Appendix D2

Geotechnical investigations:

RMS Factual Geotechnical Investigation Report

Foxground and Berry Bypass Project

Proposed South Berry Option, Princes Hwy (HW1), Berry NSW

Factual Geotechnical Investigation Report

Job Ref:	11-02
WBS:	D/00386/C/P1
Prepared by:	Geotechnical Services, Southern Region
Date:	21 May 2012

RMS tracked drill rig set up on borehole B22

Important Disclaimer

This report was prepared by a study team managed by officers of the Roads & Maritime Services of New South Wales (RMS). This report was prepared solely for the purposes of RMS. The opinions expressed in this report are those of the study team and not necessarily those of RMS. No person should rely on the contents of this publication without first obtaining advice from a qualified professional person. Those persons applying any contents, opinions or conclusions contained in this report do so at their own risk. RMS expressly disclaims all and any liability and responsibility to any person in respect of anything, and of the consequences of anything done, or omitted to be done by any person in reliance, whether wholly or partly, upon the contents of this publication.

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1. INTRODUCTION

1.1 Project Background

The NSW Roads and Maritime Services (RMS) are proposing to upgrade the Princes Highway between Toolijooa Road and Schofields Lane – also called the Foxground and Berry Bypass (FBB). This project is part of RMS's program to upgrade the Princes Highway, providing increased road safety and traffic efficiency in the South Coast region.

The original concept alignment for the FBB project bypasses Berry to the north. However, recently an alternate proposal has been put forward to bypass Berry to the south. These two alignments are referred to in this report as the 'North Berry Option' and the 'South Berry Option'. Geotechnical data along the North Berry Option has been obtained in previous investigations in 2007 and 2009.

Between February and April 2012 a geotechnical investigation was carried out in order to characterise the likely geotechnical conditions that would be encountered along the South Berry Option. This report presents the results of the investigation, and also draws on relevant data from previous investigations.

1.2 Previous Reports

Several geotechnical reports have previously been carried out on a wider study area between Gerringong and Bomaderry. Three of these reports contain test data (borehole, cone penetration test, test pit and laboratory testing) in the vicinity of Berry. These reports are:

- Coffey Geotechnics, (May 2010), *"Geotechnical Interpretive Report for Concept Design".* Preferred Route of the Princes Highway, Gerringong to Bomaderry. Report Ref: GEOTWOLL02580AE-BL.

- Coffey Geotechnics, (February 2010), *"Geotechnical Factual Report for Concept Design".* Gerringong to Bomaderry. Report Ref: GEOTWOLL02580AE-BD.

- Maunsell-Aecom and Coffey Geotechnics, (October 2007), "*Preliminary Geotechnical Report - Gerringong to Bomaderry Princes Highway Upgrade*"

1.3 Scope of Work

The investigation was carried out at the request of RMS Development Section. The scope of work was to carry out a geotechnical investigation of the proposed South Berry Option and provide a factual report summarising the data obtained.

This Factual Geotechnical Report and does not contain any interpretation, analysis or design. The data presented within this report is intended to assist in the compilation of a Geotechnical Interpretive Report.

2. GEOTECHNICAL INVESTIGATION

2.1 General

Fieldwork for the South Berry Option was conducted between February 2012 and April 2012 by RMS, Southern Geotechnical Services. Significant delays (up to 3 weeks downtime) were experienced over the course of the investigation due to heavy rain and flooding of the study area. During these times of flooding it was observed that up to about 50% of the proposed South Berry Option became submerged.

Details of the investigation are given in the below sections.

2.2 Boreholes

Twenty four boreholes were drilled at the locations presented within Figure 1. Boreholes were labelled B1 through to B23. Boreholes B16 and B18 were not drilled due to property access constraints. A number of boreholes were labelled with an "A" after the borehole number indicating their location on the furthest south alignment option. Boreholes N1 and N2 were drilled on the proposed North Berry alignment.

The boreholes were drilled using either a track mounted DB515 drilling rig, truck mounted Edson 3000 or a track mounted Comacchio 205. Boreholes were generally commenced using continuous flight augers above the water table and completed using a combination of wash boring and coring techniques. Standard Penetration tests (SPT) were conducted at intervals of approximately 1.50m in soil materials. Point load ($Is_{(50)}$) strength index tests were performed on specimens of the core at the time of logging.

Borehole locations are presented below within Table 1. Detailed borehole logs, core photographs and explanatory notes are presented within Appendix A.

Table 1 – Borehole Coordinates and Reduced Levels, as Surveyed

BH No.	Easting (MGA94)	Northing (MGA94)	R.L (m, AHD)
B1	290290.64	6149969.46	40.41
B2	290136.89	6149541.75	4.15
B3	290092.97	6149191.99	3.25
B4	289982.28	6148914.05	4.28
B5	289751.26	6148686.71	2.57
B6	289544.08	6148517.27	3.69
B7	289302.04	6148435.94	4.71
B8	289070.01	6148357.54	3.80
B9	288642.25	6148215.95	2.03
B10	288397.64	6148144.71	1.59
B11	287880.65	6147969.08	3.12
B12	287739.57	6147927.32	4.66
B13	287302.20	6147783.77	6.91
B14	287108.99	6147635.18	12.93
B15	288091.92	6148241.94	1.85
B17	287355.24	6148169.58	10.38
B19A	288017.22	6147735.22	2.38
B20A	287669.28	6147639.67	4.87

BH No.	Easting (MGA94)	Northing (MGA94)	R.L (m, AHD)
B21A	287415.06	6147491.42	10.24
B22	286783.31	6147011.35	19.41
B22A	286876.18	6147237.25	20.44
B23	289746.60	6148316.17	2.66
N1	289872.72	6149947.88	8.58
N2	289683.22	6149925.12	9.41

2.3 Cone Penetration Tests and Pore Pressure Dissipation Tests

Fourteen Cone Penetration Tests (CPT) were carried out at the locations shown in Figure 1. The CPT's were labelled CPT401 through to CPT413, with the addition of CPT413a which was pushed directly adjacent to CPT413. In situ testing included four Pore Pressure Dissipation Tests (PPDT).

The CPT's were pushed using one of two CPT rigs, as follows:

- Truck mounted CPT rig, 15 tonne mass. (CPT401, 402, 403, 403a, 404, 407, 411, 412, 413)
- Tracked Geoprobe rig, 4.5 tonne mass, with soil anchors giving an effective push capacity of 20 tonnes. (CPT405, 406, 408, 409, 410)

PPDT's were carried out at the following locations:

- CPT403a – 2.51m
- CPT407 – 2.84m
- CPT409 – 3.01m
- CPT410 – 2.51m

CPT locations are presented below within Table 2. Detailed Cone Penetration Test Results are presented within Appendix B, and Pore Pressure Dissipation Test Results are presented within Appendix C.

Table 2 – CPT Coordinates and Reduced Levels, as Surveyed

CPT No.	Easting (MGA94)	Northing (MGA94)	R.L (m, AHD)
CPT401	290139.10	6149574.06	3.65
CPT402	289983.82	6148916.86	4.11
CPT403	289101.72	6148340.27	3.99
CPT403A	289101.75	6148339.28	3.96
CPT404	288643.02	6148215.59	1.92
CPT405	288398.59	6148145.88	1.50
CPT406	288117.27	6148051.05	2.30
CPT407	287880.97	6147969.48	3.07
CPT408	288735.58	6148076.05	1.25
CPT409	288355.75	6147839.77	1.66
CPT410	288234.16	6147783.68	1.71
CPT411	288017.27	6147735.54	2.30
CPT412	289348.59	6148366.58	4.66
CPT413	289746.14	6148316.32	2.69

2.4 Standpipes and Water Level Monitoring

Water level monitoring standpipes were installed in boreholes B1, B4, B8, B14, B17 and B22.

Standpipe construction details were as follows:

- The bottom 3m of each standpipe was slotted and covered with filter sock
- The annulus was backfilled with cuttings and/ or sand to a depth of 0.5m below the ground surface.
- A bentonite plug was formed from 0.5m to 0.3m below ground level.
- A concrete capping was formed between 0.3m and the ground surface, with a road cover (gattic cover) set into the concrete.
- Each standpipe was flushed with fresh water and bailed after the completion of drilling. The standpipes were constructed using 50mm internal diameter PVC pipes.

Monitoring was conducted by manual reading using a dip meter. Water levels have only been measured once since installation and these levels are presented below within Table 3.

Table 3 – Recorded Water Levels

Standpipe	Ground RL (mAHD[note2])	Monitoring Date	SWL[note1] (mAHD[note2])	SWL[note1] (mBGL[note3])
B1	40.41	19/4/12	34.51	5.9
B4	4.28	19/4/12	1.88	2.4
B8	3.80	19/4/12	3.69	0.11
B14	12.93	17/4/12	11.48	1.45
B17	10.38	19/4/12	10.36	0.02
B22	2.04	19/4/12	-2.54	4.58

Notes to Table

Note 1 - SWL- Standing Water Level
Note 2 - mAHD- Metres above Australian Height Datum
Note 3 - mBGL- Metres *below Ground Level*

2.5 Laboratory Testing

Soil and rock testing was conducted on disturbed and undisturbed samples collected during the field investigation. Geotechnical testing was carried out at RMS Russell Vale Laboratory and Coffey Geotechnics Lane Cove Laboratory. Environmental testing was carried out at Environmental Analysis Laboratory, Lismore. A summary of testing carried out is given in Table 4.

Table 4 – Summary of Laboratory Testing

Test Type	Standard	No. of Tests Carried Out
Geotechnical Laboratory Testing		
Consolidated Undrained Triaxial	AS1289.6.4.2	4 note 1
One Dimensional Consolidation	AS1289.6.6.1	4
Moisture Content	AS1289.2.1.1	4
Atterberg Limits	AS1289.3.1.2 AS1289.3.2.1 AS1289.3.3.1	36
Linear Shrinkage	AS1289.3.4.1	4
Particle Size Distribution (Coarse)	AS1289.3.6.1	15
Particle Size Distribution (Fine)	AS1289.3.6.3	4
Shear Vane on U75 sample	AS1289.6.2.1	2
Environmental Laboratory Testing		
Acid Sulphate Soil (Chromium Suite)	N/A	48
Aggressivity	N/A	6
Acid Sulphate Rock	N/A	3 note 2

Notes to Table 4

Note 1: 3 of the 4 tests are outstanding.
Note 2: All Acid Rock testing is outstanding.

It is anticipated that all outstanding testing will be finalised within 1 week of the date of issue of this report.

The full geotechnical laboratory test reports are included in Appendix D, and the full environmental laboratory test reports are included in Appendix E.

2.6 Survey of Test Locations

All test locations were pegged by RMS Geotechnical Services and subsequently cleared for buried services where required. Borehole and CPT locations were surveyed by RMS Survey staff using Global Navigation Satellite Systems (GNSS). It should be noted that there are slight differences in the coordinates expressed on some CPT data sheets compared to those recorded by RMS surveyors. This is due to the accuracy differences in survey equipment used or the exact location of the survey staff surrounding the CPT hole. Surveyed coordinates take precedence in all cases.

Borehole and CPT coordinates are given in Table 1 and 2.

2.7 Data from Previous Investigations

As mentioned in Section 1.2 above, previous testing has been carried out in the vicinity of the South Berry Option. The relevant factual data from previous investigations is summarised as follows:

February 2010 Factual Report:

- Mapping of an exposed cutting to the north of Berry (Site 27)
- Two boreholes (BH24, and BH25)
- One CPT (CPTu14)
- Associated laboratory testing from the above boreholes.

October 2007 Factual Report:

- Three boreholes (CBH7, CBH8 and CBH10)
- Three CPT's (CPT5, CPT6 and CPT8)
- Two test pits (CTP8 and CTP10)
- Associated laboratory testing from the above boreholes and test pits.

This data is considered to be relevant to any further analyses carried out using this report.

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APPENDIX A

BOREHOLE LOGS AND CORE PHOTOS

EXPLANATORY NOTES - DRILL & EXCAVATION LOGS

GENERAL

Information obtained from site investigations is recorded on log sheets. The "Cored Drill Hole Log" presents data from an operation where a core barrel has been used to recover material - commonly rock. The "Non-Core Drill Hole - Geological Log" presents data from an operation where coring has not been used and information is based on a combination of regular sampling and insitu testing. The material penetrated in non-core drilling is commonly soil but may include rock. The "Excavation - Geological Log" presents data and drawings from exposures of soil and rock resulting from excavtion of pits, trenches, etc.

The heading of the log sheets contains information on Project Identification, Hole or Pit Identification, Location and Elevation. The main section of the logs contains information on methods and conditions, material substance description and structure presented as a series of columns in relation to depth below the ground surface which is plotted on the left side of the log sheet. The common depth scale is 8m per drill log sheet and about 3-5m for excavation logs sheets.

As far as is practicable the data contained on the log sheets is factual. Some interpretation is inevitable in the identification of material boundaries in areas of partial sampling, the location of areas of core loss, description and classification of material, estimation of strength and identification of drilling induced fractures. Material description and classifications are based on SAA Site Investigation Code AS 1726 - 1993 with some modifications as defined below.

These notes contain an explanation of the terms and abbreviations commonly used on the log sheets.

DRILLING

Drilling & Casing

AS	Auger Screwing
AD/V	Auger Drilling with V-Bit
AD/T	Auger Drilling with TC Bit
WB	Wash-bore drilling
RR	Rock Roller
NMLC	NMLC core barrel
NQ	NQ core barrel
HMLC	HMLC core barrel
HQ	HQ core barrel

Drilling Fluid/Water

The drilling fluid used is identified and loss of return to the surface estimated as a percentage.

Drilling Penetration/Drill Depth

Core lifts are identified by a line and depth with core loss per run as a percentage. Ease of penetration in non-core drilling is abbreviated as follows:

VE	Very Easy
E	Easy
F	Firm
H	Hard
VH	Very Hard

Groundwater Levels

Date of measurement is shown.

Standing water level measured in completed borehole

Level taken during or immediately after drilling

Samples/Tests

D	Disturbed
U	Undisturbed
C	Core Sample
SPT	Standard Penetration Test
N	Result of SPT (*sample taken)
VS	Vane Shear Test
IMP	Borehole Impression Device
PBT	Plate Bearing Test
PZ	Piezometer Installation
HP	Hand Penetrometer Test

EXCAVATION LOGS

Explanatory notes are provided at the bottom of drill log sheets. Information about the origin, geology and pedology may be entered in the "Structure and other Observations" column. The depth of the base of excavation (for the logged section) at the appropriate depth in the "Material Description" column. Refusal of excavation plant is noted should it occur. A sketch of the exposure may be added.

MATERIAL DESCRIPTION - SOIL

Classification Symbol - In accordance with the Unified Classification System (AS 1726-1993, Appendix A, Table A1)

Material Description - In accordance with AS 1726-1993, Appendix A2.3

Moisture Condition

D	Dry, looks and feels dry
M	Moist, No free water on remoulding
W	Wet, free water on remoulding

Consistency - In accordance with AS 1726-1993, Appendix A2.5

VS	Very Soft	< 25kPa
S	Soft	25 - 50kPa
F	Firm	50 - 100kPa
St	Stiff	100 - 200kPa
VSt	Very Stiff	200 - 400kPa
H	Hard	≥ 400kPa

Strength figures quoted are the approximate range of Unconfined Compressive Strength for each class.

Density Index. (%) is estimated or is based on SPT results. Approximate N Value correlation is shown in right column.

VL	Very Loose	< 15%	0 - 4
L	Loose	15 - 35%	4 - 10
MD	Medium Dense	35 - 65%	10 - 30
D	Dense	65 - 85%	30 - 50
VD	Very Dense	> 85%	> 50

MATERIAL DESCRIPTION -ROCK

Material Description

Identification of rock type, composition and texture based on visual features in accordance with AS 1726-1993, Appendix A3.1-A3.3 and Tables A6a, A6b and A7.

Core Loss

Is shown at the bottom of the run unless otherwise indicated.

Bedding

Description	Spacing (mm)
Thinly Laminated	< 6
Laminated	6 - 20
Very Thinly Bedded	20 - 60
Thinly Bedded	60 - 200
Medium Bedded	200 - 600
Thickly Bedded	600 - 2000
Very Thickly Bedded	> 2000

Weathering - No distinction is made between weathering and alteration. Weathering classification assists in identification but does not imply engineering properties.

Fresh (F)	Rock substance unaffected by weathering
Slightly Weathered (SW)	Rock substance partly stained or discoloured. Colour and texture of fresh rock recognisable.
Moderately Weathered (MW)	Staining or discolouration extends throughout rock substance. Fresh rock colour not recognisable.
Highly Weathered (HW)	Stained or discoloured throughout. Signs of chemical or physical alteration. Rock texture retained.
Extremely Weathered (EW)	Rock texture evident but material has soil properties and can be remoulded.

Strength - The following terms are used to described rock strength:

Rock Strength Class	Abbreviation	Point Load Strength Index, Is(50) (MPa)
Extremely Low	EL	< 0.03
Very Low	VL	0.03 to 0.1
Low	L	0.1 to 0.3
Medium	M	0.3 to 1
High	H	1 to 3
Very High	VH	3 to 10
Extremely High	EH	≥ 10

Strengths are estimated and where possible supported by Point Load Index Testing of representative samples. Test results are plotted on the graphical estimated strength by using:

- ° Diametral Point Load Test
- • Axial Point Load Test

Where the estimated strength log covers more than one range it indicates the rock strength varies between the limits shown.

MATERIALS STRUCTURE/FRACTURES

ROCK

Natural Fracture Spacing - A plot of average fracture spacing excluding defects known or suspected to be due to drilling, core boxing or testing. Closed or cemented joints, drilling breaks and handling breaks are not included in the Natural Fracture Spacing.

Visual Log - A diagrammatic plot of defects showing type, spacing and orientation in relation to core axis.

Defects	————	Defects open in-situ or clay sealed
	- - - - - - -	Defects closed in-situ
	.....	Breaks through rock substance

Additional Data - Description of individual defects by type, orientation, in-filling, shape and roughness in accordance with AS 1726-1993, Appendix A Table A10, notes and Figure A2.

Type	BP	Bedding Parting
	JT	Joint
	SM	Seam
	FZ	Fracture Zone
	SZ	Shear Zone
	VN	Vein
	FL	Foliation
	CL	Cleavage
	DL	Drill Lift
	HB	Handling break
	DB	Drilling break

Orientation - angle relative to the plane normal to the core axis.

Infilling	CN	Clean
	X	Carbonaceous
	Clay	Clay
	KT	Chlorite
	CA	Calcite
	Fe	Iron Oxide
	Qz	Quartz
	MS	Secondary Mineral
	MU	Unidentified Mineral
Shape	PR	Planar
	CU	Curved
	UN	Undulose
	ST	Stepped
	IR	Irregular
	DIS	Discontinuous
Roughness	POL	Polished
	SL	Slickensided
	S	Smooth
	RF	Rough
	VR	Very Rough

SOIL

Structures - Fissuring and other defects are described in accordance with AS 1726-1993, Appendix A2.6, using the terminology for rock defects.

Origin - Where practicable an assessment is provided of the probable origin of the soil, eg fill, topsoil, alluvium, colluvium, residual soil.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : B1
FILE / JOB NO : G4372
SHEET : 1 OF 4

PROJECT : BERRY BYPASS
LOCATION :

POSITION : E: 290290.640, N: 6149969.460 (56 MGA94) SURFACE ELEVATION : 40.410 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Edson 3000 MOUNTING : Truck CONTRACTOR : TERRATEST DRILLER : R. WELSH

DATE STARTED : 9/3/12 DATE COMPLETED : 11/3/12 DATE LOGGED : 11/3/12 LOGGED BY : TW CHECKED BY : DH

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T HW Casing		E		0.50m SPT 4, 6, 10 N*=16 0.95m	0.0		ML	0.20m CLAYEY SILT: dark brown, low plasticity, trace of vegetation	M		TOPSOIL
							CI-CH	0.40m SILTY CLAY: yellow brown and pale grey, medium to high plasticity			RESIDUAL SOIL
		F		1.50m SPT 12/150mm HB N=R 1.65m	1.0			SILTY SANDSTONE: yellow brown and pale grey, fine grained; extremely weathered		H	BEDROCK 0.50: SPT Recovery: 0.45 m 0.80: HP Samp >400 kPa
					2.0			2.00m Continued as Cored Drill Hole			
					3.0						
					4.0						
					5.0						
					6.0						
					7.0						
					8.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

ROADS AND MARITIME SERVICES, NSW

Transport Roads & Maritime Services

File: G4372 B1 1 OF 4

CORED DRILL HOLE LOG

HOLE NO : B1
FILE / JOB NO : G4372
SHEET : 2 OF 4

PROJECT : BERRY BYPASS
LOCATION :

POSITION : E: 290290.640, N: 6149969.460 (56 MGA94) SURFACE ELEVATION : 40.410 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Edson 3000 MOUNTING : Truck CONTRACTOR : TERRATEST DRILLER : R. WELSH

DATE STARTED : 9/3/12 DATE COMPLETED : 11/3/12 DATE LOGGED : 11/3/12 LOGGED BY : TW CHECKED BY : DH

CASING DIAMETER : HW BARREL (Length) : 3.00 m BIT : IMPREG BIT CONDITION : GOOD

DRILLING				MATERIAL			FRACTURES		
PROGRESS: DRILLING & CASING	PROGRESS: WATER	(CORE LOSS RUN %) / DRILL DEPTH	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) ● - Axial ○ - Diametral	NATURAL FRACTURE (mm)	VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
				0.0				EL 0.03 VL 0.1 L 0.3 M 1 H 3 VH 10 EH	20 40 100 300 1000		
				1.0							
				2.0		2.00m START CORING AT 2.00m					
HW Casing	80% Polymer LOSS (HW casing at 2.00m)	0% LOSS				SILTY SANDSTONE: yellow brown, fine grained, bedded at 0-10°.	EW MW				SM Clay 20 mm BPs 5 - 10° Fe IR RF PR
		2.40				2.34m					
		0% LOSS				SILTY SANDSTONE /SILTSTONE: grey with dark grey, fine grained, colours interlaminated, wavy bedding at 0-10°, occasional off-white clasts.	F				DB
		3.00	Is(50) d=2.05 a=3.81 MPa			2.97m					BP 10° Fe IR RF
		0% LOSS		3.0		SILTY SANDSTONE: yellow brown and grey, fine grained, with dark grey silty laminae, bedded at 0-10°.	MW				BPs & JTs 0 - 90° Fe IR RF PR
				4.0							BPs & JTs 5 - 80° Fe IR RF PR
			Is(50) a=1.19 MPa				EW				SM Clay 90 mm
						4.40m	MW				BPs & JTs 10 - 80° Fe IR RF PR
						SILTY SANDSTONE /SILTSTONE: grey with dark grey, fine grained, colours interlaminated, wavy bedding at 0-10°, occasional off-white clasts.	F				DB
						4.98m					
HQ3			Is(50) d=2.75 a=3.76 MPa	5.0		SILTY SANDSTONE: yellow brown, fine grained, with some dark grey silty laminae, bedded at 0-10°.	MW				SM Clay 80 mm BPs & JTs 5 - 90° Fe IR RF PR
		5.30									
		0% LOSS									
		6.00									
		0% LOSS	Is(50) a=1.4 MPa	6.0							BPs & JTs 5 - 50° Fe IR RF PR
							EW				SM Clay 30 mm
							MW				
	0% Polymer LOSS (HW casing at 5.30m)	6.80									BPs & JTs 5 - 60° Fe Clay IR RF PR
		14% LOSS		7.0							
							EW				SM Clay 230 mm
		7.50				7.37m					
		0% LOSS	Is(50) a=3.82 MPa			7.47m CORE LOSS 0.10m (7.37-7.47)					
						7.57m SILTY SANDSTONE: yellow brown, fine grained, with some dark grey silty laminae, bedded at 0-10°.	MW F				BPs & JTs 0 - 90° Fe IR RF PR DB
						SILTY SANDSTONE /SILTSTONE: grey with dark grey, fine grained, colours interlaminated, wavy bedding at 0-10°, occasional thin off-white secondary mineralised					BPs 0 - 10° Fe IR RF PR
				8.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

ROADS AND MARITIME SERVICES, NSW

Transport Roads & Maritime Services

File: G4372 B1 2 OF 4

CORED DRILL HOLE LOG

HOLE NO : B1
FILE / JOB NO : G4372
SHEET : 3 OF 4

PROJECT : BERRY BYPASS
LOCATION :

POSITION : E: 290290.640, N: 6149969.460 (56 MGA94) SURFACE ELEVATION : 40.410 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Edson 3000 MOUNTING : Truck CONTRACTOR : TERRATEST DRILLER : R. WELSH

DATE STARTED : 9/3/12 DATE COMPLETED : 11/3/12 DATE LOGGED : 11/3/12 LOGGED BY : TW CHECKED BY : DH

CASING DIAMETER : HW BARREL (Length) : 3.00 m BIT : IMPREG BIT CONDITION : GOOD

DRILLING				MATERIAL			FRACTURES		
PROGRESS: DRILLING & CASING	PROGRESS: WATER	(CORE LOSS RUN %) / DRILL DEPTH	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) ● - Axial ○ - Diametral	NATURAL FRACTURE (mm)	VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
HQ3	30% Polymer LOSS (HW casing at 5.30m)	0% LOSS		8.0		veins. SILTY SANDSTONE /SILTSTONE: grey with dark grey, fine grained, colours interlaminated, wavy bedding at 0-10°, occasional thin off-white secondary mineralised veins. *(continued)*	F	EL VL L M H VH EH -0.03 -0.1 -0.3 -1 -3 -10	20 40 100 300 1000		HB DB
											DB
											DB
											DB
		9.00				8.80m					DL
		0% LOSS	Is(50) d=1.39 a=2.78 MPa	9.0		SILTSTONE: dark grey with some grey, fine grained sandstone layers, bedded at 0-10°, occasional thin off-white secondary mineralised veins.					BPs & JTs 5 - 30° Fe IR RF PR BP 5° Fe IR RF BP 2° Fe PR RF BP 10° Fe PR RF BP 5° Fe PR RF BP 10° Fe PR RF DB DB DB
				10.0							JT 30° Fe PR RF BP 10° Fe IR RF DB BPx3 5° Fe PR RF BP 10° Fe IR RF
			Is(50) d=1.26 a=2.11 MPa								
			Is(50) d=1.52 a=3.14 MPa	11.0							DB DB JT 20° Fe MS IR RF BP 5° Fe MS IR RF DB
		12.00									DB DL
		0% LOSS	Is(50) d=2.07 a=3.67 MPa	12.0		12.92m					DBs BPsx2 Fe PR RF DB
						SILTY SANDSTONE /SILTSTONE: grey with dark grey, fine grained, colour interlaminated, wavy bedding at 0-10°, occasional thin off-white secondary mineralised veins and clasts.					BPs & JTs 5 - 30° Fe MS IR RF DB DB BP 10° Fe PR RF BP 5° Fe IR RF BP 10° Fe PR RF BP 5° Fe PR RF
			Is(50) d=3.75 a=3.93 MPa	13.0							
											DB DB DB
			Is(50) d=3.32 a=4.55 MPa	14.0							DB DB
		15.10									DL
		0% LOSS	Is(50) d=3.3 a=5.46 MPa	15.0							
				16.0							JT 60 - 70° Fe MS UN RF

See Explanatory Notes for details of abbreviations & basis of descriptions.

ROADS AND MARITIME SERVICES, NSW

Transport Roads & Maritime Services

File: G4372 B1 3 OF 4

CORED DRILL HOLE LOG

HOLE NO : B1
FILE / JOB NO : G4372
SHEET : 4 OF 4

PROJECT : BERRY BYPASS
LOCATION :

POSITION : E: 290290.640, N: 6149969.460 (56 MGA94) SURFACE ELEVATION : 40.410 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Edson 3000 MOUNTING : Truck CONTRACTOR : TERRATEST DRILLER : R. WELSH

DATE STARTED : 9/3/12 DATE COMPLETED : 11/3/12 DATE LOGGED : 11/3/12 LOGGED BY : TW CHECKED BY : DH

CASING DIAMETER : HW BARREL (Length) : 3.00 m BIT : IMPREG BIT CONDITION : GOOD

DRILLING				MATERIAL			FRACTURES		
PROGRESS: DRILLING & CASING	PROGRESS: WATER	(CORE LOSS RUN %) / DRILL DEPTH	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) ● - Axial ○ - Diametral (EL, VL, L, M, H, VH, EH)	NATURAL FRACTURE (mm) (20, 40, 100, 300, 1000)	VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
HQ3	30% Polymer LOSS (HW casing at 5.30m)	0% LOSS	Is(50) d=3.12 a=5.16 MPa	16.0		SILTY SANDSTONE /SILTSTONE: grey with dark grey, fine grained, colour interlaminated, wavy bedding at 0-10°, occasional thin off-white secondary mineralised veins and clasts. *(continued)*	F			DB DB DB	
						16.44m SILTSTONE: dark grey, with thin fine grained grey silty sandstone interlaminated bedding at 0-10°, occasional thin off white secondary mineralised veins.				DB	
				17.0						DB	
			Is(50) d=1.36 a=3.4 MPa							HB	
										HB DB	
		18.00								DB	
		0% LOSS	Is(50) d=1.3 a=3.35 MPa	18.0						BP 5° Fe IR RF	
										BP 5° Fe PR RF	
										DB	
										BP 5° Fe PR RF	
			Is(50) d=1.62 a=3.2 MPa	19.0						DB DB DB	
										DB	
				20.0						BP 5° Fe PR RF	
			Is(50) d=2.39 a=3.27 MPa							DB DB	
										DB	
		21.00									
		0% LOSS	Is(50) d=2.45 a=4.62 MPa	21.0						DB JT 30° CN IR RF JT 30° CN IR RF DB	
										DB	
				22.0						DB	
			Is(50) d=1.45 a=3.14 MPa							DB	
										DB	
				23.0						BPsx2 10° Fe IR RF	
			Is(50) d=1.32 a=3.1 MPa							23.50: NOTE: Standpipe installed, slotted 18.00 to 24.00mm DB	
		24.00		24.0		24.00m					

BOREHOLEB1 TERMINATED AT 24.00 m

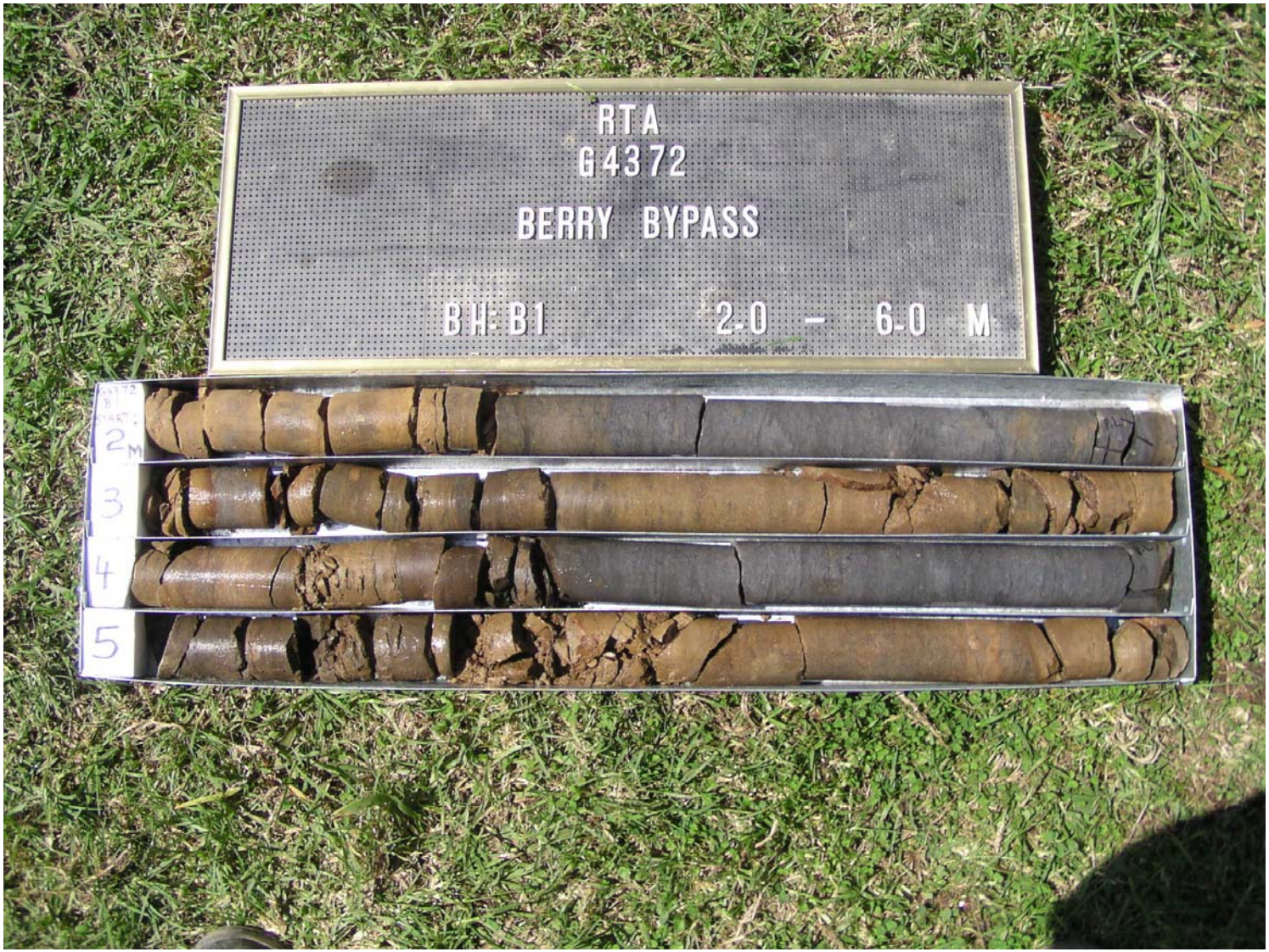
See Explanatory Notes for details of abbreviations & basis of descriptions.

ROADS AND MARITIME SERVICES, NSW
NOTE: Standpipe installed, slotted 18.00 to 24.00m

Transport Roads & Maritime Services

File: G4372 B1 4 OF 4

RMS LIB 32.GLB Log RTA CORED DRILL HOLE G4372 BERRY BYPASS.GPJ <<DrawingFile>> 10/May/2012 14:36 8.30.002 Datgel CPT Tool gINT Add-In

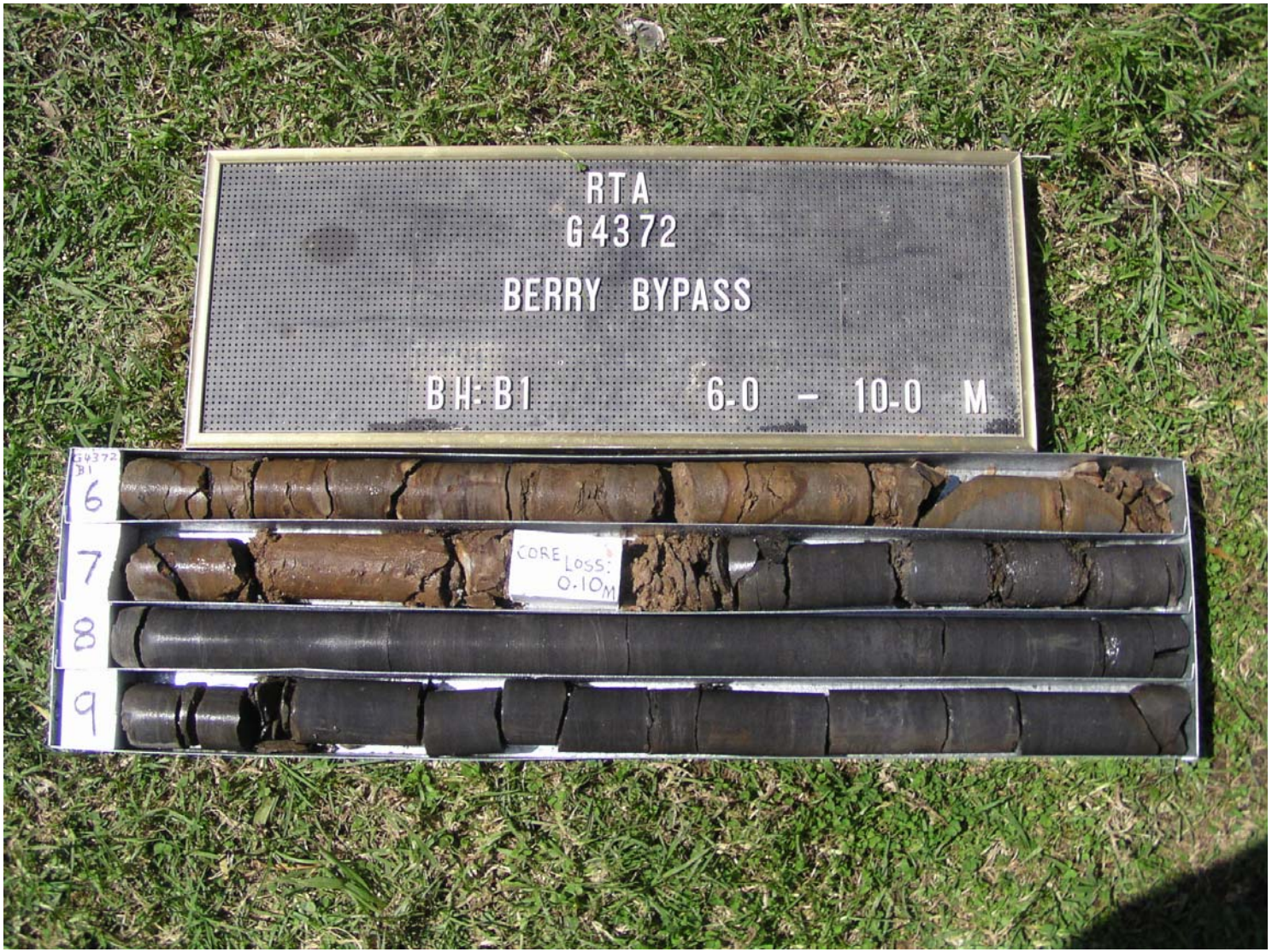


Geotechnical Investigation
Bore Hole: B1

Photo 1 of 6

G4372
HW 1 - Princes Highway
Berry Bypass

NSW GOVERNMENT Transport Roads & Maritime Services



Geotechnical Investigation
Bore Hole: B1

Photo 2 of 6

G4372
HW 1 - Princes Highway
Berry Bypass

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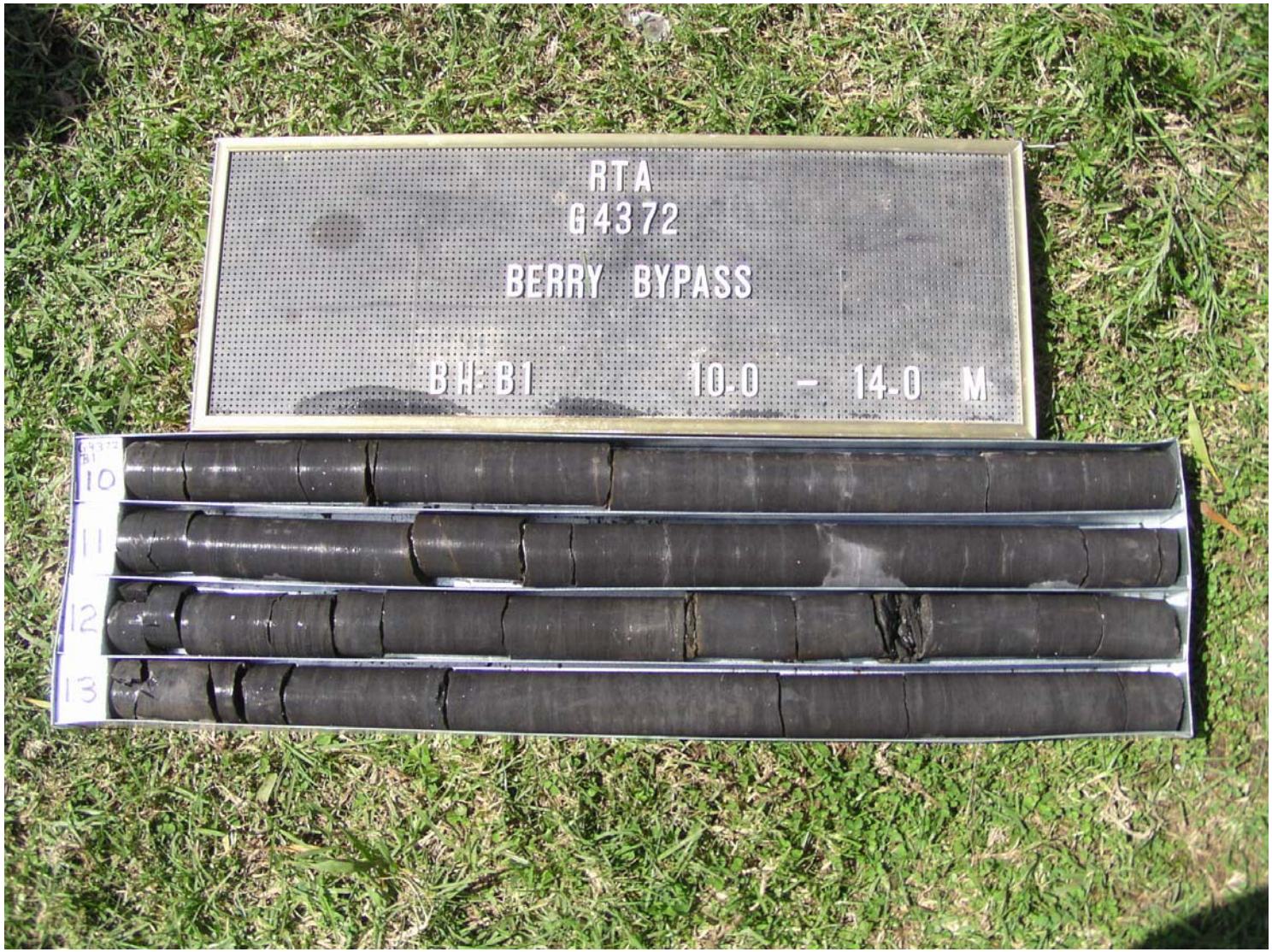
Services

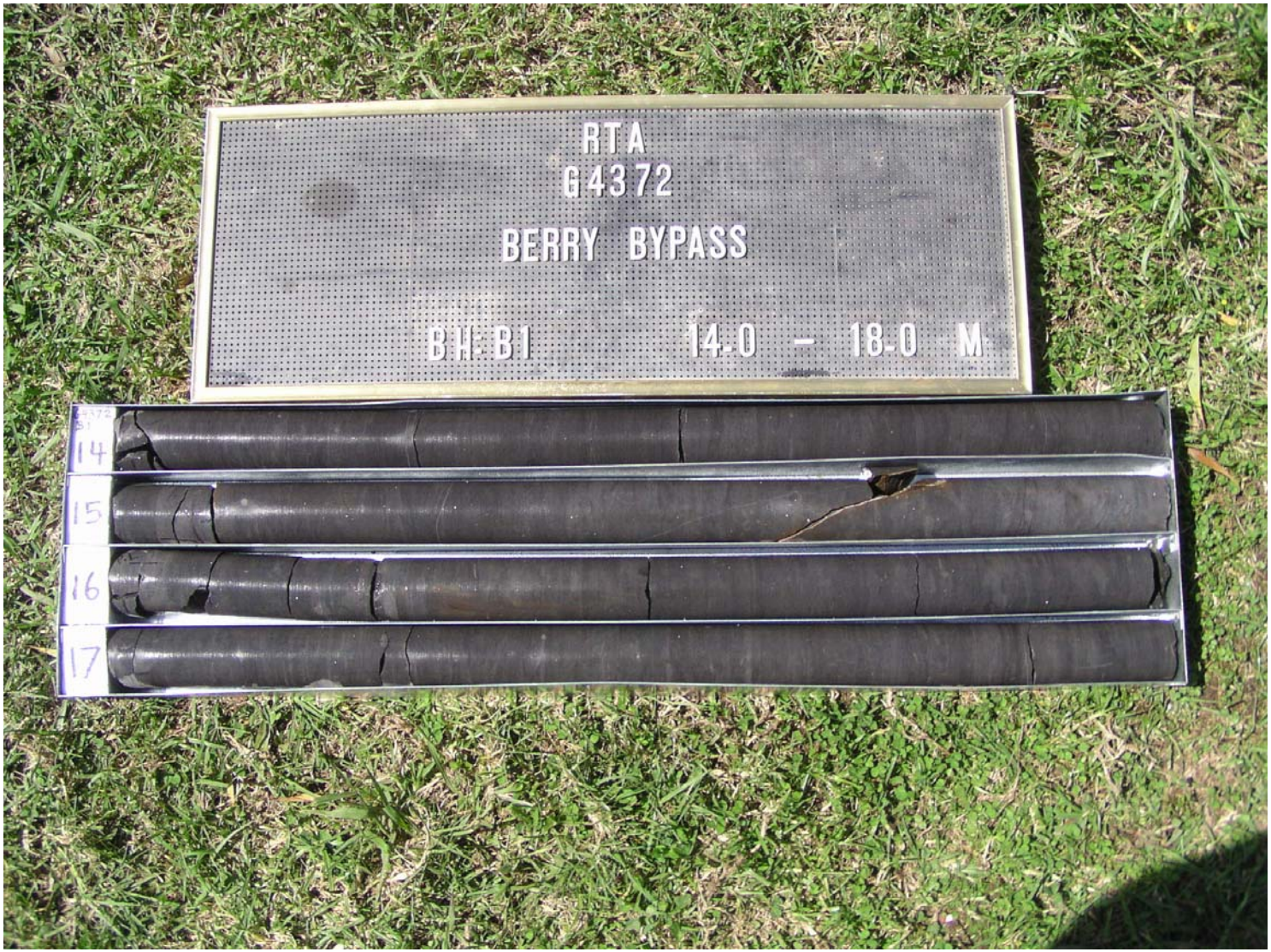


Geotechnical Investigation
Bore Hole: B1

Photo 3 of 6

G4372
HW 1 - Princes Highway
Berry Bypass

NSW GOVERNMENT Transport Roads & Maritime Services



Geotechnical Investigation
Bore Hole: B1

Photo 4 of 6

G4372
HW 1 - Princes Highway
Berry Bypass

NSW GOVERNMENT Transport Roads & Maritime Services

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : B2
FILE / JOB NO : G4372
SHEET : 1 OF 3

PROJECT : BERRY BYPASS
LOCATION :

POSITION : E: 290136.890, N: 6149541.750 (56 MGA94) SURFACE ELEVATION : 4.150 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Edson 3000 MOUNTING : Truck CONTRACTOR : TERRATEST DRILLER : R. WELSH

DATE STARTED : 22/2/12 DATE COMPLETED : 24/2/12 DATE LOGGED : 24/2/12 LOGGED BY : TW CHECKED BY : DH

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T					0.0			SILTY CLAY: brown, medium plasticity, trace of vegetation.			TOPSOIL
							CI	0.30m			
				0.50m SPT 2, 4, 5 N*=9 0.80m ES				CLAY: yellow brown, high plasticity			ALLUVIUM 0.50: SPT Recovery: 0.38 m 0.80: HP Samp = 310 kPa
					1.0		CH				
								1.30m			
				1.50m SPT 3, 3, 4 N*=7 1.80m ES				CLAY: yellow brown and pale grey, high plasticity		VSt	1.50: SPT Recovery: 0.4 m 1.80: HP Samp = 220 kPa
		E			2.0		CH				
			24/02/12					2.30m			
								SANDY CLAY: yellow brown and pale grey, low plasticity, fine grained sand			
							CL			S	
				3.00m SPT 3, 11, 18 N*=29	3.0			3.25m			3.00: SPT Recovery: 0.2 m 3.20: HP Samp = 30 kPa
				3.45m				GRAVEL: dark grey, yellow brown and off-white, fine to coarse gravel, non plastic			
					4.0				M		
				4.50m SPT 10, 19, 25 N*=44							4.50: SPT Recovery: 0.27 m
				4.95m	5.0		GW				
		H-VH								D	
					6.0						
				6.00m SPT 14, 19, 15 N*=34							6.00: SPT Recovery: 0.28 m
				6.45m							
					7.0			7.10m			
		F						CLAYEY GRAVEL: yellow brown, brown and pale grey, low plasticity, sandy clay bound fine to coarse sub-angular gravel			
		H		7.50m SPT 17, 27, 21 N*=48			GC				7.50: SPT Recovery: 0.26 m
				7.95m	8.0						

HW Casing
WB/RR
HW Casing
40% LOSS (HW casing at 4.00m)
HW Casing
40% LOSS (HW casing at 6.00m)

See Explanatory Notes for details of abbreviations & basis of descriptions.

ROADS AND MARITIME SERVICES, NSW

Transport Roads & Maritime Services

File: G4372 B2 1 OF 3

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : B2
FILE / JOB NO : G4372
SHEET : 2 OF 3

PROJECT : BERRY BYPASS
LOCATION :

POSITION : E: 290136.890, N: 6149541.750 (56 MGA94) SURFACE ELEVATION : 4.150 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Edson 3000 MOUNTING : Truck CONTRACTOR : TERRATEST DRILLER : R. WELSH

DATE STARTED : 22/2/12 DATE COMPLETED : 24/2/12 DATE LOGGED : 24/2/12 LOGGED BY : TW CHECKED BY : DH

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
WB/RR	0% LOSS (HW casing at 7.50m)	H			8.0		GC	CLAYEY GRAVEL: yellow brown, brown and pale grey, low plasticity, sandy clay bound fine to coarse sub-angular gravel *(continued)*		D	8.00: ALLUVIUM
								8.50m			
		E		9.00m SPT 7, 30/150mm HB N=R 9.30m	9.0		CI	SILTY CLAY: yellow brown and grey, medium plasticity	M	St	RESIDUAL SOIL
								9.05m			
								SILTSTONE: yellow brown and dark grey, highly to moderately weathered.			BEDROCK
								9.25m			9.20: HP Samp = 110 kPa
								Continued as Cored Drill Hole			
					10.0						
					11.0						
					12.0						
					13.0						
					14.0						
					15.0						
					16.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

ROADS AND MARITIME SERVICES, NSW

Transport Roads & Maritime Services

CORED DRILL HOLE LOG

HOLE NO : B2
FILE / JOB NO : G4372
SHEET : 3 OF 3

PROJECT : BERRY BYPASS
LOCATION :

POSITION : E: 290136.890, N: 6149541.750 (56 MGA94) SURFACE ELEVATION : 4.150 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Edson 3000 MOUNTING : Truck CONTRACTOR : TERRATEST DRILLER : R. WELSH

DATE STARTED : 22/2/12 DATE COMPLETED : 24/2/12 DATE LOGGED : 24/2/12 LOGGED BY : TW CHECKED BY : DH

CASING DIAMETER : HW BARREL (Length) : 3.00 m BIT : STEP FACE BIT CONDITION : GOOD

DRILLING				MATERIAL			FRACTURES		
PROGRESS: DRILLING & CASING	PROGRESS: WATER	(CORE LOSS RUN %) DRILL DEPTH	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) ● - Axial ○ - Diametral EL -0.03 / VL -0.1 / L -0.3 / M -1 / H -3 / VH -10 / EH	NATURAL FRACTURE (mm) 20 / 40 / 100 / 300 / 1000	VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
				8.0							
				9.0							
						9.25m START CORING AT 9.25m					
HQ3	0% LOSS (HW casing at 7.50m)	0% LOSS	SPT 7, 30/150mm HB N=R 9.30m			9.33m CORE LOSS 0.08m (9.25-9.33)					
						9.46m SILTSTONE: dark grey and dark orange brown	MW				BPs & JTs 5 - 45° Fe PR RF
						SILTSTONE: dark grey, bedded at 0-10°, occasional thin off-white secondary mineralised veins.	F				
			Is(50) d=0.8 a=2.42 MPa	10.0							DB JTs 60 - 85° MS PR RF BPs 10° Fe MS PR RF DB
			Is(50) d=1.63 a=1.77 MPa	11.0							HB DB JT 90° CN PR RF BP 5° Clay PR RF
		12.00 0% LOSS	Is(50) d=1.46 a=4.04 MPa	12.0							HB DL HB HB
			Is(50) d=1.83 a=3.52 MPa	13.0							DB on VN DB on VN DB HB
		13.86				13.86m					
				14.0		BOREHOLEB2 TERMINATED AT 13.86 m					
				15.0							
				16.0							

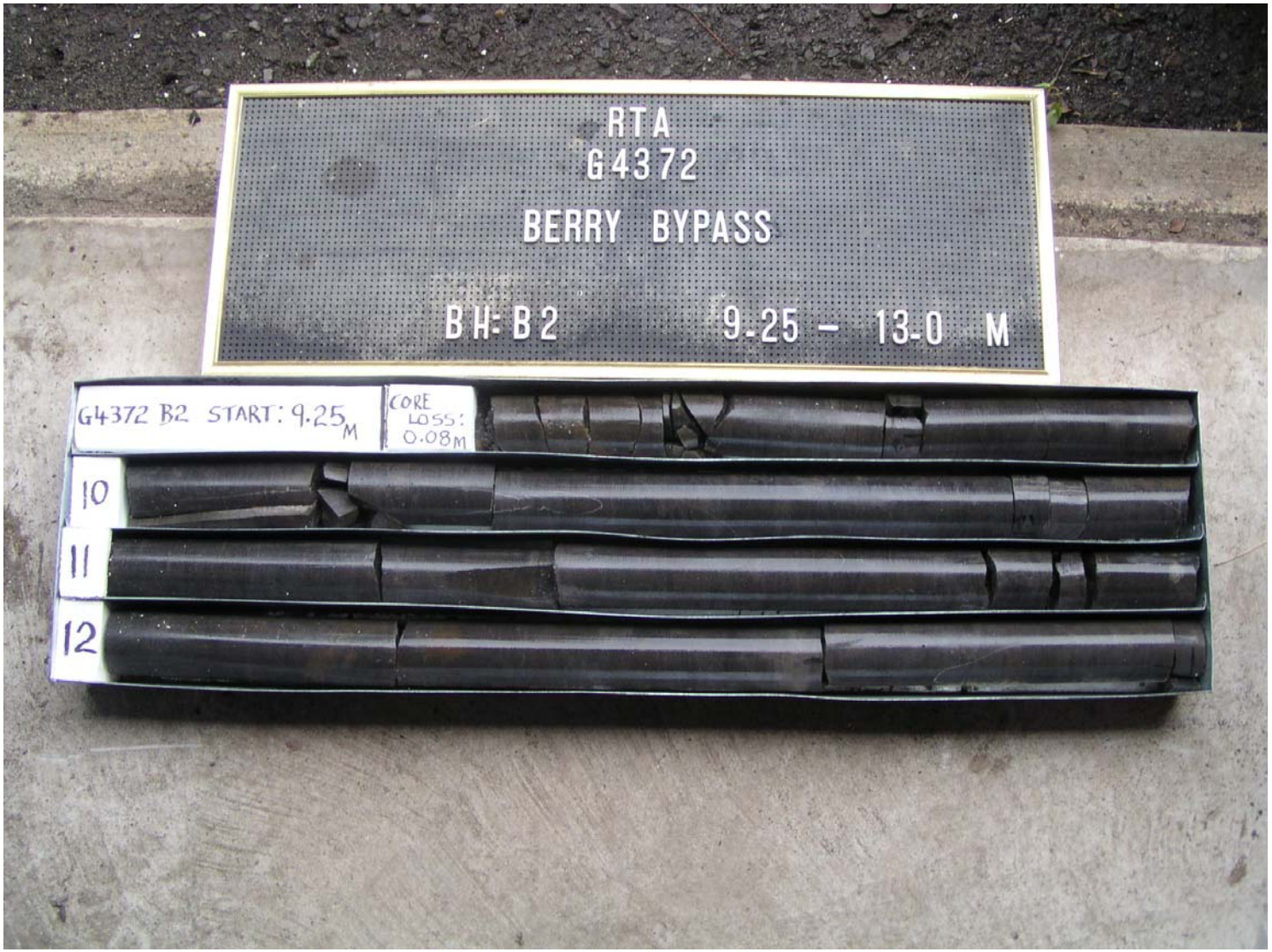
See Explanatory Notes for details of abbreviations & basis of descriptions.

ROADS AND MARITIME SERVICES, NSW

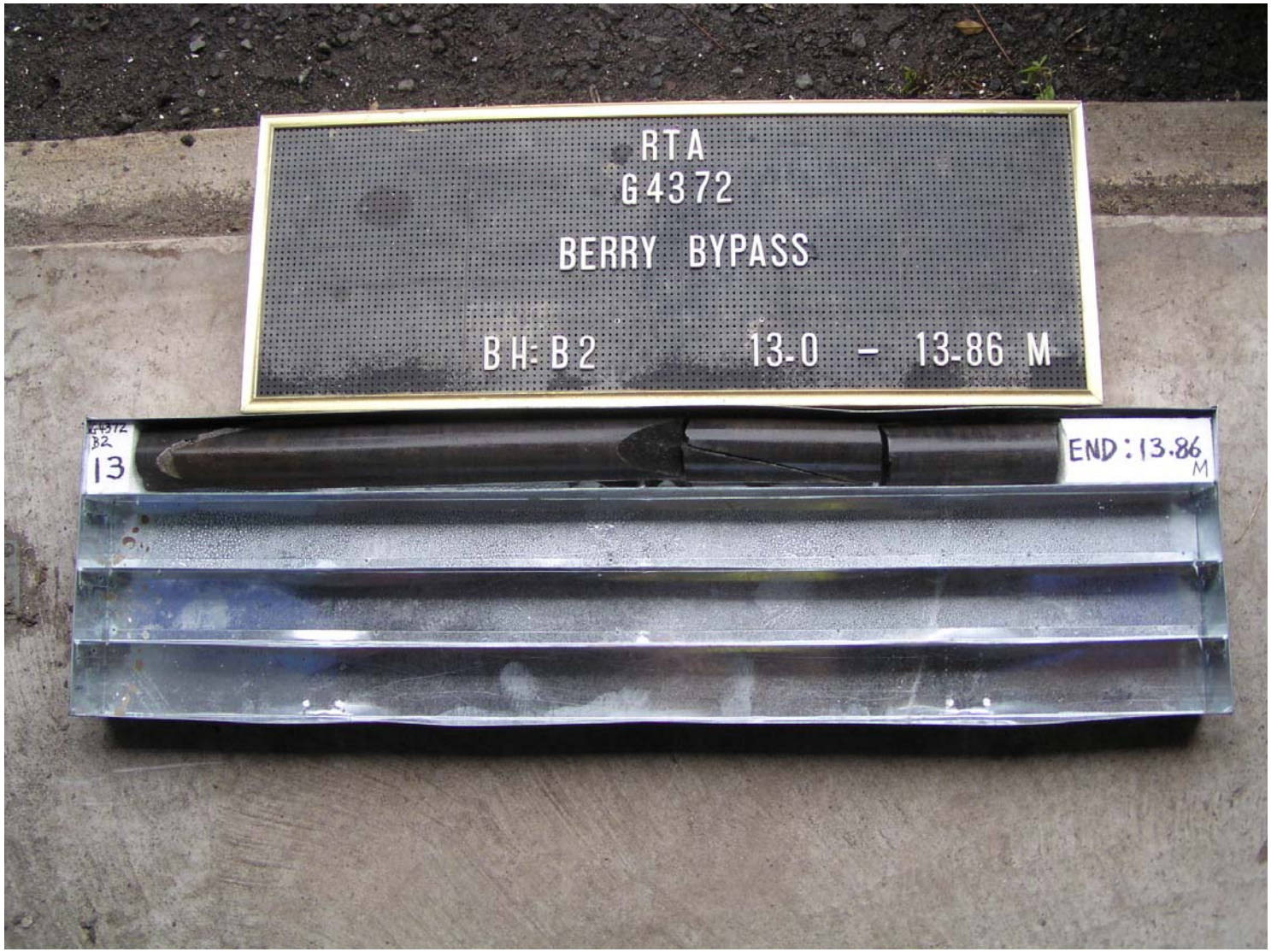
Transport Roads & Maritime Services

File: G4372 B2 3 OF 3

RMS LIB 32.GLB Log RTA CORED DRILL HOLE G4372 BERRY BYPASS.GPJ <<DrawingFile>> 10/May/2012 14:37 8.30.002 Datgel CPT Tool gINT Add-In



Geotechnical Investigation Bore Hole: B2 Photo 1 of 2	G4372 HW 1 - Princes Highway Berry Bypass	NSW GOVERNMENT Transport Roads & Maritime Services



Geotechnical Investigation Bore Hole: B2 Photo 2 of 2	G4372 HW 1 - Princes Highway Berry Bypass	NSW GOVERNMENT Transport Roads & Maritime Services

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : B3
FILE / JOB NO : G4372
SHEET : 1 OF 2

PROJECT : BERRY BYPASS
LOCATION :

POSITION : E: 290092.970, N: 6149191.990 (56 MGA94) | SURFACE ELEVATION : 3.250 (AHD) | ANGLE FROM HORIZONTAL : 90°

RIG TYPE : DB515 | MOUNTING : Track | CONTRACTOR : RMS | DRILLER : R MORTON

DATE STARTED : 16/3/12 | DATE COMPLETED : 17/3/12 | DATE LOGGED : 17/3/12 | LOGGED BY : MH | CHECKED BY : DH

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
					0.0			CLAY WITH SILT: dark brown and dark grey brown, high plasticity, trace root fibres		F	TOPSOIL
							CH				
					0.40m			CLAY: red brown and orange brown mottled pale grey, low plasticity, with black spots, possible iron oxide			ALLUVIUM
			16/03/12 12:13	0.50m SPT 2, 3, 5 N*=8							0.50: SPT Recovery: 0.45 m
				0.95m	1.0						0.90: HP Samp = 130 - 150 kPa
				1.50m SPT 2, 3, 4 N*=7							1.50: SPT Recovery: 0.45 m 1.70: HP Samp = 130 - 200 kPa
AD/T HW Casing				1.95m 2.00m U75	2.0		CH		M	St	
				2.35m 2.50m SPT 3, 2, 3 N*=5				becoming sandy			2.20: HP Samp = 130 kPa 2.50: SPT Recovery: 0.45 m
				2.95m	3.0						2.90: HP Samp = 130 - 180 kPa
					3.80m			GRAVEL WITH SAND: dark brown and dark grey brown, fine and medium gravel, rounded to angular, fine to coarse grained sand			
		E		4.15m SPT 15, 33/150mm N*=R 4.45m	4.0				W with M	VD	4.15: SPT Recovery: 0.2 m
NW Casing WB	0% Water LOSS				5.0		GP				
				5.65m SPT HW/220mm, 1, 4 N*=5 6.10m				possible loose sand layer 100-200mm		VL	5.65: SPT Recovery: 0.1 m
					6.0				W		
					6.60m			evidence of charcoal pieces approx. 4mm			
								SANDY GRAVEL / GRAVEL WITH SAND: dark grey brown and dark grey, fine to medium gravel, rounded to angular, fine to coarse grained sand, trace silt, trace clay		MD	
				7.15m SPT 19, 17, 11 N*=28 7.60m	7.0		GP				7.15: SPT Recovery: 0.15 m
					7.85m			SANDY SILTSTONE: grey and dark grey, weathered			BEDROCK
					8.00m			Continued as Cored Drill Hole			
					8.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

ROADS AND MARITIME SERVICES, NSW

Transport Roads & Maritime Services

File: G4372 B3 1 OF 2

CORED DRILL HOLE LOG

HOLE NO : B3
FILE / JOB NO : G4372
SHEET : 2 OF 2

PROJECT : BERRY BYPASS
LOCATION :

POSITION : E: 290092.970, N: 6149191.990 (56 MGA94) SURFACE ELEVATION : 3.250 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : DB515 MOUNTING : Track CONTRACTOR : RMS DRILLER : R MORTON

DATE STARTED : 16/3/12 DATE COMPLETED : 17/3/12 DATE LOGGED : 17/3/12 LOGGED BY : MH CHECKED BY : DH

CASING DIAMETER : HW/NW BARREL (Length) : 1.50 m BIT : STEP FACE BIT CONDITION : GOOD

DRILLING

PROGRESS: DRILLING & CASING; WATER

(CORE LOSS RUN %) / DRILL DEPTH

SAMPLES & FIELD TESTS

DEPTH (m)

MATERIAL

GRAPHIC LOG

DESCRIPTION
ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)

Weathering

ESTIMATED STRENGTH Is(50) ● - Axial ○ - Diametral

FRACTURES

NATURAL FRACTURE (mm)

VISUAL

ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other

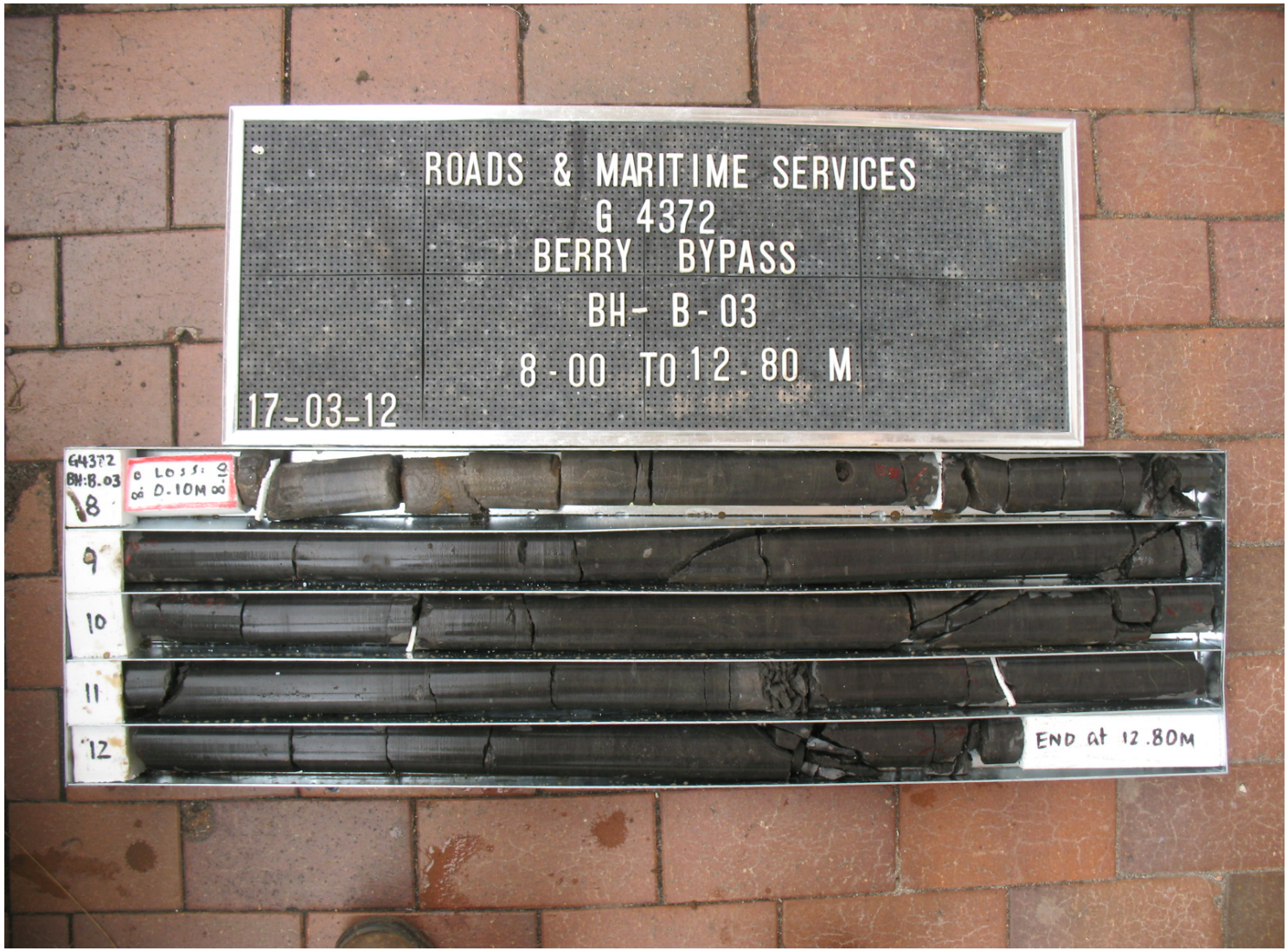
Depth (m)	Drilling & Casing	Water	(Core Loss Run %) / Drill Depth	Samples & Field Tests	Description	Weathering	Additional Data
8.0	NMLC	0% Water LOSS	START CORING AT 8.00m				
8.00m			66% LOSS 8.15		CORE LOSS 0.10m (8.00-8.10)		
8.10m			0% LOSS		SANDY SILTSTONE / SILTY SANDSTONE: sandstone is dark grey and grey, fine grained, occasional carbonaceous veneers and laminations	MW	DL; BP 10° Fe IR RF
						HW	DB; BP 5° Pyrite IR RF
						MW	
			8.75			SW to F	
			0% LOSS	Is(50) d=1.2 a=4.66 MPa			DB; DL; DB; DBs
9.0				Is(50) d=1.52 a=2.22 MPa			DB
							DBs; JT 60° CN IR RF
							JT 50° CN IR RF
10.0							HB; DL; DB
			10.25	Is(50) d=2.08 a=4.18 MPa			
			0% LOSS				JTs 60° Pyrite IR RF; DB
		20% Water LOSS					JT 40° CN IR RF
11.0				Is(50) d=2.12 a=3.15 MPa			DB; DB; DB; FZs
						HW	
			11.80			SW to F	
			0% LOSS	Is(50) d=1.68 a=4.21 MPa			
12.0							DB; DB; DB
			12.80	Is(50) d=1.96 a=3.78 MPa	12.80m		JTs 65° CN IR RF
					BOREHOLEB3 TERMINATED AT 12.80 m		
13.0							
14.0							
15.0							
16.0							

See Explanatory Notes for details of abbreviations & basis of descriptions.

ROADS AND MARITIME SERVICES, NSW

Transport Roads & Maritime Services

File: G4372 B3 2 OF 2



Geotechnical Investigation Bore Hole: B3 Photo 1 of 1	G4372 HW 1 - Princes Highway Berry Bypass	NSW GOVERNMENT Transport Roads & Maritime Services

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : B4
FILE / JOB NO : G4372
SHEET : 1 OF 3

PROJECT : BERRY BYPASS
LOCATION :

POSITION : E: 289982.280, N: 6148914.050 (56 MGA94) | SURFACE ELEVATION : 4.280 (AHD) | ANGLE FROM HORIZONTAL : 90°

RIG TYPE : DB515 | MOUNTING : Track | CONTRACTOR : RMS | DRILLER : R MORTON

DATE STARTED : 13/3/12 | DATE COMPLETED : 15/3/12 | DATE LOGGED : 15/3/12 | LOGGED BY : MH | CHECKED BY : DH

DRILLING					MATERIAL						
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
					0.0			CLAY WITH SAND: dark brown and brown, medium plasticity, fine grained sand, trace root fibres		St	TOPSOIL
					0.40m						
AD/T HW Casing			14/02/12	0.50m SPT 3, 5, 7 N*=12 0.95m	1.0		CI-CH	CLAY: brown and orange brown, medium to high plasticity, trace fine grained sand	M	VSt	ALLUVIUM 0.50: SPT Recovery: 0.4 m 0.70: HP Samp = 300 - 350 kPa
		E		1.50m SPT 3, 4, 6 N*=10 1.95m	2.0					St to VSt	1.50: SPT Recovery: 0.45 m 1.80: HP Samp = 200 - 250 kPa
			14/03/12, Inflow	2.50m SPT 2, 3, 3 N*=6 2.95m	2.20m			CLAYEY SAND: orange brown and brown with grey, fine to medium grained sand, medium to high plasticity, trace coarse grained sand, trace fine gravel	M to W	L	2.50: SPT Recovery: 0.45 m
DB					3.0		SC				
					3.15m			GRAVEL WITH SAND: brown, dark brown and red brown, fine to coarse gravel, angular, fine to coarse grained sand			3.20: Installed HW casing to 2.65m. Water table raised up after penetrating top of clay layer
		H		4.10m SPT 11, 7, 9 N*=16 4.55m	4.0		GP			MD	4.10: SPT Recovery: 0.15 m
	10% Water LOSS				5.0						
					5.40m			SILTY SAND: grey and dark grey, fine grained sand, trace low plasticity clay	W		
NW Casing		E		5.60m SPT 4, 2, 1 N*=3 6.05m	6.0		SM			VL	5.60: SPT Recovery: 0.07 m
WB					6.25m			GRAVEL: brown and dark brown, fine to medium gravel, rounded to angular, with fine to coarse grained sand			
		H		7.10m SPT 12, 12, 11 N*=23 7.55m	7.0		GP			MD	7.10: SPT Recovery: 0.2 m
					7.75m			SILTY SAND: grey and dark grey, fine to medium grained sand			
		E			8.0		SM			L	7.75: Soil type based on cuttings from recycled water return

See Explanatory Notes for details of abbreviations & basis of descriptions.

ROADS AND MARITIME SERVICES, NSW

Transport Roads & Maritime Services

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : B4
FILE / JOB NO : G4372
SHEET : 2 OF 3

PROJECT : BERRY BYPASS
LOCATION :

POSITION : E: 289982.280, N: 6148914.050 (56 MGA94) SURFACE ELEVATION : 4.280 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : DB515 MOUNTING : Track CONTRACTOR : RMS DRILLER : R MORTON

DATE STARTED : 13/3/12 DATE COMPLETED : 15/3/12 DATE LOGGED : 15/3/12 LOGGED BY : MH CHECKED BY : DH

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
NW Casing		E			8.0		SM	SILTY SAND: grey and dark grey, fine to medium grained sand *(continued)*	W	L	
								8.20m GRAVEL: brown and grey brown, fine and medium gravel, rounded to angular, trace silt, trace fine grained sand			
				8.60m SPT 19, 16, 20/120mm N*=R							8.60: SPT Recovery: 0.1 m
WB NW Casing	10% Water LOSS	H		9.02m	9.0		GP		M	VD	
								9.60m SANDY SILTSTONE: grey and dark grey, fine grained, weathered			BEDROCK
					10.0			10.00m Continued as Cored Drill Hole			
					11.0						
					12.0						
					13.0						
					14.0						
					15.0						
					16.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

ROADS AND MARITIME SERVICES, NSW

Transport Roads & Maritime Services

CORED DRILL HOLE LOG

HOLE NO : B4
FILE / JOB NO : G4372
SHEET : 3 OF 3

PROJECT : BERRY BYPASS
LOCATION :

POSITION : E: 289982.280, N: 6148914.050 (56 MGA94) SURFACE ELEVATION : 4.280 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : DB515 MOUNTING : Track CONTRACTOR : RMS DRILLER : R MORTON

DATE STARTED : 13/3/12 DATE COMPLETED : 15/3/12 DATE LOGGED : 15/3/12 LOGGED BY : MH CHECKED BY : DH

CASING DIAMETER : HW/NW BARREL (Length) : 1.50 m BIT : STEP FACE BIT CONDITION : GOOD

DRILLING					MATERIAL			FRACTURES		
PROGRESS: DRILLING & CASING	PROGRESS: WATER	(CORE LOSS RUN %) / DRILL DEPTH	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) ● - Axial ○ - Diametral (EL, VL, L, M, H, VH, EH)	NATURAL FRACTURE (mm)	VISUAL	ADDITIONAL DATA (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
				8.0							
				9.0							
				10.0		10.00m START CORING AT 10.00m					
NMLC	0% Water LOSS	0% LOSS	Is(50) d=1.55 a=2.69 MPa	11.0		SANDY SILTSTONE / SILTY SANDSTONE: siltstone is dark grey and grey; sandstone is fine grained, Numerous closed fractures at 0° - 30°. Trace of pyrite on joints and BPs. Occasional carbonaceous veneers and laminations at 0° - 10°. Moderately to well cemented.	SW				JT 80° closed JT? 15° closed JT 70° closed DB DB JT? 50° MU IR RF
		11.47									DL BPs
		0% LOSS					MW SW				DB FZs JTDB 25° CN IR RF
			Is(50) d=2.9 a=4.92 MPa	12.0			MW SW				DB HB DB FCDB 80° CN IR RF
											DB BPDB 0° CN IR RF DB
		12.95	Is(50) d=2.5 a=1.76 MPa	13.0							DL BP?HB 10° Pyrite IR RF
	20% Water LOSS	0% LOSS									JT 90° Pyrite DIS BP? 0° CN IR RF BPs CN IR RF FZs 20 mm BPsDB 0° CN IR RF
							MW - HW SW				BP 20° CN IR RF JTsDB 0 - 10° CN IR RF
				14.0							JT 10° CN IR RF DB
		14.41	Is(50) d=3 a=2.78 MPa								DL FZs 20 mm BP 20° CN IR RF
		0% LOSS					MW				BPs 0° CN IR RF DB
	70% Water LOSS			15.0			SW				FZs 20 mm DB DB
											BP? 20° CN IR RF JT 90° CN IR RF FZs 20 mm BP 20° CN IR RF DB DB
		15.90	Is(50) d=5.1 a=6.37 MPa			15.90m					
				16.0		BOREHOLEB4 TERMINATED AT 15.90 m Standpipe installed					

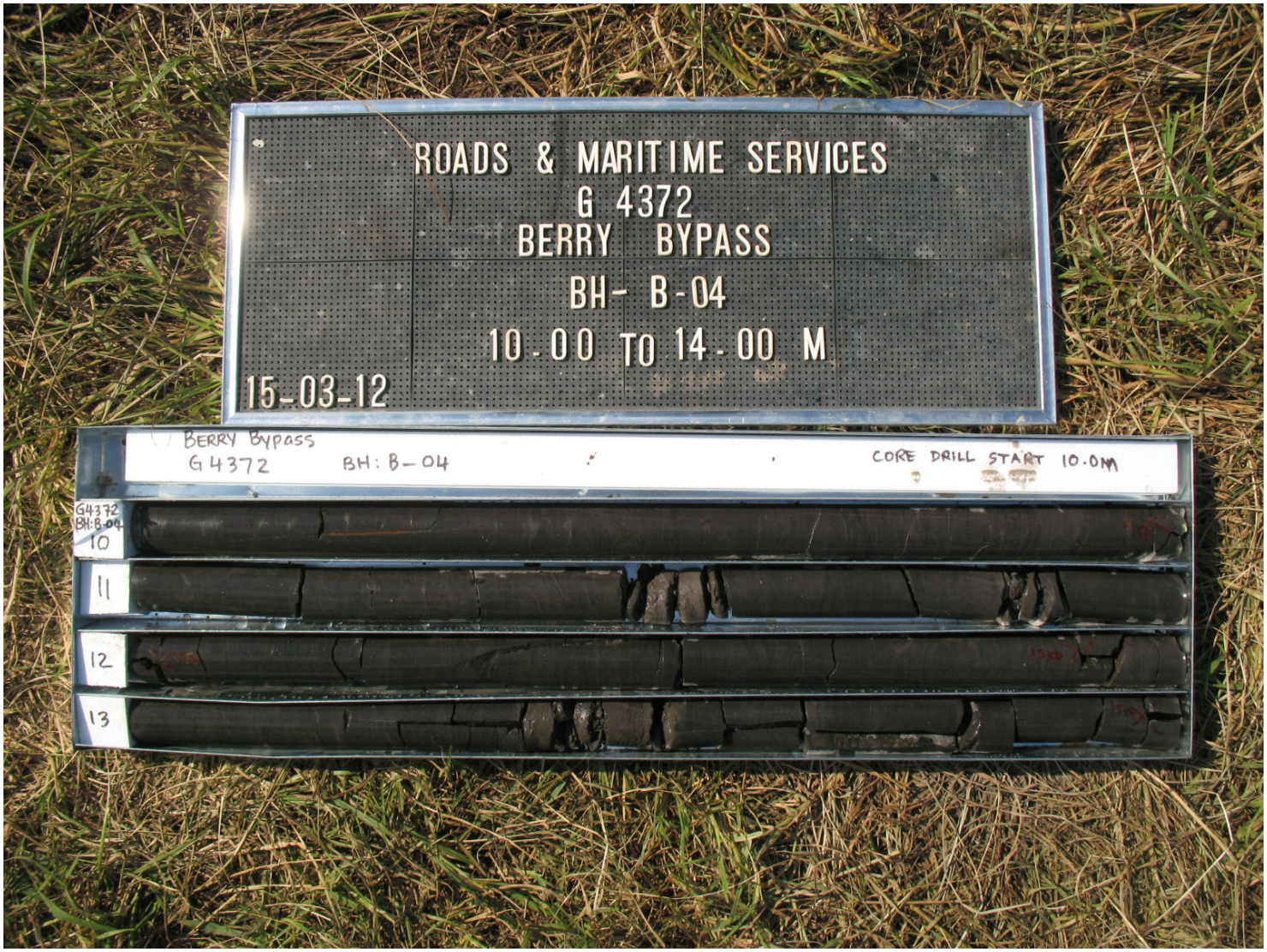
See Explanatory Notes for details of abbreviations & basis of descriptions.

ROADS AND MARITIME SERVICES, NSW

Transport Roads & Maritime Services

File: G4372 B4 3 OF 3

RMS LIB 32.GLB Log RTA CORED DRILL HOLE G4372 BERRY BYPASS.GPJ <<DrawingFile>> 10/May/2012 14:38 8.30.002 Datgel CPT Tool gINT Add-In



Geotechnical Investigation
Bore Hole: B4

Photo 1 of 2

G4372
HW 1 - Princes Highway
Berry Bypass

NSW GOVERNMENT
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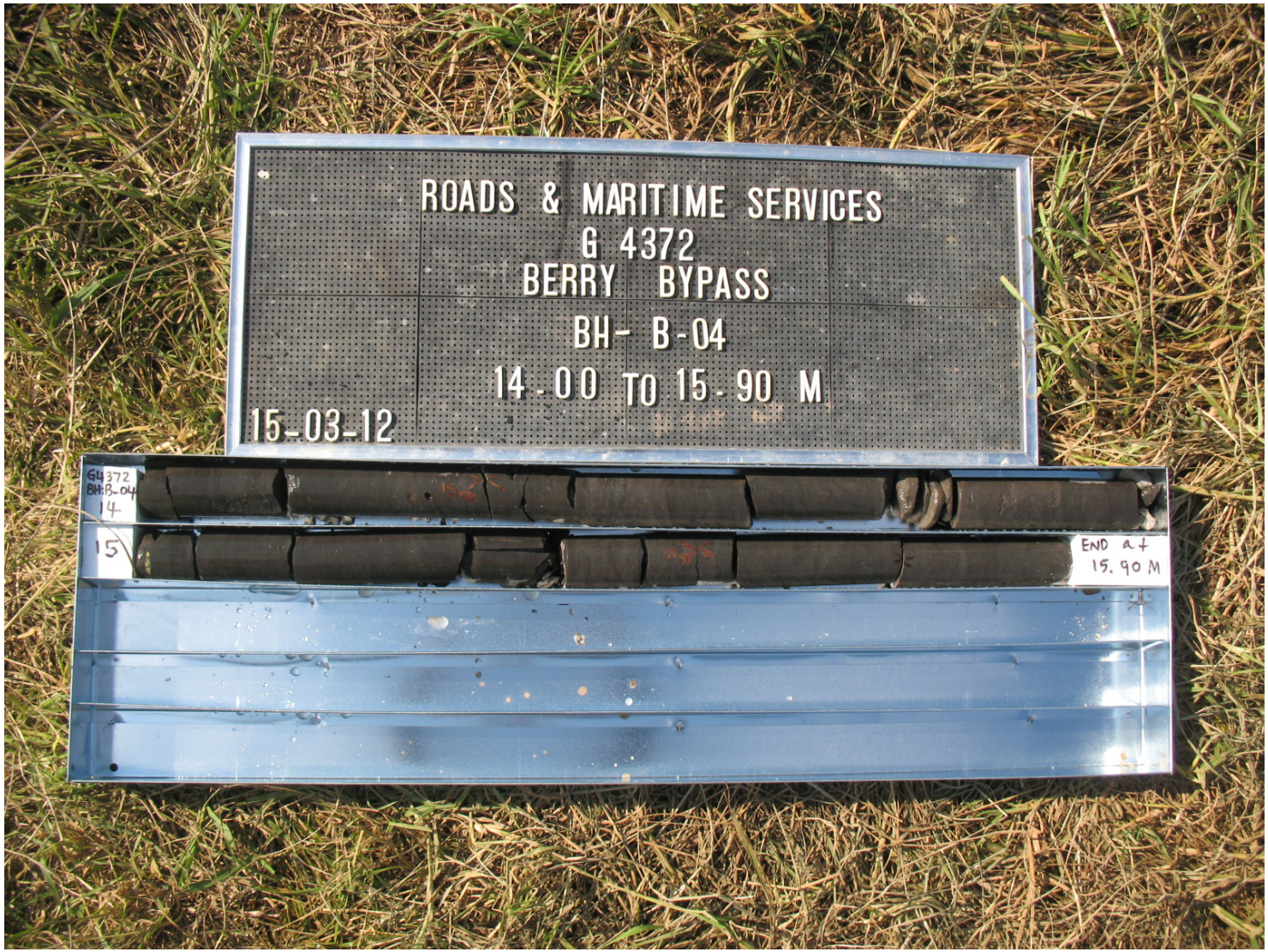

Geotechnical Investigation
Bore Hole: B4

Photo 2 of 2

G4372
HW 1 - Princes Highway
Berry Bypass

NSW GOVERNMENT Transport Roads & Maritime Services