

**PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL**

Approval no: DEV2022/1306

Date: 3 February 2023



JOB NO DE22/126

June 2022

GOLDING CONTRACTORS PTY LTD

GEOTECHNICAL DESKTOP

REVIEW PRECINCT 5 - MIBA (North)

YARRABILBA



MORRISON
GEOTECHNIC

Job No. DE22/126
Ref No: 27812
Author: M Ballard

23rd June 2022

Golding Contractors Pty Ltd
Level 2, 40 McDougall Street
Milton QLD 4064

ATTENTION: MR CAMERON MCCLURE
Email: cameron.mcclure@golding.com.au

Dear Cameron,

RE: GEOTECHNICAL DESKTOP REVIEW FOR PRECINCT 5 – MIBA (NORTH) YARRABILBA

1.0 INTRODUCTION

This report presents the results of a geotechnical desktop review conducted for the proposed residential development at Yarrabilba – Precinct 5 -MIBA (North) MIBA (North) herein referred to as the ‘Site’. The work was requested by Mr. Cameron McClure, representing Golding Contractors Pty Ltd.

The following information, pertaining to the geotechnical aspects associated with precinct 5 – MIBA (North) have been reviewed as part of this report: -

- Bowler Geotechnical Pty Ltd, “Broadscale Geotechnical Report for the Yarrabilba Development” dated May 2004.
- KN Group Precinct 5 – MIBA (North) Drawings as follows: -
 - 21-221-01 Rev A - General Locality Plan, Drawing Index and Notes
 - 21-221-02 Rev A - Bulk Earthworks Layout Plan
 - 21-221-03 Rev A – Erosion and Sediment Control – Layout Plan
 - 21-221-04 Rev A – Erosion and Sediment Control - Notes
 - 21-221-05 Rev A – Erosion and Sediment Control - Details

2.0 SITE DESCRIPTION

The area of Yarrabilba is bound by Tamborine Waterford Road to the west, Powerlink easement and existing residential development to the north and drainage corridor to the south and Precinct 5 beyond that.

The ground surface comprises of gently undulating terrain with vegetation consisting of various ground cover including grasses with common weeds and sparse mature trees. Rill and gully erosion of the upper soil layers is expected on some slopes by water turbulence or concentrated rapid water flow toward the vegetated gullies and the farm dams scattered throughout the area.

Based on Nearmap aerial imagery (Refer to Figure 1 the site would appear to already be used as a borrow pit from which material has already been excavated and removed. The bulk earthworks layout plan is presented in Figure 2.

Image 1 – Site Location Plan of Precinct 5 – MIBA (North) Bulk Earthworks Layout Plan
(Provided by KN Group)

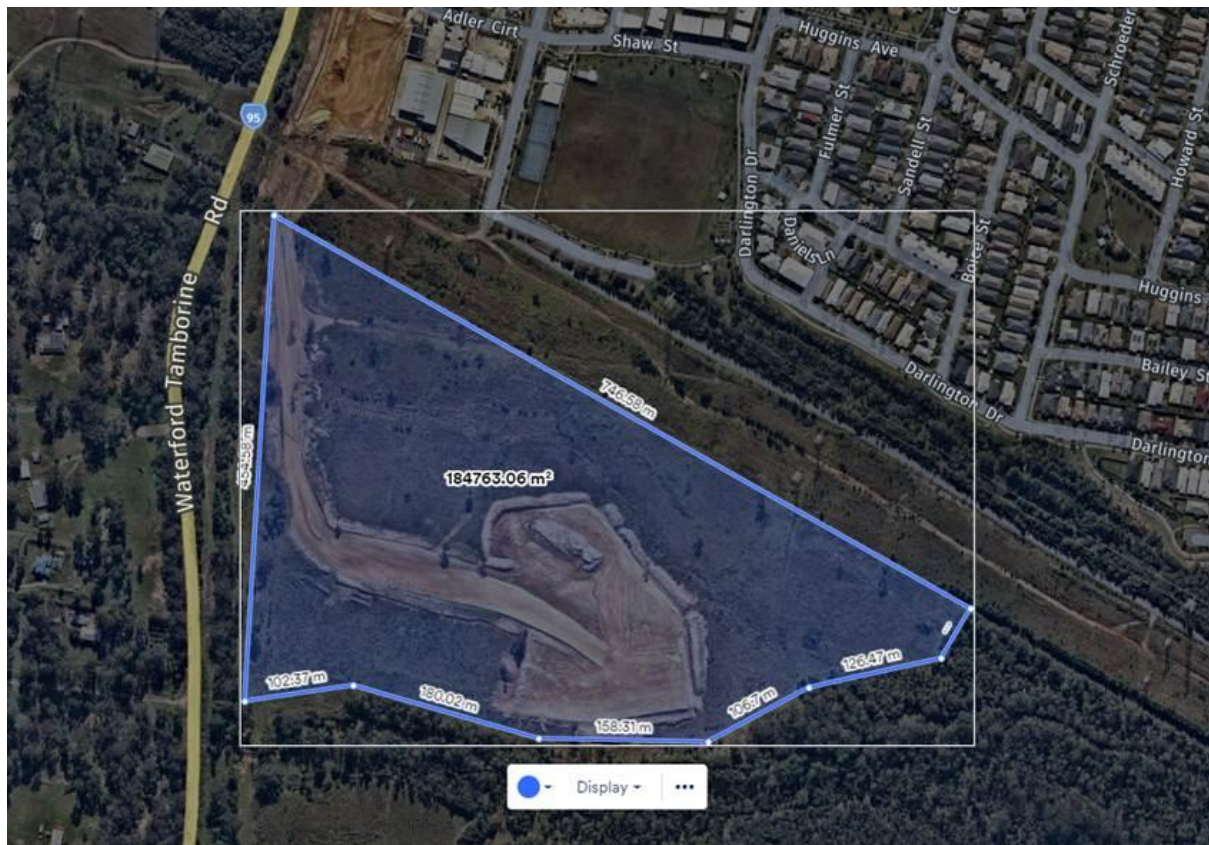
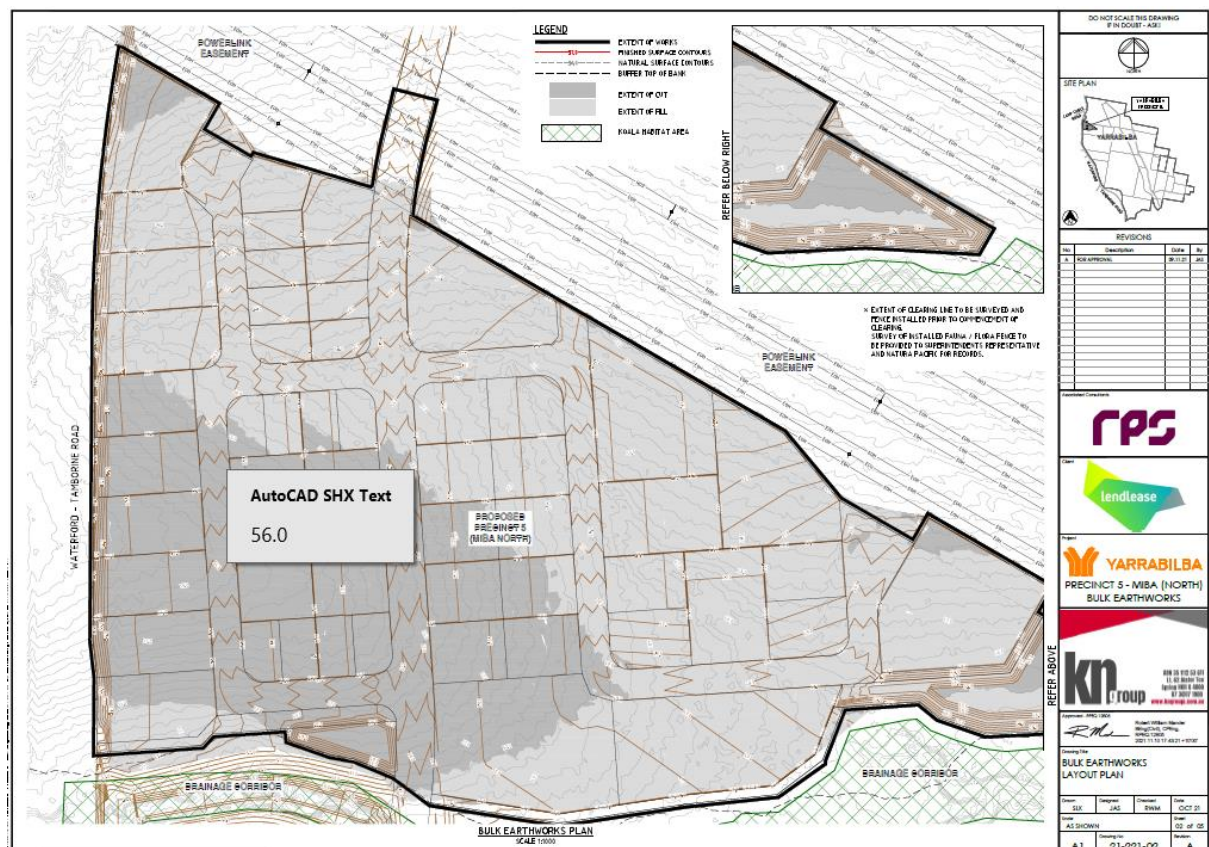


Image 2 – Bulk Earthworks Layout Plan for Precinct 5 – MIBA (North) Provided by KN Group



3.0 SUBSURFACE CONDITIONS

3.1 Regional Geology

Reference to the National Map website, <https://nationalmap.gov.au> (State of Queensland (Department of Resources, 2022 ©)) indicates that the surface and near-surface geology near the area of investigation comprises Quaternary aged alluvium over Late Triassic – Early Jurassic aged basement rocks. Table 1 summarises the Geological units described near the area of investigation.

Table 1 – Regional Geology summary

Rock Unit Name	Map Symbol	Lithological Summary	Dominant Rock	Age
Woogaroo Subgroup	RJbw	Sublabile to quartzose sandstone, siltstone, quartz-rich granule to cobble conglomerate and coal	SEDIMENTARY ROCK	LATE JURASSIC – EARLY JURASSIC
Qa - QLD	Qa	Clay, silt, sand, and gravel; flood-plain alluvium	ALLUVIUM	QUATERNARY

3.2 Local Site Geology (Precinct 5)

The subsurface profile revealed within the available Bowler Geotechnical Pty Ltd test pits typically comprised:

- **Topsoil Silty SAND** with grass rootlets, encountered from the ground surface to a depth of up to 0.2m in all test locations.
- **Natural Silty SAND / Sandy Gravel (SM)**, generally orange brown or brown was encountered in all test locations to depths ranging between 0.5m and 1.1m.
- **Residual Silty CLAY (CI - CH)**, very stiff to hard, orange brown, mottled orange brown and brown, of medium to high plasticity, encountered in all test locations except TP 4 to depths ranging between 1.0m and 2.7m.
- **Extremely Weathered Sandstone** encountered in all test pit locations, and these terminated at ripper refusal occurring at depths of between 1.2m and 2.8m.

Table 2 provides a summary of the subsurface profiles revealed within the Bowler Geotechnical Investigation 2004 test pits around Precinct 5 – MIBA (North).

Table 2 – Summary of Encountered Subsurface Profiles Precinct 5 – MIBA (North)

Test Location	Topsoil (m)	Silty Sandy Gravel (m)	Silty Sand (m)	Very Stiff to Hard Silty Clay (m)	Hard silty Clay (m)	Extremely Weathered Sandstone (m)	Termination Depth (m) ⁽³⁾
TP2	0.0 – 0.1	0.1 – 0.6		0.6 – 1.4	1.4 – 1.7	1.7 -TD	1.9
TP3	0.0 -0.2		0.2 – 0.5	0.5 – 1.6	1.6 - 2.7	2.7 – TD	2.8
TP4	0.0 – 0.1	0.1 – 0.5	0.5 – 1.1			1.1 – TD	1.9
TP5	0.0 – 0.1		0.1 – 0.5	0.5 – 1.0		1.0 – TD	1.2
Notes: -							
(1) TD – Termination Depth							
(2) NE – Not Encountered							
(3) All Test pits terminated at Ripper Refusal							

3.3 Local Groundwater Conditions

At the time of the Bowler investigation, no groundwater seepage was observed at test pit locations. However, within adjacent investigation in Precinct 5 seepages were observed within the natural sand-based soils during a season of above average rainfall.

The presence, depth and flow rates of the groundwater will vary with seasonal changes, rainfall, subsurface material and permeability, integrity of in-ground services, proximity to existing waterways and water bodies, and the proximity to, type and density of vegetation.

4.0 ENGINEERING ASSESSMENT

Based on the existing geological mapping and the findings of the available broadscale geotechnical investigations undertaken by Bowler and Morrison Geotechnic, the geotechnical conditions in Precinct 5 – MIBA (North) are like those already experienced across the Yarrabilba Site.

Trafficability problems could arise for earthworks and construction machinery from softening of the upper layers and adequate drainage should be maintained to divert run off away from the construction area to prevent ponding of water.

From the supplied earthworks plans, cuts of up to 5m would be carried out in the area. In addition to this, it is assumed that cutting and filling that is typical of large residential estates will be carried out in the areas of Precinct 5 – MIBA (North). Where deep fills are to be constructed then these are likely to experience self-weight settlement of the fill material that could be between 0.5% and 1% of the fill height for well compacted material.

The insitu soils obtained from site cuttings, where free of organic and deleterious material, may be used for structural fill in accordance with AS3798, provided the moisture content of the soils on placement approximates the Optimum Moisture Content (OMC) required for compaction. However, it should be noted that the residual silty clay soils of high plasticity may present difficulties in handling, placement, and compaction if the appropriate moisture content cannot be achieved, particularly if the clay soils are overly moist. It is likely that sediments and soft soils will be present at the base of any farm dams and these materials will not be suitable for reuse as fill material.

Excavations in the residual sand-based soils, residual clay-based soils and very low strength weathered sandstone rock should be within the capacity of conventional earthmoving equipment such as medium to large sized excavators (15t – 30t). More efficient excavations in the very low to low strength weathered sandstone rock may be achieved using large excavators fitted with toothed buckets and ripper attachments. All the Bowler test pits were terminated at the limit of ripper excavation at depths between 1.2m and 2.8m. Excavation below this depth would require larger machines (CAT D9 dozer) to perform hard to very hard ripping (CAT D9/D10 dozer) working in open excavations. However, where hard rock bars or zones of less weathering sandstone cannot be ripped then rock breakers may need to be implemented.

All structural fill batters should be overconstructed and trimmed back at no steeper than 2.5(H):1(V) or 22° and be top soiled, mulched and vegetated to reduce erosion. Drainage will need to be included to direct surface water flows away from all sloping batters and no runoff should be allowed to discharge directly across the slopes.

Emerson Class laboratory testing indicates that the soils are dispersive (Emerson Class Numbers 3 and 5). This is confirmed by the presence of rill and gully erosion of the upper soil layers was observed on most slopes, this was caused by water turbulence or concentrated rapid water flow toward the vegetated gullies and the farm dams.

Drainage will be required to be incorporated into all retaining wall designs and it is important to separate the surface drainage from the sub soil drainage system. Surface water must be diverted away from the back of retaining walls to prevent the ponding of surface water behind the top of the wall. Sub soil drainage must be placed behind the permanent retaining walls to prevent the build-up of groundwater pressures, and this must be freely discharged to a point of legal discharge.

Pavement subgrades are likely to be constructed on a wide variety of materials and should be compacted to achieve a minimum density ratio of 100% SMDD. Preliminary design CBR values of 10% for natural sandy materials and 1.5% for silty clay materials could be initially considered.

The above assessment is based on current available information and some variations across the site are to be expected and regardless of the frequency of the test pitting or borehole drilling there always remains an inherent risk that geotechnical conditions may differ from those revealed within the investigation.

5.0 LIMITATIONS OF DESKTOP GEOTECHNICAL INVESTIGATION

This Report has been prepared by Morrison Geotechnic Pty Ltd (**Morrison Geotechnic**) and may include contributions from Morrison Geotechnic's officers and employees, sub-contractors, sub-consultants, or agents (**Contributors**).

This Report is for the sole benefit and use of Golding Contractors Pty Ltd (**Client**) for the sole purpose of providing geotechnical information in respect of the residential development within Yarrabilba – Precinct 5 -MIBA (North) (**Project**). The Report is only intended to address those issues expressly described in the scope of work in the Proposal Letter and this Report.

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The information (including technical information and information obtained through discussions) on which this report is based has been provided by the Client and third parties. Morrison Geotechnic and the Contributors:

- (a) have relied upon and presumed the accuracy of this information.
- (b) have not verified the accuracy or reliability of this information (other than as expressly stated in this Report).
- (c) have not made any independent investigations or enquiries in respect of those matters of which it has no actual knowledge at the time of giving this Report to the Client; and
- (d) make no warranty or guarantee, expressed or implied, as to the accuracy or reliability of this information.

Morrison Geotechnic and the Contributors do not accept responsibility or liability for any incorrect assumptions related to this Report. For the avoidance of doubt, this Report:

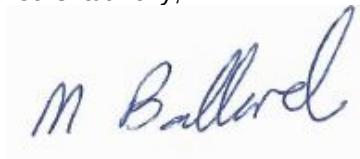
- (a) contains information from widely spread borehole and test pit locations.
- (b) cannot predict the ground conditions encountered at any untested location because the ground conditions surrounding test sampling locations, (or between any two test sampling locations) may be different from the test samples we have obtained
- (c) is not an environmental, contamination or hazardous materials assessment; may be invalid, incomplete, or inaccurate (including errors in the scope of work, investigation methodology, observations, opinions, and advice) where the information provided to Morrison Geotechnic was invalid, incomplete, or inaccurate.
- (d) is limited to observations of those parts of the site that were accessible at the time of the field investigation and is not based on observations about areas of the site which were inaccessible to the investigation equipment (including slopes, heavily vegetated areas, or service corridors); and
- (e) is not a comprehensive representation of the actual site conditions and may only show a reasonable interpretation of conditions encountered at discrete, widely spaced test locations, as selected by the Client, along with general site observations.

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If further information becomes available, or additional assumptions need to be made, Morrison Geotechnic reserves its right to amend this Report.

We trust that this desk study is acceptable however, do not hesitate to contact us if you require any further details or assistance.

Yours faithfully,

A handwritten signature in blue ink, appearing to read 'M Ballard', is written over a light blue rectangular background.

M BALLARD (RPEQ 10223)

For and on Behalf of

MORRISON GEOTECHNIC PTY LIMITED

Encl Appendix A – Drawings provided by the Client.
 Appendix B – Location plan and Geological Map.
 Appendix C – Test Pit Logs and Laboratory Test Results .

A P P E N D I X A

**DRAWINGS PROVIDED BY
CLIENT**



PRECINCT 5 - MIBA (NORTH) BULK EARTHWORKS



LOCALITY PLAN
SCALE 1:10000

GENERAL NOTES

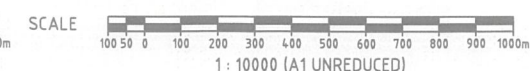
1. ALL WORK SHALL BE JOINED NEATLY TO EXISTING CONSTRUCTION.
2. WHERE REFERENCE IS MADE ON THESE DRAWINGS TO A KERB LINE, IT SHALL BE TAKEN TO MEAN THE KERB INVERT LINE.
3. LEVELS FOR KERB AND CHANNEL CONSTRUCTION ARE SHOWN AT LIP OF CHANNEL UNLESS SHOWN OTHERWISE.
4. KERB AND CHANNEL AND SPOON DRAINS SHALL BE CONSTRUCTED IN ACCORDANCE WITH INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA STANDARD DWG NO SEQ RS-80. SPOON DRAINS ACROSS ROAD INTERSECTIONS SHALL BE IN ACCORDANCE WITH INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA STD DWG NO SEQ RS-80. THE CONCRETE SHALL BE CLASS N32 AND THE DEPTH INCREASED BY 50mm TO 175mm AT INVERT. FLUSH KERB TO BE INCREASED IN DEPTH BY 50mm TO 280mm.
5. IF MACHINE MADE KERB AND CHANNEL IS USED, EXTRA FINES AND 20mm SLUMP IS REQUIRED.
6. ALL DRAINAGE CENTRE LINES ARE 2m FROM INVERT OF KERB UNLESS OTHERWISE SHOWN.
7. GULLY CONNECTIONS AND STORM WATER PIPES SHALL BE 375mm DIAMETER CLASS '2' R.C. PIPES UNLESS SHOWN OTHERWISE.
8. THE CONTRACTOR SHALL INITIALLY EXCAVATE THE PAVEMENT BOX TO 445mm BELOW THE FINISHED PAVEMENT LEVEL SHOWN ON THE DRAWINGS. HE SHALL THEN NOTIFY THE ENGINEER WHO WILL FIX THE PAVEMENT THICKNESS TO BE CONSTRUCTED FOLLOWING THE RESULTS OF SUB-GRADE TESTING.
9. NOTWITHSTANDING THE LIMITS OF CUTTING AND FILLING SHOWN ON THE DRAWINGS, THE ACTUAL LIMITS SHALL BE DETERMINED ON SITE BY THE ENGINEER AND SIMILARLY THE FINISHED SURFACE CONTOURS MAY BE ADJUSTED BY WRITTEN DIRECTION OF THE ENGINEER DURING CONSTRUCTION.
10. THE MINIMUM CLEARANCE BETWEEN OUTER WALLS OF PIPES IN MANHOLES SHALL BE 150mm.
11. SUBSURFACE DRAIN CLEANING POINTS SHALL BE INSTALLED IN ACCORDANCE WITH IPWEAQ STD DWG NO SEQ RS-142.
12. CONSTRUCTION LOAD CONTROL ON THE INSTALLATION OF REINFORCED CONCRETE STORMWATER PIPE WORK SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE RECOMMENDATIONS DEFINED IN THE CONCRETE PIPE ASSOCIATIONS OF AUSTRALASIA'S "THE INSTALLATIONS OF STEEL REINFORCED CONCRETE PIPES - MINIMUM PIPE COVER REQUIRED FOR VARIOUS COMPACTORS".
13. PRIOR TO COMMENCEMENT OF CONSTRUCTION, THE CONTRACTOR SHALL ERECT A 2 STRAND WIRE FENCE INCLUDING SAFETY BARRIER MESH TO THE PERIMETER OF VEGETATION TO BE RETAINED AND/OR EXCLUSION ZONES.
14. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION AND DEPTH OF EXISTING SERVICES WITH RELEVANT AUTHORITIES/DIAL BEFORE YOU DIG PRIOR TO COMMENCING WORKS.
15. THE CONTRACTOR SHALL NOTE THE PRESENCE OF EXISTING SERVICES ASSOCIATED WITH THE WORKS. SPECIAL CARE MUST BE TAKEN BY THE CONTRACTOR IN THE VICINITY OF ALL SERVICES.

DRAWING INDEX

DRAWING NO.	DRAWING TITLE
21-221-01	GENERAL - LOCALITY PLAN, DRAWING INDEX AND NOTES
21-221-02	BULK EARTHWORKS - LAYOUT PLAN
21-221-03	EROSION AND SEDIMENT - CONTROL - LAYOUT PLAN
21-221-04	EROSION AND SEDIMENT - CONTROL - NOTES
21-221-05	EROSION AND SEDIMENT - CONTROL - DETAILS

PLAN
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SITE PLAN



REVISIONS

No	Description	Date	By
A	FOR APPROVAL	09.11.21	JAS

Associated Consultants



Client



Project



Approved - RPEQ 12805

Robert William Mander
BEng(Civil), CPEng,
RPEQ 12805
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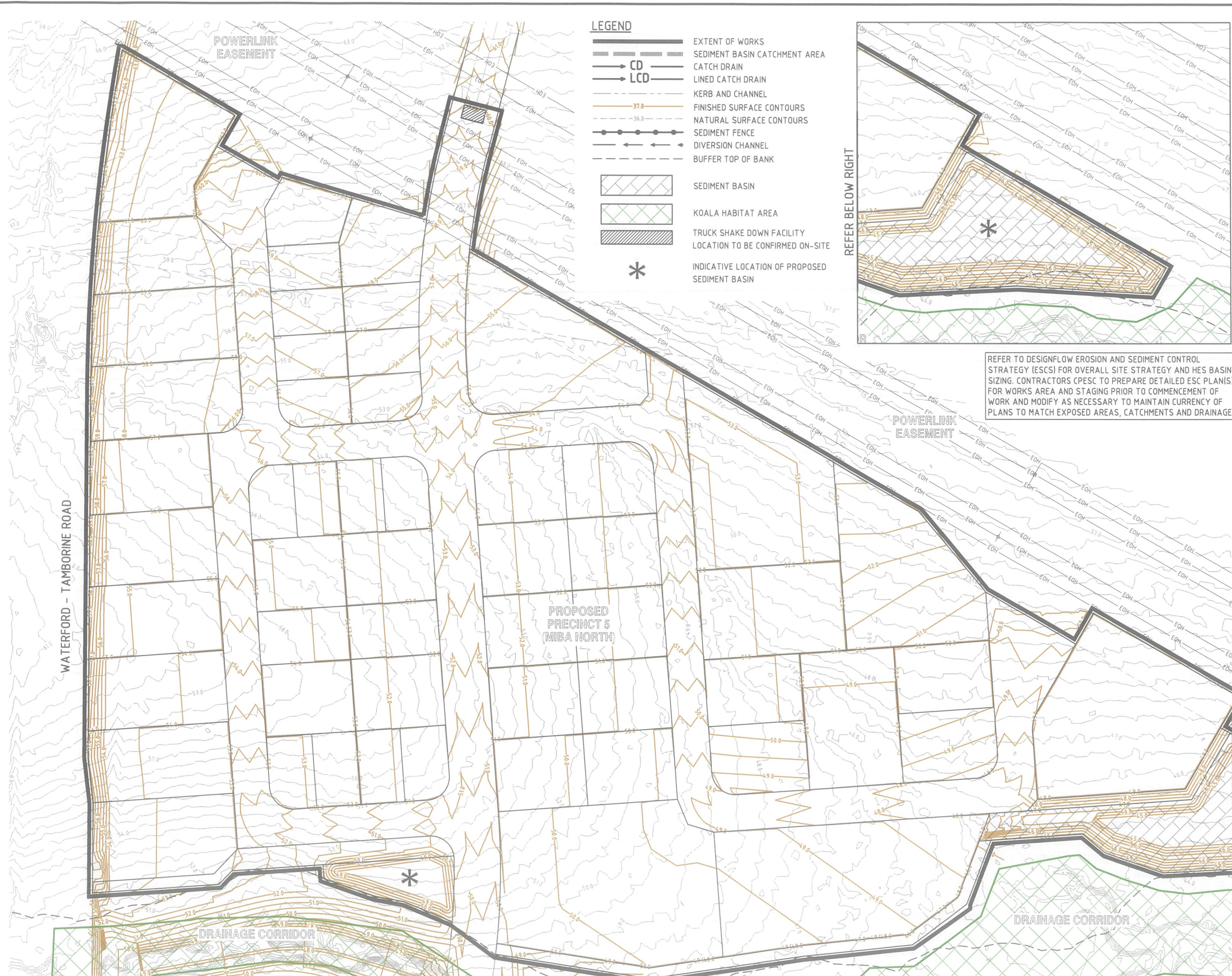
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GENERAL
LOCALITY PLAN,
DRAWING INDEX AND NOTES

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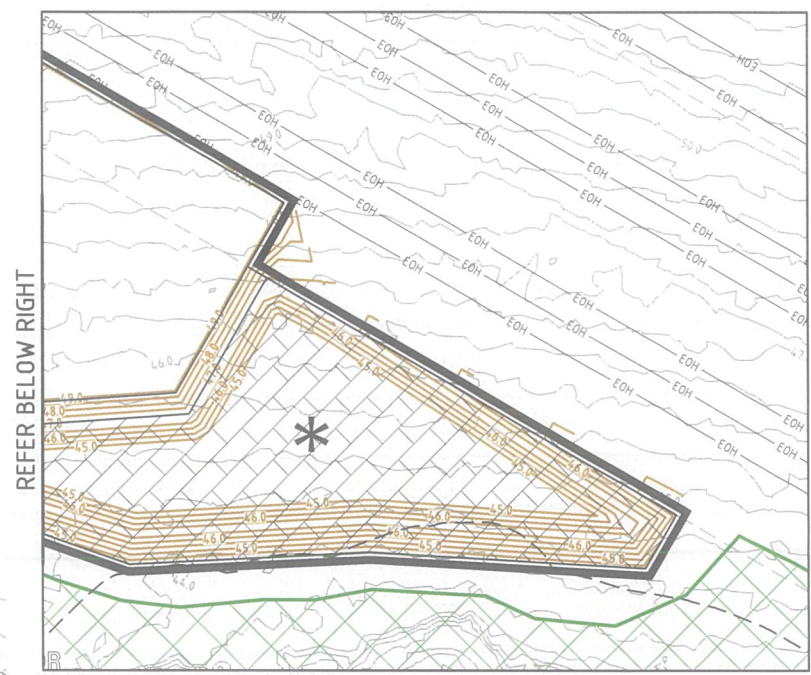


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LEGEND

- EXTENT OF WORKS
- SEDIMENT BASIN CATCHMENT AREA
- CATCH DRAIN
- LINED CATCH DRAIN
- KERB AND CHANNEL
- FINISHED SURFACE CONTOURS
- NATURAL SURFACE CONTOURS
- SEDIMENT FENCE
- DIVERSION CHANNEL
- BUFFER TOP OF BANK
- SEDIMENT BASIN
- KOALA HABITAT AREA
- TRUCK SHAKE DOWN FACILITY LOCATION TO BE CONFIRMED ON-SITE
- INDICATIVE LOCATION OF PROPOSED SEDIMENT BASIN



DO NOT SCALE THIS DRAWING IF IN DOUBT - ASK!

SITE PLAN

REVISIONS

No	Description	Date	By
A	FOR APPROVAL	09.11.21	JAS

Associated Consultants:

rps

Client: **lendlease**

Project: **YARRABILBA**
PRECINCT 5 - MIBA (NORTH)
BULK EARTHWORKS

kn group
ABN 35 112 53 611
L1, 62 Astor Tce
Spring Hill Q 4000
07 3017 1900
www.knigroup.com.au

Approved - RPEQ 12805
R Mander
Robert William Mander
BEng(Civil), CPEng,
RPEQ: 12805
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Drawing Title:
EROSION AND SEDIMENT CONTROL - LAYOUT PLAN

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- ## TREES

- EROSION AND SEDIMENTATION CONTROL NOTES:

1. STRIP AND STOCKPILE AVAILABLE TOPSOIL (ASSUMED AVERAGE DEPTH 150MM) FROM ALL DISTURBED AREAS PRIOR TO BULK EARTHWORKS. STOCKPILES TO BE STABILISED WITH APPLICATION OF VITAL CHEMICALS VITAL-BON STONEWALL OR EQUIVALENT.
2. MINIMUM SLOPE ACROSS ALLOTMENTS TO BE 1%.
3. ALL FOOTPATHS, BATTERS, AND EARTHWORKS AFFECTED ALLOTMENTS ARE TO BE TOPSOILED TO A MINIMUM DEPTH OF 150MM (LIGHTLY COMPACTED) AND TURFED WHERE SPECIFIED.
4. SEDIMENT FENCES TO BE PLACED AS SHOWN. FOR DETAILS OF SEDIMENT FENCE REFER BEST PRACTICE EROSION & SEDIMENT CONTROL BOOK 1, PAGE 2.50, FIGURE 2.7. SEDIMENT FENCED TO BE REPAIRED AND EXCESSIVE SEDIMENT DEPOSITS SHALL BE REMOVED ONCE CAPACITY FALLS BELOW 75%

1. FOR DETAILS OF SEDIMENT FENCE REFER BEST PRACTICE EROSION & SEDIMENT CONTROL BOOK 1, PAGE 2.50, FIGURE 2.8.
2. SEDIMENT FENCES TO BE REPAIRED AS REQUIRED AND EXCESSIVE SEDIMENT DEPOSITS SHOULD BE REMOVED.
3. INSTALL KERB INLETS WITH GRAVEL RANGING FROM 50MM TO 75MM IN SIZE SHALL BE INSTALLED AT ALL COMPLETED INLETS. REFER IPWEAQ STANDARD DRAWING D-0041. THESE SHALL BE MAINTAINED IN A CLEAN CONDITION. IN THE EVENT OF HEAVY RAIN THEY SHALL BE REMOVED TO MINIMISE THE POTENTIAL FOR FLOODING.
4. CHECKS OF SILT CONTROL DEVICES ARE TO BE MADE WEEKLY, OR AFTER ANY SIGNIFICANT STORM EVENT TO ENSURE INTEGRITY AND PERFORMANCE.

1. CAT-DRAINS ARE TO BE PROVIDED PARALLEL TO THE CONTOUR AND AT MAXIMUM SPACINGS AND DIMENSIONS SPECIFIED (REFER STANDARD DETAIL).
2. WITHIN AREAS OF ACTIVE EARTHWORKS THE CATCH-DRAINS ARE TO BE INSTALLED WITH SURFACE AMELIORATED WITH GYPSUM AT A RATE OF 5t/Ha AND STABILISED WITH VITAL BON-MATT STONEWALL OR EQUIVALENT (REFER STANDARD DETAIL)
3. CATCH DRAINS TO BE MAXIMUM LENGTH OF 50m BEFORE JOINING INTO A DRAIN WHICH RUNS PERPENDICULAR TO THE CONTOUR AND JOINS WITH A DIVERSION CHANNEL. THESE DRAINS ARE TO BE 0.2m BASE WIDTH, 1:4 SIDE SLOPES, 0.5m DEPTH AND HAVE A SURFACE AMELIORATED WITH GYPSUM AT A RATE OF 5T/Ha AND STABILISED WITH GEOFABRIC OR VITAL BON-MATT STONEWALL.

1. PROVIDE TURFING TO ENTIRE WIDTH OF ALL SWALES, FOOTPATHS, AND 1 IN 4 CUT AND FILL BATTERS.
2. FOOTPATH BATTERS ARE TO BE STABILISED WITH TOPSOIL (AND TURFED) AS SOON AS PRACTICAL AFTER THE BATTERS HAVE BEEN COMPLETED.

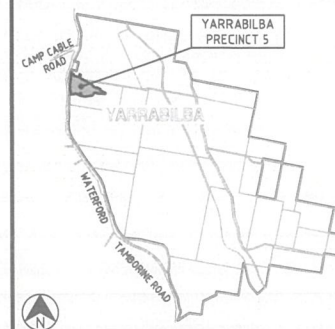
1. THE AMOUNT OF AREA EXPOSED AT ANY ONETIME TO BE MINIMISED BY STAGING THE WORKS WHEREVER POSSIBLE AND AIMING TO ACHIEVE FINISHED LEVEL IN EACH AREA AS QUICKLY AS POSSIBLE BEFORE OPENING NEW AREAS.
2. TOPSOIL TO BE STRIPPED AND STOCKPILED SEPARATELY TO SUB-SOILS.
3. STOCKPILES TO BE PROVIDED WITH SURFACE COVER USING A CHEMICAL SURFACE STABILISER SUCH AS VITAL CHEMICALS VITAL-BON MATT STONEWALL.
4. IF WORKS ARE DELAYED OR PUT ON HOLD THEN TEMPORARY EROSION CONTROL COVERING TO BE PROVIDED USING VITAL CHEMICALS VITAL-BON MATT P47-VR1 OR EQUIVALENT.
5. ONCE AREAS REACH FINISHED LEVEL:
 - I. TOPSOIL TO BE SPREAD TO CAP/BURY THE DISPERSIVE SUBSOILS
 - II. TOPSOIL TO BE DRILL-SEEDED WITH A MIXTURE OF ANNUAL AND PERENNIAL GRASS SPECIES (REFER TABLE) AT SEEDING RATE OF 80kg/ha AND FERTILISER WITH CROP-KING 88 (0.3t/Ha)
 - III. TEMPORARY SOIL COVER TO BE APPLIED CONSISTING OF VITAL CHEMICALS VITAL-BON MATT P47-VR1 OR EQUIVALENT.
 - IV. WATERING UNDERTAKEN AS NECESSARY UNTIL STABLE GRASS SURFACE COVER ESTABLISHED.

SEED MIXES			
	SUMMER BLEND (APPLICATIONS NOVEMBER - DECEMBER)	MID SEASON BLEND (APPLICATIONS MARCH/APRIL & SEPTEMBER/OCTOBER)	WINTER BLEND (APPLICATIONS MAY/AUGUST)
UNHULLED GREEN COUCH (CYNODON DACTYLON) OR BLUE COACH (DIGITARIA DIDACLYA)	25%	25%	25%
HULLED GREEN COUCH (CYNODON DACTYLON) OR BLUE COACH (DIGITARIA DIDACLYA)	25%	25%	25%
JAPANESE MILLET	30%	15%	N/A
RYE GRASS	N/A	15%	30%
CARPET GRASS (AXONOPUS AFFINIS)	20%	20%	20%

DO NOT SCALE THIS DRAWING
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SITE PLAN



REVISIONS

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Associated Consultants



Client



Project



Approved - RPEQ 12805

Robert William Mander
BEng(Civil), CPEng,
RPEQ:12805
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Drawing Title

EROSION AND SEDIMENT CONTROL - NOTES

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Scale AS SHOWN			Sheet 04 of 04
A1	Drawing No 21-221-04		Revision A



CATCH DRAINS DIMENSIONS & SPACINGS



SIZING TO BE DETERMINED DURING CONSTRUCTION



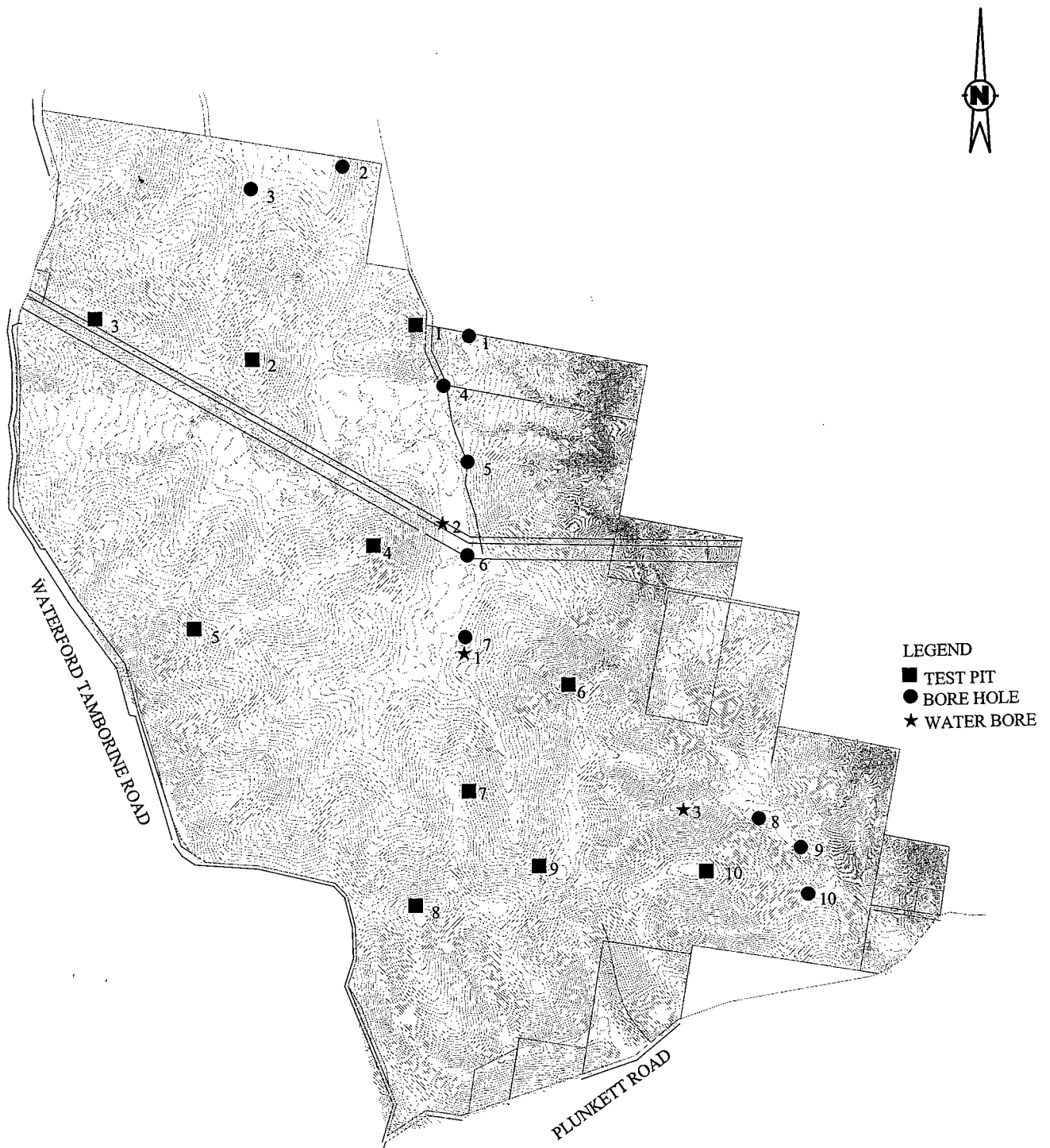
DIVERSION DRAINAGE BANK



Drawn SLK	Designed JAS	Checked RWM	Date OCT 21
Scale AS SHOWN			Sheet 05 of 05
A1	Drawing No 21-221-035	Revision A	

A P P E N D I X B

LOCATION PLAN AND GEOLOGICAL MAP



NOT TO SCALE

B BOWLER
GEOTECHNICAL PTY LTD

E-mail: admin@bowlergeotechnical.com.au

Also at Gold Coast, Geelong, Sunshine Coast, Gladstone, Rockhampton, Mackay, Townsville, Cairns, Mt Isa, Sydney and Bendigo (Vic). Associated Offices in Melbourne, Adelaide, Perth, Vietnam and Papua New Guinea.

7/98 Anzac Avenue
HILLCREST QLD 4118
Telephone 3800 6446 Facsimile 3800 0616

INVESTIGATION LOCATION PLAN

YARRABILBA

JOB NO.:
5928

FIGURE 1

A P P E N D I X C

TEST PIT LOGS AND LABORATORY TEST RESULTS

BOREHOLE LOG SHEET

Client:	DELFIN LEND LEASE	Hole No:	TP2
Project:	YARRABILBA	Sheet:	1 of 1
Location:	WATERFORD TAMBORINE ROAD	Job No:	5928
Position:	S: 27° 48, 497' E: 153° 06, 786'	Surface Elevation:	
Date Started:	24/3/04	Logged By:	RK
Rig Type (Mounting):	13 TONNE EXCAVATOR	Contractor:	ALLIED EARTHMOVING

Depth (m)	BIT	Sample or Test	Depth (RL) (m)	DCP Test	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
					SM, SILTY SAND, fine to medium grained, dark brown, moist, TOPSOIL
		Bulk Sample			SM, SILTY SANDY GRAVEL, fine to coarse grained, fine to coarse grained sand, orange/brown, moist, NATURAL
0.5					
		PP-250kPa			CI, SILTY CLAY, medium plasticity, orange/brown, with fine to coarse grained sand, moist
1.0		PP-600kPa			
		D			
1.5					CI, SILTY CLAY, medium plasticity, pale grey, mottled pale orange/brown, with fine to coarse grained sand, moist
					XW, EXTREMELY WEATHERED ROCK, SANDSTONE, pale grey
2.0					Ripper used at 1.8m RIPPER REFUSAL AT 1.9m TEST PIT TERMINATED
2.5					
3.0					
3.5					
4.0					

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BOREHOLE LOG SHEET

Client:	DELFIN LEND LEASE	Hole No:	TP3
Project:	YARRABILBA	Sheet:	1 of 1
Location:	WATERFORD TAMBORINE ROAD	Job No:	5928
Position:	S: 27° 48, 347' E: 153° 06, 173'	Surface Elevation:	
Date Started:	24/3/04	Logged By:	RK
Rig Type (Mounting):	13 TONNE EXCAVATOR	Contractor:	ALLIED EARTHMOVING

Depth (m)	BIT	Sample or Test	Depth (RL) (m)	DCP Test	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
					SM, SILTY SAND, fine to medium grained, dark brown, moist, TOPSOIL
					SM, SILTY SAND, fine to coarse grained, pale brown, moist, NATURAL
0.5					With clay
					CI, SANDY SILTY CLAY, medium plasticity, fine to coarse grained sand, orange/brown, mottled brown, NATURAL
1.0		PP- 270kPa	D		Orange/brown
1.5					
2.0					SC, CLAYEY SAND, fine to coarse grained, medium plasticity clay, mottled pale grey, orange/brown, moist, very dense, NATURAL
2.5					
					XW, EXTREMELY WEATHERED ROCK, SANDSTONE, pale grey, Ripper used at 2.8m mottled orange/brown
3.0					RIPPER REFUSAL AT 2.8m
					TEST PIT TERMINATED
3.5					
4.0					

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BOREHOLE LOG SHEET

Client:	DELFIN LEND LEASE	Hole No:	TP4
Project:	YARRABILBA	Sheet:	1 of 1
Location:	WATERFORD TAMBORINE ROAD	Job No:	5928
Position:	S: 27° 49, 158' E: 153° 07, 253'	Surface Elevation:	
Date Started:	24/3/04	Logged By:	RK
Rig Type (Mounting):	13 TONNE EXCAVATOR	Contractor:	ALLIED EARTHMOVING

Depth (m)	BIT	Sample or Test	Depth (RL) (m)	DCP Test	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
					SM, SILTY SAND, fine to medium grained, dark brown, moist, TOPSOIL
					GP, SANDY GRAVEL, fine to coarse grained gravel, fine to coarse grained sand, orange/brown, dry to moist, trace of cobbles
0.5					
					SP, SAND, fine to coarse grained, orange/brown, with medium plasticity clay, moist, NATURAL
1.0					
					XW, EXTREMELY WEATHERED SANDSTONE
1.5					Ripper used at 1.4m
2.0					RIPPER REFUSAL AT 1.9m TEST PIT TERMINATED
2.5					
3.0					
3.5					
4.0					

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BOREHOLE LOG SHEET

Client:	DELFIN LEND LEASE	Hole No:	TP5
Project:	YARRABILBA	Sheet:	1 of 1
Location:	WATERFORD TAMBORINE ROAD	Job No:	5928
Position:	S: 27° 49, 442' E: 153° 06, 545'	Surface Elevation:	
Date Started:	24/3/04	Logged By:	RK
Rig Type (Mounting):	13 TONNE EXCAVATOR	Contractor:	ALLIED EARTHMOVING

Depth (m)	BIT	Sample or Test	Depth (RL) (m)	DCP Test	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
					SM, SILTY SAND, fine to coarse grained, dark brown, moist, TOPSOIL
					SP, SAND, fine to coarse grained, grey, brown, dry to moist
		Bulk Sample			
0.5					
		PP- 350kPa			CH, SANDY SILTY CLAY, high plasticity, fine to coarse grained sand, mottled orange/brown, brown, NATURAL
1.0					Grey, mottled orange/brown
					XW, EXTREMELY WEATHERED ROCK
					Ripper used at 1.1m
					RIPPER REFUSAL AT 1.2m
1.5					TEST PIT TERMINATED
2.0					
2.5					
3.0					
3.5					
4.0					

Test Report

California Bearing Ratio

Customer: DELFIN LAND LEASE LTD
PO Box 4403
Forest Lake

Report Number: 1

Job Number: 5928

Customer Reference: 0

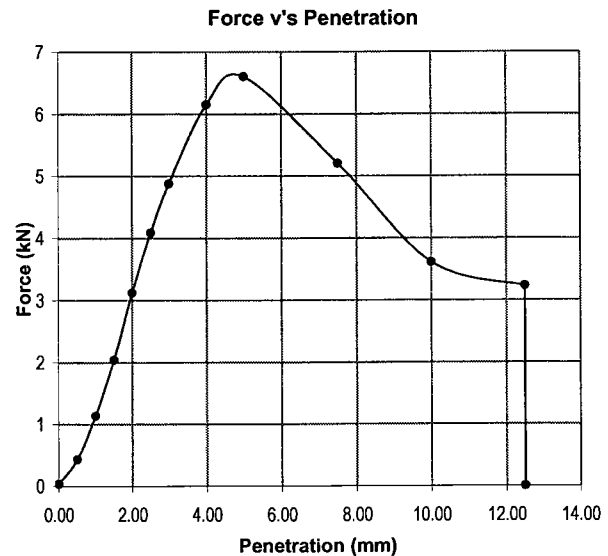
Sample No: 57949

Test Specification: Australian Standard 1289.6.1.1 - 1998

Soil Description	DISTURBED
Sample Location	TP5 0.2-0.4m
Project	YARRABILBA GEO ENG CONSULTANCY

Compaction Criteria		STD
Condition of Specimen		Soaked
Surcharge	g	4500
Period of Soak		4 DAYS
Percentage Retained 19 mm (Not Included in Sample)		0
Moisture Content of Top 30 mm	%	11
Swell/Consolidation	%	-0.4
Laboratory Moisture Ratio	%	97
Laboratory Density Ratio	%	100

Optimum Moisture Content	%	10.0
Maximum Dry Density	t/m ³	1.87
CBR Penetration	mm	3.0
CBR VALUE	%	35.0



Comments:

Testing Officer:	DAVID HAMMELSWANG	Date:	13.04.2004
Reported By:	MJS	Date:	14.04.04
NATA Signatory:		Date:	14.04.04

M.J. SANDILANDS

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NATA Accreditation No. 1986

Page 1 of 1

SOIL CLASSIFICATION TEST REPORT

CLIENT: Delfin Lend Lease Ltd **JOB No.:** 5829
ADDRESS: PO Box 4403 **REPORT No.:** 7
Forest Lake **DATE ISSUED:** _
PROJECT: Yarrabilba Geo Eng Consultancy

SITE TEST No.: _ **LOCATION:** TP 2
SAMPLE No.: 57946 **SAMPLE DEPTH m:** 1.0-1.2
DATE SAMPLED: _ **SOIL DESCRIPTION:** _

ATTERBERG LIMITS & LINEAR SHRINKAGE

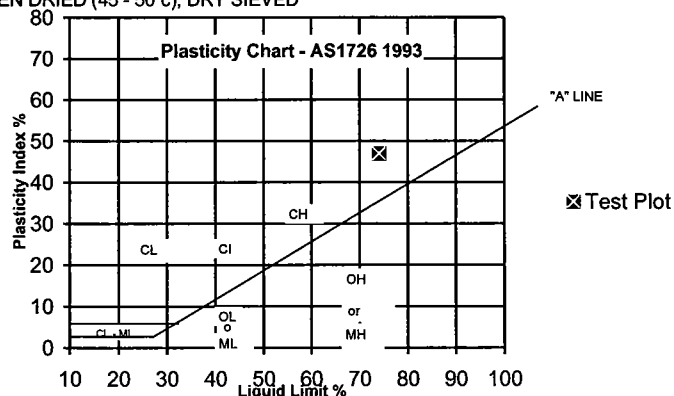
TEST PROCEDURES: AS1289.2.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1,
SAMPLE HISTORY: OVEN DRIED (45 - 50°C), DRY SIEVED

RESULTS

LIQUID LIMIT: 74 %
PLASTIC LIMIT: 27 %
PLASTICITY INDEX: 47 %
LINEAR SHRINKAGE: 16.5 %
FIELD MOISTURE CONTENT: _ %

PLASTICITY

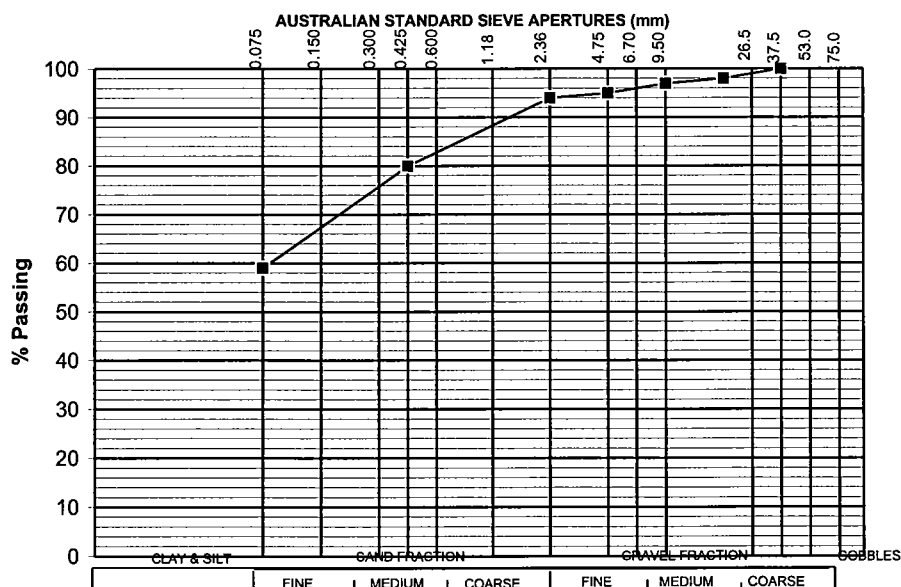
Descriptive Term	Range of L.L.
Of low plasticity	≤ 35
Of medium plasticity	> 35 ≤ 50
Of high plasticity	> 50



PARTICLE SIZE DISTRIBUTION

TEST PROCEDURES: AS1289.3.6.1 - WET SIEVED

SIEVE SIZE (mm)	% PASSING (by mass)
37.5	100
19.0	98
9.5	97
4.75	95
2.36	94
0.425	80
0.075	59



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APPROVED BY: _____

M. J. SANDILANDS

SOIL CLASSIFICATION TEST REPORT

CLIENT: **Delfin Lend Lease Ltd** JOB No.: **5829**
ADDRESS: **PO Box 4403** REPORT No: **8**
Forest Lake DATE ISSUED: **—**
PROJECT: **Yarrabilba Geo Eng Consultancy**
SITE TEST No.: **—** LOCATION: **TP 5**
SAMPLE No.: **57949** SAMPLE DEPTH m: **0.2-0.4**
DATE SAMPLED: **—** SOIL DESCRIPTION: **—**

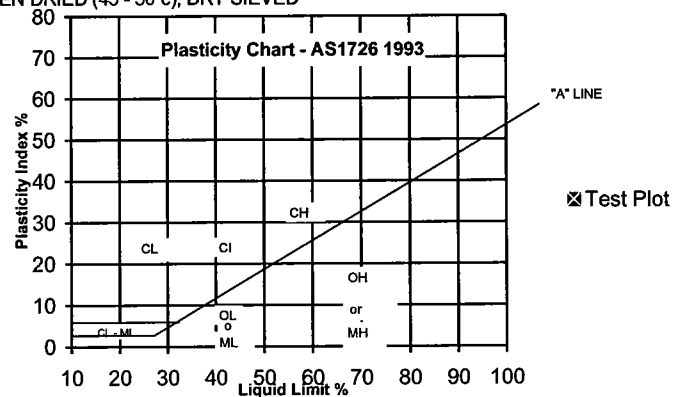
ATTERBERG LIMITS & LINEAR SHRINKAGE

TEST PROCEDURES: AS1289.2.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1,
SAMPLE HISTORY: OVEN DRIED (45 - 50°C), DRY SIEVED

RESULTS

LIQUID LIMIT: **ND** %
PLASTIC LIMIT: **ND** %
PLASTICITY INDEX: **NP** %
LINEAR SHRINKAGE: **—** %
FIELD MOISTURE CONTENT: **—** %

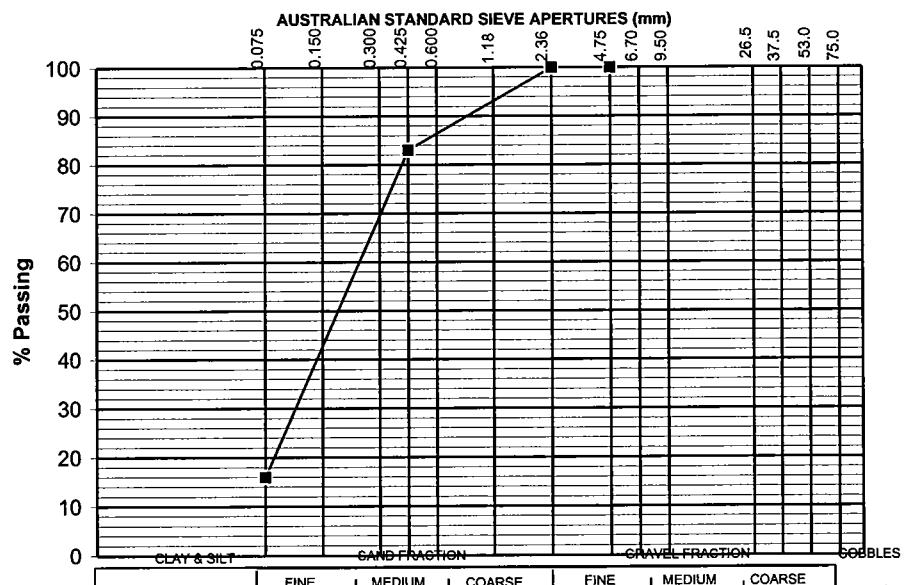
PLASTICITY	
Descriptive Term	Range of I.L.
Of low plasticity	≤ 35
Of medium plasticity	> 35 ≤ 50
Of high plasticity	> 50



PARTICLE SIZE DISTRIBUTION

TEST PROCEDURES: AS1289.3.6.1 - WET SIEVED

SIEVE SIZE (mm)	% PASSING (by mass)
4.75	100
2.36	100
0.425	83
0.075	16



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APPROVED BY: *[Signature]*

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LABORATORY TESTING REPORT SHEET

CLIENT:	Delfin Lend Lease Ltd	JOB No.: 5928
ADDRESS:	PO Box 4403	REPORT No: 18
	Forest Lake	DATE ISSUED: 14.04.04
PROJECT:	Yarrabilba Geo Eng Consultancy	
SITE TEST No.:	—	LOCATION: TP 2
SAMPLE No.:	57946	SAMPLE DEPTH m: 1.0-1.2
DATE SAMPLED:	—	SOIL DESCRIPTION: —
TESTED BY:	jm	DATE TESTED: 13.04.04
CHECKED BY:	MJS	DATE CHECKED: 14.04.04

TEST RESULTS**TEST METHOD****RESULT****DISPERSION OF SOIL (AS1289 3.8.3-1997)****DETERMINATION OF THE PH OF A SOIL
(ELECTROMETRIC METHOD) (AS 1289 4.3.1-1997)****DETERMINATION OF THE EMERSON CLASS
NUMBER OF A SOIL (AS 1289 3.8.1-1997)****TYPE OF WATER
TEMPERATURE OF WATER °C****DISTILLED
26****CLASS NUMBER****ELECTRICIAL CONDUCTIVITY *****NATA Accredited Laboratory
Number: 1986**

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LABORATORY TESTING REPORT SHEET

CLIENT:	Delfin Lend Lease Ltd	JOB No.: 5928
ADDRESS:	PO Box 4403	REPORT No: 19
	Forest Lake	DATE ISSUED: 14.04.04
PROJECT:	Yarrabilba Geo Eng Consultancy	
SITE TEST No.:	—	LOCATION: TP 4
SAMPLE No.:	57947	SAMPLE DEPTH m: 0.0-0.1
DATE SAMPLED:	—	SOIL DESCRIPTION: —
TESTED BY:	jm	DATE TESTED: 13.04.04
CHECKED BY:	MJS	DATE CHECKED: 14.04.04

TEST RESULTSTEST METHODRESULTDISPERSION OF SOIL (AS1289 3.8.3-1997)DETERMINATION OF THE PH OF A SOIL
(ELECTROMETRIC METHOD) (AS 1289 4.3.1-1997)**4.4**DETERMINATION OF THE EMERSON CLASS
NUMBER OF A SOIL (AS 1289 3.8.1-1997)
TYPE OF WATER
TEMPERATURE OF WATER °C**DISTILLED**
26

CLASS NUMBER

3

ELECTRICIAL CONDUCTIVITY *

41uSNATA Accredited Laboratory
Number: 1986

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LABORATORY TESTING REPORT SHEET

CLIENT:	Delfin Lend Lease Ltd	JOB No.: 5928
ADDRESS:	PO Box 4403	REPORT No: 20
	Forest Lake	DATE ISSUED: 14.04.04
PROJECT:	Yarrabilba Geo Eng Consultancy	
SITE TEST No.:	—	LOCATION: TP 5
SAMPLE No.:	57948	SAMPLE DEPTH m: 0.0-0.4
DATE SAMPLED:	—	SOIL DESCRIPTION: —
TESTED BY:	jm	DATE TESTED: 13.04.04
CHECKED BY:	MJS	DATE CHECKED: 14.04.04

TEST RESULTS**TEST METHOD****RESULT****DISPERSION OF SOIL (AS1289 3.8.3-1997)****DETERMINATION OF THE PH OF A SOIL****(ELECTROMETRIC METHOD) (AS 1289 4.3.1-1997)****4.7****DETERMINATION OF THE EMERSON CLASS
NUMBER OF A SOIL (AS 1289 3.8.1-1997)****TYPE OF WATER****DISTILLED****TEMPERATURE OF WATER °C****26****CLASS NUMBER****3****ELECTRICIAL CONDUCTIVITY *****81uS****NATA Accredited Laboratory
Number: 1986**

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PERMEABILITY BY FALLING HEAD	
NATA Laboratory 9926	
TEST PROCEDURE: KH2 (in house method) based on K H Head (1988) Manual of Laboratory Testing, 10.7	
Client: Bowler Geotechnical	Certificate No. 404144-P
Project: 5928 Permeability Material Check	Date: 30/04/2004
	Page 1 of 1
Sample No.	404144
Sample Identification	TP 2
Depth (m)	1.0-1.2
Field Moisture Content (%):	8.6
Maximum Dry Density (tm ³)	1.97
Optimum Moisture Content (%)	12.0
Placement Wet Density (tm ³):	2.17
Placement Moisture Content (%)	11.5
Placement Density Ratio (%):	98.5
PERMEABILITY: $k_{20} = 4 \times 10^{-9}$ m/s	
Classification: (Cl) Sandy Clay, brown, moist.	
Remarks: Sample, maximum dry density and density ratio supplied by the client.	

GT010



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Authorised Signatory

G. Hamilton

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