 0	0 0 0.15 0	AR&R 20 ر	/ear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	ə 1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name	0 0 0.001 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0.001 0 0 AILS MaxVol	0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256	0 0 0.007 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 2.25 0	0 0 0.15 0	AR&R 20 ر	rear, 2 hour	s storm, av	erage 33.6	mm/h, Zono	ə 1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN	0 0 0.001 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0.001 0 0 0 AILS MaxVol 0 0 0	0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.271 0.171	0 0 0.007 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0.001	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	/ear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	ə 1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN CONTINUITY	0 0 0.001 0 0 ASIN DET. Max WL 46.94 47.2 CHECK for	0 0 0.001 0 0 AILS MaxVol 0 0 AR&R 20 y	0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256 0.256	0 0 0.007 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	/ear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	91
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN	0 0 0.001 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0.001 0 0 0 0 AILS MaxVol 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.256 0.257 0.2570 0.2570 0.2570 0.2570 0.25700000000000000000000000000000000000	0 0 0 0.007 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	/ear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	91
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN CONTINUITY (Node	0 0.001 0 0.001 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.256 0.257 0.257 0.277 0.277 0.277 0.277 0.277 0.277 0.277 0.277	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	rear, 2 hour	s storm, av	erage 33.6	mm/h, Zoni	91
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN CONTINUITY 1 Node	0 0 0 0.001 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0.001 0 0 0 AILS MaxVol 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.256 0.257 0.2570 0.2570 0.2570 0.2570 0.2570 0.2570 0.2570 0.257	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17 0 0.17 5 storm, av 0 Difference % 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	rear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	91
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN CONTINUITY 1 Node N4	0 0 0.001 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0.001 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.256 0.257 0.257 0.257 0.257 0.257 0.2770 0.27700 0.2770 0.2770 0.27700 0.27700 0.27700 0.27700 0.2770000000000	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.17 0.17 0.	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	rear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	ə1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN CONTINUITY Node N4 N3 N3 N36	0 0 0.001 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.256 0.267 0.0570	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0.001 erage 33.6	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	rear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	91
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN CONTINUITY (Node N4 N3	0 0 0.001 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.256 0.267 0.0570	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0.001 erage 33.6	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	/ear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	ə1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN CONTINUITY 1 Node N4 N3 N36	0 0 0 0.0011 0 0 0 ASIN DET. Max WL 46.94 47.2 CHECK for Inflow (cu.m) 0 53626.63 53492.63	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.256 0.250 0.0570	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	rear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	91
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN CONTINUITY Node N4 N3 N36 CARPARK FIRE SWALE	0 0.001 0.001 ASIN DET. Max WL 46.94 47.2 CHECK for Inflow (cu.m) 0 53626.63 53492.63 53492.63	0 0.001 0.001 MaxVol 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.256 0.250 0.250 0.250 0.057 0.00000000000000000000000000000	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	rear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	91
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN CONTINUITY Node N4 N3 N36 CARPARK FIRE SWALE OSD Tank	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.256 0.257 0.057 0.057 0.057 0.057 0.057 0.057 0.057 0.057 0.057 0.077 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.0000 0.000000	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	/ear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	ə1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN CONTINUITY Node N4 N3 CARPARK FIRE SWALE OSD Tank	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.256 0.257 0.257 0.271 0.0171 0.00 0.00 0.00 0.00 0.00 0.00	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	rear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	91
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN CONTINUITY Node N4 N3 N36 CARPARK FIRE SWALE OSD Tank TRUCK1 TRUCK2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.256 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	rear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	ə1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN CONTINUITY Node N4 N3 N36 CARPARK FIRE SWALE OSD Tank TRUCK1 TRUCK2 WQ BASIN	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.256 0.257 0.026 0.026 0.026 0.026 0.026 0.026 0.026 0.026 0.026 0.026 0.026 0.026 0.026 0.027 0.027 0.0171 0.0171 0.00 0.00 0.00 0.00 0.00	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	/ear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	91
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN CONTINUITY Node N4 N3 CARPARK FIRE SWALE OSD Tank TRUCK1 TRUCK2 WO BASIN ROOF	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.256 0.057 0.0517 0.011 0.00 0.00 0.00 0.00 0.00 0.00 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	rear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	91
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN CONTINUITY Node N4 N3 N36 CARPARK FIRE SWALE OSD Tank TRUCK1 TRUCK2 WQ BASIN	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.256 0.057 0.0171 0.0171 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.0000 0.0000 0.0000 0.0000 0.000000	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	/ear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	ə1
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN CONTINUITY Node N4 N3 CARPARK FIRE SWALE OSD Tank TRUCK1 TRUCK2 WO BASIN ROOF	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.256 0.057 0.0171 0.0171 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.0000 0.0000 0.0000 0.0000 0.000000	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 2.25 0 0	0 0 0.15 0 0	AR&R 20 ر	/ear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	91
DET SPILL O TRUCK1 O TRUCK2 WQ SPILL O ROOF O CarPk 4 DETENTION E Name OSD Tank WQ BASIN CONTINUITY Node N4 N3 CARPARK FIRE SWALE OSD Tank TRUCK1 TRUCK2 WO BASIN ROOF	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.256 0.257 0.057 0.057 0.00 0.00 0.00 0.00 0.00	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 2.25 0 0 0 0 0 0 0 0 0	0 0 0.015 0 0 0 0	AR&R 20)	rear, 2 hour	s storm, av	erage 33.6	mm/h, Zon	ə1
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DRAINS RESULTS 5YR

PIT / NODE DETALS Version 8 Version 8 Overflow Constraint NN 4433 Cournel 0 Overflow Constraint Overflow Constraint NS 4433 O O Overflow Constraint Overflow Constraint NS 4433 O.097 O.19 Overflow Constraint Overflow Constraint NS 4434 O.099 O.09 Overflow Constraint Overflow Constraint ROCP 4474 O.099 Overflow Constraint Overflow Constraint Overflow Constraint SUB-CATCHMENT DETALLS Overflow Constraint Overflow Constraint Overflow Constraint Overflow Constraint AFSWALE O.097 AR84 Systar 1.5 hours storm, average 30.3 mmh, Zone 1 Overflow Constraint Overflow Constraint AFSWALE O.097 AR845 Systar 1.5 hours storm, average 30.3 mmh, Zone 1 <th></th> <th></th> <th>1</th> <th></th> <th>Version 8</th> <th>1</th> <th>1</th> <th></th> <th></th> <th></th> <th></th>			1		Version 8	1	1				
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					L						
	Run Loa for Pa	d 4 Develor	oed Basin J	uly 06 basin	pipe overfl	ow.drn run	at 11:31:47	on 5/7/2006	3		
No water upwelling from any pit. Freeboard was adequate at all pits.					l	I	T		[
	No water upwo	lling from a	y nit Freek	nard was a	dequate at	all nite		İ		1	
	mater upwe	g nom di	., pit. i 166L	Jana was d	auguaie al	un prio.					
	-		1		L	<u> </u>					
To see more detailed results select the Edit/Copy Results to Spreadsheet menu item, and paste them into a spreadsheet.	i o saa mora da	etailed resul	its select the	e Edit/Copy	Results to S	spreadshee	t menu item	, and paste	tnem into a	spreadshee	et.

APPENDIX C

Water Quality Results Pad 4



Source nodes

Location	Truck area	Car Park 4	Car Park 1&2	Car Park 3		
ID	1	Cai Faik 4		Cai Faik 3	+	
Node Type	l Irban Source Node	UrbanSourceNode	4 UrbanSourcoNodo	-	+	
Total Area (ha)	1.710				+	
Area Impervious (ha)	1.233				+	
Area Pervious (ha)	0.477	0.224		0.200	+	
Field Capacity (mm)	0.477		-		 +	
	200				+	
Pervious Area Infiltration Capacity coefficient - a	200				+	
Pervious Area Infiltration Capacity exponent - b	1	2	2	2	+	
Impervious Area Rainfall Threshold (mm/day)	1		1	1	+	
Pervious Area Soil Storage Capacity (mm)	120				+	
Pervious Area Soil Initial Storage (% of Capacity)	25					
Groundwater Initial Depth (mm)	50					
Groundwater Daily Recharge Rate (%)	25				<u> </u>	
Groundwater Daily Baseflow Rate (%)	5	0.85	0.85		<u> </u>	
Groundwater Daily Deep Seepage Rate (%)	0	0	0	•	<u> </u>	
Stormflow Total Suspended Solids Mean (log mg/L)	1.92				<u> </u>	
Stormflow Total Suspended Solids Standard Deviation (log mg/L)	0.44		0.32		<u> </u>	
Stormflow Total Suspended Solids Estimation Method	Mean	Mean	Mean	Mean	<u> </u>	
Stormflow Total Suspended Solids Serial Correlation	0	0	0	0		
Stormflow Total Phosphorus Mean (log mg/L)	-0.59					
Stormflow Total Phosphorus Standard Deviation (log mg/L)	0.36		••			
Stormflow Total Phosphorus Estimation Method	Mean	Mean	Mean	Mean		
Stormflow Total Phosphorus Serial Correlation	0	0	0	0		
Stormflow Total Nitrogen Mean (log mg/L)	0.25					
Stormflow Total Nitrogen Standard Deviation (log mg/L)	0.32	0.19	0.19	0.19		
Stormflow Total Nitrogen Estimation Method	Mean	Mean	Mean	Mean		
Stormflow Total Nitrogen Serial Correlation	0	0	0	0		
Baseflow Total Suspended Solids Mean (log mg/L)	0.78		1.1	1.1		
Baseflow Total Suspended Solids Standard Deviation (log mg/L)	0.45	0.17	0.17	0.17		
Baseflow Total Suspended Solids Estimation Method	Mean	Mean	Mean	Mean		
Baseflow Total Suspended Solids Serial Correlation	0	0	0	0		
Baseflow Total Phosphorus Mean (log mg/L)	-1.11	-0.82	-0.82	-0.82		
Baseflow Total Phosphorus Standard Deviation (log mg/L)	0.48	0.19	0.19	0.19		
Baseflow Total Phosphorus Estimation Method	Mean	Mean	Mean	Mean		
Baseflow Total Phosphorus Serial Correlation	0	0	0	0		
Baseflow Total Nitrogen Mean (log mg/L)	0.14	0.32	0.32	0.32		
Baseflow Total Nitrogen Standard Deviation (log mg/L)	0.2	0.12	0.12	0.12		
Baseflow Total Nitrogen Estimation Method	Mean	Mean	Mean	Mean		
Baseflow Total Nitrogen Serial Correlation	0	0	0	0		
OUT - Mean Annual Flow (ML/yr)	9.74	1.79	2.18	1.72		
OUT - TSS Mean Annual Load (kg/yr)	754					
OUT - TP Mean Annual Load (kg/yr)	2.37	0.625	0.747	0.594		
OUT - TN Mean Annual Load (kg/yr)	17		5.66			
OUT - Gross Pollutant Mean Annual Load (kg/yr)	301					

No Imported Data Source nodes

USTM treatment nodes

Location	Infiltration Basin	Bio-Retention	Bio-Retention			
ID	2	6	7			
Node Type	BioRetentionNode	BioRetentionNode	BioRetentionNode			
Lo-flow bypass rate (cum/sec)	0	0	0			

Li flow hymogo rote (ours/oog)	100	100	100		1	
Hi-flow bypass rate (cum/sec)	100	100	100			
Inlet pond volume	E05	405	248			
Area (sqm)	565	135				
Extended detention depth (m)	1.5	0	0			
Permanent pool volume (cum)						
Proportion vegetated						
Equivalent pipe diameter (mm)					 	
Overflow weir width (m)	2	2	2			
Notional Detention Time (hrs)						
Orifice discharge coefficient						
Weir coefficient	1.7	1.7				
Number of CSTR cells	3	-	-			
Total Suspended Solids k (m/yr)	1000	1000	1000			
Total Suspended Solids C* (mg/L)	12	12	12			
Total Suspended Solids C** (mg/L)						
Total Phosphorus k (m/yr)	500	500	500			
Total Phosphorus C* (mg/L)	0.13	0.13	0.13			
Total Phosphorus C** (mg/L)						
Total Nitrogen k (m/yr)	50	50	50			
Total Nitrogen C* (mg/L)	1.3	1.3	1.3			
Total Nitrogen C** (mg/L)						
Threshold hydraulic loading for C** (m/yr)						
Extraction for Re-use	Off	Off	Off		1	
Annual Re-use Demand - scaled by daily PET (ML)					1	
Constant Daily Re-use Demand (kL)						
User-defined Annual Re-use Demand (ML)						
Percentage of User-defined Annual Re-use Demand Jan						
Percentage of User-defined Annual Re-use Demand Feb						
Percentage of User-defined Annual Re-use Demand Mar						
Percentage of User-defined Annual Re-use Demand Apr						
Percentage of User-defined Annual Re-use Demand May						
Percentage of User-defined Annual Re-use Demand Jun					1	
Percentage of User-defined Annual Re-use Demand Jul						
Percentage of User-defined Annual Re-use Demand Aug						
Percentage of User-defined Annual Re-use Demand Aug						
Percentage of User-defined Annual Re-use Demand Oct						
Percentage of User-defined Annual Re-use Demand Nov						
Percentage of User-defined Annual Re-use Demand Dec	500	135	240			
Filter area (sqm)	0.6					
Filter depth (m) Filter median particle diameter (mm)	0.6					
Saturated hydraulic conductivity (mm/hr)	120					
Voids ratio	0.3	0.3	0.3			
Length (m)						
Bed slope					 	
Base Width (m)				┤────┤───	 }	
Top width (m)					 L	
Vegetation height (m)						
Proportion of upstream impervious area treated					 	
Seepage Rate (mm/hr)	35	0	0		1	
Evap Loss as proportion of PET						
Depth in metres below the drain pipe	0				 	
IN - Mean Annual Flow (ML/yr)	11.5				 	
IN - TSS Mean Annual Load (kg/yr)	1.03E+03	326	261			

PAD 4 MUSIC RESULTS

IN - TP Mean Annual Load (kg/yr)	3	0.747	0.594			
IN - TN Mean Annual Load (kg/yr)	21.7	5.66	4.47			
IN - Gross Pollutant Mean Annual Load (kg/yr)	355	65.4	52.1			
OUT - Mean Annual Flow (ML/yr)	4.82	2.2	1.76			
OUT - TSS Mean Annual Load (kg/yr)	33.3	63.5	35.3			
OUT - TP Mean Annual Load (kg/yr)	0.361	0.304	0.213			
OUT - TN Mean Annual Load (kg/yr)	4.92	3.64	2.75			
OUT - Gross Pollutant Mean Annual Load (kg/yr)	0	0	0			

No Generic treatment nodes

Other nodes

Location	Junction	Receiving Node			
ID	8	9			
Node Type	JunctionNode	ReceivingNode			
IN - Mean Annual Flow (ML/yr)	8.78	8.78			
IN - TSS Mean Annual Load (kg/yr)	132	132			
IN - TP Mean Annual Load (kg/yr)	0.878	0.878			
IN - TN Mean Annual Load (kg/yr)	11.3	11.3			
IN - Gross Pollutant Mean Annual Load (kg/yr)	0	0			
OUT - Mean Annual Flow (ML/yr)	8.78	0			
OUT - TSS Mean Annual Load (kg/yr)	132	0			
OUT - TP Mean Annual Load (kg/yr)	0.878	0			
OUT - TN Mean Annual Load (kg/yr)	11.3	0			
OUT - Gross Pollutant Mean Annual Load (kg/yr)	0	0			

Links

LIIRS								
Location	Drainage Link	Drainage Link	Drainage Link	Drainage Link	Drainage Link	Drainage Link	Drainage Link	Drainage Link
Source node ID	1	4	5	2	6	7	3	8
Target node ID	2	6	7	8	8	8	2	9
Muskingum-Cunge Routing	Not Routed							
Muskingum K								
Muskingum theta								
IN - Mean Annual Flow (ML/yr)	9.74	2.18	1.72	4.82	2.2	1.76	1.79	8.78
IN - TSS Mean Annual Load (kg/yr)	754	326	261	33.3	63.5	35.3	276	132
IN - TP Mean Annual Load (kg/yr)	2.37	0.747	0.594	0.361	0.304	0.213	0.625	0.878
IN - TN Mean Annual Load (kg/yr)	17	5.66	4.47	4.92	3.64	2.75	4.69	11.3
IN - Gross Pollutant Mean Annual Load (kg/yr)	301	65.4	52.1	0	0	0	54.5	0
OUT - Mean Annual Flow (ML/yr)	9.74	2.18	1.72	4.82	2.2	1.76	1.79	8.78
OUT - TSS Mean Annual Load (kg/yr)	754	326	261	33.3	63.5	35.3	276	132
OUT - TP Mean Annual Load (kg/yr)	2.37	0.747	0.594	0.361	0.304	0.213	0.625	0.878
OUT - TN Mean Annual Load (kg/yr)	17	5.66	4.47	4.92	3.64	2.75	4.69	11.3
OUT - Gross Pollutant Mean Annual Load (kg/yr)	301	65.4	52.1	0	0	0	54.5	0



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T		PROJECT MANAGER		PROJECT:					DRAWING TITLE:	
R CSR		, ,		Proposed Industrial Building Pad 4, Lenore Lane Erskine Park, NSW			Siteplan			
				SCALE:	DRAWN BY:	DATE:	CHECKED:	QA:	JOB No:	DRAWING NUMBER
Bag 6 ood NSW 2057	phone : (02) 9235 800 fax : (02) 9235 8073 email: info@csr.com.au	STREET ADDRESS SUBURB STATE AND POSTCODE	phone : (02) 0000 0000 fax : (02) 0000 0000 email: emailaddress	1:500	MB	4/07/20	06		06056	DA-03





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