AREA SCHEDULE

SITE	AREA	18.497 ha
	CARPARKS	5
EXISTING SHED	SINGLE STOREY	
	MAXIMUM HEIGHT ABOVE GROUND LEVEL	4.5m
	GROSS FLOOR AREA	84m²
PROPOSED BUILD ENVELOPE	VEHICLE MAINTENANCE SHED (LENGTHxWIDTHxHEIGHT)	20mx15mx6m HIGH
SITE COVERAGE	EXISTING SHED	84m²
	PROPOSED SHED	300m²
	WASHDOWN BAY	46m²
	TOTAL	430m²
IMPERVIOUS AREAS	TOTAL GRAVEL HARDSTAND/INTERNAL ROAD	7623.9m²
	TOTAL SITE COVER	430m²
	TOTAL	8054m²
SAND EXTRACTION AREA	AREA	3.52ha

LOT 96
PL4022

LOT 93
PL4022

ROAD RESERVE

PROPOSED COVERED MAINTENANCE AREA

EXISTING SHED

ELEVATED GRAVEL HARDSTAND
(APPROX RL 11.9m)

HEAVY VEHICLE
PARKING AREA

PROPOSED WETLAND
DETENTION BASIN
REFER SWMP

TEMPORARY
STOCKPILE AREA

STAFF
CARPARKING

PROPOSED 6.0m WIDE GRAVEL
ACCESS ROAD TO SAND
QUARRY AND VEHICLE DEPOT

WASHDOWN BAY

POWER POLE AND STAY

DRAIN

EXISTING GATE

PROPOSED ACCESS INTERSECTION
AND ROAD TO BE CONSTRUCTED
(REFER DRAWING D16.150-SK03)

GATE

ACCESS CROSSOVER TO BE RELOCATED
TO THE ROAD RESERVE OPPOSITE
EDWARDS ROAD

LOT BOUNDARY

NINE MILE ROAD

EDWARDS RD

LEGEND

- PRE-DEVELOPED SITE CONTOUR
- EXISTING OVERHEAD ELECTRICITY (LINE, POLE & STAY)
- EXISTING FENCE
- EXISTING BUILDINGS
- MAPPED WETLANDS
- PROPOSED GRAVEL HARDSTAND AREA PLANT AND MATERIALS STORAGE
- PROPOSED 6.0m WIDE GRAVEL ACCESS ROAD/VEHICLE MANEUVERING
- PROPOSED SAND EXTRACTION AREA
- PROPOSED GRASSED BATTERS AND DRAINS
- PROPOSED WASHDOWN BAY (INCLUDING OIL SEPARATOR, SEDIMENT TRAP AND TANK FOR COLLECTION AND RE-USE WATER ON SITE)
- PROPOSED BUILDING
- PROPOSED RETAINING WALL (UP TO 2.0m HIGH)

NOTES

1. DEFINED FLOOD EVENT 1.0% AEP (1 IN 100 YEARS) FLOOD LEVEL APPROXIMATELY 10.968 AHD
2. PROPOSED ELEVATED GRAVEL HARDSTAND LEVEL APPROXIMATELY 11.9 AHD

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

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Development Permit No.: D/90-2017

Dated: 13 April 2018

DRAFT ISSUE
NOT FOR CONSTRUCTION

SCALE
0 10 20 30 40 1:2000
DESCRIPTION

REV	REVISION	DATE
A	DEHP PRE-LODGEMENT	19/06/2017
B	MCU APPLICATION	08/2017
C	MCU RFI RESPONSE	11/2017
D	MCU RFI RESPONSE - ACCESS AMENDMENT	02/2018

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Drawn by	CER
Checked by	RAJ
Approved	G B A SIMMERS
RPEQ	7682
Sign	

G K AND L R THOMPSON
MCU FOR TRANSPORT DEPOT AND SAND QUARRY
LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY
SITE CONCEPT PLAN

D16.150-SK01

SHEET 01 OF 5

A B C D

ROCKHAMPTON REGIONAL COUNCIL

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SCALE

0 25 50 75 100 1:5000

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REV	REVISION	DATE
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RPEQ 7682	Sign

G K AND L R THOMPSON

MCU FOR TRANSPORT DEPOT AND SAND QUARRY

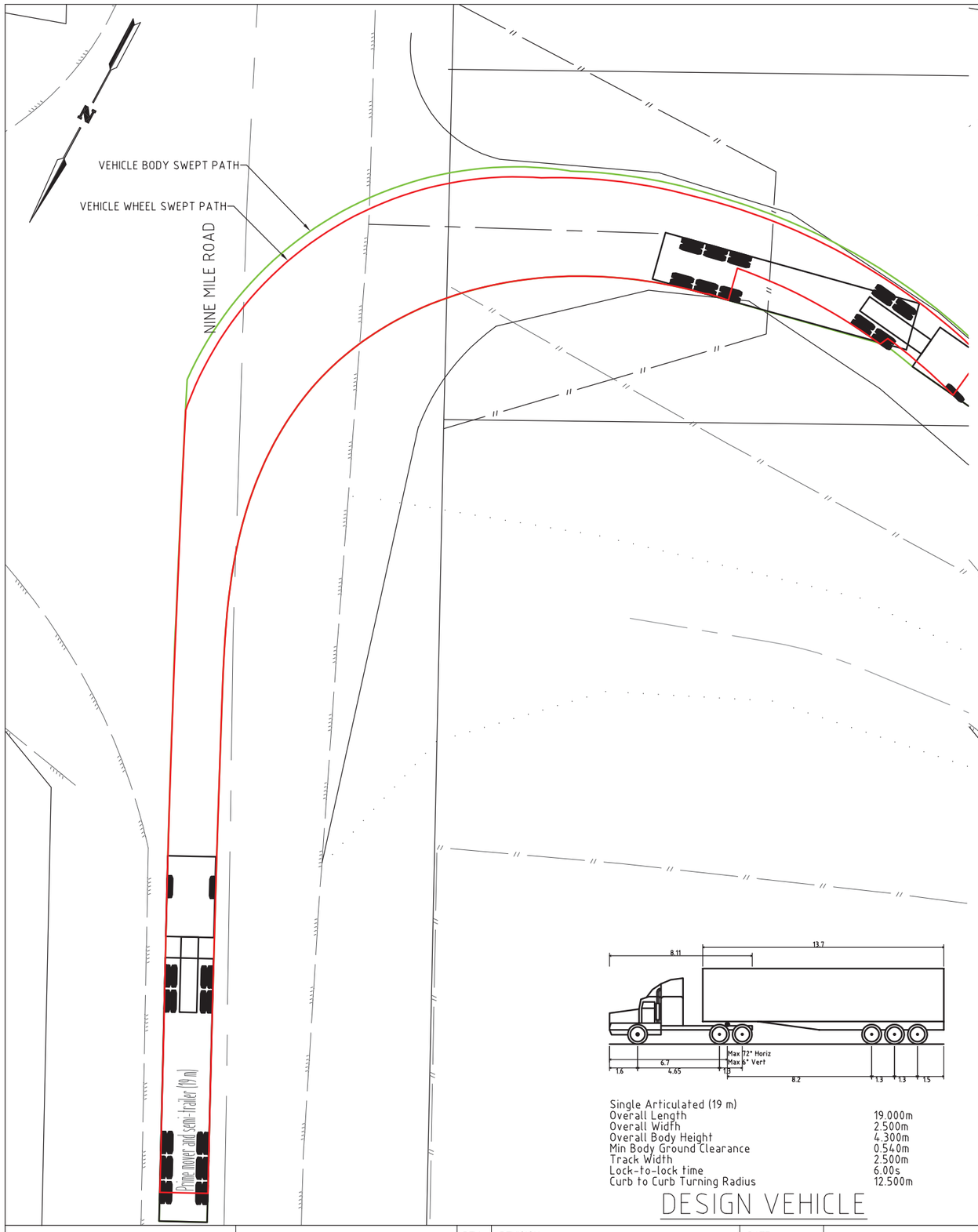
LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY

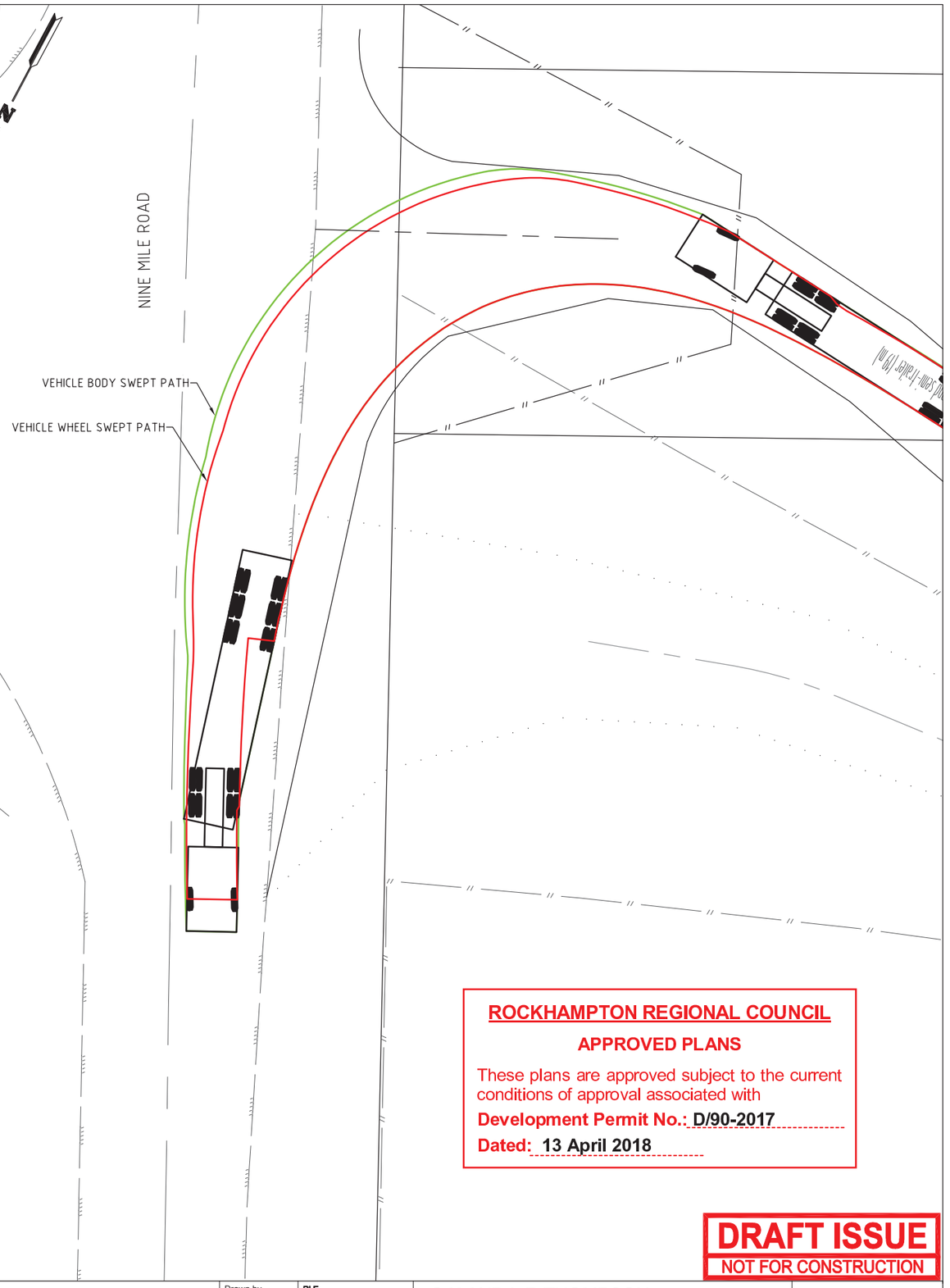
LOCALITY PLAN

D16.150-SK02

SHEET 02 OF 5

A C D





Single Articulated (19 m)

Overall Length	19.000m
Overall Width	2.500m
Overall Body Height	4.300m
Min Body Ground Clearance	0.540m
Track Width	2.500m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	12.500m

DESIGN VEHICLE

ROCKHAMPTON REGIONAL COUNCIL

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SCALE

0 1.25 2.5 3.75 5
DESCRIPTION 1:250

REV	REVISION	DATE
C	MCU RFI RESPONSE	11/2017
D	MCU RFI RESPONSE - ACCESS AMENDMENT	02/2018

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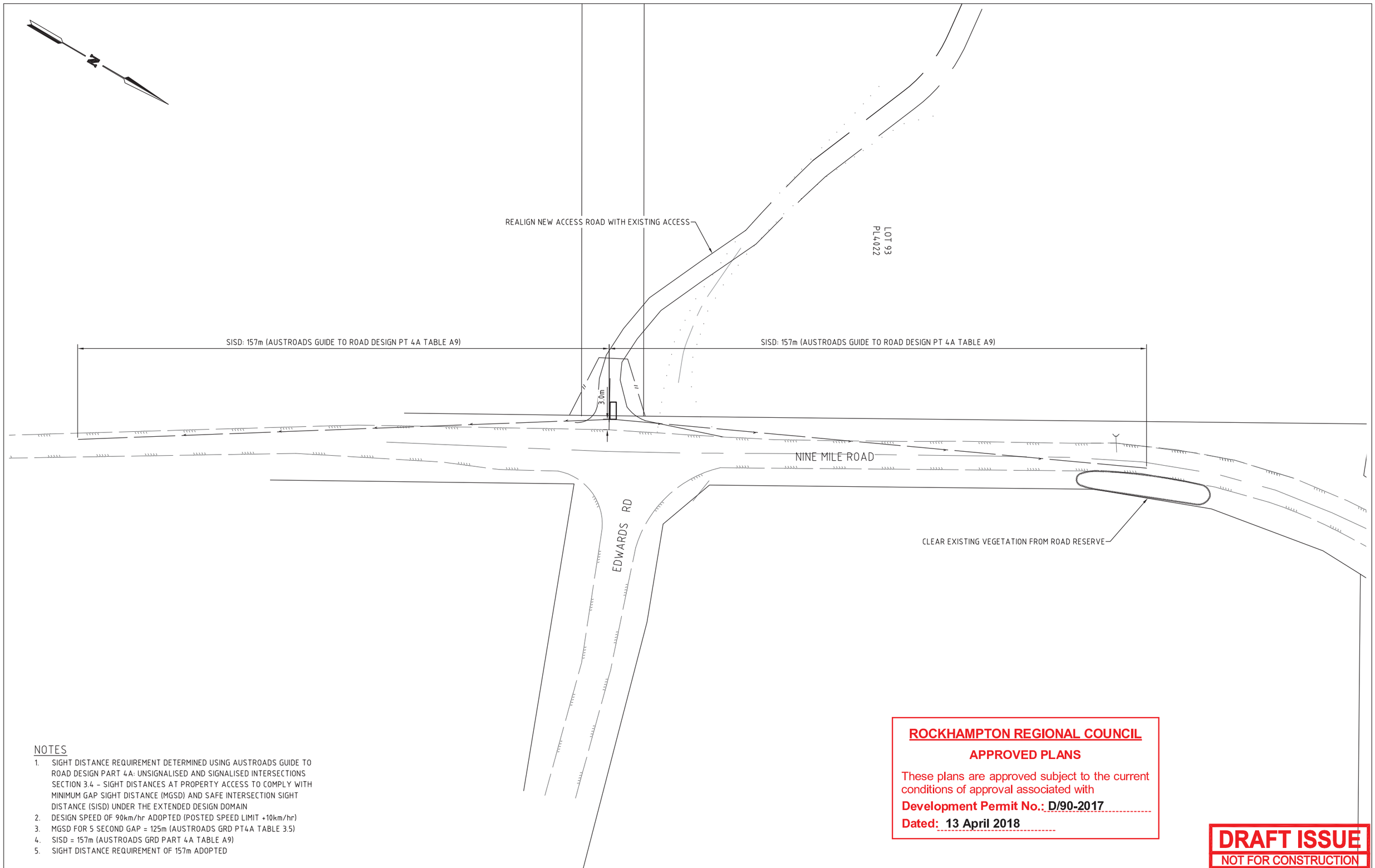
G K AND L R THOMPSON
MCU FOR TRANSPORT DEPOT AND SAND QUARRY
LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY
ACCESS SWEPT PATHS

D16.150-SK04

SHEET 04 OF 5

C D



NOTES

1. SIGHT DISTANCE REQUIREMENT DETERMINED USING AUSTROADS GUIDE TO ROAD DESIGN PART 4A: UNSIGNALISED AND SIGNALISED INTERSECTIONS SECTION 3.4 – SIGHT DISTANCES AT PROPERTY ACCESS TO COMPLY WITH MINIMUM GAP SIGHT DISTANCE (MGSD) AND SAFE INTERSECTION SIGHT DISTANCE (SISD) UNDER THE EXTENDED DESIGN DOMAIN
2. DESIGN SPEED OF 90km/hr ADOPTED (POSTED SPEED LIMIT +10km/hr)
3. MGSD FOR 5 SECOND GAP = 125m (AUSTROADS GRD PT4A TABLE 3.5)
4. SISD = 157m (AUSTROADS GRD PART 4A TABLE A9)
5. SIGHT DISTANCE REQUIREMENT OF 157m ADOPTED

ROCKHAMPTON REGIONAL COUNCIL

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Dated: 13 April 2018

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SCALE

0 5 10 15 20
DESCRIPTION 1:1000

REV	REVISION	DATE
A	PRELIMINARY-NOT FOR CONSTRUCTION	11/2017
C	MCU RFI RESPONSE	11/2017
D	MCU RFI RESPONSE - ACCESS AMENDMENT	02/2018

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RPEQ 7682	Sign

G K AND L R THOMPSON
MCU FOR TRANSPORT DEPOT AND SAND QUARRY
LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY
ACCESS SIGHT DISTANCE CHECK

D16.150-SK05

SHEET 05 OF 5

A C D

Q= F*C*I*A

POST DEVELOPED CATCHMENT TO DEPRESSION TC= 11 min

Development Area 3.075 ha

	F sq kms	C co eff	I mm/hr	A sq kms	Q m3/sec
Q2	0.278	0.563993659	100.4	0.03075	0.4838
Q5	0.278	0.630345854	129.8	0.03075	0.6996
Q10	0.278	0.663521951	148.2	0.03075	0.8408
Q20	0.278	0.696698049	172.8	0.03075	1.0292
Q50	0.278	0.763050244	206.4	0.03075	1.3465
Q100	0.278	0.796226341	233.1	0.03075	**1.5863**

Fi	0.239	
$^{T}I_{10}$	62.96	mm/hr
C_{10}	0.664	

From QUDM T4.5.3

SUB CATCHMENT - DEVELOPMENT TO WETLAND

Q= F*C*I*A

Post Developed to Wetland TC= 11 min

1.126 ha

C1	F sq kms	C co eff	I mm/hr	A sq kms	Q m3/sec
Q2	0.278	0.6766	100.4	0.01126	0.2125
Q5	0.278	0.7562	129.8	0.01126	0.3073
Q10	0.278	0.796	148.2	0.01126	0.3694
Q20	0.278	0.8358	172.8	0.01126	0.4521
Q50	0.278	0.9154	206.4	0.01126	0.5915
Q100	0.278	0.9552	233.1	0.01126	**0.6969**

Fi	0.652	
$^{T}I_{10}$	62.96	mm/hr
C_{10}	0.796	

Friends Equation - Post-developed

L m	n	S %	t minutes
50	0.015	0.5	6.79

$tc = \frac{(107.n.L^{0.333})}{S^{0.2}}$

+75m in Channel - 4 minutes at 0.5% in blade cut channel

Mannings n = 0.026 for gravel (Brisbane City Council guidelines)

PROPOSED TABLE DRAIN

PROPOSED COVERED MAINTENANCE AREA

PROPOSED WASHDOWN BAY

EXISTING SHED

ROCK OUTLET SCOUR PROTECTION

750mm WIDE OUTLET WEIR

BUND

PROPOSED 800m² WETLAND/DETENTION BASIN

75.0m CHANNEL FLOW

50.0m SHEET FLOW

PROPOSED TABLE DRAIN

DRAIN

SUB-CATCHMENT TO WETLAND/DETENTION BASIN

POST DEVELOPED CATCHMENT TO DEPRESSION

LOT 93 PL4022

NINE MILE ROAD

A SK14

B SK14

LEGEND

- EXISTING OVERHEAD ELECTRICITY (LINE, POLE & STAY)
- EXISTING FENCE
- EXISTING BUILDINGS
- MAPPED WETLANDS
- PROPOSED GRAVEL HARDSTAND AREA PLANT AND MATERIALS STORAGE
- PROPOSED 6.0m WIDE GRAVEL ACCESS ROAD/VEHICLE MANEUVERING
- POST DEVELOPMENT CATCHMENT
- PROPOSED GRASSED BATTERS AND DRAINS
- PROPOSED WASHDOWN BAY
- PROPOSED BUILDING
- PROPOSED RETAINING WALL (UP TO 2.0m HIGH)
- PROPOSED FLOW PATH
- 8.5 EXISTING CONTOUR

ROCKHAMPTON REGIONAL COUNCIL

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Dated: 13 April 2018

SCALE

0 5 10 15 20 1:1000

DESCRIPTION

REV	REVISION	DATE
A	MCU APPLICATION - SWMP	28/06/2017

DILEIGH CIVIL / STRUCTURAL DESIGN & PROJECT MANAGEMENT

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Approved	GEOFF SIMMERS
RPEQ	4585
Sign	30-6-17

G K AND L R THOMPSON

MCU FOR TRANSPORT DEPOT AND SAND QUARRY

LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY

POST DEVELOPED STORMWATER CATCHMENTS

D16.150-SK12

SHEET 02 OF 04

A

N

GRAVEL ACCESS ROAD1
AREA = 0.246ha
55% IMPERVIOUS

HARDSTAND AREA1
AREA = 0.288ha
65% IMPERVIOUS

PROPOSED COVERED MAINTENANCE AREA

PROPOSED WASHDOWN BAY

EXISTING SHED

GRAVEL ACCESS ROAD2
AREA = 0.210ha
70% IMPERVIOUS

LOT 93
PL4022

NINE MILE ROAD

PROPOSED 800m² WETLAND/DETENTION BASIN

HARDSTAND AREA2
AREA = 0.327ha
71% IMPERVIOUS

LEGEND

- EXISTING OVERHEAD ELECTRICITY (LINE, POLE & STAY)
- EXISTING FENCE
- EXISTING BUILDINGS
- MAPPED WETLANDS
- PROPOSED GRAVEL HARDSTAND AREA PLANT AND MATERIALS STORAGE
- PROPOSED 6.0m WIDE GRAVEL ACCESS ROAD/VEHICLE MANEUVERING
- POST DEVELOPED SUB-CATCHMENT
- PROPOSED GRASSED BATTERS AND DRAINS
- PROPOSED WASHDOWN BAY
- PROPOSED BUILDING
- PROPOSED RETAINING WALL (UP TO 2.0m HIGH)
- EXISTING CONTOUR

ROCKHAMPTON REGIONAL COUNCIL

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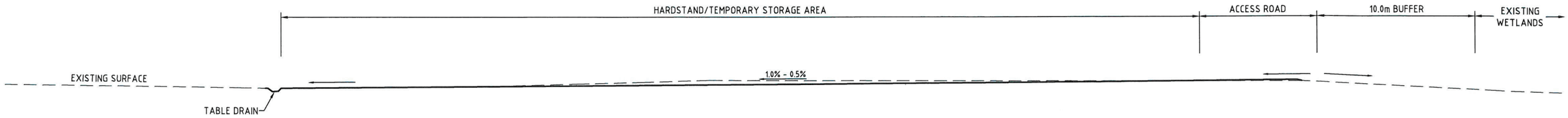
G K AND L R THOMPSON
MCU FOR TRANSPORT DEPOT AND SAND QUARRY
LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY
MUSIC SUB-CATCHMENTS

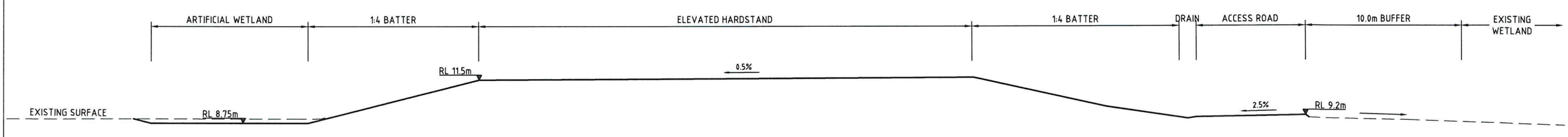
D16.150-SK13

SHEET 03 OF 04

A



SECTION B SK12



SECTION A SK12

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

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Development Permit No.: D/90-2017

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0 1.25 2.5 3.75 5 1:250

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G K AND L R THOMPSON

MCU FOR TRANSPORT DEPOT AND SAND QUARRY

LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY

SITE SECTIONS (LOT 93)

D16.150-SK14

SHEET 4 OF 04

A

Construction Sciences

Construction Sciences Pty Ltd
ABN 74 128 806 735

32 Hi-tech Drive
Kunda Park
Queensland 4556

Phone: 5452 0100

www.constructionsciences.net

18/09/2017

REEL Planning
PO Box 437
Rockhampton
QLD 4700

Email: Rachel@reelplanning.com

Dear Rachel

Lot 96 on PL4022, 9 Mile Road, Rockhampton-Acid Sulfate Soils test results

At the request of Mr Greg Thomson, preliminary investigation work and sample recovery have yielded a number of samples for testing to determine the presence and severity of any Acid Sulfate Soils at defined locations/depths within the subject site.

The recovered samples were first screened using the qualitative pH_F and pH_{FOX} test before the results of this testing were used to select a number of samples for quantitative analytical laboratory testing via the Chromium Suite.

The initial qualitative testing indicated that the majority of samples recovered from the site showed limited evidence of the presence of Acid Sulfate Soils. While moderate to high reactions to the addition of peroxide were observed for the majority of samples tested, the magnitude and similarity of the pH_F and pH_{FOX} results indicates limited Acid Sulfate Soils risk, see Construction Sciences report 2128E.P.639 for presentation of pH_F and pH_{FOX} results in detail.

The subsequent Chromium Suite test results were consistent with the initial qualitative pH_F and pH_{FOX} test results, showing no evidence of the presence of Acid Sulfate Soils within the five samples selected for testing. Two of the five samples showing excess neutralising capacity and for the other three samples acidity was well below the applicable action criteria and in most cases below the detection limits of the applicable test methods, see attached laboratory report.

I trust this meets with your requirements, if you have any further questions feel free to contact the undersigned.

Yours faithfully

Paul Mayes
Principal Environmental Scientist
For
Construction Sciences

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1716263**	Page	: 1 of 3
Client	: **CONSTRUCTION SCIENCES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: POKA KILAVERAVE	Contact	: Jenny Bevan
Address	: 101 HIGH STREET NORTH ROCKHAMPTON QLD 4701	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 4928 0044	Telephone	: +61-7-3243 7222
Project	: P/639 P.639	Date Samples Received	: 27-Jul-2017 09:30
Order number	: P639	Date Analysis Commenced	: 14-Aug-2017
C-O-C number	: ----	Issue Date	: 14-Aug-2017 13:33
Sampler	: POKA KILAVERAVE		
Site	: ----		
Quote number	: EN/024/16 - Planned Events		
No. of samples received	: 5		
No. of samples analysed	: 5		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris		Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ASS: EA033 (CRS Suite):Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP1@0.0-0.25	TP1@3.5-4.0	TP2@2.0-2.5	TP2@3.5-4.0	TP2@5.0-5.5
			Client sampling date / time	[09-Aug-2017]	[09-Aug-2017]	[09-Aug-2017]	[09-Aug-2017]	[09-Aug-2017]
Compound	CAS Number	LOR	Unit	EB1716263-001	EB1716263-002	EB1716263-003	EB1716263-004	EB1716263-005
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**5.1**	**6.9**	**5.8**	**7.0**	**6.1**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**2**	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	<0.005	**0.005**	<0.005	<0.005
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	<10	<10	<10
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	**----**	**0.50**	**----**	**0.43**	**----**
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	**----**	**101**	**----**	**87**	**----**
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	**----**	**0.16**	**----**	**0.14**	**----**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	<1	<1	<1	<1

ACID SULPHATE SOILS REPORT

Prepared for:	Greg Thompson Earthmoving 26 Dalma/Ridgelands Road Ridgelands Qld 4702
Project:	Proposed Sand Quarry Investigation Lot 96 on PL4022 9 Mile Road Rockhampton Qld 4700
Job Reference:	2128E.P.639
Date:	8th August 2017

Construction Sciences

Contact Information

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Document Information

Prepared for	Greg Thompson Earthmoving
Project Name	Proposed Sand Quarry Investigation Lot 96 on Plan PL4022 9 Mile Road Rockhampton Qld 4700
Commission	Acid Sulphate Soils Investigation and Report
File Reference	2128E/P/639
Job Reference	2128E/P/639A
Date	8th August 2017

Document Control

Version	Date	Description of Revision	Prepared By	Prepared (Signature)	Reviewed By	Reviewed (Signature)
A	08/08/2017	FINAL REPORT	M.Walters		P.Kilaverave	

Version	Reason for Issue	Approved for Release By	Approved (Signature)	Approved Release Date
A	FOR ISSUE	P.Kilaverave		08/08/2017

1 Introduction

As requested by Mr Greg Thomson, this office has undertaken a preliminary Acid Sulfate Soils assessment for the proposed sand quarry located at Lot 96 on PL4022 Nine Mile Road. The purpose of the investigation was to confirm the presence or otherwise of Acid Sulfate Soils at the subject site.

This Acid Sulfate Soils study has been carried out in general accordance with the State Planning Policy SPP2/02 Guideline – Planning and Management Development including Acid Sulfate Soils.

2 Fieldwork

Fieldwork for this investigation was carried out on 25th July 2017 with two (2) test pits advanced to depths of 5.5m and 6.5m at TP1 and TP2 respectively, using a 12 tonne excavator. The Site Investigation Location Plan at the end of this letter report shows the location of the test pits undertaken for this investigation.

The subsurface profile was logged in general accordance with AS1726 "Geotechnical Site Investigations". Strata identification was based on inspection of the test pit wall and materials recovered during excavation. Details of the strata encountered can be reviewed on the borehole logs included at the rear of this letter report.

Samples were collected in general accordance with the QASSIT guidelines to allow assessment for the presence and extent of acid sulphate soils. Field pH and pH (fox) samples were collected at generally 0.25m intervals to 3.0m and 0.5m intervals thereafter. Samples were stored in a suitably cool storage container for transport to a NATA accredited external laboratory.

3 Laboratory Results

Samples recovered from the test sites were tested to determine the following;

- Field pH and pH(fox)

The following tables detail the samples tested and results obtained. All NATA Accredited laboratory test results are at the rear of this letter.

Table 1: Acid Sulfate Soils Screening Results

Sample Location	Sample Depth (m)	pH (F)	pH (Fox)	pH Shift	Reaction (See Note)	Indication (See Note)
TP1	0.0-0.25	7.0	3.7	3.3	4	No TAA & High TPA, High Sulphide Hazard
	0.25-0.5	8.7	7.0	1.7	4	No TAA & No TPA, Low Sulphide Hazard
	0.5-0.75	8.8	8.6	0.2	4	No TAA & No TPA, No/Low Sulphide Hazard
	0.75-1.0	8.8	8.8	0	4	No TAA & No TPA, No/Low Sulphide Hazard
	1.0-1.25	9.0	8.9	0.1	4	No TAA & No TPA, No/Low Sulphide Hazard
	1.25-1.5	8.9	5.9	3	3	No TAA & No/Low TPA, Mod Sulphide Hazard
	1.5-1.75	9.2	6.0	3.2	3	No TAA & No/Low TPA, Mod/High Sulphide Hazard
	1.75-2.0	9.2	9.1	0.1	4	No TAA & No TPA, No/Low Sulphide Hazard
	2.0-2.25	9.3	9.2	0.1	4	No TAA & No TPA, No/Low Sulphide Hazard
	2.25-2.5	9.2	9.2	0	4	No TAA & No TPA, No/Low Sulphide Hazard
	2.5-2.8	8.9	9.0	-0.1	4	No TAA & No TPA, No/Low Sulphide Hazard

TP1	2.8-3.0	9.2	5.9	3.3	3	No TAA & No/Low TPA, Mod/High Sulphide Hazard
	3.0-3.5	9.4	5.8	3.6	3	No TAA & No/Low TPA, Mod/High Sulphide Hazard
	3.5-4.0	9.6	5.8	3.8	3	No TAA & No/Low TPA, Mod/High Sulphide Hazard
	4.0-4.5	9.6	6.7	2.9	3	No TAA & No/Low TPA, Mod Sulphide Hazard
	4.5-5.0	9.6	6.7	2.9	3	No TAA & No/Low TPA, Mod Sulphide Hazard
	5.0-5.5	9.5	8.0	1.5	4	No TAA & No TPA, Low Sulphide Hazard
TP2	0.0-0.25	6.9	4.4	2.5	4	No TAA & Low/Mod TPA, Mod Sulphide Hazard
	0.25-0.5	7.9	8.0	-0.1	4	No TAA & No TPA, No/Low Sulphide Hazard
	0.5-0.75	8.5	6.9	1.6	4	No TAA & No/Low TPA, Low Sulphide Hazard
	0.75-1.0	8.7	8.0	0.7	4	No TAA & No TPA, No/Low Sulphide Hazard
	1.0-1.25	8.9	8.4	0.5	4	No TAA & No TPA, No/Low Sulphide Hazard
	1.25-1.5	9.1	8.6	0.5	4	No TAA & No TPA, No/Low Sulphide Hazard
	1.5-1.75	9.0	6.2	2.8	3	No TAA & No/Low TPA, Mod Sulphide Hazard
	1.75-2.0	8.7	6.2	2.5	3	No TAA & No/Low TPA, Mod Sulphide Hazard
	2.0-2.25	8.1	5.8	2.3	3	No TAA & No/Low TPA, Mod Sulphide Hazard
	2.25-2.5	8.2	5.9	2.3	3	No TAA & No/Low TPA, Mod Sulphide Hazard
	2.5-2.75	8.3	7.4	0.9	4	No TAA & No TPA, No/Low Sulphide Hazard
	2.75-3.0	8.2	5.9	2.3	3	No TAA & No/Low TPA, Mod Sulphide Hazard
	3.0-3.5	8.5	6.2	2.3	3	No TAA & No/Low TPA, Mod Sulphide Hazard
	3.5-4.0	8.4	5.6	2.8	3	No TAA & No/Low TPA, Mod Sulphide Hazard
	4.0-4.5	8.5	5.9	2.6	3	No TAA & No/Low TPA, Mod Sulphide Hazard
	4.5-5.0	8.5	5.8	2.7	3	No TAA & No/Low TPA, Mod Sulphide Hazard
	5.0-5.5	8.7	5.9	2.8	3	No TAA & No/Low TPA, Mod Sulphide Hazard
	5.5-6.0	8.4	5.7	2.7	3	No TAA & No/Low TPA, Mod Sulphide Hazard
	6.0-6.5	8.7	6.1	2.6	3	No TAA & No/Low TPA, Mod Sulphide Hazard

(1) NOTES:

Reaction: 1 – none/slight, 2 – slight/moderate, 3 – moderate/high, 4 – high/violent

TAA: Titratable Actual Acidity

TPA: Titratable Potential Acidity

Based on the results of the laboratory tests, it is recommended that Chromium Suite Testing be undertaken to confirm the presence or otherwise of potential acid sulfate soils, consequently determining the liming rate required for neutralisation as appropriate. The proposed depths for testing would be;

- TP1 0.0-0.25
- TP1 3.5-4.0
- TP2 2.0-2.25
- TP2 3.5-4.0
- TP2 5.0-5.5

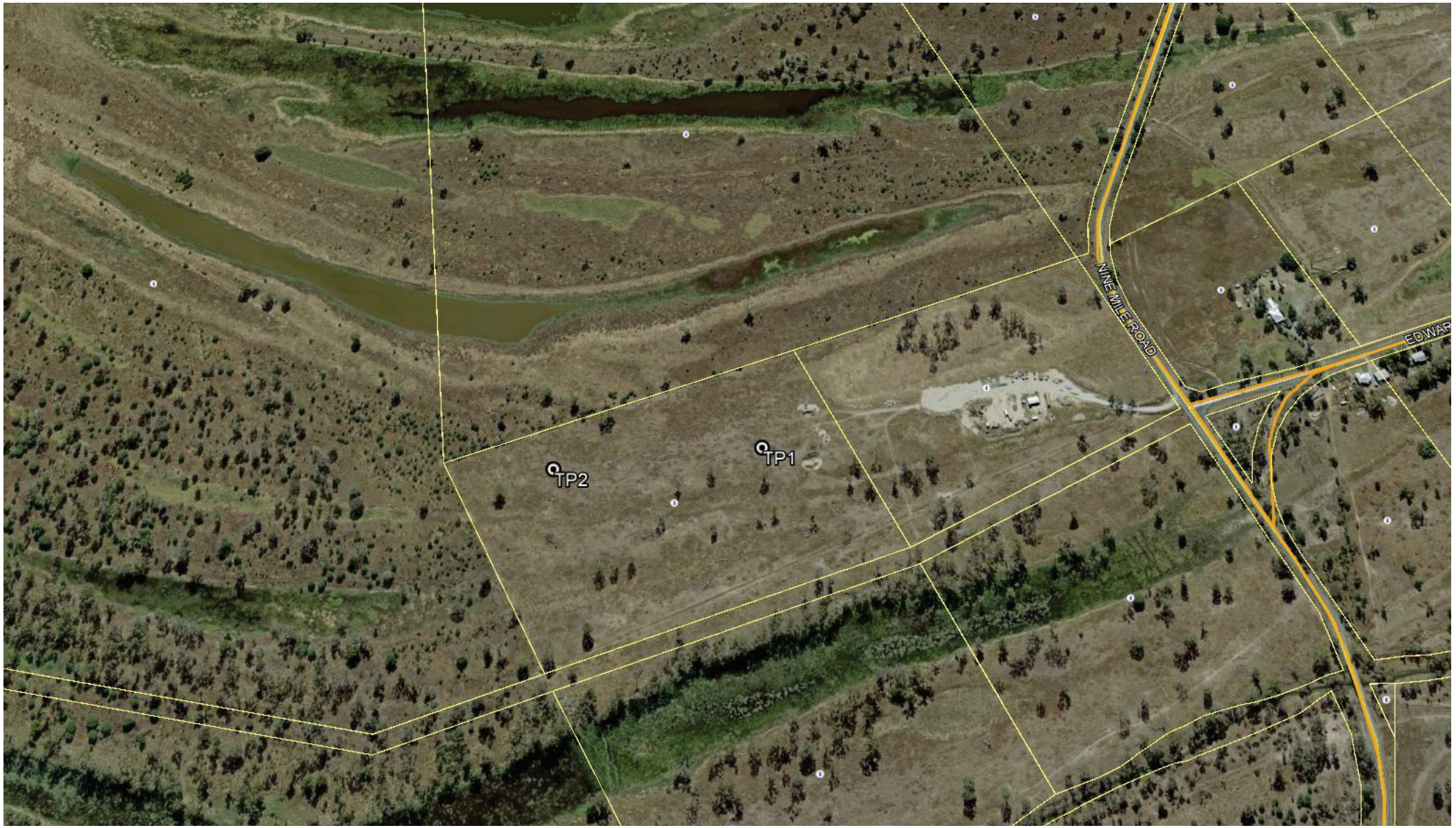
In the event that the results of the Chromium Suite Testing indicate that liming is required, consideration shall be given to the practicality of excavating the proposed material source. The following issues could arise if a liming agent is introduced for neutralisation of the excavated material;

- Additional environmental hazards and increased handling requirements during material processing stage
- The addition of lime fines would most likely alter the natural characteristics (ie. Grading and Atterberg Limit values) of the desired material source
- An Acid Sulfate Management Plan would be required to outline specific requirements from excavation to treatment of the excavated potential acid sulfate soils.

We trust that this information is helpful. Please contact our office with any queries or if further information is required.

Yours faithfully,

Poka Kilaverave
Geotechnical Engineer
For Construction Sciences



Lot 96 on PL4022, Nine Mile Road

Construction Sciences

Construction Sciences Pty Ltd
101 High Street
North Rockhampton QLD 4701
Telephone: 49280044
Fax: 49261286

TEST PIT NUMBER TP1

CLIENT Greg Thompson Earthmoving **PROJECT NAME** Proposed Sand Quarry Investigation

PROJECT NUMBER 2128E.P.639 **PROJECT LOCATION** Lot 96 on PL4022, 9 Mile Road, R'ton

DATE STARTED _____ **COMPLETED** _____ **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR Greg Thompson Earthmoving **SLOPE** --- **BEARING** ---

EQUIPMENT 12t Excavator **TEST PIT LOCATION** Refer to Site Plan in Appendix B

TEST PIT SIZE 100mm **LOGGED BY** P.Kilaverave **CHECKED BY** M.Walters

NOTES GPS Location: 56K, E 239773, 7412361

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Bucket					SM	SILTY SAND (TOPSOIL) fine to medium-coarse sand, low plasticity, dry, grey, friable.		
			1		CH	CLAY with SAND (ALLUVIUM) high plasticity, fine to medium-coarse sand, moist, dark grey, very stiff.		
					CI/SC	SANDY CLAY/CLAYEY SAND medium plasticity, fine to medium-coarse sand, moist, brown, very stiff.		
			2		SC	CLAYEY SAND (ALLUVIUM) low to medium plasticity, fine to medium-coarse sand, moist, brown, medium dense to dense.		
			3		SP	SAND (ALLUVIUM) fine sand, pale brown, moist, medium dense to loose.		
			4					
			5		CI	SANDY CLAY (ALLUVIUM) fine to coarse sand, medium plasticity, moist, brown/grey, very stiff.		
			6			Test Pit Terminated at 5.5m		
			7					

Test Pit TP1

Construction Sciences

Construction Sciences Pty Ltd
101 High Street
North Rockhampton QLD 4701
Telephone: 49280044
Fax: 49261286

TEST PIT NUMBER TP2

CLIENT Greg Thompson Earthmoving **PROJECT NAME** Proposed Sand Quarry Investigation

PROJECT NUMBER 2128E.P.639 **PROJECT LOCATION** Lot 96 on PL4022, 9 Mile Road, R'ton

DATE STARTED _____ **COMPLETED** _____ **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR Greg Thompson Earthmoving **SLOPE** --- **BEARING** ---

EQUIPMENT 12t Excavator **TEST PIT LOCATION** Refer to Site Plan in Appendix B

TEST PIT SIZE 100mm **LOGGED BY** P.Kilaverave **CHECKED BY** M.Walters

NOTES GPS Location: 56K, E 239548, 7412332

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Bucket					SM	SILTY SAND (TOPSOIL) fine to medium-coarse sand, low plasticity, dry, grey, friable.		
			1		CH	CLAY with SAND (ALLUVIUM) high plasticity, fine to medium-coarse sand, moist, dark grey, very stiff.		
			2		SC	CLAYEY SAND (ALLUVIUM) low to medium plasticity, fine to medium-coarse sand, moist, brown, medium dense.		
			3		SP	SAND (ALLUVIUM) fine sand, pale brown, moist, medium dense to loose.		
			4					
			5					
	Seepage		6			...seepage, becoming wet		
			7			Test Pit Terminated at 6.5m		

Test Pit TP2

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1715170**	Page	: 1 of 10
Client	: **CONSTRUCTION SCIENCES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: POKA KILAVERAVE	Contact	: Jenny Bevan
Address	: 101 HIGH STREET NORTH ROCKHAMPTON QLD 4701	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 4928 0044	Telephone	: +61-7-3243 7222
Project	: P/639 9 Mile Road	Date Samples Received	: 27-Jul-2017 09:30
Order number	: P/639	Date Analysis Commenced	: 28-Jul-2017
C-O-C number	: ----	Issue Date	: 28-Jul-2017 15:34
Sampler	: POKA KILAVERAVE		
Site	: ----		
Quote number	: EN/024/16 - Planned Events		
No. of samples received	: 36		
No. of samples analysed	: 36		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris		Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ASS: EA037 (Rapid Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP1 @ 0-0.25	TP1 @ 0.25-5.0	TP1 @ 0.5-0.75	TP1 @ 0.75-1.0	TP1 @ 1.0-1.25
			Client sampling date / time	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]
Compound	CAS Number	LOR	Unit	EB1715170-001	EB1715170-002	EB1715170-003	EB1715170-004	EB1715170-005
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	----	0.1	pH Unit	**7.0**	**8.7**	**8.8**	**8.8**	**9.0**
ø **pH (Fox)**	----	0.1	pH Unit	**3.7**	**7.0**	**8.6**	**8.8**	**8.9**
ø **Reaction Rate**	----	1	-	**4**	**4**	**4**	**4**	**4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP1 @ 1.25-1.5	TP1 @ 1.5-1.75	TP1 @ 1.75-2.0	TP1 @ 2.0-2.25	TP1 @ 2.25-2.5
			Client sampling date / time	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]
Compound	CAS Number	LOR	Unit	EB1715170-006	EB1715170-007	EB1715170-008	EB1715170-009	EB1715170-010
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	----	0.1	pH Unit	**8.9**	**9.2**	**9.2**	**9.3**	**9.2**
ø **pH (Fox)**	----	0.1	pH Unit	**5.9**	**6.0**	**9.1**	**9.2**	**9.2**
ø **Reaction Rate**	----	1	-	**3**	**3**	**4**	**4**	**4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP1 @ 2.5-2.80	TP1 @ 2.80-3.0	TP1 @ 3.0-3.5	TP1 @ 3.5-4.0	TP1 @ 4.0-4.5
			Client sampling date / time	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]
Compound	CAS Number	LOR	Unit	EB1715170-011	EB1715170-012	EB1715170-013	EB1715170-014	EB1715170-015
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	----	0.1	pH Unit	**8.9**	**9.2**	**9.4**	**9.6**	**9.6**
ø **pH (Fox)**	----	0.1	pH Unit	**9.0**	**5.9**	**5.8**	**5.8**	**6.7**
ø **Reaction Rate**	----	1	-	**4**	**3**	**3**	**3**	**3**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP1 @ 4.5-5.0	TP1 @ 5.0-5.5	TP2 @ 0-0.25	TP2 @ 0.25-0.5	TP2 @ 0.5-0.75
			Client sampling date / time	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]
Compound	CAS Number	LOR	Unit	EB1715170-016	EB1715170-017	EB1715170-018	EB1715170-019	EB1715170-020
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	----	0.1	pH Unit	**9.6**	**9.5**	**6.9**	**7.9**	**8.5**
ø **pH (Fox)**	----	0.1	pH Unit	**6.7**	**8.0**	**4.4**	**8.0**	**6.9**
ø **Reaction Rate**	----	1	-	**3**	**4**	**4**	**4**	**4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP2 @ 0.75-1.0	TP2 @ 1.0-1.25	TP2 @ 1.25-1.5	TP2 @ 1.5-1.75	TP2 @ 1.75-2.0
			Client sampling date / time	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]
Compound	CAS Number	LOR	Unit	EB1715170-021	EB1715170-022	EB1715170-023	EB1715170-024	EB1715170-025
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	----	0.1	pH Unit	**8.7**	**8.9**	**9.1**	**9.0**	**8.7**
ø **pH (Fox)**	----	0.1	pH Unit	**8.0**	**8.4**	**8.6**	**6.2**	**6.2**
ø **Reaction Rate**	----	1	-	**4**	**4**	**4**	**3**	**3**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP2 @ 2.0-2.25	TP2 @ 2.25-2.5	TP2 @ 2.5-2.75	TP2 @ 2.75-3.0	TP2 @ 3.0-3.5
			Client sampling date / time	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]
Compound	CAS Number	LOR	Unit	EB1715170-026	EB1715170-027	EB1715170-028	EB1715170-029	EB1715170-030
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	----	0.1	pH Unit	**8.1**	**8.2**	**8.3**	**8.2**	**8.5**
ø **pH (Fox)**	----	0.1	pH Unit	**5.8**	**5.9**	**7.4**	**5.9**	**6.2**
ø **Reaction Rate**	----	1	-	**3**	**3**	**4**	**3**	**3**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP2 @ 3.5-4.0	TP2 @ 4.0-4.5	TP2 @ 4.5-5.0	TP2 @ 5.0-5.5	TP2 @ 5.5-6.0
			Client sampling date / time	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]	[25-Jul-2017]
Compound	CAS Number	LOR	Unit	EB1715170-031	EB1715170-032	EB1715170-033	EB1715170-034	EB1715170-035
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	----	0.1	pH Unit	**8.4**	**8.5**	**8.5**	**8.7**	**8.4**
ø **pH (Fox)**	----	0.1	pH Unit	**5.6**	**5.9**	**5.8**	**5.9**	**5.7**
ø **Reaction Rate**	----	1	-	**3**	**3**	**3**	**3**	**3**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**TP2 @ 6.0-6.5**	**----**	**----**	**----**	**----**
			Client sampling date / time	[25-Jul-2017]	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB1715170-036**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EA037: Ass Field Screening Analysis								
ø **pH (F)**	----	0.1	pH Unit	**8.7**	**----**	**----**	**----**	**----**
ø **pH (Fox)**	----	0.1	pH Unit	**6.1**	**----**	**----**	**----**	**----**
ø **Reaction Rate**	----	1	-	**3**	**----**	**----**	**----**	**----**

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Denley Environmental
ECOLOGY & ENVIRONMENT

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/90-2017

Dated: 13 April 2018

HES Wetland Impact Assessment

MCU for a Transport Depot & Sand Quarry .

Lots 93 & 96 on PL4022

Nine Mile Road

Pink Lily, QLD 4702

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1 Introduction

This report provides an assessment on the existing wetland conditions, location and values, potential and expected impacts from the proposed development and mitigation where necessary. The report was compiled by Denley Environmental Consultants on behalf of the development applicant.

1.1 Site Location

The subject site referred to in this report is Lots 93 and 96 on PL4022, situated at Nine Mile Road, Pink Lily, QLD, 4702. See Figure 1 for the subject site location.

Figure 1. Lots 93 and 96 on PL4022 located at Lot 93 Nine Mile Road, Pink Lily, QLD, 4702.

1.2 Development Proposal

This Wetland Impact Assessment report has been prepared in support of a Material Change of Use application by the applicant for a Vehicle Depot and Sand Quarry at the subject site. The total area of the site is 18.5ha and is located within the Rockhampton Regional Council LGA. The land is zoned rural.

The proposed MCU is located within the trigger area of wetlands of High Ecological Significance (HES). The proposed development is not within the boundary of a wetland.

Figure 2 provides a concept plan of the proposed heavy vehicle depot and sand quarry in relation to mapped HES Wetlands. Original Diliegh Drawings are provided in Apppendix B

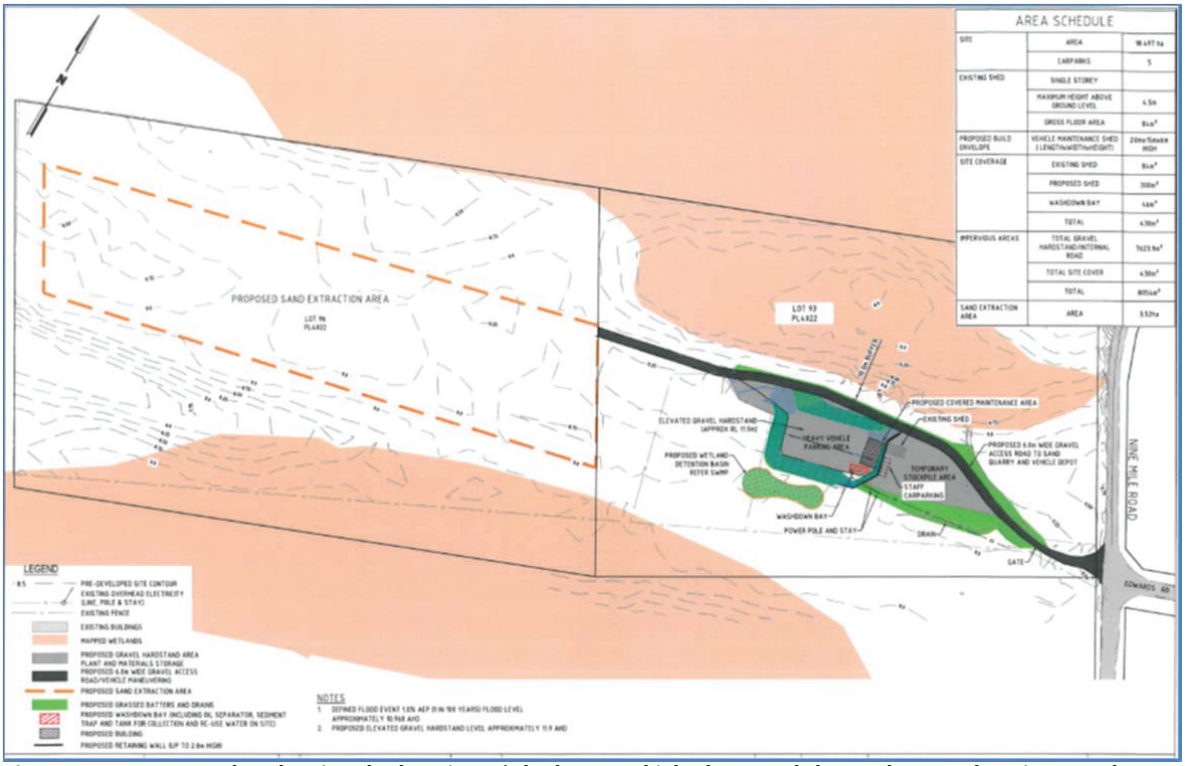

Figure 2. A concept plan showing the location of the heavy vehicle depot and the sand quarry locations on the subject site. Extracted from Diliegh drawing D16.150-SK01 Sheet I of 2.

2 State Mapping Results

GIS wetland data *Wetland protection area - high ecological significance wetland* (https://data.qld.gov.au/) was laid over Google Earth imagery to provide an indication of the current location of wetland areas and the relative accuracy of the High Ecological Significance (HES) wetland data. The location of GIS wetland data over aerial imagery is shown in Figure 3.

GIS wetland data in Figure 3 and the Map of Referable Wetlands provided in Appendix A indicate HES wetlands are present on the subject site with the balance of the subject site within a wetland trigger area.

The subject site contains wetlands which are considered of High Ecological Significance. Within wetland protection areas, certain types of development involving high impact earthworks require State agency referral under Schedule 10 of the Panning Regulation 2017.

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Figure 3. The Map of Referable HES Wetlands (QLD Data) with Google Earth overlay over lot 93 and 96 on PL4022.

2.1 Site Observation Results

The subject site was surveyed on the 30th May 2017 to determine the location and condition of wetlands within and adjacent to the subject site. Wetland and non-wetland areas were primarily assessed using wetland indicator plants with reference to *Wetland indicator plants of Ridgelands 100K map tile (*WetlandInfo.ehp.qld.gov.au, 2017*)*. An aerial image (Google Earth) overlaid with wetland boundaries determined from the site visit is provided in Figure 8.

In summary we found that

- the DEHP HES wetland area on lot 93 was a palustrine wetland;
- the DEHP HES wetland area on lot 96 was not present. This was a cleared area with terrestrial flora; and
- a small area of marginal palustrine wetland was present at the western boundary of Lot 96. This area was not indicated as a HES wetland but did connect to a HES wetland further west.

Figure 4 provides an aerial image of the site with the location and view direction of photographs taken of site 1 and site 2.

Figure 4. Location and view direction of site photographs provided in this report.

2.1.1 Site 1 Palustrine wetland

Site 1 is located in the northern extent of Lot 93/PL4022. The area was indicated as containing a wetland of High Ecological Significance. Vegetation in the area indicated Site 1 is a palustrine wetland. Figure 5 shows a view of this wetland looking east from the western extent of the wetland.

Characteristic wetland species included a patch of *Eucalyptus tereticornis* occurring in the eastern extent of the wetland with an almost mono-specific central community of *Eleocharis sphacelata*. Dense introduced *Urochloa mutica* was located around the outer edges of the wetland. *Cyperus* spp. were located around the margins of the water body. These species were indicative of a palustrine wetland.

Figure 5. Site 1. Photo 1. The palustrine wetland located on the northern extent of Lot 93/PL4022 looking east. Lighter green vegetation is *Urochloa mutica*. Darker green reeds are *Eleocharis sphacelata*. A stand of *Eucalyptus tereticornis* is located in the background.

2.1.2 Site 2 Open Woodland (cleared)

Site 2 is located in the southern extent of Lot 96/PL4022. The general area was indicated as containing a wetland of High Ecological Significance (HES). The area shown in the HES mapping as a palustrine wetland was a pastured area with extant *Eucalyptus tereticornis* and *E. coolabah* trees. The site has been previously cleared with isolated trees left standing. The date of clearing is unknown but available aerial photography indicates clearing occurred sometime before 2003. Dominant native ground layer species included patches of *Bothriochloa bladhii and Dichanthium sericeum* with a significant number of introduced grasses, herbs and shrubs present (see Figure 6 and Figure 7).

There was no indication that a palustrine wetland was present in the location indicated on the HES wetland map on lot 96. Flora species and natural contours indicate the area could not be a wetland. However, a small area of palustrine wetland extended 5 metres into the western boundary of Lot 96. This wetland continues to the west in the neighbouring allotment where it becomes more substantial. The area within lot 96 contained small patches of *Eleocharis sphacelata* and *Cyperus* spp. but was otherwise very marginal in classification (see Figure 6).

This area adjoins an HES wetland but the area mentioned is not indicated as an HES wetland in the wetland mapping. The location of this area is indicated in Figure 8.

Areas of site 2 appear to hold water for extended periods (see Figure 6) but not sufficiently long to provide suitable conditions for wetland indicator plants. Other than this small area of wetland, flora within lot 96 was not indicative of a palustrine, lacustrine or riverine wetland. A riverine wetland is present within lots 95/PL4022 and 3/RP609472. These lots are adjacent to and south of the subject site.

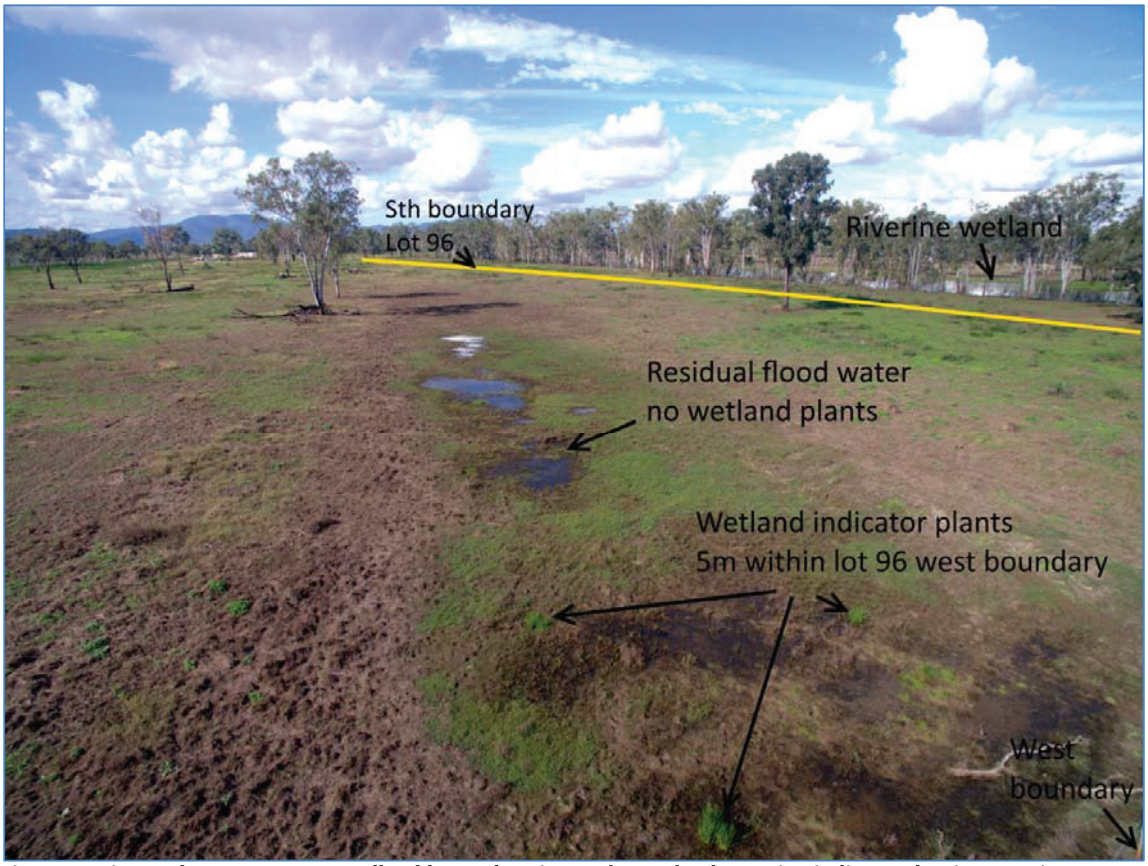

Figure 6. Site 2. Photo 2. Open woodland located at site 2. The wetland mapping indicates the site contains HES wetland. However; vegetation of scattered E. coolabah, grasses and herbs was not indicative of a wetland. Wetland was limited to a small area along the western boundary as shown in the bottom right corner of the photograph.

Figure 7. Site 2. Photo 3. A view of site 2 on looking towards the west along the south boundary of lot 96. This area is indicated as an HES wetland. However, species were not indicative of a wetland. Vegetation consisted of some native grasses and a high proportion of introduced herbs and shrubs. Prickly acacia (*Vachellia nilotica*) regrowth is located to the right of the photo.

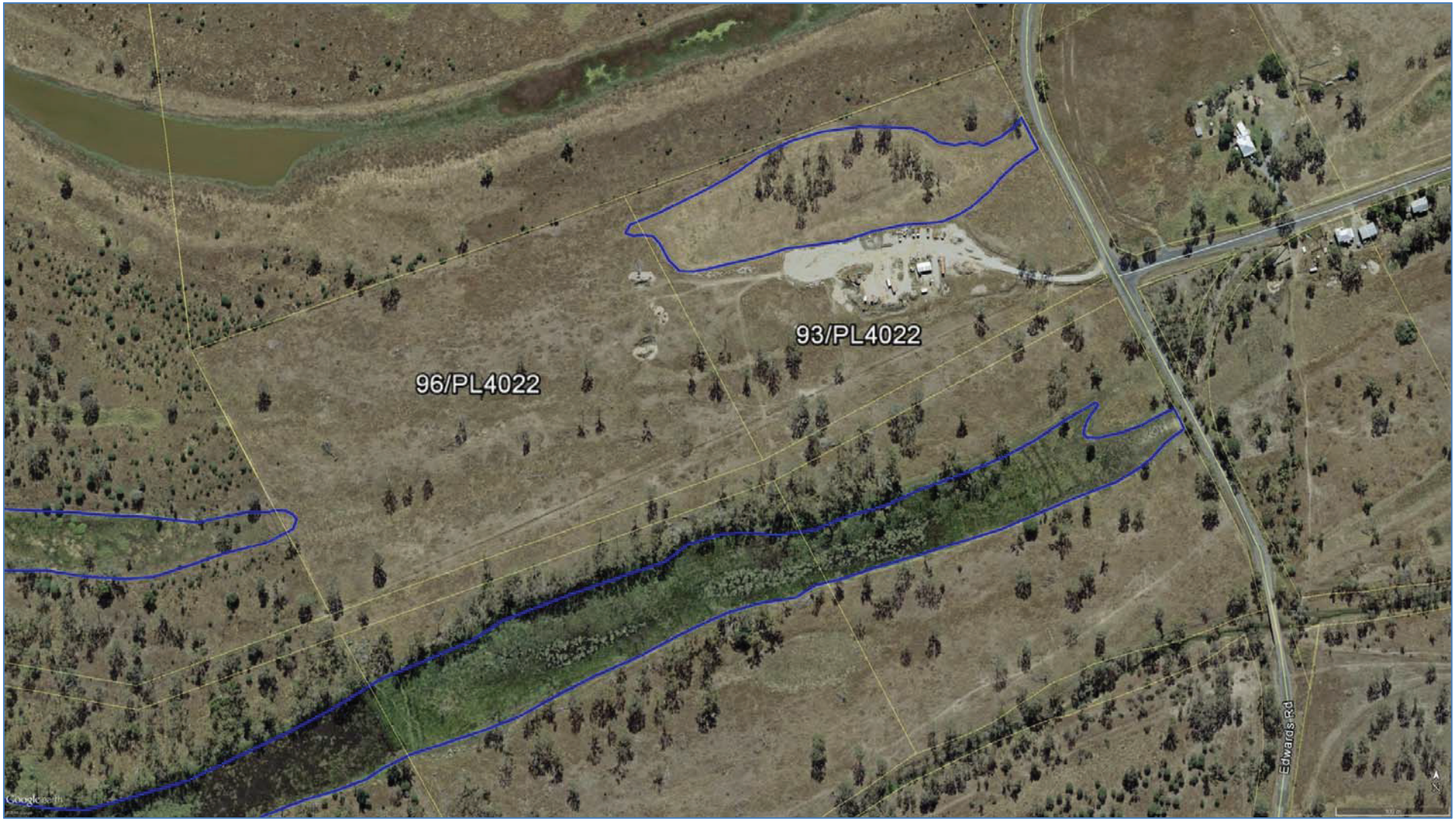

Figure 8. Map of field survey results of wetlands with Google Earth overlay. Wetlands on lots 93 and 96 are Palustrine wetlands. The wetland to the south of the subject site is a riverine wetland.

2.2 Existing Condition

While the site does provide some wetland ecosystem values, the natural condition of the wetlands has been significantly reduced by historical clearing, grazing and road construction.

The site is located within a rural area where surrounding land use includes grazing and equestrian uses. This use has resulted in the clearing and modification of some wetlands and substantial areas of fringing habitat in the surrounding area has been cleared.

2.2.1 Existing impacts

Current stressors and pressures on the subject wetland ecosystem observed in field observations include:

- **catchment disturbance:**
  - Fringing and wetland supporting vegetation cleared locally and in the wider area.
  - Probable introduction of sediments and pollutants to the wetland from historical land use.
  - Increases in weed and introduced animal species locally and in the broader area.
- **impacts on the fringing zone of the wetland**
  - Historical clearing but no evidence of cattle trampling. Cattle have a dedicated waterpoint away from the wetland.
  - Weeds. Largely *Urochloa mutica* within the wetland.
- **loss of connectivity of the wetland to the overall landscape**
  - historical clearing in the surrounding areas has reduced habitat connectivity
  - Construction of Nine Mile Road (aka Edwards Road) has disconnected the natural East to West overland flow.
- **hydrological disturbances:**
  - Nine Mile Road has disconnected the natural East to West overland flow.
- **impacts on physical form of the wetland from**:
  - Possible shrinkage in area resulting from reduced inputs from the east over Nine Mile Road.
- **impacts on water quality**:
  - Direct input of contaminants to wetlands from:
    - Agricultural run-off. Possible inputs from the subject site and neighbouring areas. The owner indicated occasional use of herbicides to reduce weeds. No obvious signs of eutrophication within the wetland on lot 93.
    - Salinity changes. Possible from combined impacts in the general area.
    - Possible increases in water temperature from removal of surrounding canopy.
    - Possible reduction in flushing due to impeded east to west flows (Nine Mile Road).
  - Increased sediment suspension. Sight observation only.
- **impacts on wetland soils:**

- No signs of significant mechanical disturbance that could lead to acid sulphate soils.
- Disturbances and changes to soil structure and nutrients:
  - Grazing occurs on the property. However, disturbance at the margins of the wetland was not significant.
  - Pest species were introduced shrubs, grasses and herbs. No signs of feral animal disturbance at the site.

- **impacts on wetland biota:**
  - Removal of fringing wetland and wetland supporting flora in the surrounding areas.
  - *Urochloa mutica* has a significant impact on the wetlands on the site and in the broader area.
- **miscellaneous impacts:**
  - No other impacts apparent. i.e. inappropriate fire regimes, litter or rubbish.

2.2.2 Overall Habitat Condition

At the time of survey some wetland birds and raptors were present (observed by sight and by calls) around the palustrine wetland (site 1) on lot 93. However, available habitat is significantly less than that of less disturbed systems in the area. Surrounding vegetation does not exist for a considerable area around the wetland, on site and in the broader area. This has most likely limited fauna to less cryptic species. Flora species were depauperate. There were no signs that the natural flow had been significantly changed on the subject site. However, significant changes have occurred in the broader area that would inevitably affect the wetland on the subject site.

2.3 Potential Impacts

2.3.1 Flow Direction

Figure 9 Shows the site on the 22nd February 2015 with standing water immediately after Cyclone Marcia. The image gives an indication of higher ground and flow directions. Flows from higher land gravitate north and south to low lying areas on the subject site, then west through two lower lying areas. The impact of Nine Mile Road on natural flows is apparent in the image.

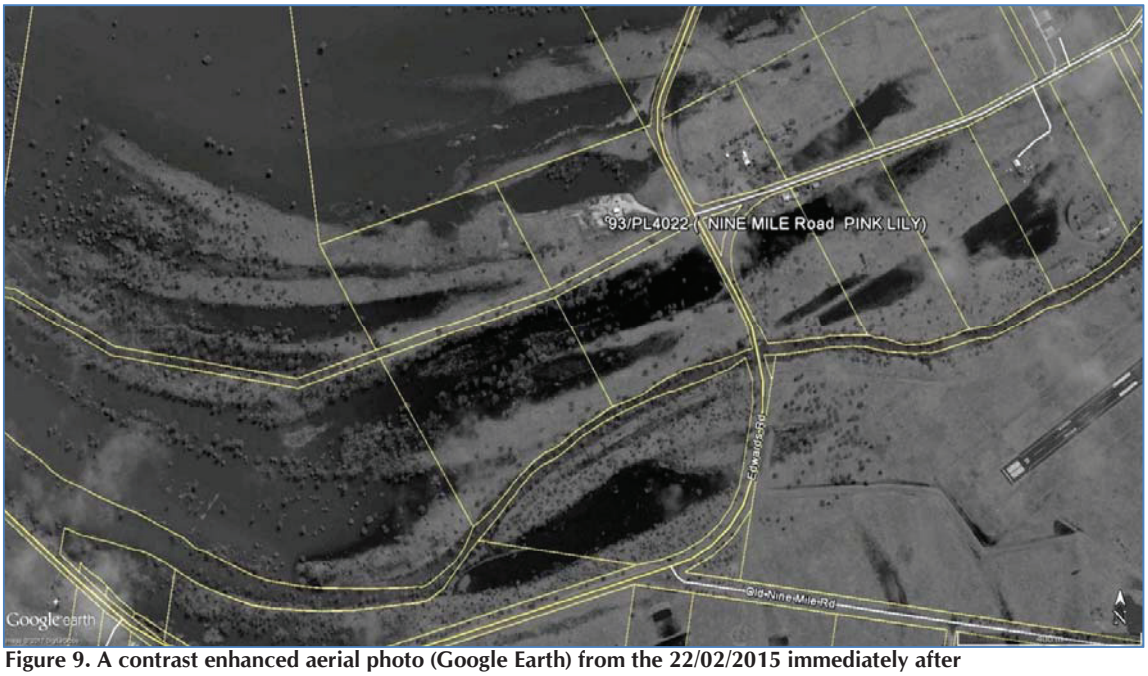

Figure 9. A contrast enhanced aerial photo (Google Earth) from the 22/02/2015 immediately after Cyclone Marcia showing the location of standing water and general flow direction. The photo shows the effect on flows by the location of Nine Mile Road and lack of fringing vegetation

2.3.2 Impacts on Overland Flows

The Diliegh Drawing D16.150-SK01_RevB Sheet 01 of 02 (Appendix B) show the natural direction of overland flows in relation to the proposed vehicle hardstand and sand quarry. The drawings indicate there will be no significant impact to groundwater or overland flows entering the wetlands.

Hardstand Area

Diliegh Drawing 01 of 02 shows flows from the hardstand area are directed to a wetland detention basin to the south of the hardstand area. There is an undeveloped area no less than 10 metres in width between the wetland on Lot 93 and the hardstand area. This is a proposed buffer area to the wetland.

Quarry

The Diliegh Report (*D16.150 Engineering Report – MCU for Vehicle Depot and Sand Quarry – Lots 93 and 96 PL4022, Nine Mile Road, Pink Lily*) P. 12 indicates:

> ...There will therefore be no increase in peak flows or concentration of surface water runoff from the sand extraction area.

It is also not proposed to pump or extract the groundwater in any way as part of sand extraction operations:

> ... Sand extracted will initially be stockpiled within the pit to allow any excess water to drain prior to removal from site to ensure it is returned to the water table.

As such there will be no significant impacts to overland flow, the water table or potential for siltation of wetlands in the area from the proposed development.

2.3.3 *Direct Impacts on HES Wetlands*

There are no direct impacts to HES wetlands or any other wetland.

2.3.4 *Direct impacts on Supporting Habitat*

Approximately six canopy trees will be removed to operate the sand quarry. These trees potentially provide roosting for some wetland avian fauna.

2.4 Conclusions

In review, the wetland impact assessment has identified differences in the location of HES wetlands. The HES Palustrine wetland located on lot 93 was found to be relatively accurate. The HES Palustrine wetland on lot 96 was not present.

The general condition of current wetlands on site and nearby is due to a combination of pre-existing environmental stressors and pressures that have modified the naturalness and ecological integrity of the wetland ecosystem as a whole. A loss of connectivity within the wetland aggregation, disturbances to catchment extent and hydrology, and current rural land uses have resulted in an altered ecosystem and have certainly diminished the ecological value and ecological significance of this wetland through landscape modification and clearing in the broader area.

In consideration of the current development proposal within this wetland protection area, the recommendations and implementation of impact management actions will protect the current conditions of the wetlands and wetland water quality, with no further negative impacts.

The nature of the proposed activities on the site are unlikely to change the existing ecological amenity that the wetland currently provides. The proposed vehicle depot and sand quarry will not adversely impact the existing HES wetlands, overland flows or groundwater given controls proposed in the Diliegh Report and where environmental impact mitigation is undertaken taken as proposed in this report (Section 3. Impact Management).

Mitigation actions are outlined where development proposal will result in the loss of habitat trees and restoration of adjacent wetland areas. The aims and justifications of the impact management action plan are detailed in the following section of this report.

3 Impact Management

Managing impacts on the wetlands identified in this report have been developed following the guidelines set out in:

- The State Planning Policy 4/11: Protecting Wetlands of High Ecological Significance in Great Barrier Reef Catchments;
- DLGIP, State Development Assessment Provisions - version 2 - State code 9:— Wetland protection areas,
- DERM, 2011, Queensland Wetland Buffer Planning Guideline; and
- DSITIA, 2015, A landscape hazard assessment for wetlands in the Great Barrier Reef catchment. Queensland Government, Brisbane.

Implementation of management actions will assist in addressing identified impacts to the wetlands and ensure that development is planned, designed, constructed and operated so as to not cause harm to the existing wetland environmental values.

Owners should implement all practical measures to maintain the current quality and condition of the wetland support area and mitigate impacts to the wetland support area. Measures should incorporate management actions that maintain the ecological processes of these wetlands to reduce nutrient, pesticide and sediment loads and mitigate any negative impacts due to the proposed development, in particular the effects of high impact earthworks as outlined in SDAP State Code 9 and the associated guideline.

3.1 Aims of the Wetland Impact Management Action

Specific outcomes addressed in this Wetland Impact Management Action are requirements to maintain the current condition of the wetland support area, and mitigate any potential negative impacts from the proposed development.

3.2 Management Actions

A map of mitigation areas noted below is provided in Appendix B.

3.2.1 Management actions will include

1. **Contour and revegetation of the 10m wetland buffer support area**

The 10m buffer area (see Mitigation Map Appendix B) is to be contoured to replicate the naturally occurring contours surrounding the wetland. There should be no obstructions such as large rocks or rough terrain to reduce the likelihood of erosion. The area should be seeded with locally occurring native grasses. Shrubs and trees are not recommended in this area due to the likelihood of erosion around tree bases on slopes.

2. **Revegetation of wetland support areas with native grass species**

Wetland support areas are all low lying areas draining into nearby wetlands. Maintain existing weed control practices and supplement ground layers with locally occurring native grass species.

Vegetation is very effective in areas where overland flow concentrates due to their ability to slow overland flows and trap contaminant loads entering or leaving the wetland. Additionally, vegetation is effective in slowing or trapping surface run-off, and thereby consolidating a wetland substrate and reducing bank and bed erosion.

Grassed areas are effective filters, but must be maintained to retain their effectiveness. Grassed areas can result in weed invasion into the wetland and additional nutrients if fertilizers are applied or clippings travel into the wetland.

Supplemental planting in the wetland support areas will:

- filter nutrients and other pollutants travelling to wetland from surface run-off
- reduce the speed of overland flows, thereby reducing erosion hazards
- trap pesticides and herbicides, and
- provide competition for invasive pest plants.

3. Integrated Pest Plant control

A program of integrated pest control should be undertaken to protect the native species in the wetland support area. Currently the owner undertakes this management action. Regular pest control is necessary to maintain conditions to a reasonable level. The ability of vegetation, in particular the native grasses, to perform as an effective buffer element, will vary according to the condition of that vegetation.

For information on local pest management planning contact the Fitzroy Basin Association (www.fba.org.au).

4. Replacement of Habitat Trees

Where habitat trees are removed as outlined in the development proposal, identify suitable regrowth seedlings of native trees, in particular blue gum and coolabah trees, in sufficient numbers to replace the cleared vegetation. Seedlings are to be protected from grazing with the use of a tree tube until they are unlikely to be trampled or grazed. The preferred location for replacement habitat trees is provided in the Mitigation Map (Appendix B).

5. Maintenance of Wetland Hydrology

The development proposal demonstrates that no water flows will enter the wetland from the road/hardstand area. Water flows from the hardstand area are to be directed to sediment lagoons (being the detention basin to the south of the hardstand area, away from the wetland to the north of the hardstand area) for filtration, before discharging as overland flow. The water flows will then return to the original flow path along the depression to the west of the basin, which feeds back into wetlands in the broader area.

The development proposal demonstrates that the sand quarry will not alter the water table, cause sedimentation to enter the wetland, pollute the groundwater or change natural flows into the wetland.

The development proposal also demonstrates that there will be no stockpiling of overburden that could enter the wetland. Stockpiling will occur in a temporary stockpile area on the base pad of depot area, which drains to the detention basin to the south, away from the northern wetland. Suitable sediment fences will be implemented around the stockpile area to contain potential sediments and mitigate any run-off to the northern wetland.

4 References & Bibliography

Department of Environment and Resource Management 2011, *Queensland Wetland Buffer Planning Guideline*, 54 pp, Queensland Wetlands Program, Brisbane Queensland.

DSITIA, (2015), *A landscape hazard assessment for wetlands in the Great Barrier Reef catchment*, Department of Science, Information technology, Innovation and the Arts Queensland Government, Brisbane.

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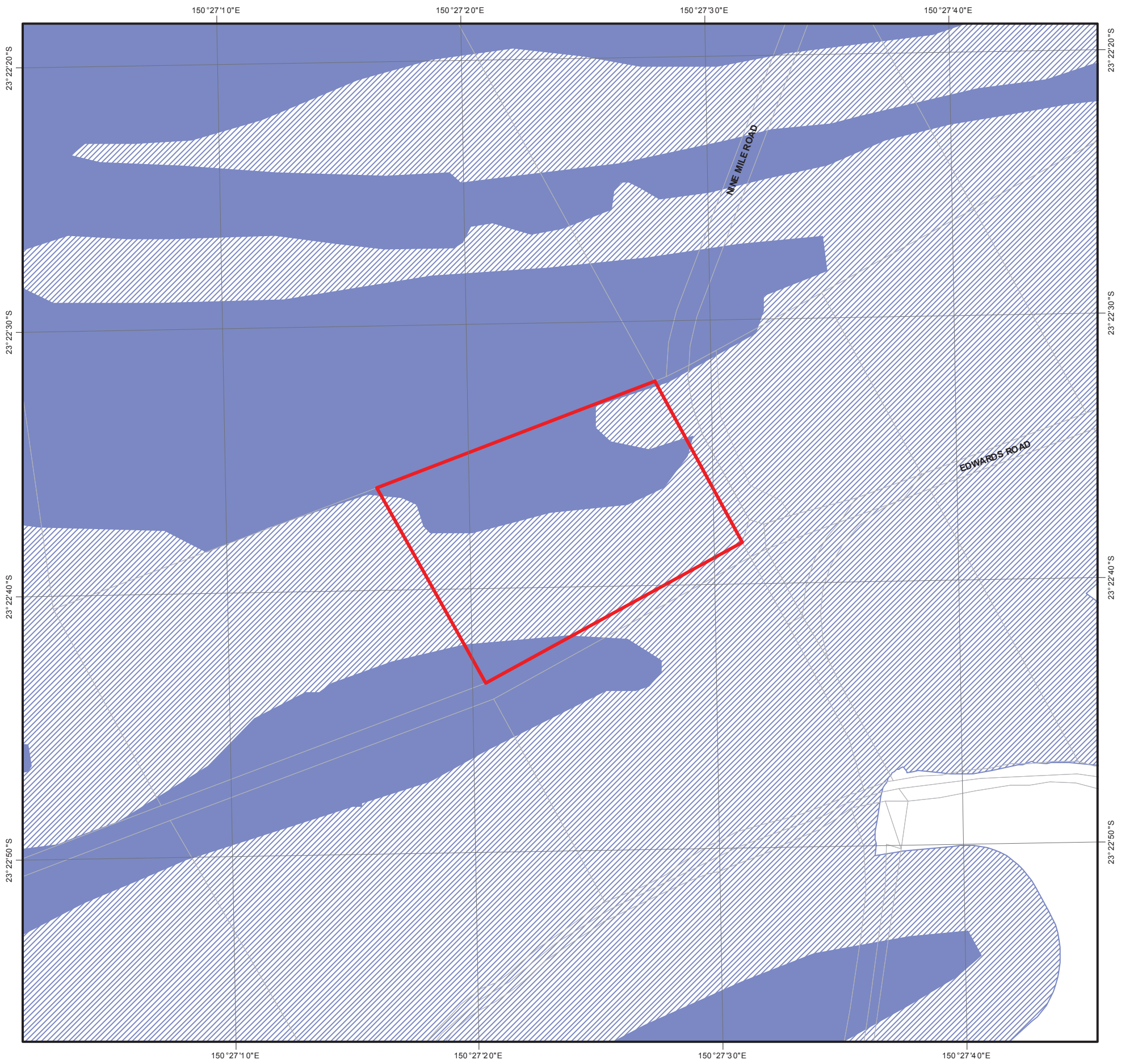
Wetlandinfo.ehp.qld.gov.au. (2017). Pressures (Department of Environment and Heritage Protection). [online] Available at: https://wetlandinfo.ehp.qld.gov.au/wetlands/management/pressures/ [Accessed 04 Jun. 2017].

Wetlandinfo.ehp.qld.gov.au. (2017). *Wetland indicator plants of Ridgelands 100K map tile (Department of Environment and Heritage Protection)*. [online] Available at: https://wetlandinfo.ehp.qld.gov.au/wetlands/facts-maps/wildlife/?AreaID=tile-100k-ridgelands&Kingdom=plants&SpeciesFilter=WetlandIndicator [Accessed 28 May. 2017]

5 Appendix A. Map of Referable Wetlands



Map of Referable Wetlands
Wetland Protection Areas

Requested By: IAN@DENLEY.COM.AU
Date: 15 Jan 16 Time: 11.44.12

Centred on Lot on Plan:
93 PL4022

Selected Land Parcel

Cadastral Boundary

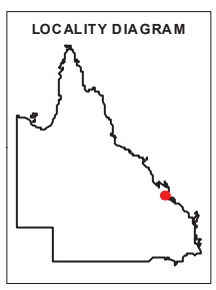
Wetland Protection Areas

Wetland

Trigger Area

Queensland Government

LOCALITY DIAGRAM



N

0 60 120 180 240 300 m

This product is projected into GDA 1994 MGA Zone 56

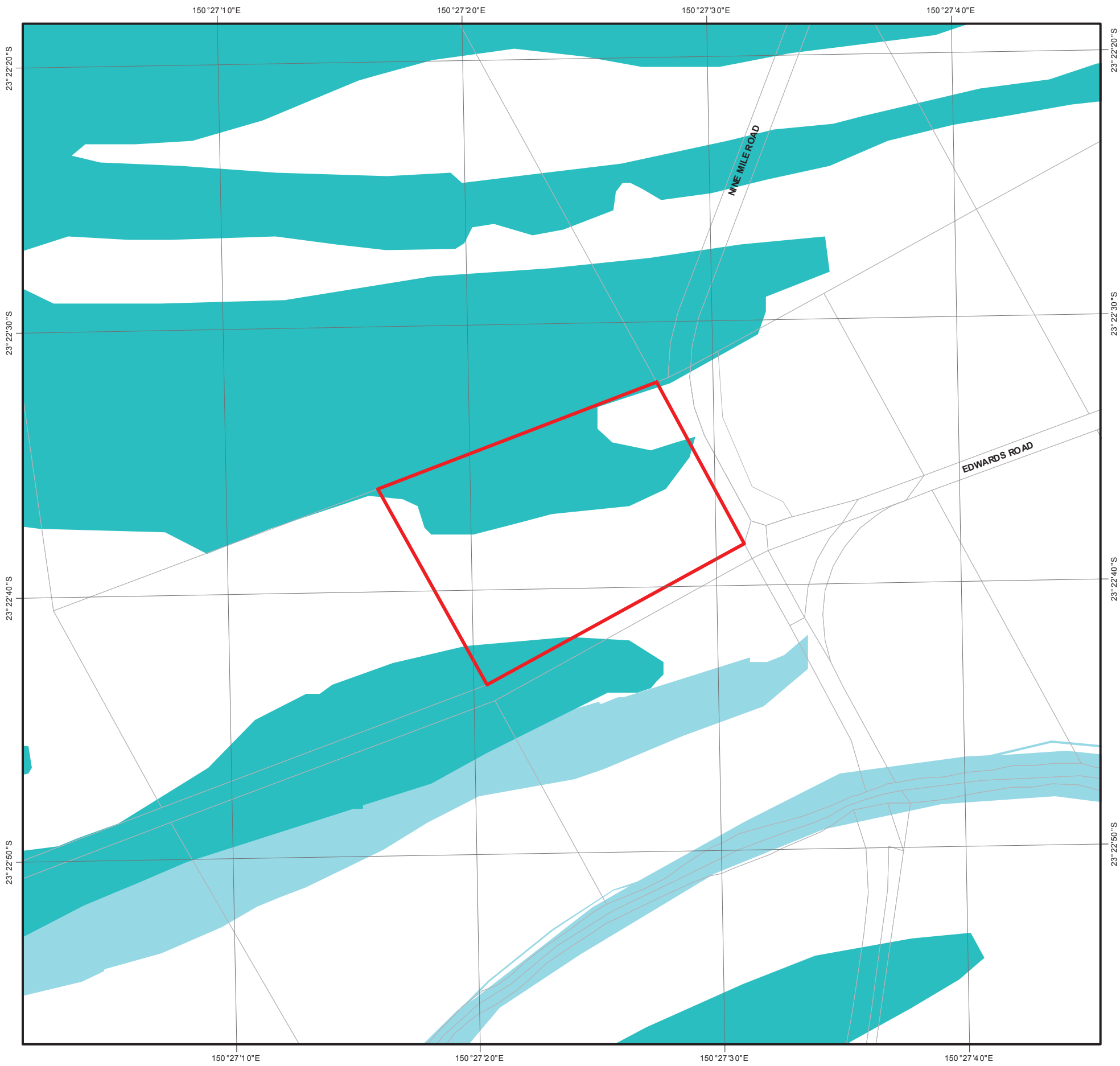
Note:
This map shows the location of wetland protection areas which are defined under the Environmental Protection Regulation 2008. Within wetland protection areas, certain types of development involving high impact earthworks are made assessable under Schedule 3 of the Sustainable Planning Regulation 2009.

The Department of State Development Infrastructure and Planning is the State Assessment Referral Agency (SARA) under Schedule 7 of the Sustainable Planning Regulation 2009 for assessable development involving high impact earthworks within wetland protection areas. The Department of Environment and Heritage Protection is a technical agency.

The policy outcome and assessment criteria for assessing these applications are described in the State Development Assessment Provisions (SDAP) *Module 11: Wetlands and wild rivers*.

This map is produced at a scale relevant to the size of the lot on plan identified and should be printed at A4 size in portrait orientation. Consideration of the effects of mapped scale is necessary when interpreting data at a large scale.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Heritage Protection at www.ehp.qld.gov.au or email planning.support@ehp.qld.gov.au.



Map of Referable Wetlands for the Environmental Protection Act 1994

Requested By: IAN@DENLEY.COM.AU
Date: 15 Jan 16 Time: 11.44.14

Centred on Lot on Plan:
93 PL4022

Selected Land Parcel

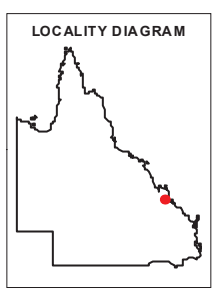
Cadastral Boundary

HES Wetland

GES Wetland

Queensland Government

LOCALITY DIAGRAM



N

0 60 120 180 240 300 m

Note:
This map shows the location of wetlands on the Map of Referable Wetlands which are defined under the Environmental Protection Regulation 2008.

Wetlands are assessed for ecological significance using the environmental values for wetlands in section 81A of the Environmental Protection Regulation 2008. Wetlands are considered either High Ecological Significance (HES) or of General Ecological Significance (GES) for the purposes of the environmental values.

This map is produced at a scale relevant to the size of the lot on plan identified and should be printed at A4 size in portrait orientation. Consideration of the effects of mapped scale is necessary when interpreting data at a large scale.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Heritage Protection at <www.ehp.qld.gov.au> or email <planning.support@ehp.qld.gov.au>

This product is projected into GDA 1994 MGA Zone 56

6 Appendix B. Diliegh Drawings.

1. **Diliegh drawing D16.150-SK02 Sheet I of 2**
2. **Diliegh drawing D16.150-SK01_RevB Sheet 01 of 02**
3. **Mitigation Map modified from Diliegh drawing D16.150-SK01_RevB Sheet 01 of 02**

SCALE

0 25 50 75 100 1:5000

DESCRIPTION

REV	REVISION	DATE
A	MCU APPLICATION	08/2017

DILEIGH
CIVIL / STRUCTURAL DESIGN & PROJECT MANAGEMENT

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Yeppoon, Queensland 4703

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Checked by	ACD
Approved	G B A SIMMERS
RPEQ	4585
Sign	30/6/17

G K AND L R THOMPSON

MCU FOR TRANSPORT DEPOT AND SAND QUARRY

LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY

LOCALITY PLAN

D16.150-SK02

SHEET 02 OF 02

A

N

PROPOSED SAND EXTRACTION AREA

LOT 96
PL4022

LOT 93
PL4022

10.0m BUFFER

PROPOSED COVERED MAINTENANCE AREA

EXISTING SHED

ELEVATED GRAVEL HARDSTAND
(APPROX RL 11.9m)

HEAVY VEHICLE
PARKING AREA

PROPOSED WETLAND
DETENTION BASIN
REFER SWMP

TEMPORARY
STOCKPILE AREA
STAFF
CARPARKING

PROPOSED 6.0m WIDE GRAVEL
ACCESS ROAD TO SAND
QUARRY AND VEHICLE DEPOT

WASHDOWN BAY

POWER POLE AND STAY

DRAIN

GATE

NINE MILE ROAD

EDWARDS RD

AREA SCHEDULE

SITE	AREA	18.497 ha
	CARPARKS	5
EXISTING SHED	SINGLE STOREY	
	MAXIMUM HEIGHT ABOVE GROUND LEVEL	4.5m
	GROSS FLOOR AREA	84m²
PROPOSED BUILD ENVELOPE	VEHICLE MAINTENANCE SHED (LENGTHxWIDTHxHEIGHT)	20mx15mx6m HIGH
SITE COVERAGE	EXISTING SHED	84m²
	PROPOSED SHED	300m²
	WASHDOWN BAY	46m²
	TOTAL	430m²
IMPERVIOUS AREAS	TOTAL GRAVEL HARDSTAND/INTERNAL ROAD	7623.9m²
	TOTAL SITE COVER	430m²
	TOTAL	8054m²
SAND EXTRACTION AREA	AREA	3.52ha

LEGEND

- 8.5 — PRE-DEVELOPED SITE CONTOUR
- EXISTING OVERHEAD ELECTRICITY (LINE, POLE & STAY)
- EXISTING FENCE
- EXISTING BUILDINGS
- MAPPED WETLANDS
- PROPOSED GRAVEL HARDSTAND AREA PLANT AND MATERIALS STORAGE
- PROPOSED 6.0m WIDE GRAVEL ACCESS ROAD/VEHICLE MANEUVERING
- PROPOSED SAND EXTRACTION AREA
- PROPOSED GRASSED BATTERS AND DRAINS
- PROPOSED WASHDOWN BAY (INCLUDING OIL SEPARATOR, SEDIMENT TRAP AND TANK FOR COLLECTION AND RE-USE WATER ON SITE)
- PROPOSED BUILDING
- PROPOSED RETAINING WALL (UP TO 2.0m HIGH)

NOTES

1. DEFINED FLOOD EVENT 1.0% AEP (1 IN 100 YEARS) FLOOD LEVEL APPROXIMATELY 10.968 AHD
2. PROPOSED ELEVATED GRAVEL HARDSTAND LEVEL APPROXIMATELY 11.9 AHD

SCALE

0 10 20 30 40
DESCRIPTION 1:2000

REV	REVISION	DATE
A	DEHP PRE-LODGEMENT	19/06/2017
B	MCU APPLICATION	06/2017

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Checked by	ACD
Approved	G B A SIMMERS
RPEQ	4585
Sign	30-6-17

G K AND L R THOMPSON

MCU FOR TRANSPORT DEPOT AND SAND QUARRY
LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY
SITE CONCEPT PLAN

D16.150-SK01

SHEET 01 OF 02

A B

N

Preferred location for replacement trees

PROPOSED SAND EXTRACTION AREA

LOT 96
PL4022

LOT 93
PL4022

10 metre buffer area

10.0m BUFFER

PROPOSED COVERED MAINTENANCE AREA

EXISTING SHED

ELEVATED GRAVEL HARDSTAND
(APPROX RL 11.9m)

HEAVY VEHICLE PARKING AREA

PROPOSED WETLAND DETENTION BASIN REFER SWMP

PROPOSED 6.0m WIDE GRAVEL ACCESS ROAD TO SAND QUARRY AND VEHICLE DEPOT

TEMPORARY STOCKPILE AREA

STAFF CARPARKING

WASHDOWN BAY

POWER POLE AND STAY

DRAIN

GATE

NINE MILE ROAD

EDWARDS RD

AREA SCHEDULE

SITE	AREA	18.497 ha
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	TOTAL SITE COVER	430m²
	TOTAL	8054m²
SAND EXTRACTION AREA	AREA	3.52ha

LEGEND

- PRE-DEVELOPED SITE CONTOUR
- EXISTING OVERHEAD ELECTRICITY (LINE, POLE & STAY)
- EXISTING FENCE
- EXISTING BUILDINGS
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2. PROPOSED ELEVATED GRAVEL HARDSTAND LEVEL APPROXIMATELY 11.9 AHD

Mitigation Map

Modified from original to show mitigation areas Denley Environmental

SCALE
0 10 20 30 40 1:2000
DESCRIPTION

REV	REVISION	DATE
A	DEHP PRE-LODGEMENT	19/06/2017
B	MCU APPLICATION	06/2017

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G K AND L R THOMPSON
MCU FOR TRANSPORT DEPOT AND SAND QUARRY
LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY
SITE CONCEPT PLAN

D16.150-SK01

SHEET 01 OF 02

A B

2017

DILEIGH

CIVIL / STRUCTURAL DESIGN & PROJECT MANAGEMENT

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/90-2017

Dated: 13 April 2018

ENGINEERING REPORT FOR AN MCU FOR A TRANSPORT DEPOT AND SAND QUARRY ON LOTS 93 AND 96 ON PL4022, NINE MILE ROAD, PINK LILY.

This report was prepared for Greg and Leonie Thompson of Greg Thompson Earthmoving Pty Ltd, in support of an MCU development application to Rockhampton Regional Council. This report should be read in conjunction with the overall application relating to this project. The proponent is seeking approval to develop the site as a Transport Depot and Sand Quarry

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Document Status					
Rev No.	Author	Reviewer	Approved For Issue		
			Name	Signature	Date
03	G Simmers / R Jones	Rob Jones / G Simmers	Geoff Simmers RPEQ 4585		16-11-17

1. Introduction

This report has been prepared in support of a Material Change of Use application by the developer to use the site as a Vehicle Depot and Sand Quarry.

The land subject to this application is described as Lot 93 on PL4022 and Lot 96 on PL4022 which are accessed from Nine Mile Road, Pink Lily, as shown outlined in red in Figure 1 below and detailed on the Locality Plan in Appendix A.

Figure 1 – Site Locality (See also Appendix A)

This engineering report addresses the following issues in relation to the development:

- Traffic generation by the development and potential impacts on traffic operations on the access road, Nine Mile Road.
- Stormwater management for the development, both quantity and quality.

It should be noted that the potential impact of the development of Riverine Flooding is to be addressed separately to this report.

2. Traffic Impact Assessment – Nine Mile Road

2.1 Development Details

- The proposal is for a Transport Depot to be located on Lot 93 and an Extractive Industry for Sand Extraction on Lot 96.

- A Locality Plan and Concept Layout plan is shown on Drawings D16.150-SK01_Rev C and D16.150-SK02 which are included in **Appendix A** to this report.
- Access to both properties is from Nine Mile Road adjacent Lot 93, with an access road to be constructed through Lot 93 via the Vehicle Depot to the Sand Quarry.
- A new property access crossover is proposed to be constructed slightly to the north of the Edwards Road / Nine Mile Road intersection to meet Rockhampton Regional Council requirements. Details of the access including sight distances on Nine Mile Road and vehicle swept paths for the design vehicle (19m articulated semi-trailer) are also provided in **Appendix A** to this report.

2.2 Surrounding Road Network Details

The site is located adjacent to, and will have access from, Nine Mile Road. Nine Mile Road is accessed from Rockhampton - Ridgelands Road (a State Controlled Road) approximately 2.5km to the north-east of the site.

There are alternative routes on local roads to the site from the south and west along Nine Mile Road, however, the standard of many of these roads and lengths of these routes makes them unsuitable for heavy vehicles and/or uneconomical to use as an access route to the site.

Nine Mile Road from Rockhampton – Ridgelands Road to the site is approximately 2.8km long and has a seal width of between 7.0 and 7.5m, with a formation width of typically 8.0m or greater. The section between the Rockhampton-Ridgelands Road and Edwards road was constructed in 2000 and the design pavement for this section is:-

- 125mm Type 2.1 road base
- 175mm Type 2.3 road base
- 0.4-4.0m Fill

2.3 Background Traffic

Rockhampton Regional Council has provided traffic counts for two locations on Nine Mile Road:-

1. 1km North of Fogarty Road undertaken in 2014 (232.9 AADT, 15.3%HV)
2. 20m from the Lion Creek Bridge undertaken in 2011 (222.9 AADT, 14%HV)

Both of these sites are quite close to the site being 600m and 350m south of the existing site access, however the count undertaken at to the North of Fogarty Road was deemed most appropriate to use given that it is the most recent. This count does not include traffic generated on Edwards Road which is before the count location, nor does it include traffic from two recent quarry approvals on Nine Mile Road:-

1. Tandy Quarries at Lot 131 Nine Mile Road – 20 vehicle movements per day.
2. Hardcore Performance Pty Ltd at Lots 257, 428, 431 and 432 Nine Mile Road – 18 vehicle movements per day.

Vehicle movements of these two additional quarry approvals were provided by Rockhampton Regional Council as the vehicle movements approved for their associated development applications.

Edwards Road services 5 rural residential properties and 1 farm. The New South Wales Roads and Maritime Services (RMS) Guide to Traffic Generating Developments - Updated Traffic Surveys (August 2013) assigns a trip generation rate of 7.4 trips per regional residential dwelling. This rate was applied to both the residential properties and the farm (in lieu of traffic generation rates for farm, and given the seasonal nature of the farm business it has been assumed that the trip generation would average to 7.4 trips per day over the course of a year). This gives total traffic generation of 88 vehicle movements per day from Edwards Road. A heavy vehicle rate of 15.3% of the traffic has been adopted, which matches the heavy vehicle percentage at the traffic count location.

A growth figure of 1.4% for the 4 years from 2014 to 2018 was applied to the count traffic based on the published growth rate for the last 5 years on the Rockhampton Regional Council Web Site, giving a AADT in 2018 (when the proposed development is expected to have gained all approvals) of 372 vehicles/day inclusive of the Edwards Road and recently approved quarry traffic.

2.4 Development Traffic Generation

2.4.1 Vehicle Depot Traffic Generation

The Vehicle Depot is to be used for storage and minor maintenance of vehicles and plant associated with the developers' business "Greg Thompson Earthmoving".

The development consists of:

- Existing shed for storage of supplies and spare parts.
- Proposed Shed (Container Shelter or similar) for use as an undercover area for undertaking minor repairs and maintenance to the businesses plant and vehicles (e.g. change tyres, grease and/or oil change, minor body repairs (e.g. lights, mudflaps), replacing teeth on excavator buckets etc.) - Note that any major plant and vehicle maintenance will be undertaken off-site and no additional staff will be employed on site to undertake this this work.
- Wash-down bay for cleaning of machinery and plant, complete with appropriate water collection, treatment and reuse.
- Property access intersection and gravel access road from Nine Mile Road.
- Hardstand areas for vehicle and plant storage, including a raised area approx. 3m above the surrounding natural surface levels for storage above flood levels during riverine flooding of the area.
- Associated drainage, stormwater water treatment, landscaping, bore water supply, rainwater tanks etc.

Traffic generation for the development was based on vehicle operations of the business based on an interview with the owner/operator, Mr Greg Thompson.

The business employs up to 7 staff including 4 full time staff (including owner Greg Thompson) and up to three casuals as required, however, only 5 staff are truck drivers/plant operators who commence work each day at the vehicle depot, with the remaining casual staff commencing at the respective job site each day.

The business operate 5 trucks as follows:

Vehicle	No.
Small Body Tip Truck	1
Regular Body Tip Truck	3
Truck and Dog Combination	1

In addition, the business has the following plant:

Plant	No.
3 Tonne Capacity Excavator	2
6 Tonne Capacity Excavator	2
24 Tonne Capacity Excavator	1
Skid Steer Loader	2
Flat Bed Trailer (for cartage of larger Plant that will not fit on truck)	1

Mr Thompson also stated that he is not intending to scale up his operations from the current level and may even reduce the size of his operations in the coming years.

Normal daily operations consist of up to 5 drivers/operators starting at the depot in the morning and collecting a truck and any plant or materials (e.g. sand) required, then travelling to site where they remain for the day, then returning the truck and any plant that is not remaining on site to the depot in the afternoon before departing for home. Staff are required to carry their lunch and do not return to the Depot for lunch or other work breaks. Associated traffic generated by these operations are summarised below:

- Employee Commutes - 5 truck drivers/plant operators travel to the Depot at the commencement of work in their private cars and leave from the Depot at the end of their working day. This generates a total of 10 vehicle movements per day.
- Vehicle Depot/Plant hire operations – depending on the nature of the jobs contracted, drivers transport plant from the site either individual (as driver/operator) or in pairs (as an individual driver and an operator). Over the course of a week, this averages at a rate of 4 trips per day for a total of 8 vehicle movements per day.

Therefore, the average additional vehicle movements per day on Nine Mile Road generated by the Vehicle Depots operations consist of the following:

- Employee Commute - 10 per day
- Vehicle Depot Operations - 8 per day

  TOTAL - 18 vehicle movements per day

2.4.2 Sand Quarry Traffic Generation

The sand extraction operations are proposed to be relatively small scale, extracting less than 5000 tonnes/annum of sand, equivalent to approximately 3125 cubic metres per annum, with main objective of supplying the developers own business operations only.

Operations will involve working an area of only 30m x 30m at a time, with this estimated to supply approximately 1 year's supply.

Initially the overburden from the first area to be quarried, consisting of a sandy loam type material to a depth of 1 to 2 meters, will be stripped. This material, estimated to amount to approximately 1350 cubic meters or about 2160 tonnes (at 1.6T/m^3 assumed density), will be temporarily stockpiled at the adjacent Vehicle Depot before being removed from site to another flood free site owned by the owner, Mr Thompson. It should be noted that as the riverine flooding from the Fitzroy River occurs with many days or even weeks warning, there will be ample time to relocate any temporary stockpile from the floodplain prior to the area being inundated by a flood.

The relocation of the overburden will be undertaken using the existing Combination Tip Truck and Dog Trailer operated by Mr Thompson which has a load capacity of 24.5 tonnes. This will generate 2160/24.5 = 88 loads, equivalent to 176 movements. In subsequent years when additional 30 x 30m areas are opened up for sand extraction the overburden will be relocated to a previously worked area, thus not requiring removal from site or generating any traffic movements.

Sand extraction will be undertaken by excavating and/or dredging the sand, where below the water table) from the pit and stockpiling on a bench within the pit below natural surface level before loading into trucks as required for delivery.

Sand delivery will be undertaken using a combination of the Tip Truck and Dog Trailer (20%) and Body Trucks (80%) depending on the circumstances, with the majority using the Body Trucks due to typical site restrictions for delivery of sand which is typically required during the later stages of projects. However, the majority of sand delivered in Body Truck will be loaded and taken to site in the morning with the body truck (estimated as 3/4 of the 80% = 60% of total), while the remainder will be additional trips back to the site to collect sand. Deliveries can therefore be summarised as follows:

- Tip Truck and Dog Trailer 20% of deliveries (1,000 t/a)
- Body Tip Truck at Start of Day 60% of deliveries (3,000 t/a)
- Body Tip Truck Additional Trips 20% of deliveries (1,000 t/a)

Note that the traffic movements for the "Tip Truck at Start of Day" deliveries are already accounted for in the Transport Depot movements above and therefore additional movements are only generated by the Tip Truck and Dog deliveries and the Body Tip Truck Additional Trips deliveries.

Based on the maximum 5000 tonnes per annum and payloads of 24.5 tonne for the existing Truck and Dog and 11.5 tonne for the Body Trucks, the additional movements generated by the Sand Quarry Operations are therefore calculated as:

- Tip Truck and Dog Trailer: (1000t/24.5 t/trip*2 mov./trip) = 82 movements
- Body Tip Truck Additional Trips: (1000t/11.5 t/trip*2 mov./trip) = 174 movements

Therefore, total additional movements for sand delivery per annum = 82 + 174 = 256 movements.

The total additional traffic movements per annum generated by the development in the first year will therefore be 176+256 = 432, reducing to 256 in subsequent years.

Allowing for 50 weeks of operation per year (Excluding Christmas/New Year shutdown) and 5 days operation per week, in line with the truck depot operations as advised by the developer, gives a total of 250 days per year of operation per year. Therefore, the above traffic generation rates for the Sand Quarry are equivalent to 1.73 v/d in the first year and 1.02 v/d in subsequent years.

2.5 Traffic Generation Comparison with AADT

A comparison of traffic generated with the AADT for Nine Mile Road in the initial year (2018) of the proposed operation can be made as follows:

- Background AADT — 372 v/d
- Development
  - Transport Depot — 18 v/d
  - Initial year of Sand Quarry Operation — 1.73 v/d
  - Total Development (Initial Year) — 19.73 v/d
  - **Development Traffic as % of AADT** — **5.3%**

In the second year of operation, assuming the Nine Mile Road background traffic AADT continues to grow at 1.4%, this will reduce as follows:

- Background AADT — 376 v/d
- Development
  - Transport Depot — 18 v/d
  - Sand Quarry Operation — 1.02 v/d
  - Total Development — 19.02 v/d
  - **Development Traffic as % of AADT** — **5.1%**

At the 10-year design horizon (2028), and continuing to assume the Nine Mile Road background traffic AADT will grow at 1.4%, the increase caused by the development will be as follows:

- Background AADT — 409 v/d
- Development
  - Transport Depot — 18 v/d
  - Sand Quarry Operation — 1.02 v/d
  - Total Development — 19.02 v/d
  - **Development Traffic as % of AADT** — **4.7%**

These percentage may reduce even further with background traffic growth and as the developer scales back his operations from the site as intended.

2.6 Traffic Impact Assessment Conclusion

Based on the above analysis, the impact of the development on traffic operations on Nine Mile Road is slightly greater than 5% both at the year of opening and until the background traffic increases to at least 381, which should be mid 2020 given the assumed growth rate for Nine Mile Road background traffic of 1.4%.

The road currently has a seal width of at least 7.0m, and a formation width of 8.0m. This is a marginally higher standard than a rural minor collector as detailed in the CMDG D1 – Geometric Road Design table D1.21.01 (Rural Road Elements for Rockhampton Regional and Livingstone Shire).

The traffic volumes specified for this cross-sectional geometry are between 151 and 999 vehicles per day and the predicted total traffic on Nine Mile Road in 2028 with the development is around 428 vehicles per day. This volume is far below the capacity of a rural minor collector, and therefore no significant impacts will be caused to the operation of Nine Mile Road by the development.

It is therefore recommended that no upgrades to the road are necessary to cater for traffic operations on Nine Mile Road as part of this development.

3. Stormwater and Drainage Lot 93 (Transport Depot)

3.1 Pre Developed Conditions

The development site is rural land with wetlands in the northern portion of the property and extending to the north of the property. There are also wetlands to the south and west of the property. The northern half of the property drains to the northern wetlands on site. A small portion of southern half of the property drains south to the southern wetlands. The remainder of the property drains to a central depression, which, when fully inundated, would drain generally to the west (see Drawing D16.150-SK11 in **Appendix E**).

3.2 Post Developed Site Conditions

The proposed development is for a Transport Depot and will see an unsealed access road constructed south of the northern wetlands (maintaining a minimum 10m wide buffer from the wetlands), an unsealed hardstand area generally at close to natural surface levels in the Eastern part of the proposed development area, and a raised unsealed hardstand with a covered plant/vehicle maintenance area and wash-down bay above the Q100 flood levels central to the site.

It is proposed that the entire developed area will drain to a proposed artificial wetland detention basin to the south of the new development area located in an existing depression. This will be achieved by grading the developed areas to the south so that stormwater runoff will drain to the south, and providing swales and table drains where appropriate to direct this runoff to the artificial wetland detention basin (See Drawing D16.150-SK12 in **Appendix E**). After exiting the wetland/detention basin water will spread out as overland flow and returned to its original flow path along the depression to the west of the basin.

3.3 Post Developed Quality Management

The 'MUSIC' model for urban stormwater improvement conceptualisation was used to assess the post-development site runoff quality and determine the performance of the proposed stormwater treatment system. The following guidelines were adopted for the water quality assessment;

1. Healthy Waterway's Water By Design MUSIC Modelling Guidelines (HW, 2010);
2. Mackay Regional Council MUSIC Guidelines (MRC, 2008);

The treatment system has been designed to meet the State Planning Policy code: Water Quality (See SPP Table B: Post construction phase).

The suggested treatment train for this development is as follows: Implementation of vegetated buffers, prior to discharge to a constructed wetland on the site. The site has been split into its component rain receiving areas, which in this case is limited to industrial road (for the gravel access and hardstand areas) and industrial roof, and modelled as industrial pollutant generators in MUSIC (Model for Urban Stormwater Improvement Conceptualisation), using the Mackay Regional Council MUSIC guidelines (See Drawing D16.150-SK13 in **Appendix E** for Music Sub-Catchments). Gravel hardstand and access road areas have been modelled as completely impervious.

The proposed treatment train was found to reduce Pollutant loading in post developed water discharge sufficiently such that it meets the requirements of the State Planning

Policy for Water Quality, with the required area of wetland being 350m^2 (see **Appendix C** for Pollutant Catchment Inputs, Treatment Train Parameters and Treatment Train Diagram).

MUSIC MODEL TREATMENT TRAIN EFFECTIVENESS				
Pollutant	**Pre-Treatment**	**Post-Development**	**Reduction**	**SPP Design Objective CQ (Sth)**
Total Suspended Solids (kg/yr)	2560	320	87.5%	85%
Total Phosphorus (kg/yr)	4.12	1.05	74.4%	60%
Total Nitrogen (kg/yr)	14.1	7.71	45.4%	45%
Gross Pollutants (kg/yr)	160	0	100%	90%

It is anticipated that the proposed treatment train will require minimal maintenance. The following tasks will be carried out as required:

- Inspection of the wetland for silting.
- Sediment removal from the inlet zone.
- Weed control and vegetation maintenance.

3.3 Post Developed Quantity Management

The post developed site will increase the amount of stormwater draining to the existing depression on site (and then subsequently discharging to the west) through two mechanisms: -

1. An increase in actual catchment area draining to the depression
2. A decrease in the time of concentration

The pre-developed catchment is 2.49ha with zero fraction impervious, it is a grassed pasture and has a time of concentration of 14 minutes. The post-developed catchment is 3.08ha, has 23.9% impervious area, and a time of concentration of 11 minutes (refer Appendix D for Time of Concentration Calculations). Comparing the pre and post developed catchments draining to the depression gives: -

COMPARING PRE-TREATMENT PEAK FLOWS			
EVENT ARI	PRE-DEV (m^3/s)	POST-DEV (m3/s)	CHANGE
Q2	0.3742	0.4838	29.30%
Q5	0.5393	0.6996	29.73%
Q10	0.6469	0.8408	29.97%
Q20	0.7907	1.0292	30.16%
Q50	1.0326	1.3465	30.39%
Q100	1.2153	1.5863	30.53%

There will be no change to the runoff from the site going South, and a small reduction in area of the site catchment draining to the North (see drawings D16.150-SK11 and SK12 in **Appendix E** for site catchment areas and details).

To mitigate the increased peak flows from the development such that there could be no increase in peak flows discharging to the west it is intended to provide some formalisation to the existing depression which would act as a detention basin. This would be achieved by having the developed area of the site drain to a bunded wetlands area which would act as a detention basin.

This detention basin would be 800m^2 with a 500mm high bund and a 750mm wide outlet weir set 400mm below the top of the bund. An area of 350m^2 of wetlands area be provided within the basin for stormwater quality management. This will have the following effect on the catchment peak discharges for the major and minor events:-

COMPARING Q2 PEAK FLOWS POST TREATMENT			
PRE DEV.	0.374	m3/sec	
POST DEV	0.342	m3/sec	
EQUALS	8.67	% DECREASE IN MINOR PEAK FLOWS	

COMPARING Q100 PEAK FLOWS POST TREATMENT			
PRE DEV.	1.215	m3/sec	
POST DEV	1.213	m3/sec	
EQUALS	0.22	% DECREASE IN PEAK MAJOR FLOWS	

Refer **Appendix D** for full calculations and details.

It should be noted that the actual volume of runoff leaving the site (and potentially feeding nearby wetlands) will actually increase due to the increase in impervious areas within the development, which will be positive for the nearby wetlands, however, the peak flow rates will be controlled by the detention storage provided, such that they are equal to or less than the peak flow rates that existed prior to the development, as is required by the Queensland Urban Drainage Manual.

4. Stormwater and Drainage Lot 96 (Extractive Industry)

The proposed sand extraction area generally runs between two slight ridgelines which run generally along the northern and southern edges of the area with a slight depression in between which is approximately between 300 and 500mm deep. This can be seen on the Site Concept Plan in **Appendix A.**

In the pre-developed state, low to medium intensity rainfall would generally collect in this depression and either percolate to groundwater or evaporate. In high intensity rainfall events initial rainfall would also collect in the depression and percolate to groundwater, but some surface runoff may overflow the area once the area is saturated and full. This overflow would run to the depressions within the property to the south of the extraction area as the ridgeline to the south of the extraction area is slightly lower than the one to the north. It is hard to quantify the amount of any surface water runoff from this area but it is not expected to be significant given the depth of the depression.

Post development would see any rain falling directly on active or previously worked sand extraction pits collect in the pit before percolating to groundwater. It is also noted that any overland flows coming from the east of the site (from the Transport Depot) would be diverted to the south around any sand extraction pit using shallow swale drains so this runoff can continue to flow to the wetlands to the south and/or west.

There will therefore be no increase in peak flows or concentration of surface water runoff from the sand extraction area.

Further, it is not proposed to pump or extract the groundwater in any way during the extraction of the sand. Sand extracted will initially be stockpiled within the pit to allow any excess water to drain prior to removal from site to ensure it is returned to the water table.

Appendix A – Site Plans

- D16.150-SK02 Rev C – Locality Plan
- D16.150-SK01 Rev C – Site Concept Plan
- D16.150-SK03 Rev C – Access Works
- D16.150-SK04 Rev C – Access Swept Paths
- D16.150-SK05 Rev C – Access Sight Distance Check

SCALE

0 25 50 75 100 1:5000
DESCRIPTION

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A	MCU APPLICATION	06/2017
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Sign	16-11-17

G K AND L R THOMPSON
MCU FOR TRANSPORT DEPOT AND SAND QUARRY
LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY
LOCALITY PLAN

D16.150-SK02

SHEET 02 OF 5

A C

AREA SCHEDULE

SITE	AREA	18.497 ha
	CARPARKS	5
EXISTING SHED	SINGLE STOREY	
	MAXIMUM HEIGHT ABOVE GROUND LEVEL	4.5m
	GROSS FLOOR AREA	84m²
PROPOSED BUILD ENVELOPE	VEHICLE MAINTENANCE SHED (LENGTHxWIDTHxHEIGHT)	20mx15mx6m HIGH
SITE COVERAGE	EXISTING SHED	84m²
	PROPOSED SHED	300m²
	WASHDOWN BAY	46m²
	TOTAL	430m²
IMPERVIOUS AREAS	TOTAL GRAVEL HARDSTAND/INTERNAL ROAD	7623.9m²
	TOTAL SITE COVER	430m²
	TOTAL	8054m²
SAND EXTRACTION AREA	AREA	3.52ha

LOT 96
PL4022

LOT 93
PL4022

PROPOSED COVERED MAINTENANCE AREA

EXISTING SHED

ELEVATED GRAVEL HARDSTAND
(APPROX RL 11.9m)

HEAVY VEHICLE
PARKING AREA

PROPOSED WETLAND
DETENTION BASIN
REFER SWMP

TEMPORARY
STOCKPILE AREA

STAFF
CARPARKING

PROPOSED 6.0m WIDE GRAVEL
ACCESS ROAD TO SAND
QUARRY AND VEHICLE DEPOT

WASHDOWN BAY

POWER POLE AND STAY

DRAIN

PROPOSED ACCESS INTERSECTION AND ROAD TO BE CONSTRUCTED
(REFER DRAWING D16.150-SK03)

GATE

EXISTING ACCESS
CROSSOVER TO BE REMOVED

NINE MILE ROAD

EDWARDS RD

LEGEND

- 8.5 — PRE-DEVELOPED SITE CONTOUR
- EXISTING OVERHEAD ELECTRICITY (LINE, POLE & STAY)
- EXISTING FENCE
- EXISTING BUILDINGS
- MAPPED WETLANDS
- PROPOSED GRAVEL HARDSTAND AREA PLANT AND MATERIALS STORAGE
- PROPOSED 6.0m WIDE GRAVEL ACCESS ROAD/VEHICLE MANEUVERING
- PROPOSED SAND EXTRACTION AREA
- PROPOSED GRASSED BATTERS AND DRAINS
- PROPOSED WASHDOWN BAY (INCLUDING OIL SEPARATOR, SEDIMENT TRAP AND TANK FOR COLLECTION AND RE-USE WATER ON SITE)
- PROPOSED BUILDING
- PROPOSED RETAINING WALL (UP TO 2.0m HIGH)

NOTES

1. DEFINED FLOOD EVENT 1.0% AEP (1 IN 100 YEARS) FLOOD LEVEL APPROXIMATELY 10.968 AHD
2. PROPOSED ELEVATED GRAVEL HARDSTAND LEVEL APPROXIMATELY 11.9 AHD

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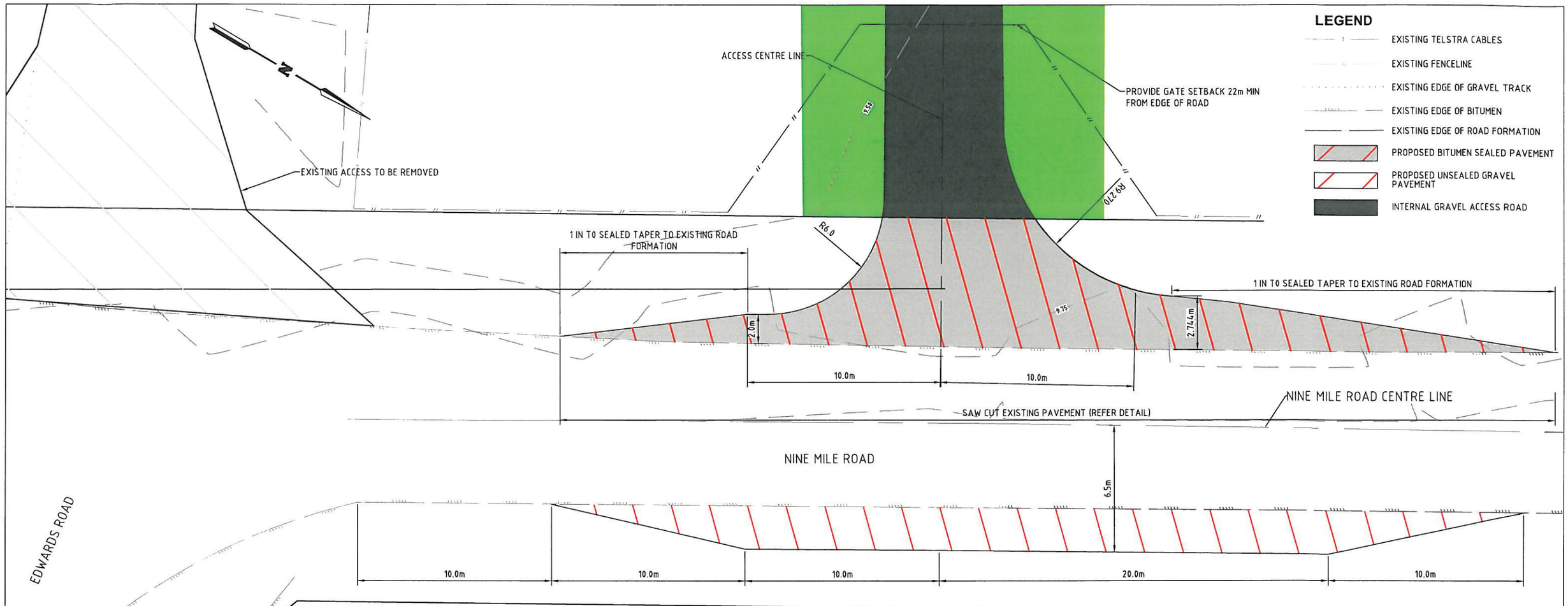
LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY
SITE CONCEPT PLAN

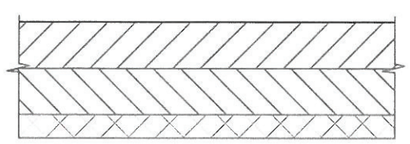
D16.150-SK01

SHEET 01 OF 5

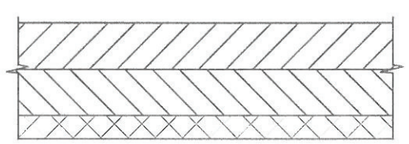
A B C



INTERSECTION LAYOUT



PROVISIONAL SEALED PAVEMENT
N.T.S.



PROVISION UNSEALED GRAVEL PAVEMENT
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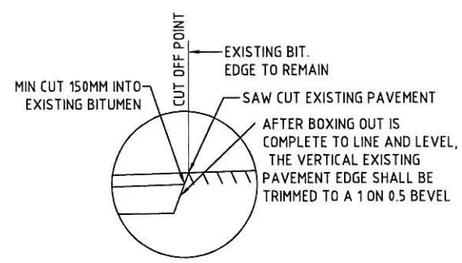

CUT IN DETAIL
NTS

DRAFT ISSUE
NOT FOR CONSTRUCTION

SCALE
0 1 2 3 4
DESCRIPTION 1:200

REV	REVISION	DATE
C	MCU RFI RESPONSE	11/2017

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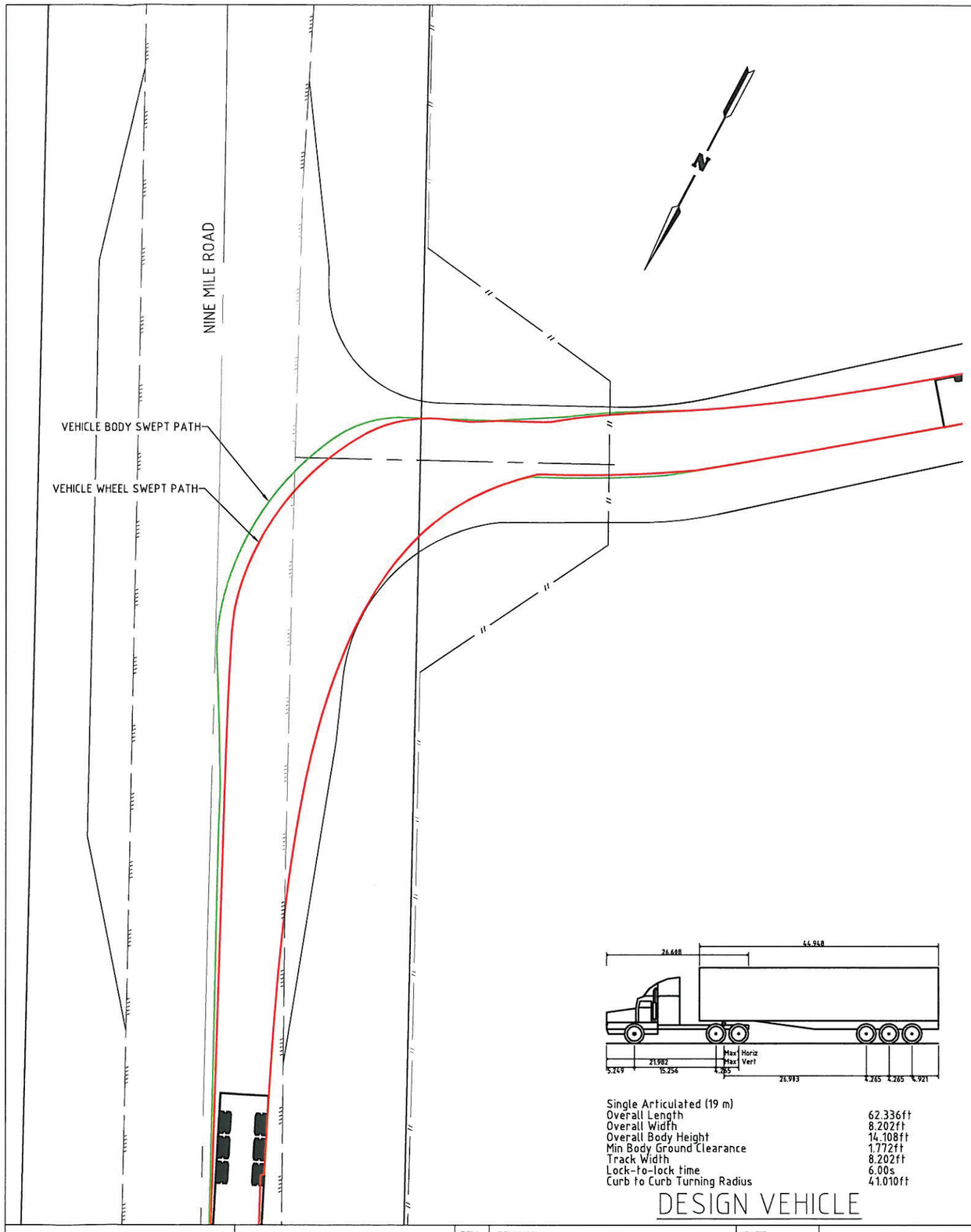
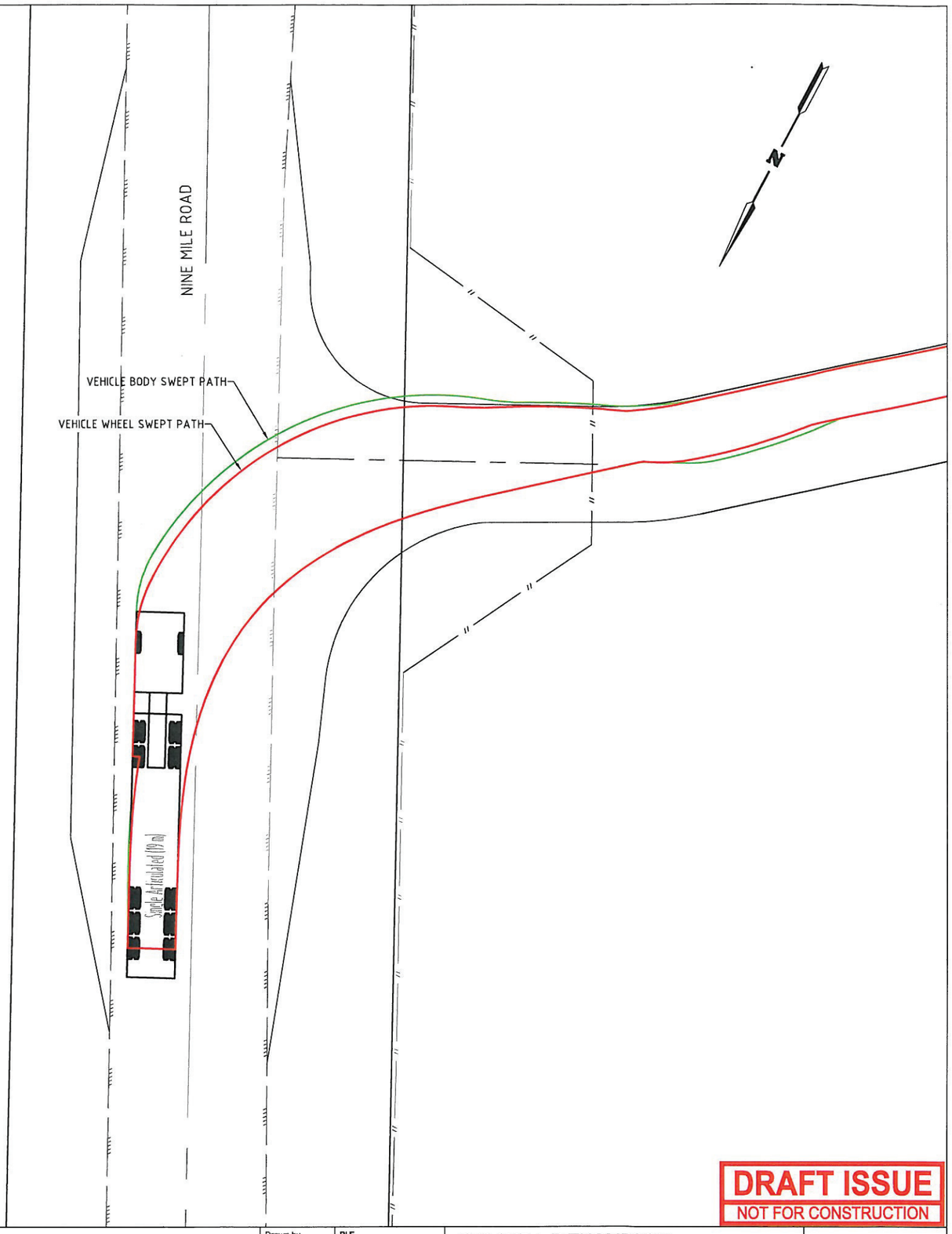
Checked by	RAJ
Approved	G B A SIMMERS
RPEQ	4585
Sign	16-11-17

G K AND L R THOMPSON
MCU FOR TRANSPORT DEPOT AND SAND QUARRY
LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY
ACCESS WORKS

D16.150-SK03
SHEET 03 OF 5
C





Single Articulated (19 m)

Overall Length	62.336ft
Overall Width	8.202ft
Overall Body Height	14.108ft
Min Body Ground Clearance	1.772ft
Track Width	8.202ft
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	41.010ft

DESIGN VEHICLE

DRAFT ISSUE
NOT FOR CONSTRUCTION

SCALE
0 1.25 2.5 3.75 5
DESCRIPTION 1:250

REV	REVISION	DATE
C	MCU RFI RESPONSE	11/2017

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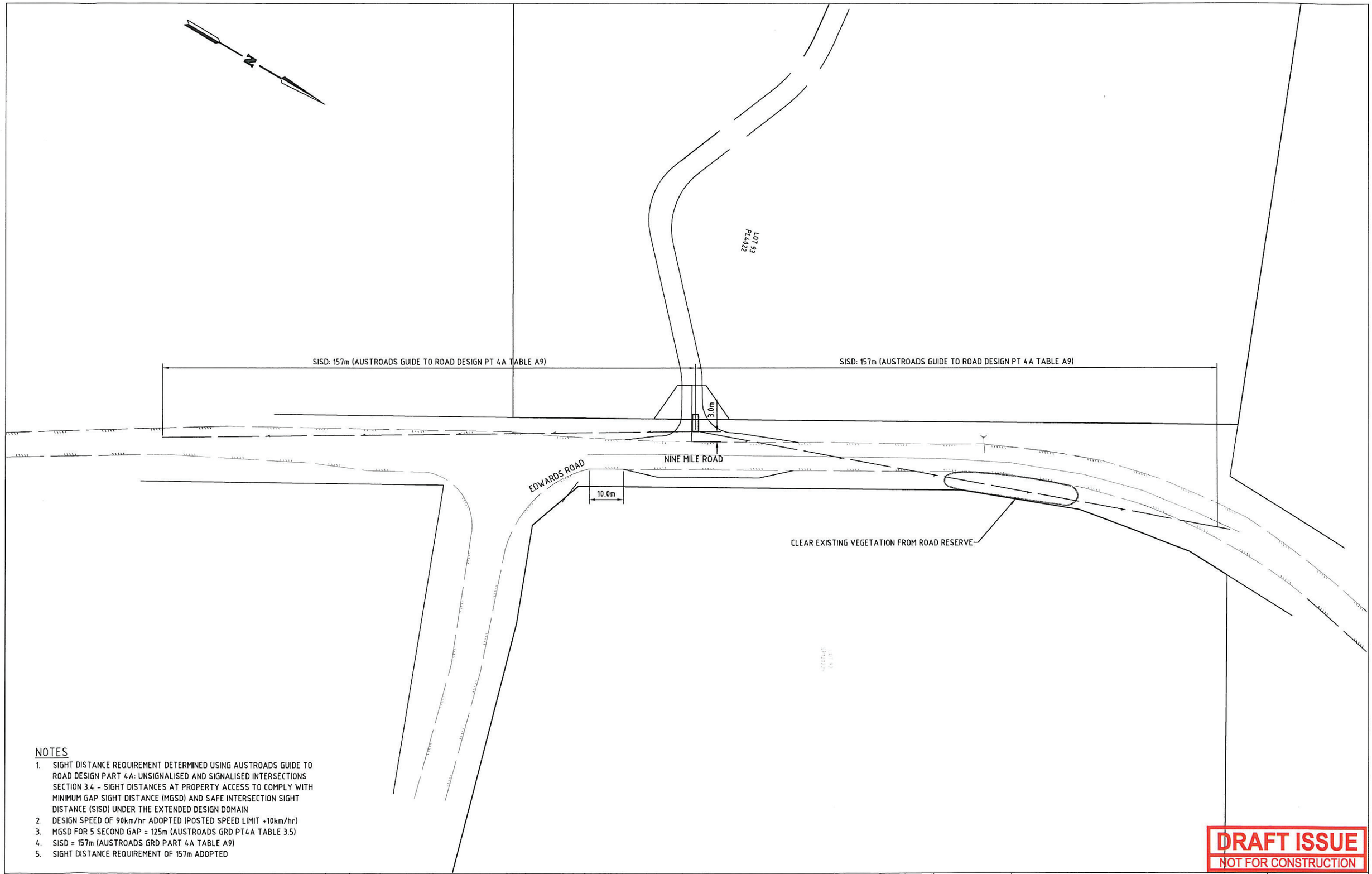
G K AND L R THOMPSON
MCU FOR TRANSPORT DEPOT AND SAND QUARRY
LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY
ACCESS SWEPT PATHS

D16.150-SK04
SHEET 04 OF 5
C



NOTES

1. SIGHT DISTANCE REQUIREMENT DETERMINED USING AUSTROADS GUIDE TO ROAD DESIGN PART 4A: UNSIGNALISED AND SIGNALISED INTERSECTIONS SECTION 3.4 - SIGHT DISTANCES AT PROPERTY ACCESS TO COMPLY WITH MINIMUM GAP SIGHT DISTANCE (MGSD) AND SAFE INTERSECTION SIGHT DISTANCE (SISD) UNDER THE EXTENDED DESIGN DOMAIN
2. DESIGN SPEED OF 90km/hr ADOPTED (POSTED SPEED LIMIT +10km/hr)
3. MGSD FOR 5 SECOND GAP = 125m (AUSTROADS GRD PT4A TABLE 3.5)
4. SISD = 157m (AUSTROADS GRD PART 4A TABLE A9)
5. SIGHT DISTANCE REQUIREMENT OF 157m ADOPTED

DRAFT ISSUE
NOT FOR CONSTRUCTION

SCALE
0 5 10 15 20
DESCRIPTION
1:1000

REV	REVISION	DATE
A	PRELIMINARY-NOT FOR CONSTRUCTION	11/2017
C	MCU RFI RESPONSE	11/2017

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Approved	G B A SIMMERS
RPEQ	4585
Sign	16-11-17

G K AND L R THOMPSON
MCU FOR TRANSPORT DEPOT AND SAND QUARRY
LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY
ACCESS SIGHT DISTANCE CHECK

D16.150-SK05

SHEET 05 OF 5

A C

Appendix B – Stormwater Quality Calculations

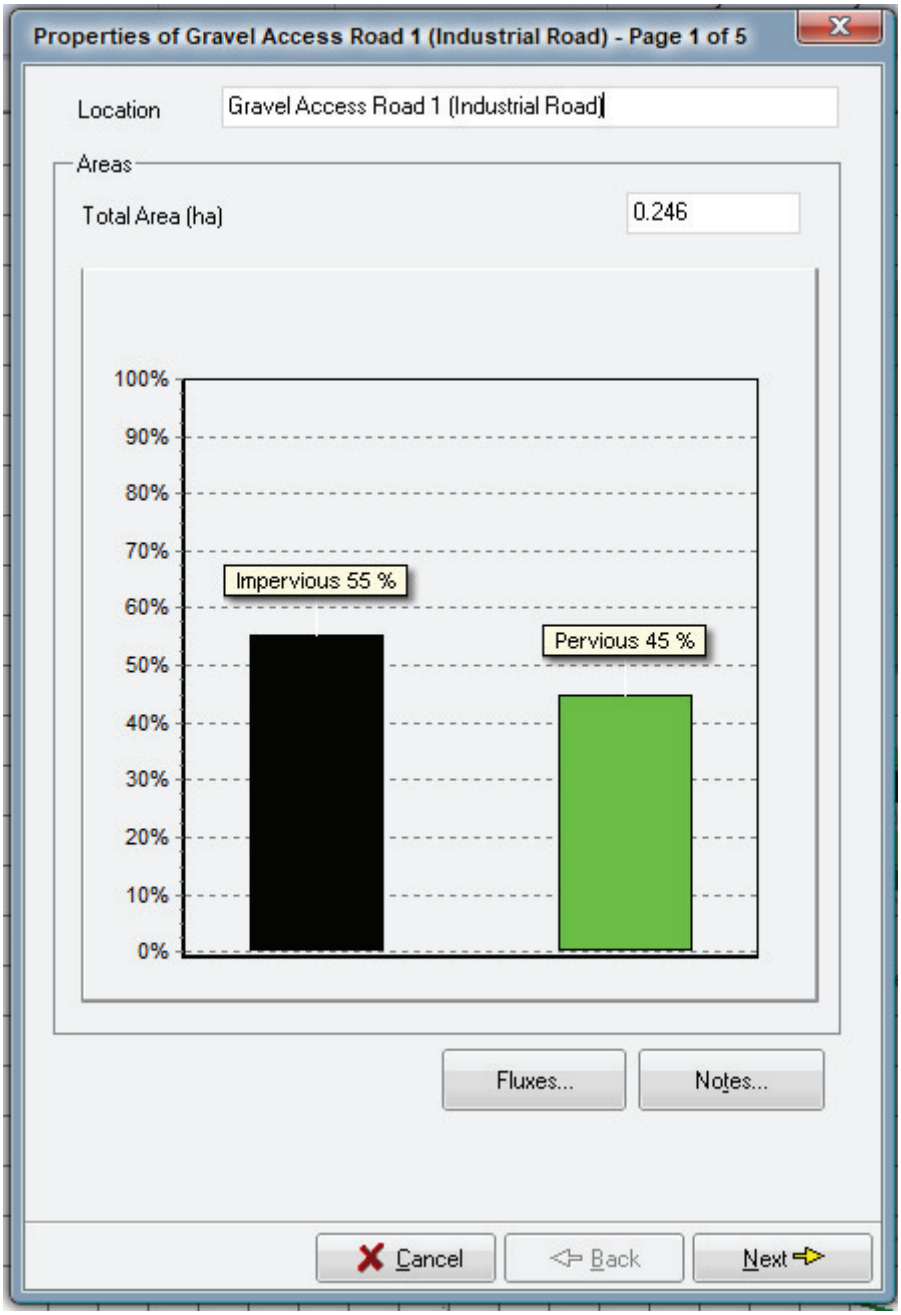
B1 Pollution Treatment Train

NOTE:

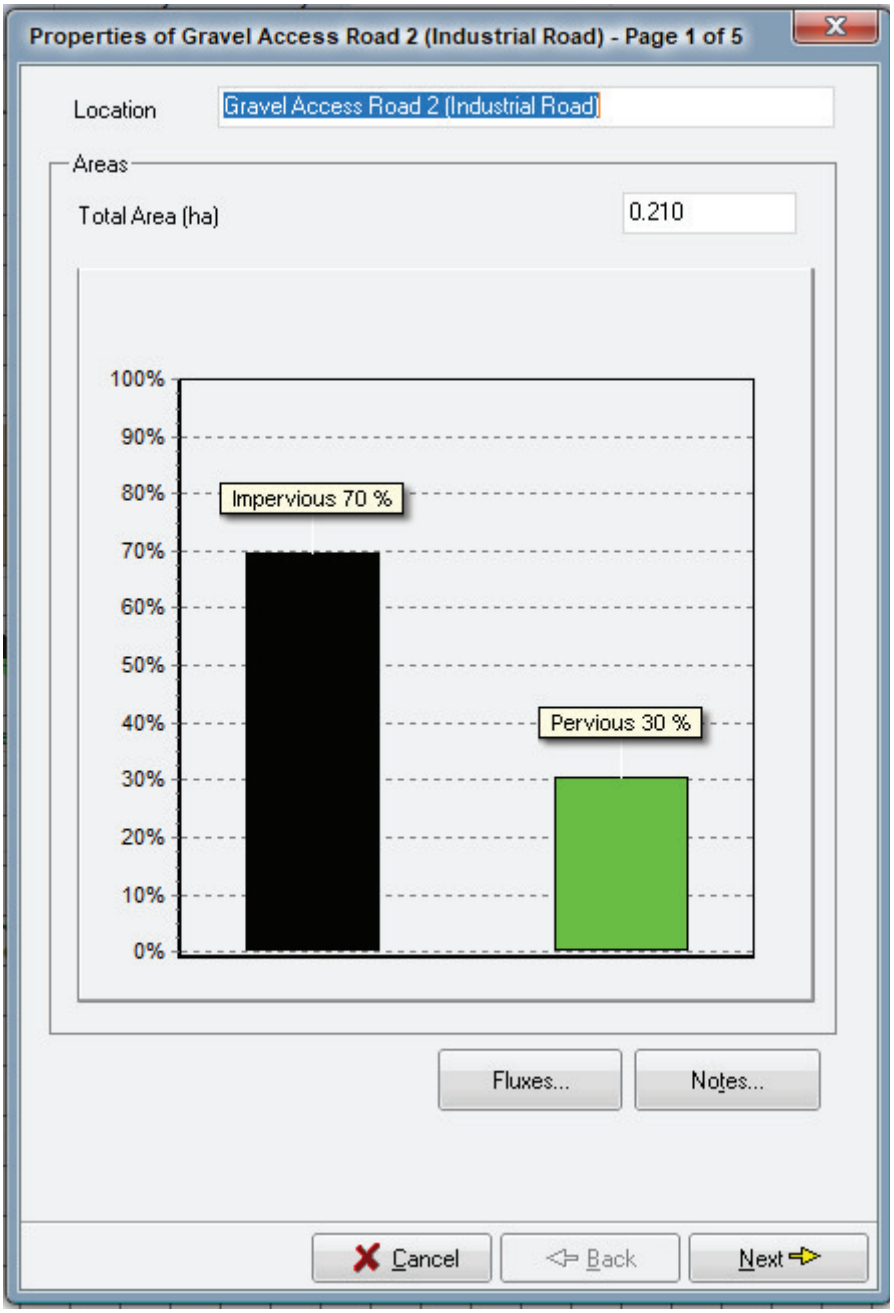
- *Gravel Access Roads* 1 & 2 and *Hardstand Areas* 1 & 2 have identical pollution inputs (as industrial roads), however their total and impervious areas are different (see section A2).
- Likewise; *New Shed Roof* and *Existing Shed Roof* have the same pollution inputs (as industrial roofs), but different total areas.
- Vegetated Buffers have identical parameters (see section A4).

B2 Pollutant Generator Catchments

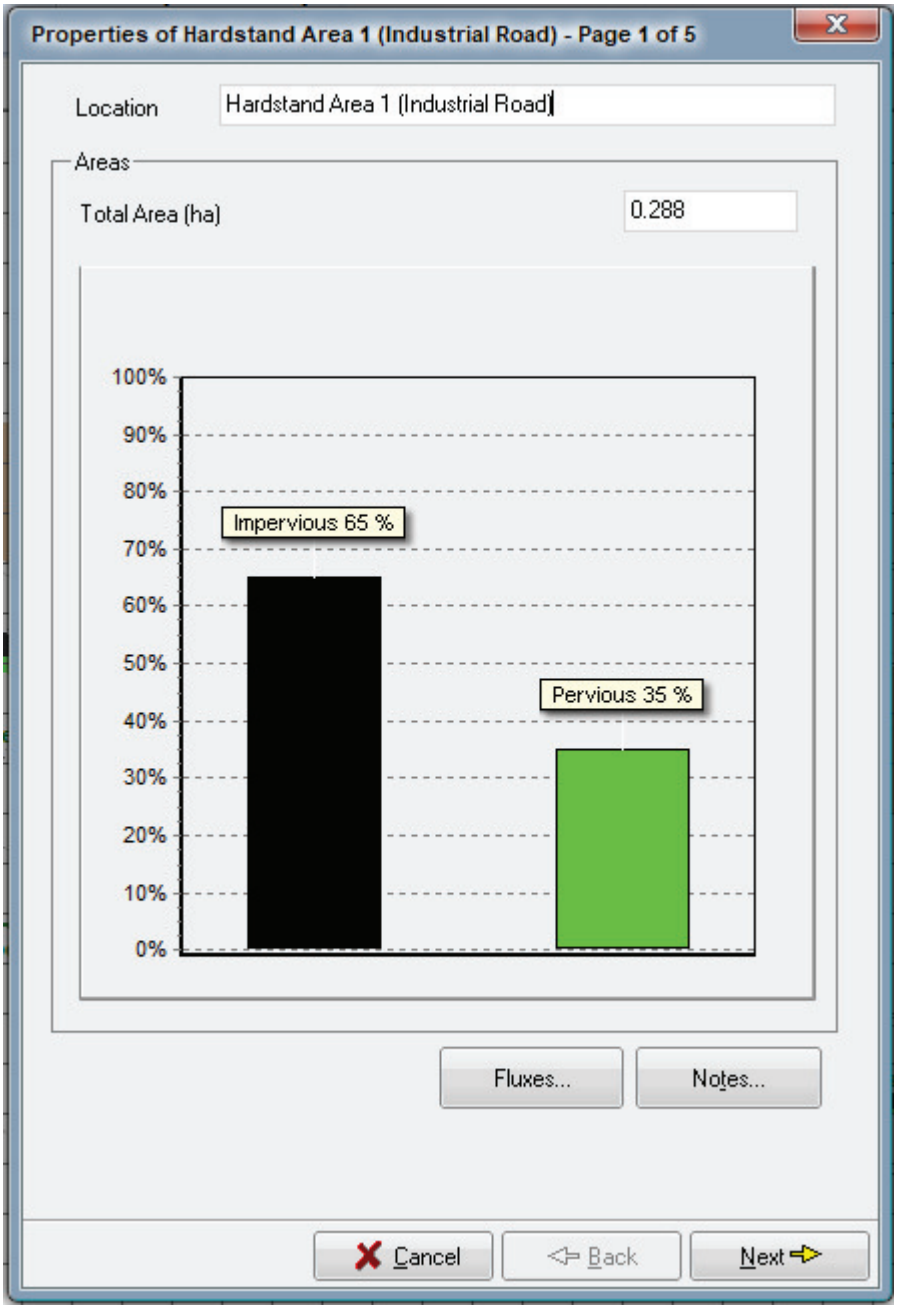
Gravel Access Road 1



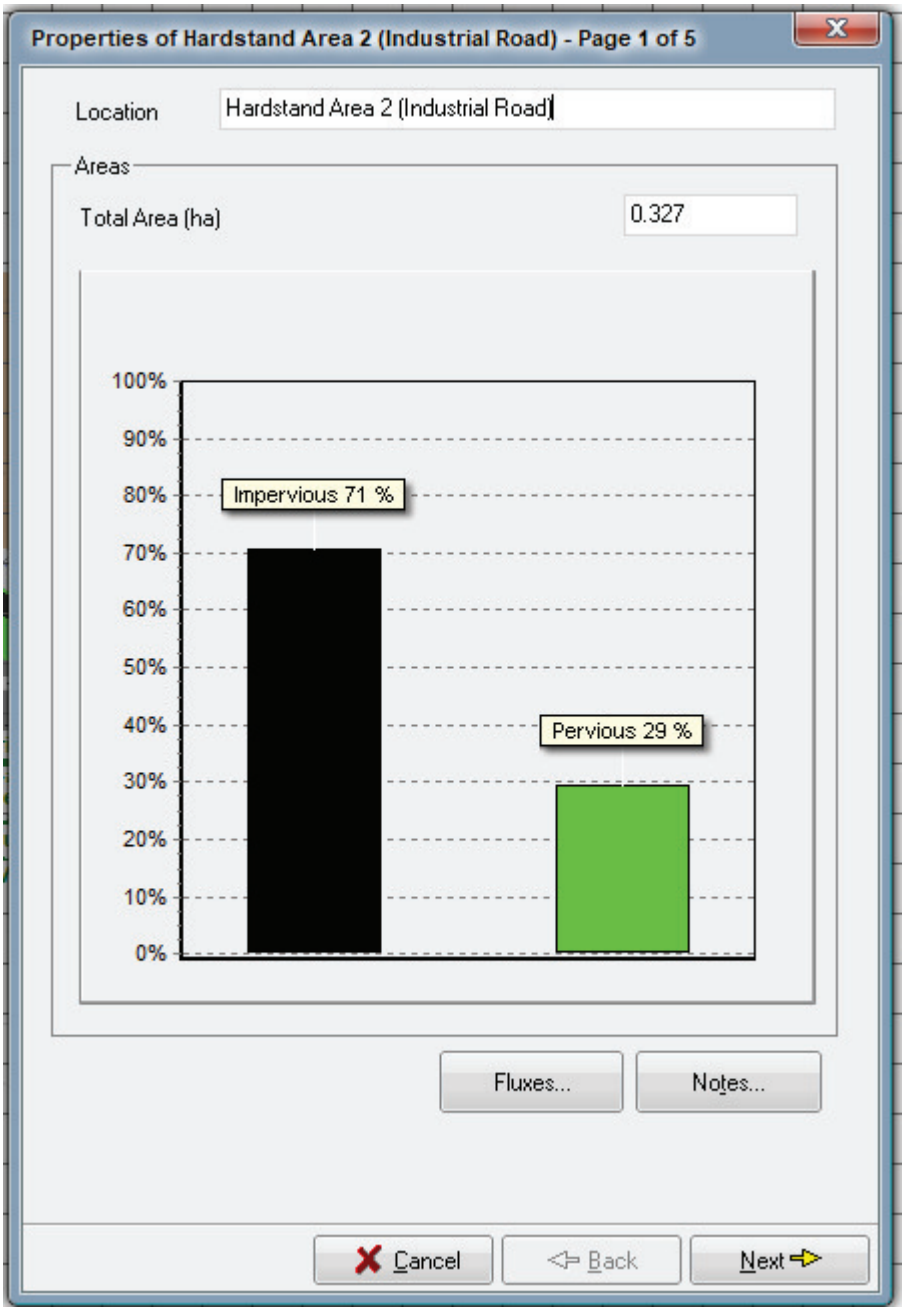
Gravel Access Road 2



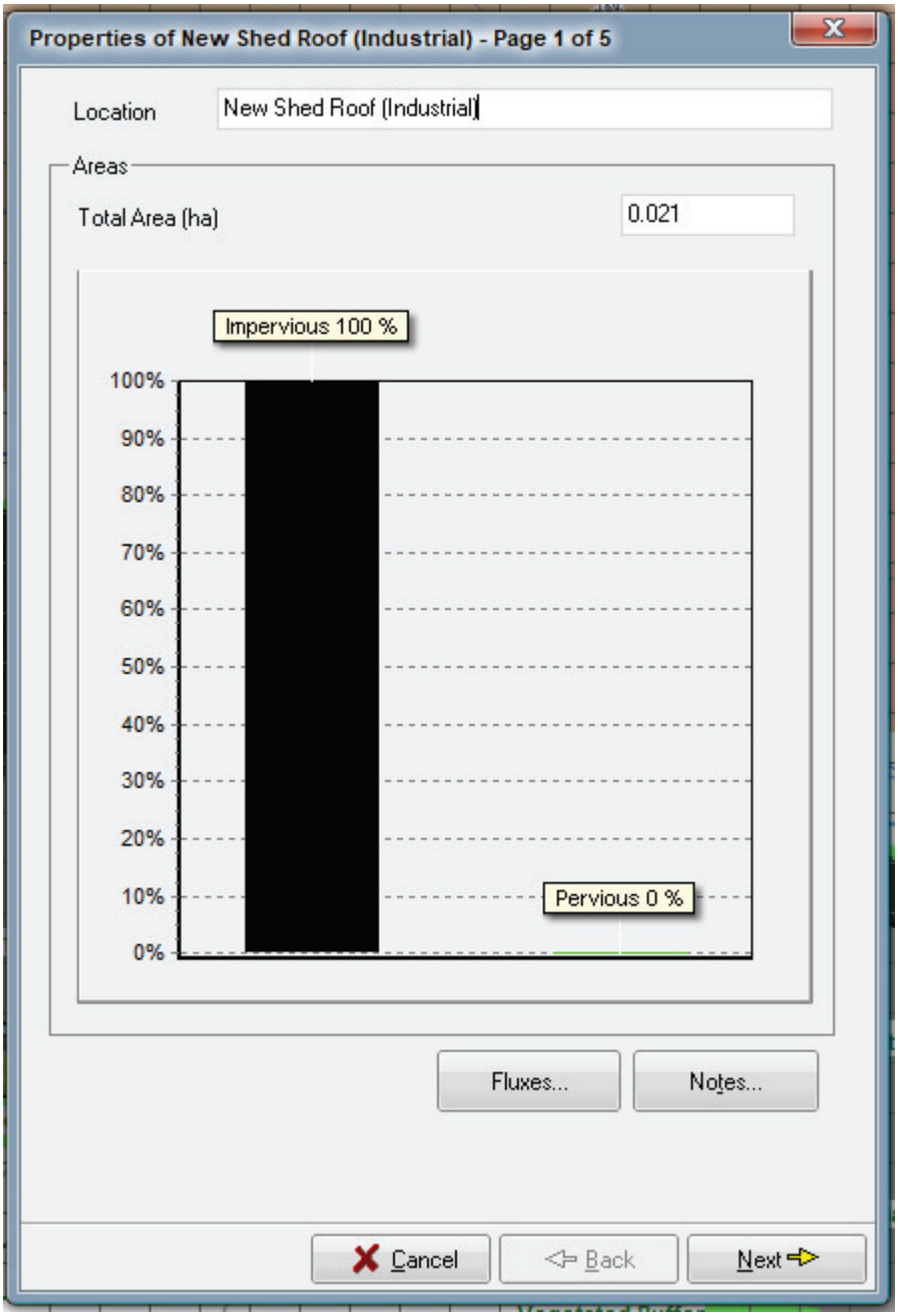
Hardstand Area 1



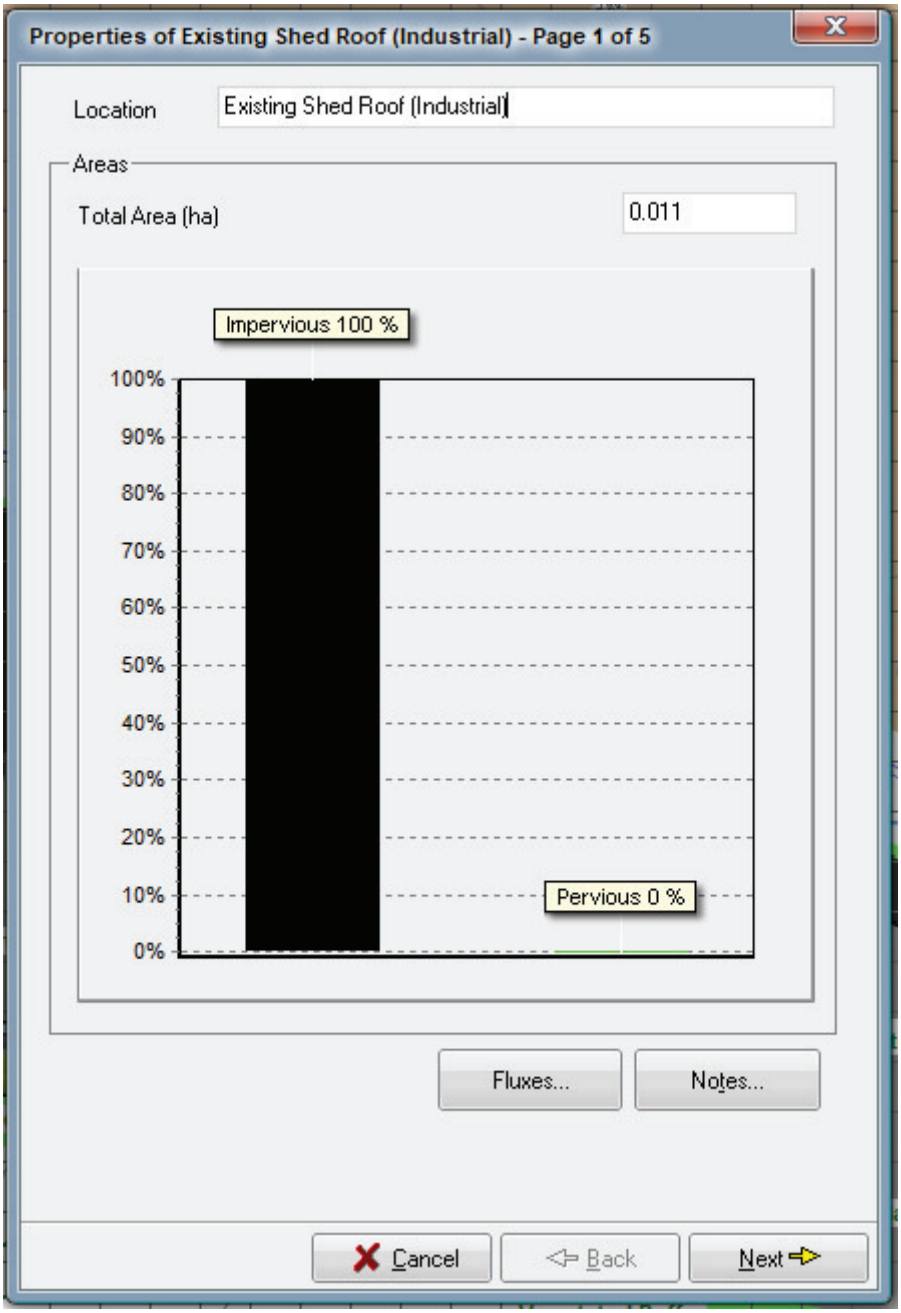
Hardstand Area 2



New Shed Roof

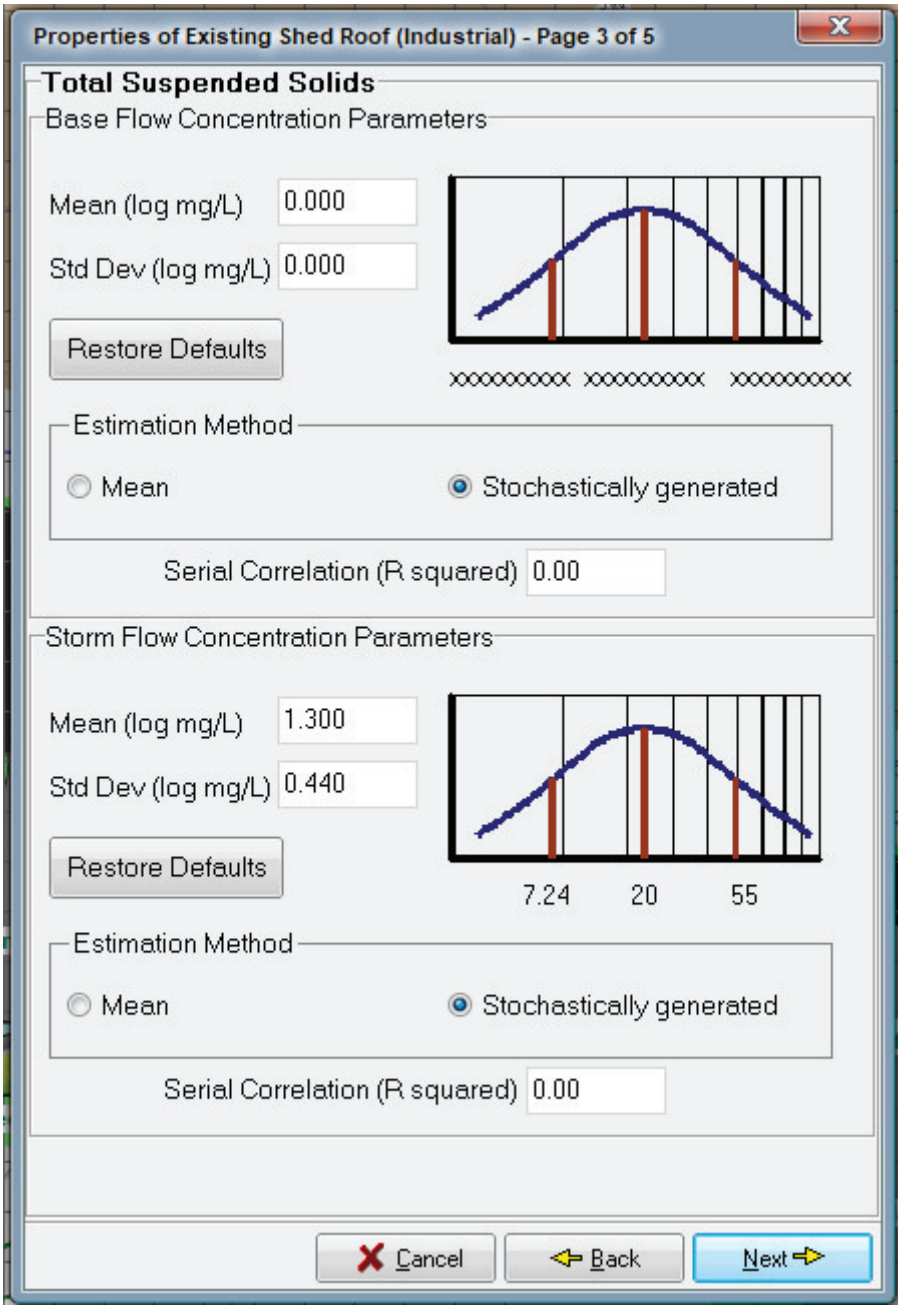


Existing Shed Roof

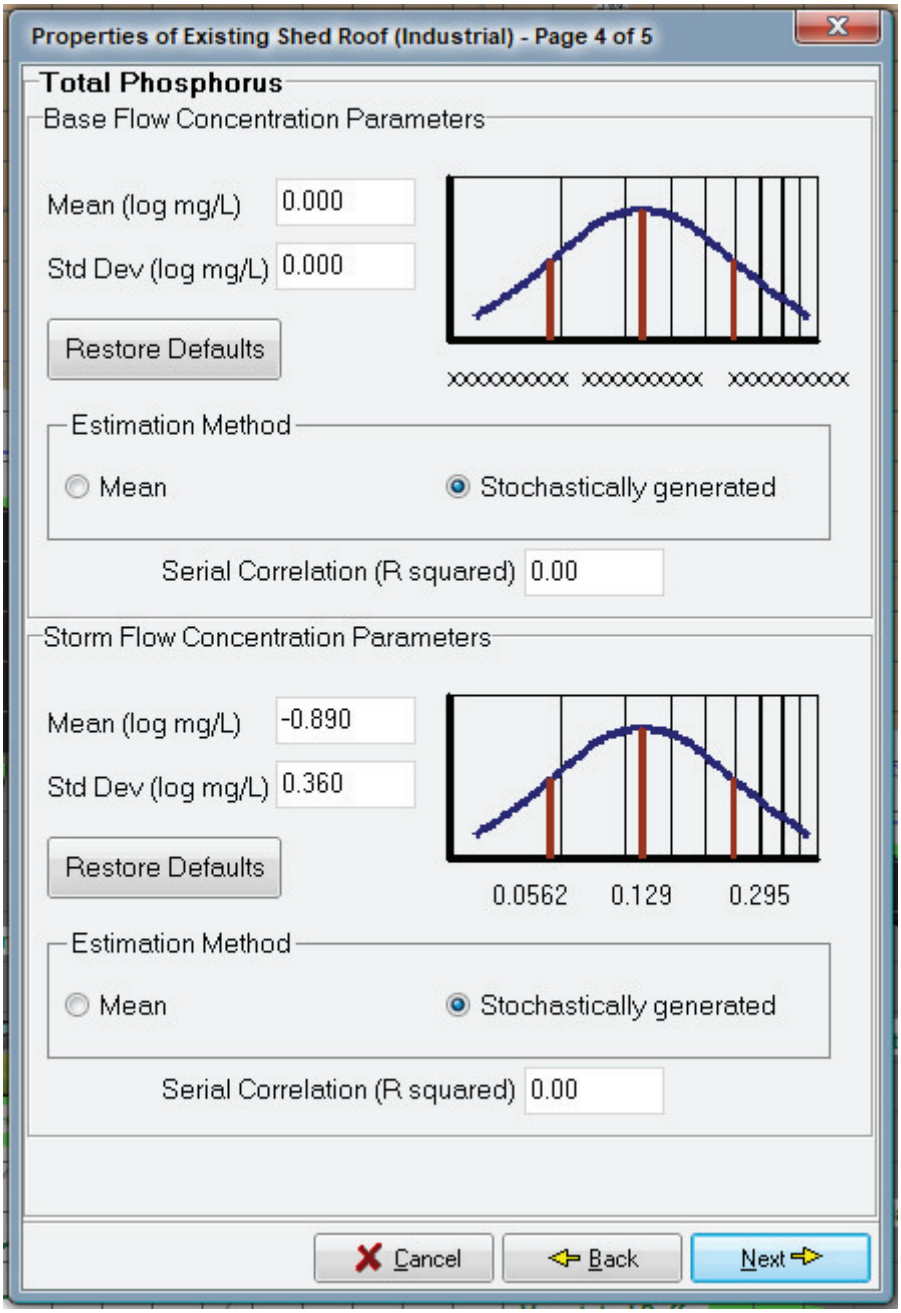


B3 Pollution Inputs

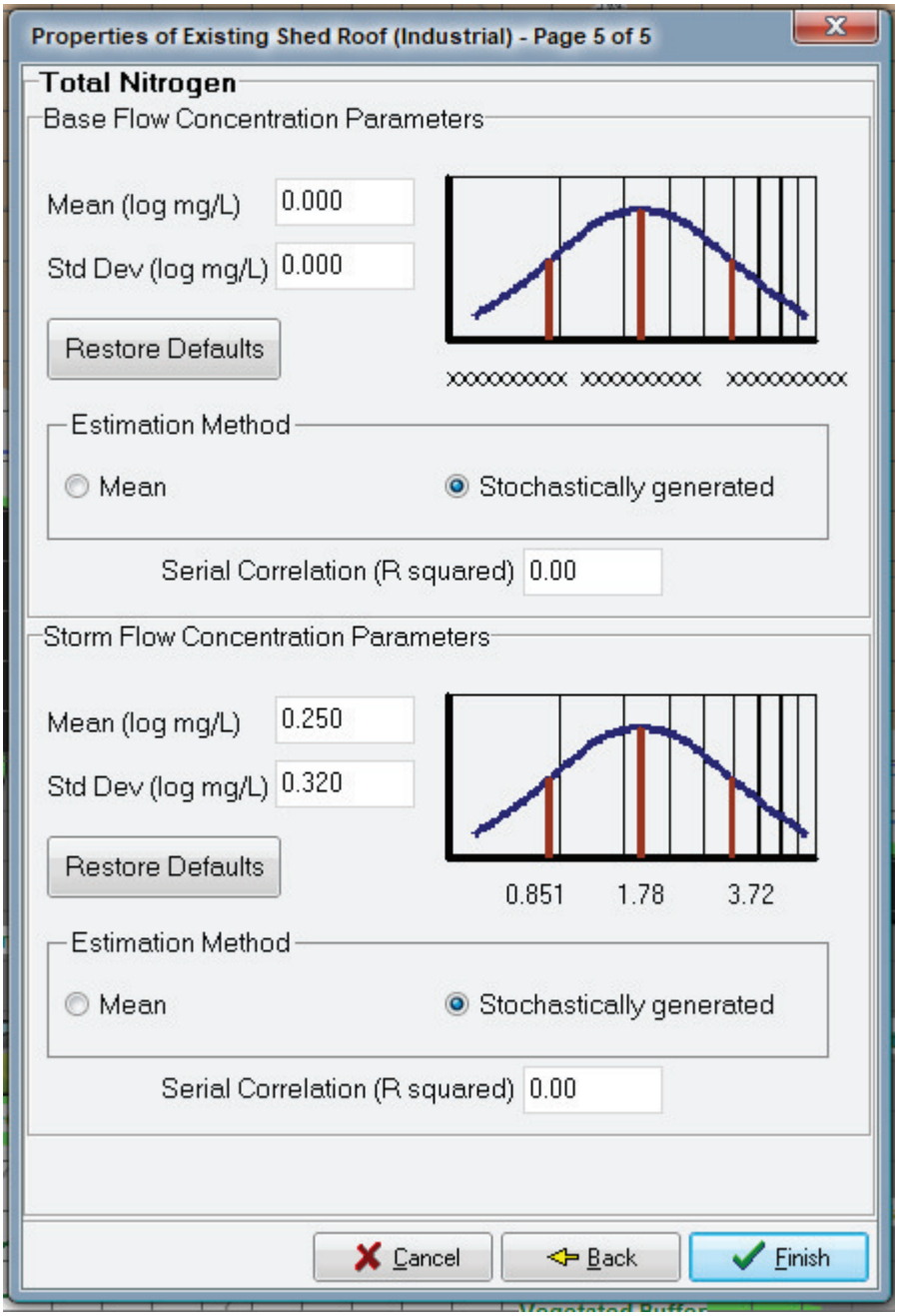
B3.1 Industrial Roof Total Suspended Solids (TSS) Input



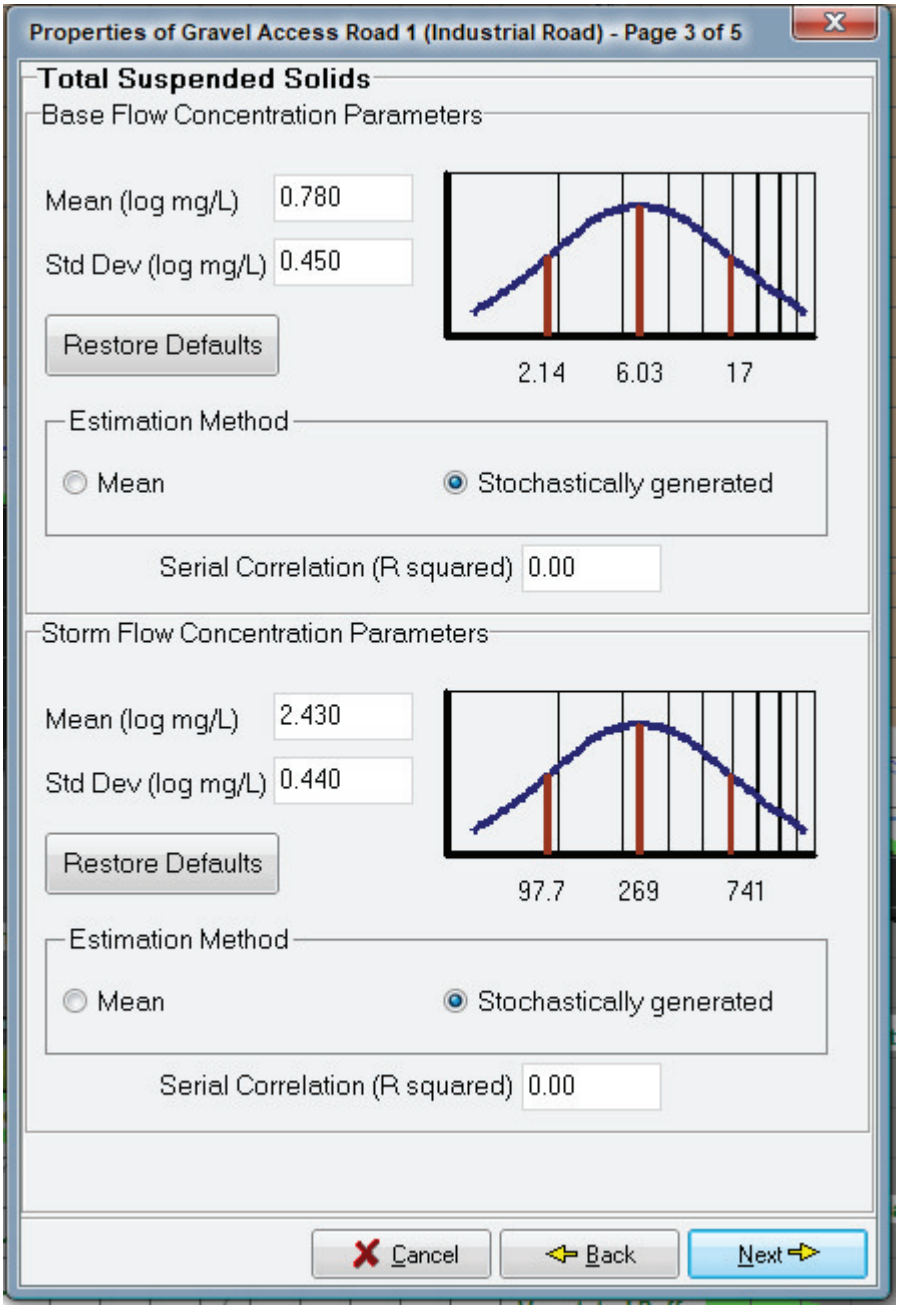
B3.2 Industrial Roof Total Phosphorus Input



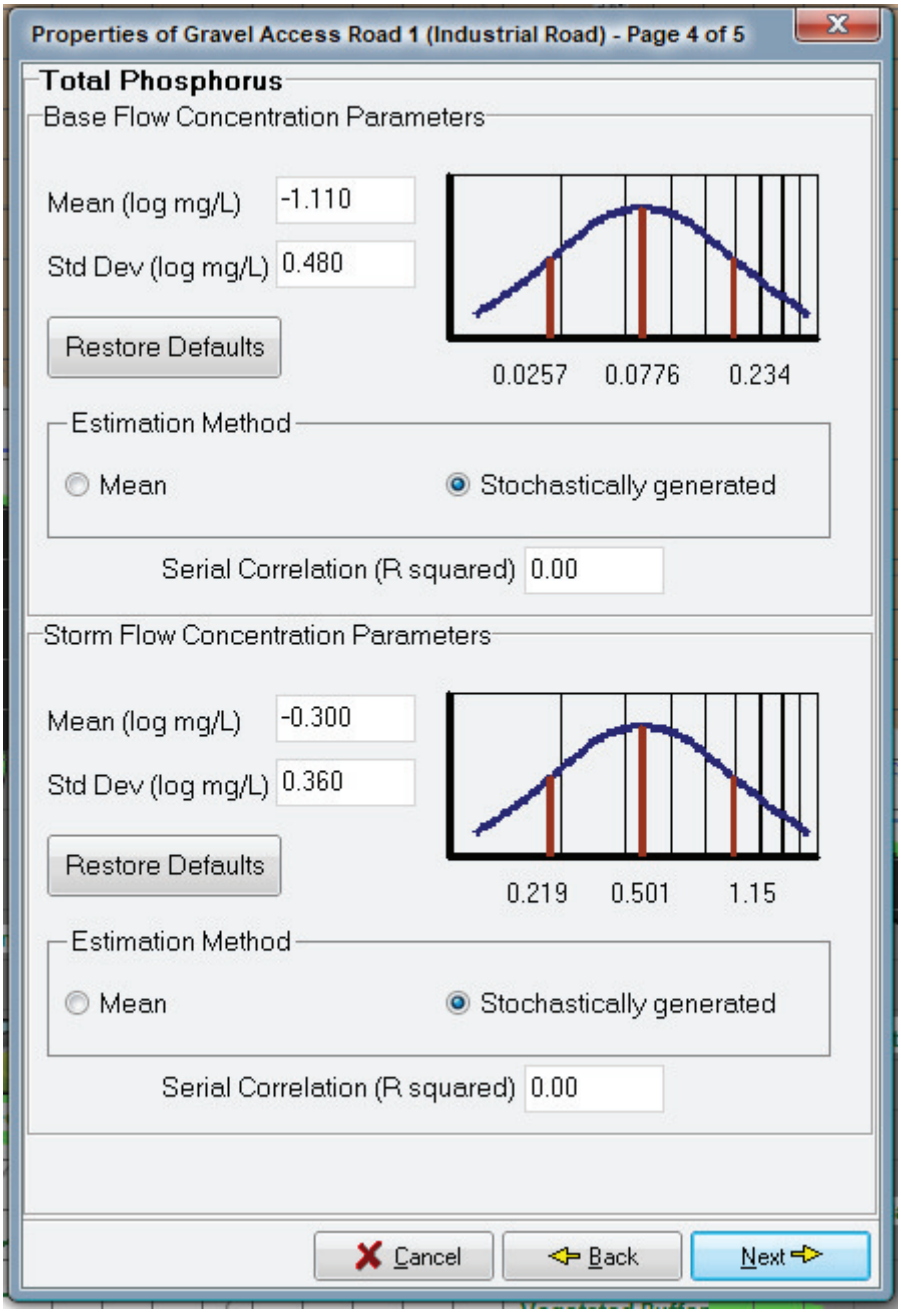
B3.3 Industrial Roof Total Nitrogen Input



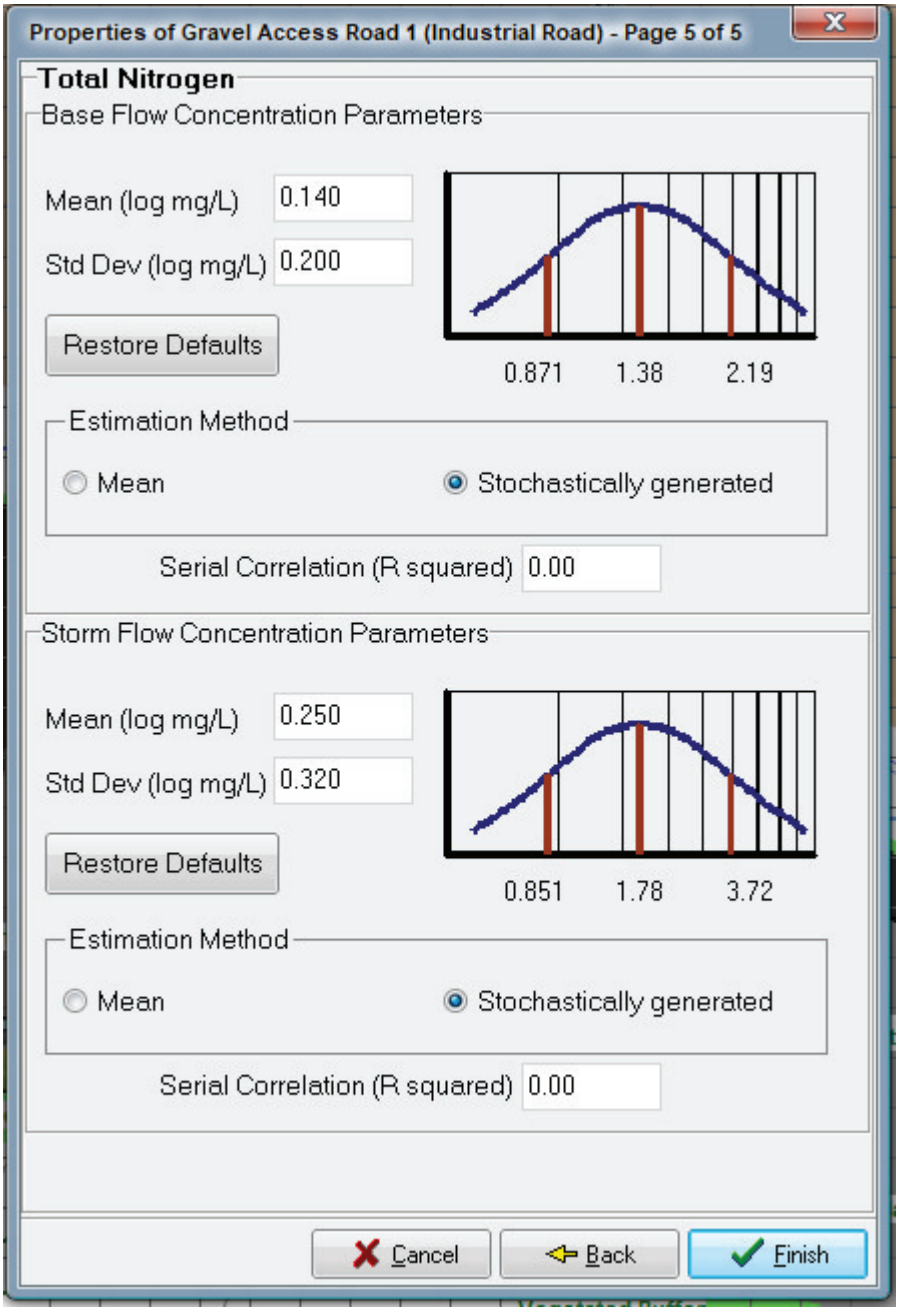
B3.4 Industrial Road Total Suspended Solids Input



B3.5 Industrial Road Total Phosphorus Solids Input

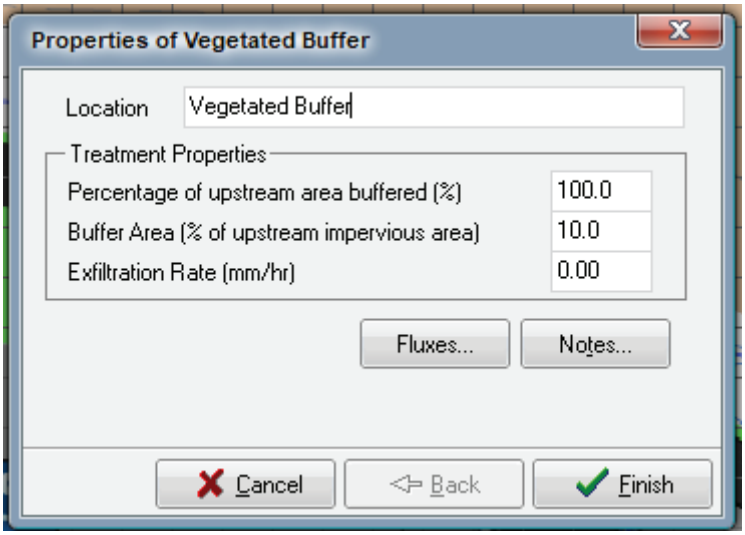


B3.6 Industrial Road Total Nitrogen Input

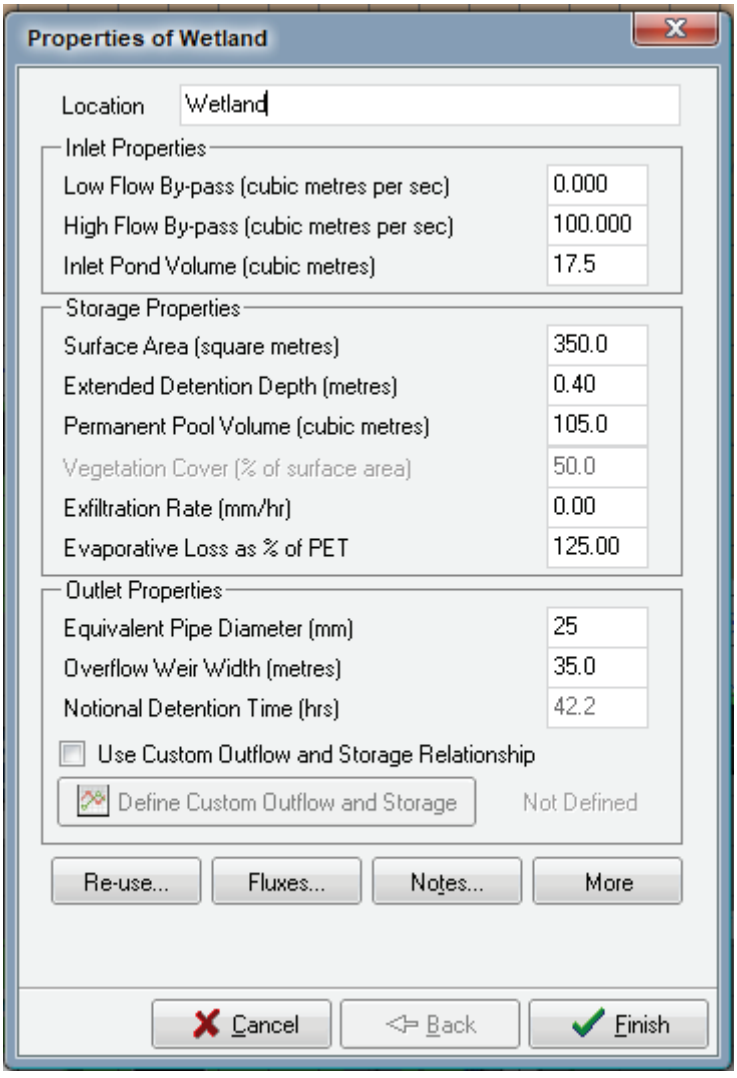


B4 Treatment Train Parameters

B4.1 Vegetated Buffer Parameters



B4.2 Wetland Parameters



Appendix C – Stormwater Quantity

C1 Pre-Development Catchment Details

C1.1 Time of Concentration

Friends Equation - Pre-developed				
L		S	t	tc= (107.n.L^0.333) / S^0.2
m	n	%	minutes	
50	0.035	1	13.79	
Mannings n = 0.035 for pasture				

NOTE:

- Total Length of flow to reach depression is 50m
- Time of Concentration of 14 minutes was adopted.

C1.2 Catchment Hydrology

Q= F*C*I*A

PRE DEVELOPED CATCHMENT TO DEPRESSION						TC=	14	min		
Development Area		2.4875	ha							
	F	C	I	A	Q					
	sq kms	co eff	mm/hr	sq kms	m3/sec			Fi	0.000	
Q2	0.278	0.595	90.9	0.02488	0.3742			$^1I_{10}$	62.96	mm/hr
Q5	0.278	0.665	117.3	0.02488	0.5393			C_{10}	0.700	
Q10	0.278	0.7	133.6	0.02488	0.6469			From QUDM T4.5.4		
Q20	0.278	0.735	155.6	0.02488	0.7907					
Q50	0.278	0.805	185.5	0.02488	1.0326					
Q100	0.278	0.84	209.2	0.02488	**1.2153**					

NOTE:

- Pre-developed impervious area is zero
- C_{10} value of 0.7 selected from QUDM table 4.5.4 for low permeability soil (clay/wetlands area) and medium vegetation

C2 Post-Development Catchment Details

C2.1 Time of Concentration

Friends Equation - Post-developed				
L		S	t	tc= (107.n.L^0.333) / S^0.2
m	n	%	minutes	
50	0.015	0.5	6.79	
+75m in Channel - 4 minutes at 0.5% in blade cut channel				
Mannings n = 0.026 for gravel (Brisbane City Council guidelines)				

NOTE:

- Total Length of flow is 125m
  - 50m of flow is sheet flow over the gravel hardstand
  - 75m of flow in Table drain/channel travel time of 4 minutes adopted from QUDM Figure 4.8
- Time of Concentration of 11 minutes was adopted.

C2.2 Catchment Hydrology

Q=	F*C*I*A								
POST DEVELOPED CATCHMENT TO DEPRESSION					TC=	11	min		
Development Area		3.075	ha						
	F	C	I	A	Q				
	sq kms	co eff	mm/hr	sq kms	m3/sec		Fi	0.239	
Q2	0.278	0.564	100.4	0.03075	0.4838		$^1I_{10}$	62.96	mm/hr
Q5	0.278	0.630	129.8	0.03075	0.6996		C_{10}	0.664	
Q10	0.278	0.664	148.2	0.03075	0.8408		From QUDM T4.5.3		
Q20	0.278	0.697	172.8	0.03075	1.0292				
Q50	0.278	0.763	206.4	0.03075	1.3465				
Q100	0.278	0.796	233.1	0.03075	**1.5863**				

NOTE:

- Post-developed impervious area is 7338m^2
- C_{10} value of 0.664 selected from QUDM table 4.5.3

C3 Post-Development Catchment to Wetlands

C3.1 Catchment Hydrology

Q=	F*C*I*A								
Post Developed to Wetland					TC=	20	min		
		1.126	ha						
	F	C	I	A	Q				
C1	sq kms	co eff	mm/hr	sq kms	m3/sec		Fi	0.652	
Q2	0.278	0.6766	77.7	0.01126	0.1646		$^1I_{10}$	62.96	mm/hr
Q5	0.278	0.7562	99.8	0.01126	0.2362		C_{10}	0.796	
Q10	0.278	0.796	113.4	0.01126	0.2826				
Q20	0.278	0.8358	131.8	0.01126	0.3448				
Q50	0.278	0.9154	156.7	0.01126	0.4491				
Q100	0.278	0.9552	176.5	0.01126	**0.5278**				

NOTE:

- Impervious area is 7338m^2
- C_{10} value of 0.796 selected from QUDM table 4.5.3

C4 Detention Calculations

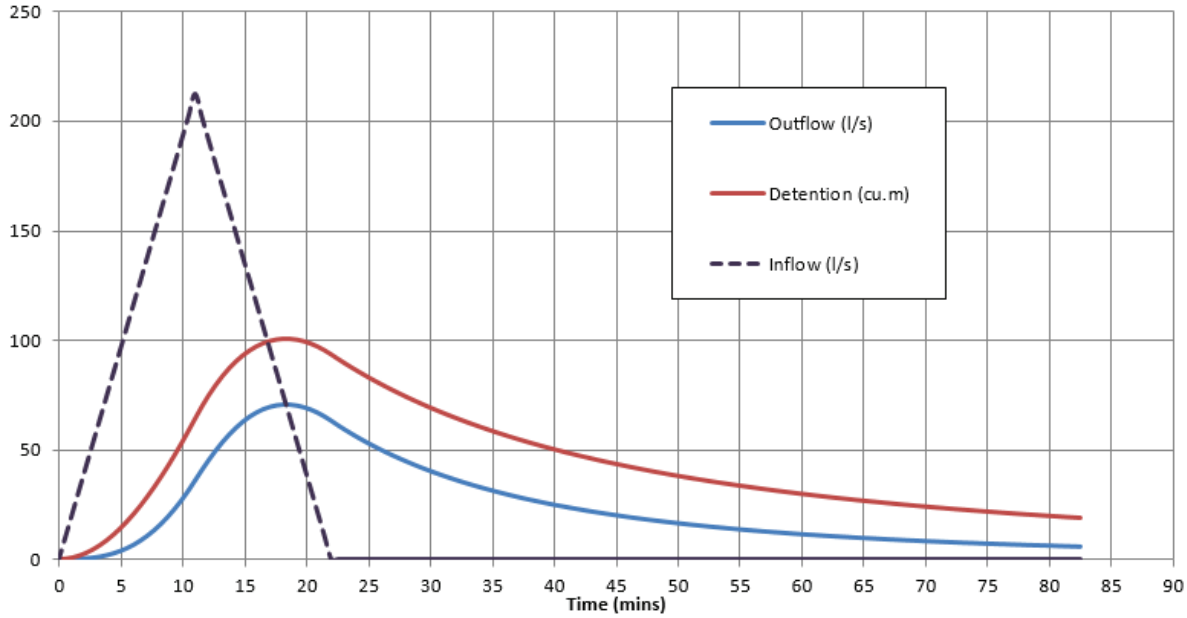
C4.1 Basin Details

- Surface Area = 800m^2
- Outlet Weir Width = 0.4m
- Weir Coefficient = 0.715 (for freefall from channel or weir)
- Height of Bund = 0.4m

C4.2 Minor (Q2) Event Detention Hydrograph

Q2 HYDROGRAPH FOR DETENTION BASIN			
TIME (sec)	INFLOW (Cu.mecs)	OUTFLOW (Cu.Mecs)	Detention (l)
165	0.053	0.001	4384.0
330	0.106	0.005	17174.2
495	0.159	0.016	37498.0
660	0.213	0.036	64062.9
825	0.159	0.057	86979.1
990	0.106	0.068	98417.6
1155	0.053	**0.070**	100002.3
1320	0.000	0.063	93276.1
1485	0.000	0.054	83679.0
1650	0.000	0.046	75490.5
1815	0.000	0.040	68447.8
1980	0.000	0.034	62346.8
2145	0.000	0.030	57026.6
2310	0.000	0.027	52359.5
2475	0.000	0.023	48242.8
2640	0.000	0.021	44593.2
2805	0.000	0.019	41342.7
2970	0.000	0.017	38435.1
3135	0.000	0.015	35823.8
3300	0.000	0.014	33469.9
3465	0.000	0.012	31340.6
3630	0.000	0.011	29408.3
3795	0.000	0.010	27649.3
3960	0.000	0.009	26043.5
4125	0.000	0.009	24573.7
4290	0.000	0.008	23224.9
4455	0.000	0.007	21984.2
4620	0.000	0.007	20840.3
4785	0.000	0.006	19783.4
4950	0.000	0.006	18805.0

Q2 HYDROGRAPH FOR DETENTION BASIN



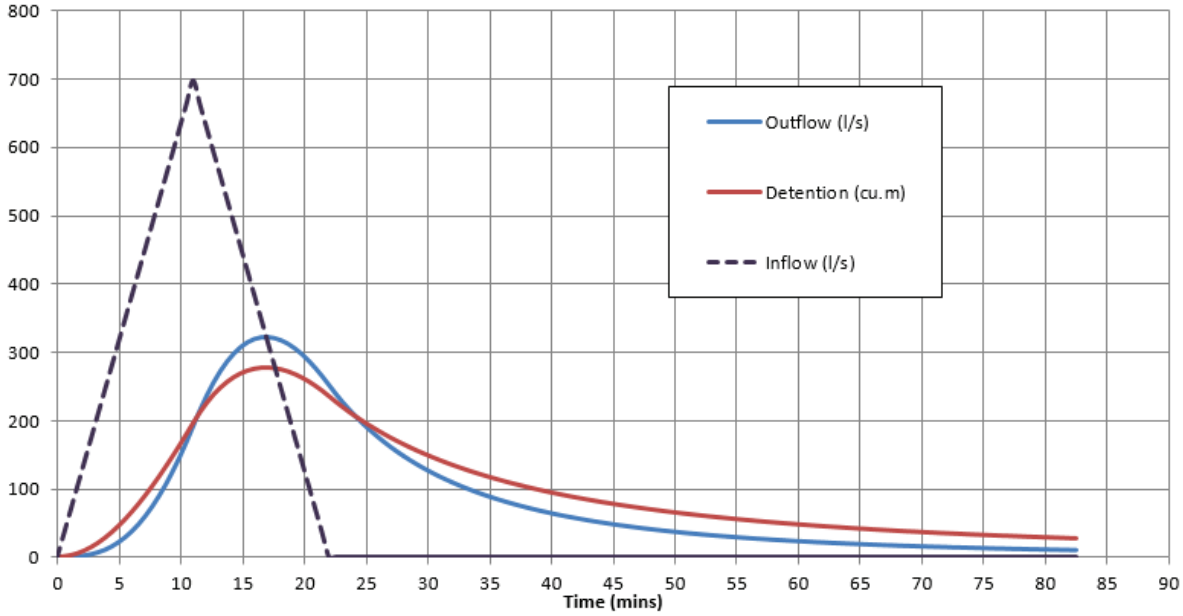
NOTE:

- Maximum Inflow of 212l/s at 660 seconds (11 minutes)
- Maximum Outflow of 70l/s at 1155 seconds (19.25 minutes)
- Maximum Detention Volume 100.5m^3 at 126mm depth
- 142l/s peak discharge reduction.

C4.3 Major (Q100) Event Detention Hydrograph

Q100 HYDROGRAPH FOR DETENTION BASIN			
TIME (sec)	INFLOW (Cu.mecs)	OUTFLOW (Cu.Mecs)	Detention (l)
165	0.174	0.004	14304.3
330	0.348	0.029	55253.9
495	0.523	0.090	118019.3
660	0.697	0.192	196078.7
825	0.523	0.287	256309.9
990	0.348	0.323	276997.3
1155	0.174	0.306	267523.3
1320	0.000	0.253	235275.1
1485	0.000	0.196	198526.0
1650	0.000	0.155	169761.4
1815	0.000	0.125	146825.0
1980	0.000	0.102	128242.1
2145	0.000	0.084	112976.7
2310	0.000	0.070	100283.7
2475	0.000	0.059	89615.8
2640	0.000	0.051	80564.0
2805	0.000	0.043	72817.7
2970	0.000	0.038	66137.3
3135	0.000	0.033	60335.8
3300	0.000	0.029	55265.6
3465	0.000	0.025	50808.7
3630	0.000	0.022	46870.1
3795	0.000	0.020	43372.3
3960	0.000	0.018	40252.0
4125	0.000	0.016	37456.7
4290	0.000	0.014	34942.9
4455	0.000	0.013	32673.8
4620	0.000	0.012	30618.9
4785	0.000	0.011	28751.9
4950	0.000	0.010	27050.6

Q100 HYDROGRAPH FOR DETENTION BASIN



NOTE:

- Maximum Inflow of 697l/s at 660 seconds (11 minutes)
- Maximum Outflow of 323l/s at 1155 seconds (19.25 minutes)
- Maximum Detention Volume 277.3m^3 at 347mm depth
- 374l/s peak discharge reduction.

Appendix D – Stormwater Drawings

- D16.150-SK11
- D16.150-SK12
- D16.150-SK13
- D16.150-SK14

Q= F*C*I*A

PRE DEVELOPED CATCHMENT TO DEPRESSION TC= 14 min

Development Area **2.4875** ha

	F sq kms	C co eff	I mm/hr	A sq kms	Q m3/sec
Q2	0.278	0.595	90.9	0.02488	0.3742
Q5	0.278	0.665	117.3	0.02488	0.5393
Q10	0.278	0.7	133.6	0.02488	0.6469
Q20	0.278	0.735	155.6	0.02488	0.7907
Q50	0.278	0.805	185.5	0.02488	1.0326
Q100	0.278	0.84	209.2	0.02488	**1.2153**

Fi	0.000	
$^1I_{10}$	62.96	mm/hr
C_{10}	0.700	

From QUDM T4.5.4

Friends Equation - Pre-developed

L m	n	S %	t minutes
50	0.035	0.85	14.25

$$tc = \frac{(107.n.L^{0.333})}{S^{0.2}}$$

Mannings n = 0.033 for grass

PRE-DEVELOPED CATCHMENT TO DEPRESSION

LOT 93
PL4022

50m SHEET FLOW TO DEPRESSION

EXISTING GRAVEL ACCESS

NINE MILE ROAD

LEGEND

- EXISTING BUILDINGS
- MAPPED WETLANDS
- 8.5 EXISTING CONTOUR
- // EXISTING FENCE LINE
- EO EXISTING OVERHEAD ELECTRICITY AND POLE
- EXISTING FLOW PATH

SCALE

0 5 10 15 20 1:1000
DESCRIPTION

REV	REVISION	DATE
A	MCU APPLICATION - SWMP	28/06/2017

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Approved	GEOFF SIMMERS
RPEQ	4585
Sign	

G K AND L R THOMPSON
MCU FOR TRANSPORT DEPOT AND SAND QUARRY
LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY
PRE-DEVELOPED STORMWATER CATCHMENTS (LOT 93)

D16.150-SK11

SHEET 01 OF 04

A

Q= F*C*I*A

POST DEVELOPED CATCHMENT TO DEPRESSION TC= 11 min

Development Area 3.075 ha

	F sq kms	C co eff	I mm/hr	A sq kms	Q m3/sec
Q2	0.278	0.563993659	100.4	0.03075	0.4838
Q5	0.278	0.630345854	129.8	0.03075	0.6996
Q10	0.278	0.663521951	148.2	0.03075	0.8408
Q20	0.278	0.696698049	172.8	0.03075	1.0292
Q50	0.278	0.763050244	206.4	0.03075	1.3465
Q100	0.278	0.796226341	233.1	0.03075	**1.5863**

Fi	0.239	
$^{T}I_{10}$	62.96	mm/hr
C_{10}	0.664	

From QUDM T4.5.3

SUB CATCHMENT - DEVELOPMENT TO WETLAND

Q= F*C*I*A

Post Developed to Wetland TC= 11 min

1.126 ha

C1	F sq kms	C co eff	I mm/hr	A sq kms	Q m3/sec
Q2	0.278	0.6766	100.4	0.01126	0.2125
Q5	0.278	0.7562	129.8	0.01126	0.3073
Q10	0.278	0.796	148.2	0.01126	0.3694
Q20	0.278	0.8358	172.8	0.01126	0.4521
Q50	0.278	0.9154	206.4	0.01126	0.5915
Q100	0.278	0.9552	233.1	0.01126	**0.6969**

Fi	0.652	
$^{T}I_{10}$	62.96	mm/hr
C_{10}	0.796	

Friends Equation - Post-developed

L m	n	S %	t minutes
50	0.015	0.5	6.79

$$tc = \frac{(107.n.L^{0.333})}{S^{0.2}}$$

+75m in Channel - 4 minutes at 0.5% in blade cut channel

Mannings n = 0.026 for gravel (Brisbane City Council guidelines)

PROPOSED TABLE DRAIN

PROPOSED COVERED MAINTENANCE AREA

PROPOSED WASHDOWN BAY

EXISTING SHED

ROCK OUTLET SCOUR PROTECTION

750mm WIDE OUTLET WEIR

BUND

PROPOSED 800m² WETLAND/DETENTION BASIN

75.0m CHANNEL FLOW

50.0m SHEET FLOW

PROPOSED TABLE DRAIN

DRAIN

SUB-CATCHMENT TO WETLAND/DETENTION BASIN

POST DEVELOPED CATCHMENT TO DEPRESSION

LOT 93 PL4022

NINE MILE ROAD

A SK14

B SK14

LEGEND

- EXISTING OVERHEAD ELECTRICITY (LINE, POLE & STAY)
- EXISTING FENCE
- EXISTING BUILDINGS
- MAPPED WETLANDS
- PROPOSED GRAVEL HARDSTAND AREA PLANT AND MATERIALS STORAGE
- PROPOSED 6.0m WIDE GRAVEL ACCESS ROAD/VEHICLE MANEUVERING
- POST DEVELOPMENT CATCHMENT
- PROPOSED GRASSED BATTERS AND DRAINS
- PROPOSED WASHDOWN BAY
- PROPOSED BUILDING
- PROPOSED RETAINING WALL (UP TO 2.0m HIGH)
- PROPOSED FLOW PATH
- 8.5 EXISTING CONTOUR

SCALE

0 5 10 15 20 1:1000

DESCRIPTION

REV	REVISION	DATE
A	MCU APPLICATION - SWMP	28/06/2017

DILEIGH CIVIL / STRUCTURAL DESIGN & PROJECT MANAGEMENT

ACN 121 309 171
47 Normanby Street
Yeppoon, Queensland 4703

Phone: 07 49112553
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Drawn by	CER
Checked by	ACD
Approved	GEOFF SIMMERS
RPEQ	4585
Sign	30-6-17

G K AND L R THOMPSON

MCU FOR TRANSPORT DEPOT AND SAND QUARRY

LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY

POST DEVELOPED STORMWATER CATCHMENTS

D16.150-SK12

SHEET 02 OF 04

A

N

GRAVEL ACCESS ROAD1
AREA = 0.246ha
55% IMPERVIOUS

HARDSTAND AREA1
AREA = 0.288ha
65% IMPERVIOUS

PROPOSED COVERED MAINTENANCE AREA

PROPOSED WASHDOWN BAY

PROPOSED 800m² WETLAND/DETENTION BASIN

GRAVEL ACCESS ROAD2
AREA = 0.210ha
70% IMPERVIOUS

EXISTING SHED

HARDSTAND AREA2
AREA = 0.327ha
71% IMPERVIOUS

LOT 93
PL4022

NINE MILE ROAD

LEGEND

- EXISTING OVERHEAD ELECTRICITY (LINE, POLE & STAY)
- EXISTING FENCE
- EXISTING BUILDINGS
- MAPPED WETLANDS
- PROPOSED GRAVEL HARDSTAND AREA PLANT AND MATERIALS STORAGE
- PROPOSED 6.0m WIDE GRAVEL ACCESS ROAD/VEHICLE MANEUVERING
- POST DEVELOPED SUB-CATCHMENT
- PROPOSED GRASSED BATTERS AND DRAINS
- PROPOSED WASHDOWN BAY
- PROPOSED BUILDING
- PROPOSED RETAINING WALL (UP TO 2.0m HIGH)
- EXISTING CONTOUR

SCALE
0 5 10 15 20
DESCRIPTION
1:1000

REV	REVISION	DATE
A	MCU APPLICATION - SWMP	28/06/2017

DILEIGH
CIVIL / STRUCTURAL DESIGN & PROJECT MANAGEMENT

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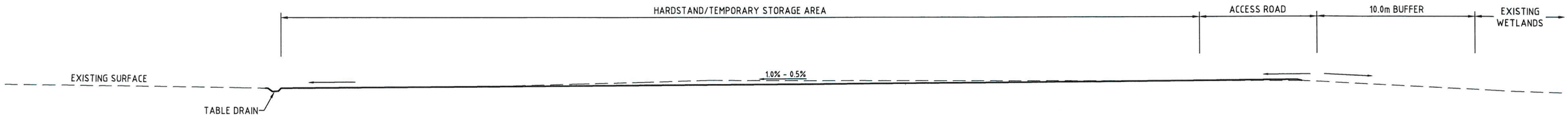
MCU FOR TRANSPORT DEPOT AND SAND QUARRY
LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY
MUSIC SUB-CATCHMENTS

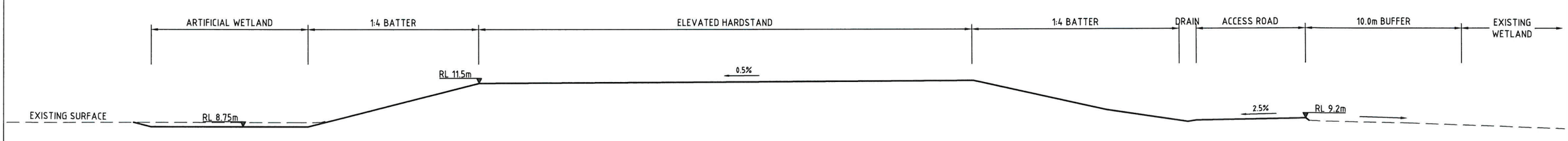
D16.150-SK13

SHEET 03 OF 04

A



SECTION B SK12



SECTION A SK12

SCALE

0 1.25 2.5 3.75 5 1:250

DESCRIPTION

REV	REVISION	DATE
A	MCU APPLICATION - SWMP	28/06/2017

DILEIGH
CIVIL / STRUCTURAL DESIGN & PROJECT MANAGEMENT

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Sign	30-6-17

G K AND L R THOMPSON

MCU FOR TRANSPORT DEPOT AND SAND QUARRY

LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY

SITE SECTIONS (LOT 93)

D16.150-SK14

SHEET 4 OF 04

A

2017

DILEIGH

CIVIL / STRUCTURAL DESIGN & PROJECT MANAGEMENT

Geoff Simmers

FLOOD STUDY OF RIVERINE FLOODING FOR MCU FOR A TRANSPORT DEPOT AND SAND QUARRY ON LOTS 93 AND 96 ON PL4022 LOCATED AT NINE MILE ROAD, PINK LILY.

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Document Status					
Rev No.	Author	Reviewer	Approved For Issue		
			Name	Signature	Date
01	G. Simmers	A Doherty	G.B.A. Simmers RPEQ 4585		28/9/17

1. Background

Dileigh Consulting Engineers has been engaged by owners, Greg and Leonie Thompson, to undertake a flood study in relation to a proposed Transport Depot and Sand Quarry at Lots 93 and 96, Nine Mile Road, Pink Lily.

The properties are described as Lot 93 on PL4022 (proposed Transport Depot) and Lot 96 on PL4022 (proposed Sand Quarry) as shown on the MCU Site Concept Plan in **Appendix A**.

The Transport depot includes an existing shed plus earthworks for access roads, parking and temporary stockpile areas as well as an elevated hardstand for heavy vehicle parking above the 1 in 100 year flood level.

Both properties are affected by Riverine Flooding from the Fitzroy River during major flood events equal to or greater that the 1 in 10 year ARI (10% AEP) flood event. A Flood Study is therefore required to determine the effects of the works on flood behaviour and assess potential impacts thereof.

This report summarises the results of modelling of Riverine Flooding for the 1 in 100 year ARI (1% AEP) Defined Flood Event as required by the Rockhampton Region Planning Scheme 2015.

2. Report Objectives

The object of this report is to undertake a detailed flood study, prepared by a suitably qualified engineer, to assess the anticipated effect of the works on flood flows and flood levels in the vicinity of the proposed development, and assess any potential impacts on surrounding properties during Riverine Flooding from the Fitzroy River.

3. Flood Study

3.1 Site Characteristics – Pre Development

The Pink Lily area is generally flat with a gentle slope from north to south. The area is crossed by many old river and/or creek channels which now form drainage features, lagoons or wetland areas following wet weather and/or flooding.

A detailed survey was undertaken of the site, which includes some earthworks undertaken to date on Lot 93, as well as the Natural Surface levels and features outside of the earthworks area. The site consists of relatively flat but gently undulating topography which varies in surface level between RL 8.0m AHD and RL 9.25m AHD.

3.2 Site Characteristics – Post Development

A Site Concept Plan for the proposed uses is shown in Appendix A.

Lot 93 will contain the Transport Depot including the existing shed, access roads and temporary stockpile areas for the sand quarry, and an elevated hardstand area. Access roads connect from Nine Mile Road to the east of the site through to the Sand Quarry on Lot 96 to

the west. Access roads and stockpiles areas consist of slightly raised embankment typically 300 to 500mm higher than the natural surface level incorporating a gravel pavement. In the centre of the Transport Depot there will be an elevated embankment with finished surface level above the Q100 Defined Flood Event. This area will be used for heavy vehicle parking and minor plant maintenance activities associated with the transport depot.

Lot 96 will contain the Sand Quarry. The proposed sand extraction area generally follows a depression which runs east to west through the property between two ridges to the north and south of this depression. As the ground around the proposed sand extraction area falls away from the extraction area there is no requirement to install any bunding around the proposed extraction area. These would normally be installed to divert any surface water flows from entering the pit. In addition, any overburden is proposed to be transported away from site or stored below natural surface level in previously worked areas. Similarly, sand extracted will be stored within the pit at below natural surface level while it drains, prior to being carted off site.

3.3 Methodology

This Flood Study was undertaken using Rockhampton Regional Councils TUFLOW Model for Riverine Flooding from the Fitzroy River developed in 2014 by AECOM. This study incorporates natural surface levels obtained from Aerial Laser Surveys in 2009 and 2010.

The TUFLOW computer modelling was undertaken by subconsultants Aurecon Australia Pty Ltd with data output provided to Dileigh Consulting Engineers for plotting and reporting.

Modelling was undertaken for the Defined Flood Event (DFE) of a 100-year Average Recurrence Interval (ARI) flood, equivalent to a 1% Annual Exceedance Probability (AEP), as defined in the Rockhampton Region Planning Scheme 2015.

The following steps were completed:

- The constructed works consisting of earthworks to date were surveyed by a licenced surveyor to determine their actual levels.
- The design of the finished surface for the Transport Deport was completed.
- As the sand extraction area will not involve any bunding or storage of overburden or sand above the Natural Surface Levels, the sand quarry will not have any impact on flood flows, which will pass freely over the top of the pit after having initially filled the pit. Therefore, the sand extraction pit was ignored in the flood modelling.
- The design surface for the Transport Deport was forwarded to Aurecon to use as the Post-Development ground surface in the flood modelling.
- The TUFLOW model was run for a 100 year ARI flood for the Pre-Development Case using the ground surface in the model, which represents the pre-development ground surface.
- The TUFLOW model was run for a 100 year ARI flood for the Post-Development Surface, including the Transport Depot design surface, to determine the Post-Development flood conditions.

Based on the outcomes of the modelling, Aurecon generated the following output files:

Existing:
- Peak Water Level - H_G_FR_E10a_D1_12-100y-MHWS.asc
- Peak Depth - D_G_FR_E10a_D1_12-100y-MHWS.asc
- Peak velocity - V_G_FR_E10a_D1_12-100y-MHWS.asc

Afflux results:
- Afflux (Developed – Existing) - A_G_FR_D04_E10_D1_12-100y-MHWS.asc
- Afflux, areas that were wet and now dry, areas that were dry and now wet - A_G_FR_D04_E10_D1_12-100y-MHWS_wd.asc

The following drawings have been generated by plotting the data output files over the DCDB map of the area:

- **Peak Flood Levels** (Pre and Post Development) with contours of equal flood levels shown:
  - D15.059-FS-01 "100 Year ARI Peak Flood Levels Pre & Post Development"
- **Afflux** (Increase in flood level from Pre to Post Development) with contours of equal afflux shown:
  - D15.059-FS-02 "100 Year ARI Flood Afflux Pre-Post Development"
- **Peak Flood Velocities** (Pre and Post Development) on a grid pattern as output by TUFLOW:
  - D15.059-FS-03 "100 Year ARI Peak Velocities Pre Development"
  - D15.059-FS-04 "100 Year ARI Peak Velocities Post Development"

Copies of these drawings are provided in **Appendix B** of this report.

3.4 Pre-Development Flood Conditions – Defined Flood Event

3.4.1 Pre-Development Peak Flood Levels

The Fitzroy River overtops its banks and breaks out of the river channel approximately 4km north of the site and travels generally south as overland flow through the gently sloping Pink Lily area towards Fairy Bower. At the peak of the flood the water surface level is predicted to be at approximately 10.9m AHD, resulting in a depth of flow of around 2m at the site. (Refer Drawing D15.059-FS-01 in **Appendix B**).

3.4.2 Pre-Development Peak Flood Velocities

Pre-Development peak flood velocities through the area are quite low due to the relatively gentle gradient through the area. Across the subject property velocities are predicted to range between 0.5 and 0.8m/s. Predicted peak velocities on surrounding properties to generally range between 0.4m/s and 0.8m/s with isolated points of slightly higher velocity up to 1.108m/s which appear to be associated with flow concentration and/or turbulence generated around some of the drainage features and old river channels which run through the area. The highest predicted pre-development velocity within 500m of the site is 1.108m/s on Lot 92 SP120229 immediately to the east of Nine Mile Road. (Refer Drawing D15.059-FS-03 in **Appendix B**)

3.5 Post Development Flood Conditions – Defined Flood Event

3.5.1 Post Development Flood Levels

Post Development peak flood levels are also shown on Drawing D15.059-FS-01 in **Appendix B**.

In addition, the predicted flood affluxes (change in peak water levels from pre to post development) have been plotted and contours of equal afflux plotted. These are shown on Drawing D15.059-FS-02 in **Appendix B**.

Based on the results of the flood modelling:

- There are no new areas of flooding predicted as a result of the filling.
- Within the development site, the maximum flood afflux predicted is 40mm at the northern edge of the proposed fill. This reduces to a maximum 13mm afflux at the northern property boundary.
- External to the development site:
  - The property immediately to the north of the development (Lot 11 LN504), is predicted to experience a maximum afflux of 13mm at the common boundary, reducing to less than 10mm within 50m of north the boundary and 3mm at the northern boundary.
  - All other properties to the west, north and east are predicted to experience very minor affluxes of less than 10mm, and in most cases less than 5mm.
  - It is noted that all areas outside the subject property that experience greater than 10mm of afflux are within the Mapped Wetland areas.
  - Properties to the south of the development are predicted to experience decreases in water levels of up to 7mm.

3.5.2 Post Development Flood Velocities

Peak pre-development and post-development flood velocities for the surrounding area are shown on a grid pattern on Drawing Numbers D15.059-FS-03 and D15.059-FS-04 in **Appendix B**.

Comparing the pre-development and post-development velocities, the development has resulted in minor localised increases and decreases within the development property and in the nearby surrounding properties. The worst affected points are typically at the fringes of the fill where the flow concentrates around the fill.

Within the development property on the western and eastern sides of the fill the flow velocity has typically increased from 0.8m/s to 0.9m/s.

External to the development properties:

- The predicted maximum velocity in the property immediately to the west (Lot 118 LN504) has increased from 0.77m/s to 0.78m/s.
- The predicted maximum velocity in the property immediately to the east across Nine Mile Road (Lot 92 SP120229) has increased from 1.108m/s to 1.115m/s.

- The predicted maximum velocity in the property immediately to the north (Lot 115 LN504) has increased from 0.732m/s to 0.741m/s.
- The predicted maximum velocities in the properties immediately to the south (Lots 95 PL4022 and Lot 3 RP609472) have decreased. In Lot 95 maximum velocity has decreased from 0.684m/s to 0.673m/s, while in Lot 3 maximum velocity has decreased from 0.743m/s to 0.721m/s.
- On properties further distant from the development the magnitude of the increases or decreases is similar or less than those of the immediately surrounding properties.
- The highest predicted post development velocity within 500m of the site is 1.115m/s on Lot 92 SP120229 immediately to the east of Nine Mile Road. This has increased from the pre-development velocity in this same location of 1.108m/s, an increase of 0.6% over the pre-development velocity at this point.

3.6 Potential Impacts from Riverine Flooding – Defined Flood Event

3.6.1 Flood Afflux Potential Impacts

Outside of the subject property, peak flood level increases are localised with limited magnitude and extent.

The maximum afflux external to the site is 13mm within the property immediately to the north, decreasing to less than 10mm within 50m north of the common boundary. All these affluxes greater than 10mm are restricted to within areas that are mapped as wetlands of high ecological significance, which would preclude any further development within these areas. All other properties predicted to experience affluxes are of 10mm or less.

All affluxes are less than the required 0.1m (100mm) required under the Rockhampton Regional Council "Flood Hazard Planning Scheme Policy - Development Assessment Requirements for Filling or Excavation" (SC6.11.4.3). Further, none of these affluxes are considered significant enough to have any material impact on these properties, particularly given the low flow velocities experienced in this area which are typically below 0.8m/s.

3.6.2 Flood Velocities and Potential Impacts

Generally small increases in peak flood velocities are predicted in the nearby surrounding properties but these are very minor. Peak velocities remain generally well below 1.0m/s and do not have the potential to cause any scouring or adverse effect on structures or buildings.

Isolated areas of influenced by drainage features and old river channels continue to have slightly higher velocities, as per the pre-development conditions, but any increases in these areas are also very minor, and not likely to have any adverse effects in these areas.

3.6.3 Roadway Flow Depth and Velocity Impacts – Nine Mile Road

North of the Edwards Road intersection there are minor increases in depth of up to 8mm on Nine Mile Road to the east of the development. At this point the pre-development flood

level is approximately 10.92m AHD and the road surface level is 9.68m AHD (from road design drawings provided by Rockhampton Regional Council). Therefore, the pre-development depth of flow at this point is 1.24m and this increases to approximately 1.25m post development. The corresponding pre and post development flood velocities at this point are 0.58m/s, decreasing to 0.55m/s post development. These points have been plotted on the Flood Hazard Category Graph in Figure 1 below (from Rockhampton Region Planning Scheme Figure SC6.10.3.2.1). It is noted that both pre and post flood hazard in this area are in the Extreme Hazard, and outside the depth capable of using the road by small or 4WD cars but within the "Wading Limit". There has therefore been no impact on the use of the Nine Mile Road north of Edwards Road as an evacuation route.

At the intersection of Nine Mile Road and Edwards Road there is an increase in flood velocity from 0.78m/s to 0.83m/s post development. The depth of flow at this point is approximately 10.87 – 9.59 = 1.28m. Plotting these depths and velocities on the Flood Hazard Category Graph in Figure 1 shows that at the intersection of Edwards Road, flood hazard is also in the Extreme Hazard category and outside "Wading Limit". This is the case for both pre and post development. Further south of Edwards Road there are even higher flow velocities, and the depth of flow also increases, making the use of the road south of Edwards Road not viable as an evacuation route even for wading. There has therefore been no impact on the use of the Nine Mile Road at Edwards Road and further south as an evacuation route as it is already not a safe evacuation route.

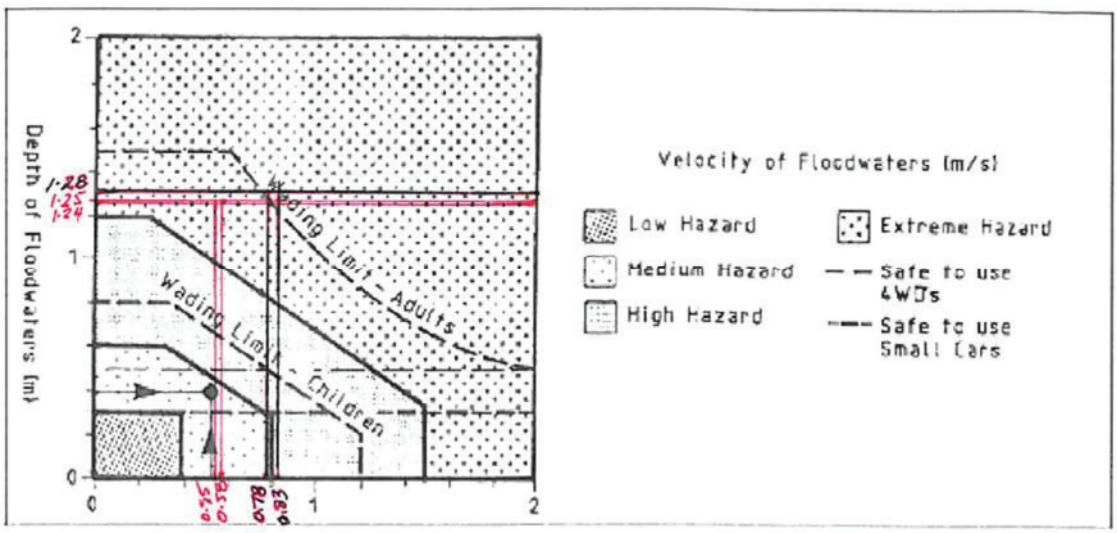

Figure 1 – Flood Hazard Classification on Nine Mile Road
(from Rockhampton Region Planning Scheme)
(Red = North of Edwards Road; Black = Edwards Road Intersection)

4. Conclusions

There are no new areas of flooding predicted from Riverine Flooding as a result of the proposed filling, with only minor localised effects predicted which include:

- Small affluxes (up to 13mm) in nearby properties which are all well below the maximum 100mm (0.1m) limit specified under the Rockhampton Regional Councils Flood Hazard Planning Scheme Policy - Development Assessment Requirements for Filling or Excavation" (SC6.11.4.3). It is further noted that all affluxes of 10mm or more are limited to the mapped wetlands of high ecological significance.

- Minor increases in flood velocity in adjacent properties to the east and west, however, increases are very small and velocities remain low and will not cause any scouring or adverse effect on structures or buildings.

- Small increases in depth of flow and velocity on the adjacent Nine Mile Road will not impact vehicle safety as the pre-existing conditions are already well in excess of safe limits for driving a car or 4WD through the flood waters (0.6m) and would require a road closure during a major storm. There is also no impact on the use of Nine Mile Road as an evacuation route.

All anticipated effects of the works on flood flows and flood levels in the vicinity of the proposed development are small and localised, and will not have any marked effect or influence on adjacent properties or roads. It is therefore concluded that the development will not impact surrounding properties during the 100 year ARI Riverine Flooding.

G.B.A. Simmers

BE(Hons), Grad Dip Mgt (Technology Management), MIEAust, CPEng, RPEQ, NER.

References

Queensland Urban Drainage Manual (2013)

Rockhampton Regional Council - Fitzroy River Flood Model (AECOM, 2014) under agreement with Rockhampton Regional Council.

Author Qualifications and Experience

Geoff Simmers has a Bachelor's Degree in Civil Engineering with First Class Honours obtained from the University of Queensland in 1984, majoring in hydrology and hydraulic engineering. Mr Simmers is A Certified Practicing Engineer in the area of Civil Engineering and specialises in the area of Water Engineering/Hydraulics/Hydrology. Mr Simmers is also a Registered Professional Engineer of Queensland.

Since graduating Mr Simmers has over 30 years experience, the majority of which has been in the water industry including:

- 5 Years as Design Engineer and Hydrologist with the Queensland Water Resources Commission designing irrigation channels, pipelines, drainage works and hydraulic structures, reviewing Queensland's stream gauging networks, and undertaking flood modelling of the Pioneer River and the proposed Tully Millstream Hydroelectric Scheme,
- 5 years with the Department of Primary Industries providing technical advice to Local Governments in Far North Queensland in regard to planning, design and operation of water infrastructure,
- 6 Years with the Mareeba Shire Council managing the Councils Water and Sewerage infrastructure including the planning, design and construction management of upgrades to reticulation and treatment facilities,
- 3 Years managing the SunWater Engineering Services in Mareeba including design and project management of the Mareeba-Dimbulah Irrigation Scheme upgrade, major water and sewerage infrastructure upgrades for the Johnstone Shire Council and drainage upgrades for the East Deeral Drainage Board,
- 8 years managing the SunWater Engineering Services in Rockhampton including design, operation and management of major water infrastructure in Central Queensland,
- Currently employed at Dileigh Consulting Engineers as Senior Civil Engineer where he leads the Civil Engineering section.

APPENDIX A – Proposed MCU Site Concept Plan

Dileigh Consulting Engineers Drawings D16.150-SK01 Rev C “Site Concept Plan”

N

PROPOSED SAND EXTRACTION AREA

LOT 96
PL4022

LOT 93
PL4022

10.0m BUFFER

PROPOSED COVERED MAINTENANCE AREA

EXISTING SHED

ELEVATED GRAVEL HARDSTAND
(APPROX RL 11.9m)

HEAVY VEHICLE
PARKING AREA

PROPOSED WETLAND
DETENTION BASIN
REFER SWMP

TEMPORARY
STOCKPILE AREA

STAFF
CARPARKING

PROPOSED 6.0m WIDE GRAVEL
ACCESS ROAD TO SAND
QUARRY AND VEHICLE DEPOT

WASHDOWN BAY

POWER POLE AND STAY

DRAIN

GATE

NINE MILE ROAD

EDWARDS RD

ACCESS CROSSOVER TO BE RELOCATED
CLEAR OF THE EDWARDS ROAD/NINE
MILE ROAD INTERSECTION

AREA SCHEDULE

SITE	AREA	18.497 ha
	CARPARKS	5
EXISTING SHED	SINGLE STOREY	
	MAXIMUM HEIGHT ABOVE GROUND LEVEL	4.5m
	GROSS FLOOR AREA	84m²
PROPOSED BUILD ENVELOPE	VEHICLE MAINTENANCE SHED (LENGTHxWIDTHxHEIGHT)	20mx15mx6m HIGH
SITE COVERAGE	EXISTING SHED	84m²
	PROPOSED SHED	300m²
	WASHDOWN BAY	46m²
	TOTAL	430m²
IMPERVIOUS AREAS	TOTAL GRAVEL HARDSTAND/INTERNAL ROAD	7623.9m²
	TOTAL SITE COVER	430m²
	TOTAL	8054m²
SAND EXTRACTION AREA	AREA	3.52ha

LEGEND

- 8.5 — PRE-DEVELOPED SITE CONTOUR
- EXISTING OVERHEAD ELECTRICITY (LINE, POLE & STAY)
- EXISTING FENCE
- EXISTING BUILDINGS
- MAPPED WETLANDS
- PROPOSED GRAVEL HARDSTAND AREA PLANT AND MATERIALS STORAGE
- PROPOSED 6.0m WIDE GRAVEL ACCESS ROAD/VEHICLE MANEUVERING
- PROPOSED SAND EXTRACTION AREA
- PROPOSED GRASSED BATTERS AND DRAINS
- PROPOSED WASHDOWN BAY (INCLUDING OIL SEPARATOR, SEDIMENT TRAP AND TANK FOR COLLECTION AND RE-USE WATER ON SITE)
- PROPOSED BUILDING
- PROPOSED RETAINING WALL (UP TO 2.0m HIGH)

NOTES

1. DEFINED FLOOD EVENT 1.0% AEP (1 IN 100 YEARS) FLOOD LEVEL APPROXIMATELY 10.968 AHD
2. PROPOSED ELEVATED GRAVEL HARDSTAND LEVEL APPROXIMATELY 11.9 AHD

DRAFT ISSUE
NOT FOR CONSTRUCTION

SCALE
0 10 20 30 40 1:2000
DESCRIPTION

REV	REVISION	DATE
A	DEHP PRE-LODGEMENT	19/06/2017
B	MCU APPLICATION	06/2017
C	MCU RFI RESPONSE	09/2017

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RPEQ	4585
Sign	

G K AND L R THOMPSON

MCU FOR TRANSPORT DEPOT AND SAND QUARRY
LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY
SITE CONCEPT PLAN

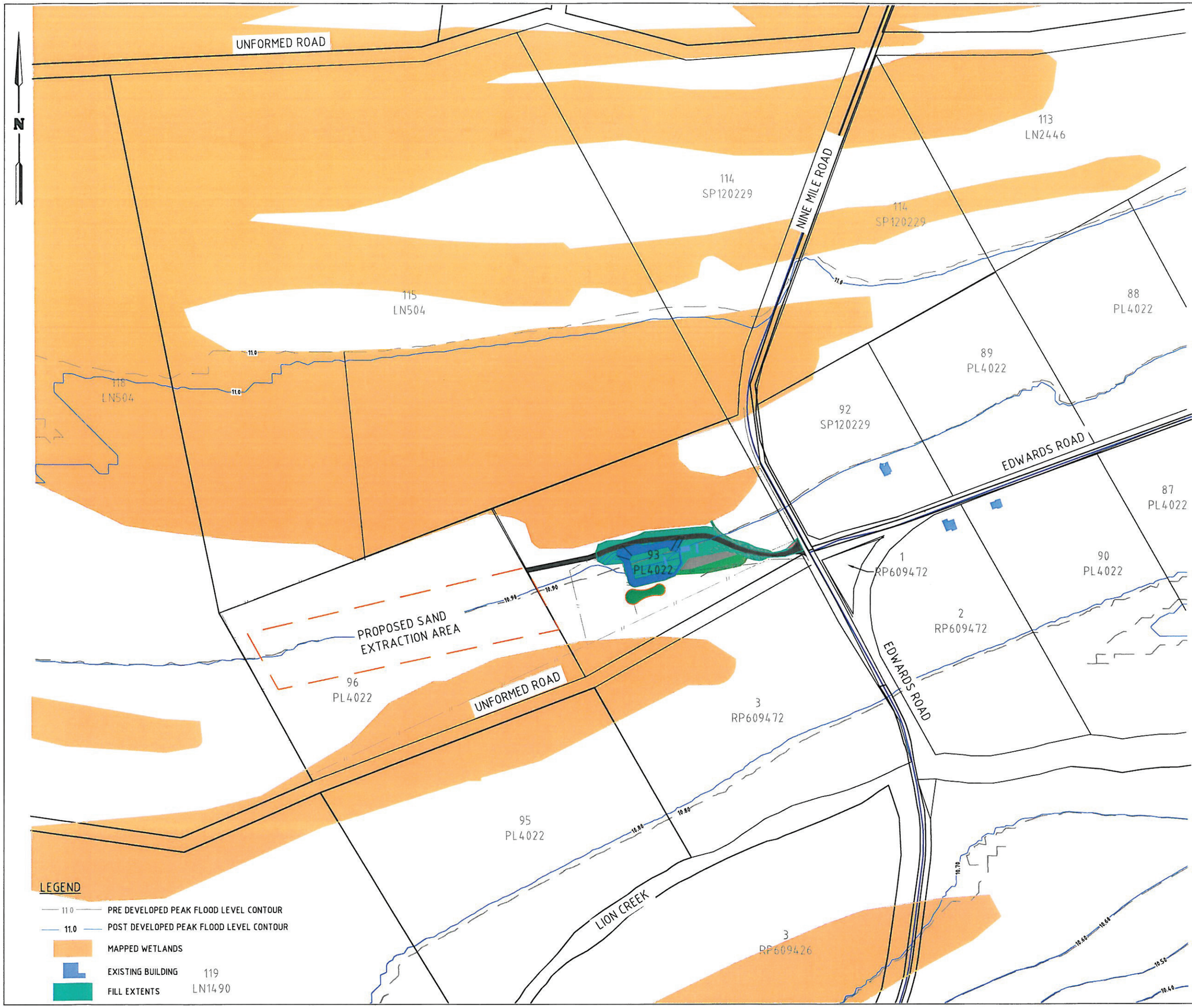
D16.150-SK01

SHEET 01 OF 02

A B C

Appendix B – Flood Model Output Drawings

- D15.059-FS-01 “100 Year ARI Peak Flood Levels Pre and Post Development”
- D15.059-FS-02 “100 Year ARI Flood Afflux Pre and Post Development”
- D15.059-FS-03 “100 Year ARI Peak Velocities Pre Development”
- D15.059-FS-04 “100 Year ARI Peak Velocities Post Development



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47 Normanby Street
Yeppoon, Queensland 4703
Phone: 07 49112553
Fax: 07 49383660
Email: admin@dileigh.com.au

REV	REVISION	DATE
A	FLOOD STUDY	09/2017

0 25 50 75 100 1:5000
DESCRIPTION

Drawn by	CER
Checked by	GBAS
Approved	GBA SIMMERS
RPEQ 4585	Signed 28-9-17

GK AND LR THOMPSON

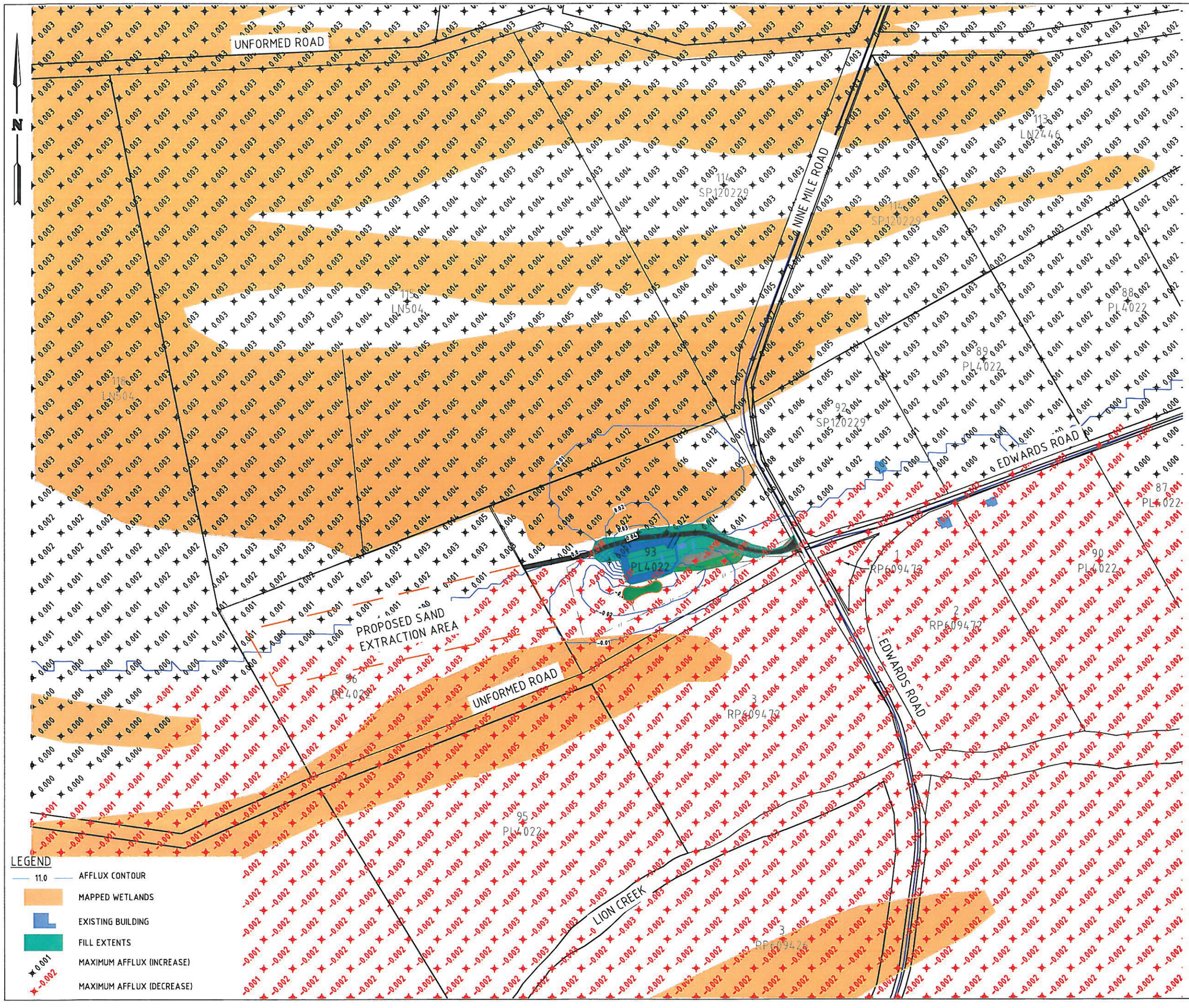
PROPOSED SITE DEVELOPMENT

LOT 93 NINE MILE ROAD, PINK LILY

100YR ARI PEAK FLOOD LEVELS PRE & POST DEVELOPMENT

D15.059-FS-01

SHEET 01 OF 04



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GK AND LR THOMPSON

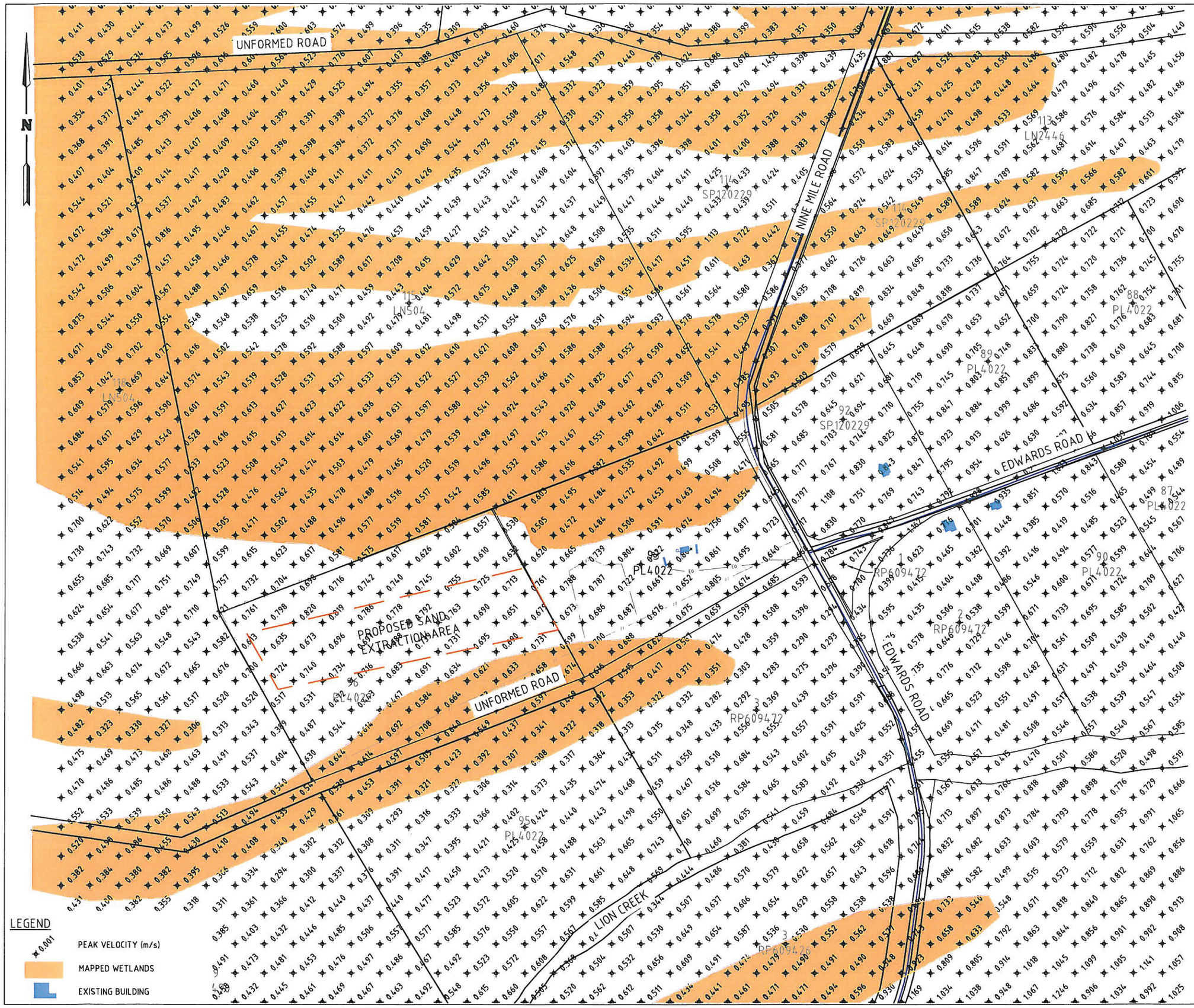
PROPOSED SITE DEVELOPMENT

LOT 93 NINE MILE ROAD, PINK LILY

100YR ARI FLOOD AFFLUX LEVELS PRE - POST DEVELOPMENT

D15.059-FS-02

SHEET 02 OF 04



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DESCRIPTION

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GK AND LR THOMPSON

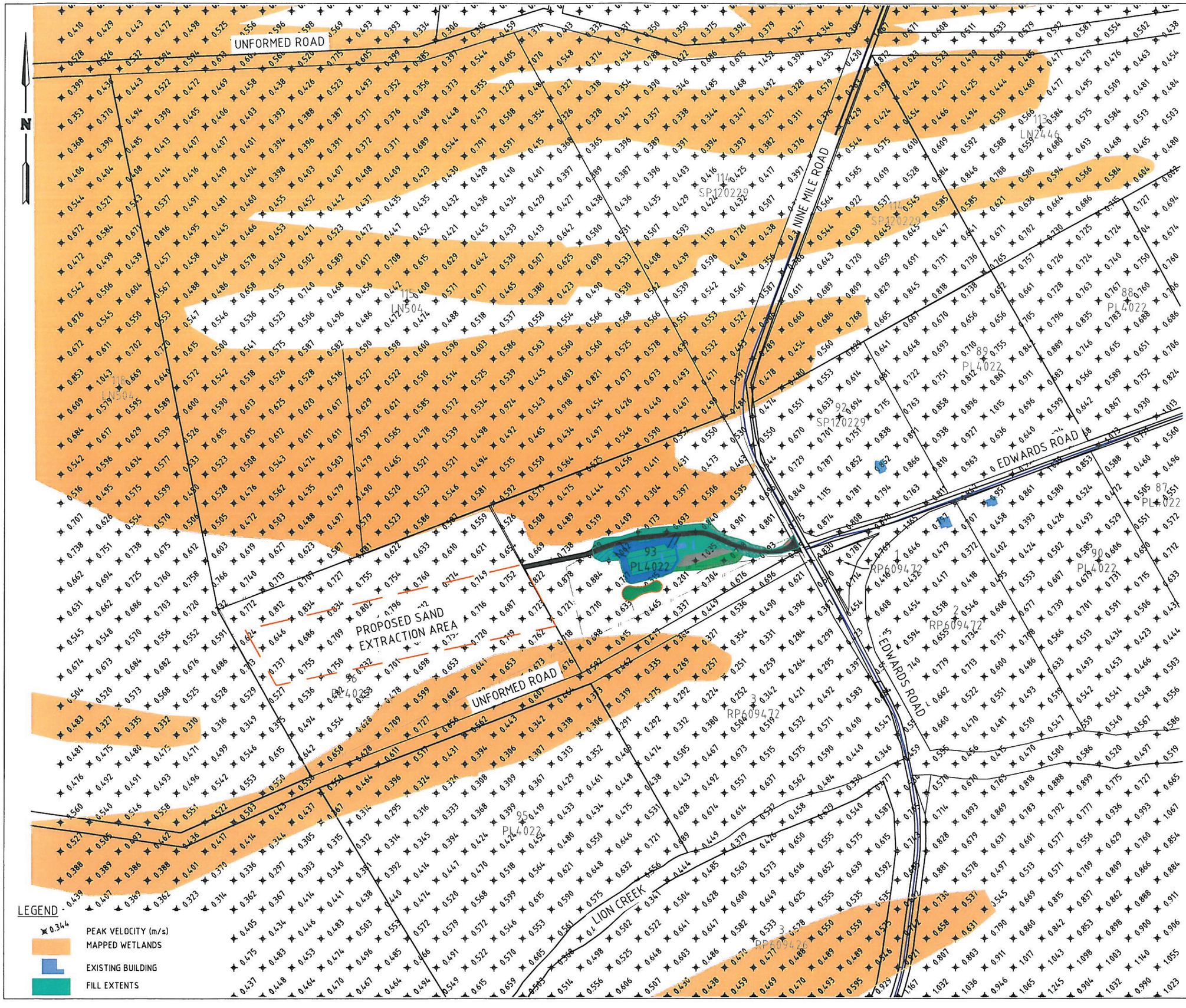
PROPOSED SITE DEVELOPMENT

LOT 93 NINE MILE ROAD, PINK LILY

100YR ARI PEAK VELOCITIES PRE DEVELOPMENT

D15.059-FS-03

SHEET 03 OF 04



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GK AND LR THOMPSON

PROPOSED SITE DEVELOPMENT

LOT 93 NINE MILE ROAD, PINK LILY

100YR ARI PEAK VELOCITIES POST DEVELOPMENT

D15.059-FS-04

SHEET 04 OF 04

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/90-2017

Dated: 13 April 2018

AREA SCHEDULE		
SITE	AREA	18.497 ha
	CARPARKS	5
EXISTING SHED	SINGLE STOREY	
	MAXIMUM HEIGHT ABOVE GROUND LEVEL	4.5m
	GROSS FLOOR AREA	84m²
PROPOSED BUILD ENVELOPE	VEHICLE MAINTENANCE SHED (LENGTHxWIDTHxHEIGHT)	20mx15mx6m HIGH
SITE COVERAGE	EXISTING SHED	84m²
	PROPOSED SHED	300m²
	WASHDOWN BAY	46m²
	TOTAL	430m²
IMPERVIOUS AREAS	TOTAL GRAVEL HARDSTAND/INTERNAL ROAD	7623.9m²
	TOTAL SITE COVER	430m²
	TOTAL	8054m²
SAND EXTRACTION AREA	AREA	3.52ha

Preferred location for replacement trees

PROPOSED SAND EXTRACTION AREA

LOT 96 PL4022

LOT 93 PL4022

10 metre buffer area

10.0m BUFFER

PROPOSED COVERED MAINTENANCE AREA

EXISTING SHED

ELEVATED GRAVEL HARDSTAND (APPROX RL 11.9m)

HEAVY VEHICLE PARKING AREA

PROPOSED WETLAND DETENTION BASIN REFER SWMP

PROPOSED 6.0m WIDE GRAVEL ACCESS ROAD TO SAND QUARRY AND VEHICLE DEPOT

TEMPORARY STOCKPILE AREA

STAFF CARPARKING

WASHDOWN BAY

POWER POLE AND STAY

DRAIN

GATE

NINE MILE ROAD

EDWARDS RD

LEGEND

- PRE-DEVELOPED SITE CONTOUR
- EXISTING OVERHEAD ELECTRICITY (LINE, POLE & STAY)
- EXISTING FENCE
- EXISTING BUILDINGS
- MAPPED WETLANDS
- PROPOSED GRAVEL HARDSTAND AREA PLANT AND MATERIALS STORAGE
- PROPOSED 6.0m WIDE GRAVEL ACCESS ROAD/VEHICLE MANEUVERING
- PROPOSED SAND EXTRACTION AREA
- PROPOSED GRASSED BATTERS AND DRAINS
- PROPOSED WASHDOWN BAY (INCLUDING OIL SEPARATOR, SEDIMENT TRAP AND TANK FOR COLLECTION AND RE-USE WATER ON SITE)
- PROPOSED BUILDING
- PROPOSED RETAINING WALL (UP TO 2.0m HIGH)

NOTES

1. DEFINED FLOOD EVENT 1.0% AEP (1 IN 100 YEARS) FLOOD LEVEL APPROXIMATELY 10.968 AHD
2. PROPOSED ELEVATED GRAVEL HARDSTAND LEVEL APPROXIMATELY 11.9 AHD

Mitigation Map

Modified from original to show mitigation areas Denley Environmental

SCALE 0 10 20 30 40 1:2000 DESCRIPTION

REV	REVISION	DATE
A	DEHP PRE-LODGEMENT	18/09/2017
B	MCU APPLICATION	09/2017

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Drawn by CER
Checked by ACD
G B A SIMMERS
Sign 30-6-17

G K AND L R THOMPSON
MCU FOR TRANSPORT DEPOT AND SAND QUARRY
LOTS 96 & 93 ON PL4022 NINE MILE ROAD, PINK LILY
SITE CONCEPT PLAN

D16.150-SK01

SHEET 01 OF 02

A B