



APPENDIX 5

CID - ENGINEERING SERVICING REPORT



ROWE GROUP



Subdivision Lot 15 & 17 Brand Highway, Rudds Gully

Engineering Services Report

PROJECT No. 10128

AUSTRALIAN MINERALS INVESTORS PTY LTD

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CONTENTS

1	INTRODUCTION	3
1.1	BACKGROUND	3
1.2	PURPOSE OF REPORT	3
1.3	STUDY BRIEF	3
1.4	TERMS OF REFERENCE	3
2	SITE EVALUATION AND BULK EARTHWORKS	4
2.1	GENERAL SITE EVALUATION	4
2.2	SITE GEOLOGY AND GEOTECHNICAL INVESTIGATIONS	4
2.3	GROUND WATER LEVEL	4
2.4	ACID SULPHATE SOILS	5
2.5	BULK EARTHWORKS/SITE WORKS	5
2.6	RETAINING WALLS	5
3	ROADWORKS	6
4	WATER & WASTEWATER	7
4.1	SEWER RETICULATION	7
4.2	WATER RETICULATION	7
5	POWER, TELECOMMUNICATIONS AND GAS	8
5.1	POWER	8
5.2	STREETLIGHTING	8
5.3	TELECOMMUNICATIONS	8
5.4	GAS RETICULATION	8
6	STORMWATER AND GROUNDWATER MANAGEMENT	9
7	CONCLUSION	10



FIGURES

Figure 1: Development Plan
Figure 2: Site Location
Figure 3: Surface Geology Map

APPENDICES

Appendix A: Survey data
Appendix B: Groundwater data
Appendix C: Acid Sulphate Soil Mapping
Appendix D: Sewer Reticulation Plan
Appendix E: Water Reticulation Plan
Appendix F: CID Drawings



1 INTRODUCTION

1.1 BACKGROUND

Lot 15 & 17 Brand Highway, Rudds Gully is owned by Australian Minerals Investors Pty. Ltd. and is located approximately 5 km south of the City of Geraldton. The areas of both sites are 31.52 hectare (ha) and 35.57 ha for Lot 15 and Lot 17 respectively. The project location is indicated in Figure 2 (Site Location), with the proposed Structure Plan for both lots illustrated in Figure 1.

1.2 PURPOSE OF REPORT

CID Consultants was commissioned by Australian Minerals Investors Pty. Ltd. to assess engineering servicing requirements for the development of Lot 15 & 17 Brand Highway, Rudds Gully. This report is supplied to support the application by Urban Plan for approval of a Local Structure Plan over the subject area.

CID Consultants role in this project was to assess and review engineering and servicing requirements including the following key areas;

- Site Evaluation
- Geology
- Groundwater
- Bulk Earthworks
- Roadworks
- Stormwater Drainage & Management Plans
- Sewer
- Water
- Acid Sulphate Soils
- Environmental Issues
- Communications
- Gas

1.3 STUDY BRIEF

The study brief includes the following key activities:

- Review of the Subdivisional Layout Plan, which was prepared by Urban Plan;
- An appraisal of engineering servicing requirements for the site; and
- Identify key infrastructure requirements.

1.4 TERMS OF REFERENCE

This report has been compiled based on consultations with the Water Corporation, Local Council and various other service authorities in relation to the servicing requirements for the site.



2 SITE EVALUATION AND BULK EARTHWORKS

2.1 GENERAL SITE EVALUATION

The areas of both sites are; 31.52 hectares (ha) and 35.57 ha for Lot 15 and Lot 17 respectively, which are located within the City of Greater Geraldton & Greenough and are adjacent to Brand Highway to the south. The properties are located approximately 5 to 6 kilometres south of Geraldton's city centre.

Observation of the survey data provided by HTD surveyors & planners, the following is noted:

- For Lot 15:
 - there is a depressed area located east within the lot and about 25% of the catchment area is grading down towards the depressed area; and
 - the remaining catchment area grades in a south westerly direction towards Brand Highway.
- For Lot 17:
 - it is observed that about 65% of the catchment area grades towards Brand Highway in a westerly direction;
 - about 15% of the catchment grades in a south direction towards neighbouring lots (i.e. Lot 477 and 500); and
 - the remaining catchment grades in a south east and northerty direction towards neighbouring Lots (i.e. Lot 30, 117 & 717).

Survey plans of both lots are provided in drawing 10128 – Appendix A 'Survey data' of this report.

2.2 SITE GEOLOGY AND GEOTECHNICAL INVESTIGATIONS

The types of soils within the project site are mainly calcareous deep sands and sand that overlays limestone (Department of Agriculture; Government of WA; Greenough Region; Resource Management Technical Report 268, December 2005). Refer to Figure 2 'surface geology map' that illustrate the various types of soil in the surrounding area.

Further geotechnical investigations on site will be required prior to detailed design and development in order to ascertain the extent of any remedial works required.

2.3 GROUND WATER LEVEL

Currently, due to the location of the site there is no data available from Perth Groundwater Atlas Data. Information on the closest bore station retrieved from the Department of Water (DoW) has been used to give some indication of the groundwater levels.

Average Annual Max Groundwater Level (AAMGL) of the DoW's bore station was retrieved and the results are shown in Appendix B, which is accompanied with the 'monitoring bores location plan'. The data gathered from DoW indicates that the groundwater level has a separation distance of more than 10m below the concept earthworks levels.

The location of the bore station is approximately 3km north east of the project site.

Therefore groundwater issues are not expected to arise in the development of the proposed lots.



2.4 ACID SULPHATE SOILS

Based on a desktop study of the Acid Sulphate Soils (ASS) within the area, both lots are categorised to have extremely low probability of containing ASS. However, having a low confidence level, a detailed study of the area may be required to confirm these findings.

ASS mapping, is provided in drawing 10128 – Appendix C ‘Acid Sulphate Soil risk mapping’.

2.5 BULK EARTHWORKS/SITE WORKS

The two sites have been extensively cleared; although some areas have not been cleared and these belong to the Acacia shrub land plant community.

Preparatory earthworks are expected to include the following:

- Stripping and clearing of areas (clear existing vegetation).
- Removing topsoil and storing for future use.
- Extensive Cut to Fill and grading of lots
- Installation of retaining walls.

Due to the steep natural existing terrain, and the need to provide flat pads for residential development, cut to fill earthworks and retaining walls are expected to be extensive. A conceptual assessment of likely earthwork levels suitable for residential development has been determined assuming flat lot pads that will be required for the individual lots and is provided in Appendix F.

Due to Main Road WA (MRWA) requirements, the stormwater run-off from the development is not allowed to enter Brand Highway. MRWA as the governing body for Brand Highway has placed a condition on both developments, which does not allow the stormwater runoff to discharge into the existing stormwater drainage system on the Brand Highway road reserve for 1 year up to 100 year ARI flood events.

2.6 RETAINING WALLS

Due to the steep natural existing terrain, and the need to provide flat pads for residential development, cut to fill earthworks and retaining walls are expected to be extensive. A conceptual assessment of likely earthwork levels suitable for residential development has been determined assuming flat lot pads that will be required for the individual lots and is provided in Appendix F.

Generally, the requirements of the City of Geraldton-Greenough will dictate that retaining walls shall not be greater than 2.0m.



3 ROADWORKS

Internal road networks and intersections will be designed in accordance with City of Geraldton-Greenough guidelines and requirements.

The requirements outlined for the road design are based on Module 3 of the Institute of Public Works Engineering Australia; Local Government Guidelines for Subdivisional Development Edition 2.1 – 2011 and Liveable Neighbourhood (WAPC).

The City of Geraldton-Greenough state the following policies should be referenced as design guidance and assessment criteria:

- Liveable Neighbourhoods (WAPC);
- WAPC Policy DC 1.5 – Bicycle Planning (February, 1990);
- WAPC Policy DC 2.6 – Residential road planning (December, 1992);
- WAPC Policy DC 4.1 – Industrial subdivisions; and
- Australian National Cycling strategy 2005-2010 (Austroads 2005).

Additionally, road designs should conform to the relevant Austroads standards and have regard to Australian Road Research Board (ARRB) and other publications, which include:

- Guide to Traffic Engineering Practice – Parts 1 to 15 (Austroads)
- Turning Path Templates (Austroads, 1995)
- Sealed Local Roads Manual (ARRB)
- Guide for the Design of Typical Urban Intersections (NAASRA 1965)
- Guide Policy for the Geometric Design of Major Urban Roads (NAASRA, 1976)
- Rural Road Design – Policy for the Geometric Design of Rural Roads (Austroads, 1993)
- Guidelines for the Design and Geometric Layout of Residential Roads (November, 1989)
- Rural Road Design – A guide to the Geometric Design of Rural Roads – (Austroads)
- Policy for Installations by Public Utility Authorities within the Road Reserve
- Pavement Design – A guide to the Structural Design of Road Pavements (Austroads 2004)
- Guidelines for the Design of Bicycle Facilities (Bikewest)
- Street (Road) Lighting Code AS 1158
- AS 2150: Hot Mix Asphalt
- AS 2008: Residual Bitumen for Pavements
- Technical Specifications, Tender Form and Schedule for Supply and Laying of Hot
- Asphalt Road Surfacing (AAPA/IPWEA)
- Guide to Traffic Engineering Practices – Part 14: Bicycles (Austroads)
- Guide to Traffic Engineering Practices – Part 13: Pedestrians (Austroads)

Entrance roads into the development will include high level treatments and provide an entry statement, while the intersection treatment from the development to Brand Highway will be subject to high level control of traffic flow and be subject to the requirements and approval of Main Roads Western Australia.



4 WATER & WASTEWATER

4.1 SEWER RETICULATION

The Water Corporation has made provision for a reticulated sewerage scheme as part of future planning for the Area. The Water Corporation's planning is illustrated in Appendix D, and indicates all sewerage is supposed to discharge into the "Greenough-on-sea" wastewater treatment plant. Presently none of the required infrastructure has been put in place to allow the proposed sewer reticulation system of lot 15 and 17 to be connected.

We estimate that the distance from the wastewater treatment plant to the development of Lot 15 to be 0.9 km. The Water Corporation plan shows this extension mainly as a 225 mm diameter sewer pipe. An additional extension of 0.8 km to service Lot 17 is also required. The Water Corporation has not provided any information about the timeframe for these works and it is most likely that land developers will carry the costs of such an extension. Subject to the status of the development and timing of the Water Corporation's Capital works program, the development may require prefunding of Water Corporation infrastructure, or other suitable arrangements with the Water Corporation put in place.

The sewer reticulation system for Lot 15, assuming that a sewer becomes available along Brand Highway, will be constructed as a gravity system. The difference in height between the area adjacent to Brand Highway and the back of the Lot will easily accommodate the required minimum grade of 1 in 200.

Some filling or alternatively a deeper sewer system towards the east end of the block is required to accommodate the 2 m lower area (catchment 1 is shown in drawing 10128-SK1). Depending on the zoning and planning for these lots, another method of disposal may be adequate and more viable for this section of the development.

The extension of sewer main for Lot 17 will also be constructed as a gravity system within road reserves..

4.2 WATER RETICULATION

Information provided by the Water Corporation for water reticulation in the area, indicates the following:

- A 250mm diameter AC water main runs from the Bootenal water tank along Lot 15 through to a 200 P -12 pipe along Brand Highway, adjacent to Lot 17.
- A 250 mm diameter AC water main continues to the opposite side of Brand Highway connecting to another 2 pipes (which are 100mm diameter pipes), one runs in a south west direction presumably as mains for future lots south of Brand Highway and another runs north west along Brand Highway.

This information is provided in Appendix E 'Water Reticulation plan'.

Water supplies for Lot 15 will be provided by connecting a proposed water reticulation system to the 250 mm diameter AC water main running through the Lot. The water connection for lot 17 will be provided by connecting a proposed water reticulation system to the 200P -12 pipe running along Brand Highway adjacent to Lot 17. This connection arrangement was suggested and confirmed by the Water Corporation.

The internal water reticulation will be designed and constructed in accordance with standard Water Corporation requirements and manual, with typical headworks charges to apply.

5 POWER, TELECOMMUNICATIONS AND GAS

5.1 POWER

Electrical Consultants and Concept Consultants Australia have provided the following preliminary estimates for power requirements for the proposed development:

- The project would require at least 3.1MVA in installed transformer capacity. The number of transformers required to service the lots is extremely difficult to determine at this early stage of the development.
- At least 620 pillars will be required.

Western Power have advised the existence of high voltage (HV) overhead power lines that run through both properties, and no underground infrastructure located on or near lots 15 and 17. Early estimates are power supply could come from these existing HV lines, but would be subject to confirmation from a network designers at higher planning stage.

5.2 STREETLIGHTING

All requirements as per AS1158 will be applicable, and approval from Western Power will be required. City of Geraldton-Greenough preference is for decorative street lighting in accordance with Western Power products to be installed.

5.3 TELECOMMUNICATIONS

From the information gathered from 'Dial Before You Dig', there are Telstra and Nextgen fibre optic cables running along Brand Highway adjacent to both lots. It is anticipated that this infrastructure will have sufficient capacity to provide telecommunication services for the future development of both lots.

5.4 GAS RETICULATION

Alinta Gas advised that the closest main gas pressure is about 2km away and it is not feasible to extend the main to provide gas reticulation for both lots. They suggest providing gas services by using a bottled LPG gas system should reticulated gas be deemed a requirement by the developer.



6 STORMWATER AND GROUNDWATER MANAGEMENT

A Local Water Management Strategy has been completed by CID Consultants and will be implemented to support the Local Structure Plan documentation. The following outlines key design approaches to be implemented to satisfy requirements of the City of Geraldton-Greenough and other authorities.

To manage the stormwater runoff at the post development stage, a drainage system designed to manage minor and major events up to the 1 in 100 years ARI event, has been developed, and is based on maintaining existing hydrology by infiltrating surface water as close to the source as possible.

The principle drainage system of the development will be based on the Better Urban Water Management (BUWM) guideline and also local government subdivision development guidelines as directed by the City of Greater Geraldton, and the DoW. The principle design will also take into account the decision made by Main Roads WA, that stormwater collected within the Lots cannot discharge onto Brand Hwy as there is a flooding issue on the road and subdivision development should make sure that all run off at post development stage should be contained within both lots for up to 1 in 100 years ARI event.

The stormwater management system includes the following design concepts:

- Stormwater runoff from each residential lot will be stored in soakwells for up to 1 in 1 year ARI event for a 1 hour duration.
- Piped street system sized to accommodate up to 1 in 5 years ARI event wholly within system.
- The proposed road reserve in conjunction with the 1 in 5 years ARI system is designed to convey the 1 in 100 years ARI event towards infiltration basins located within Public Open Spaces.
- Vegetated Open basins within Public Open Space (POS) Areas will have to cater for 1 in 5 years ARI event and up to 1 in 100 years ARI event. Outflow of water from basin will be by infiltration.
- Maximum water level in basins for 1 in 100 year events shall be 1.2m
- Basins shall empty within 48 hours.
- Minimum Lot levels to be 300mm above the 1 in 100 years flood level, except for developments adjacent to flood prone land in which case, the minimum Lot level will need to be 500mm above the adjacent 100 year ARI flood level.
- A minimum horizontal distance of 1 m will be maintained from infiltration system to building footings;
- Finished Lot levels are ensured to have a minimum of 1.5 metres vertical separation distance above AAMGL

Detailed landscaping plans will be required as part of the design and implementation of the Urban Water Management Plan at next levels of planning.



7 CONCLUSION

The overall engineering requirements of this site have been assessed based on the aspects discussed within this report. As a result of this assessment the following issues need to be addressed at the detailed design stage:

- Due to the steep existing natural surface, necessity and extent of retaining walls required to create residential lots.
- Existing services below ground level that runs through lot 15.
- Existing HV overhead power and the ability to provide power supply from these existing services.
- On site disposal systems for possible larger zoned lots to prevent excess filling of deep sewer.
- Detailed geotechnical information for provision to manage, store and infiltrate stormwater run-off for the 1 in 100 year ARI event on site.
- Stage of Water Corporation capital works programme for wastewater disposal.
- MRWA requirements for intersection/upgrades for entrance road to proposed development.

In conclusion, the land is considered to be readily serviceable for urban residential development, and the above issues will be addressed during the detailed design.



FIGURES



FIGURE 1 – DEVELOPMENT PLAN





structure plan for lots 15 and 17
brand highway, geraldton

FIGURE 2 – SITE LOCATION





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PROJECT

PROPOSED SUBDIVISION LOT 15 &
17 BRAND HWY, RUDDS GULLY

CLIENT

Australian Minerals Investors Pty Ltd

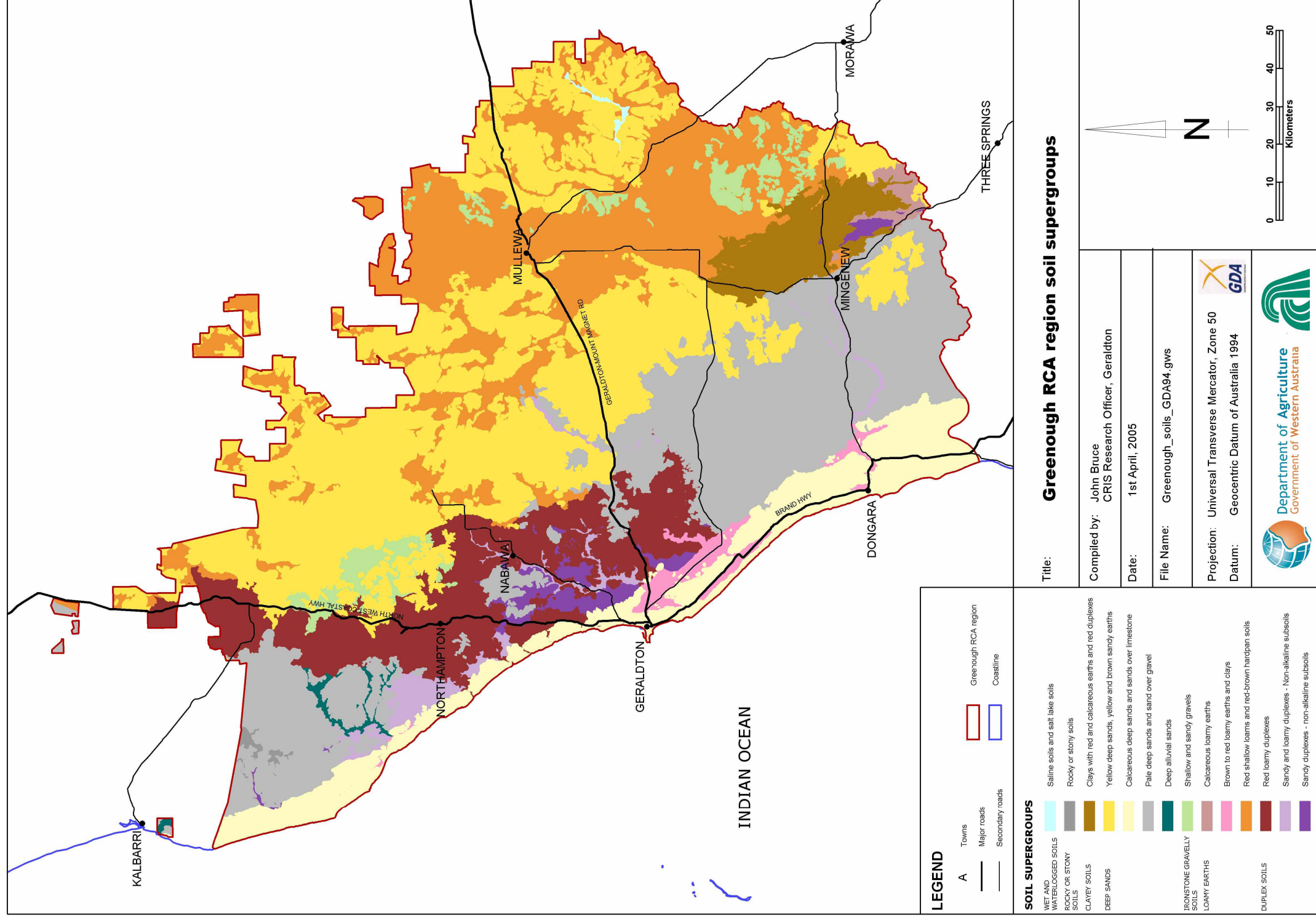
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SITE LOCATION

SCALE	SIZE	DRAWING No	REV
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FIGURE 3 – SURFACE GEOLOGY MAP



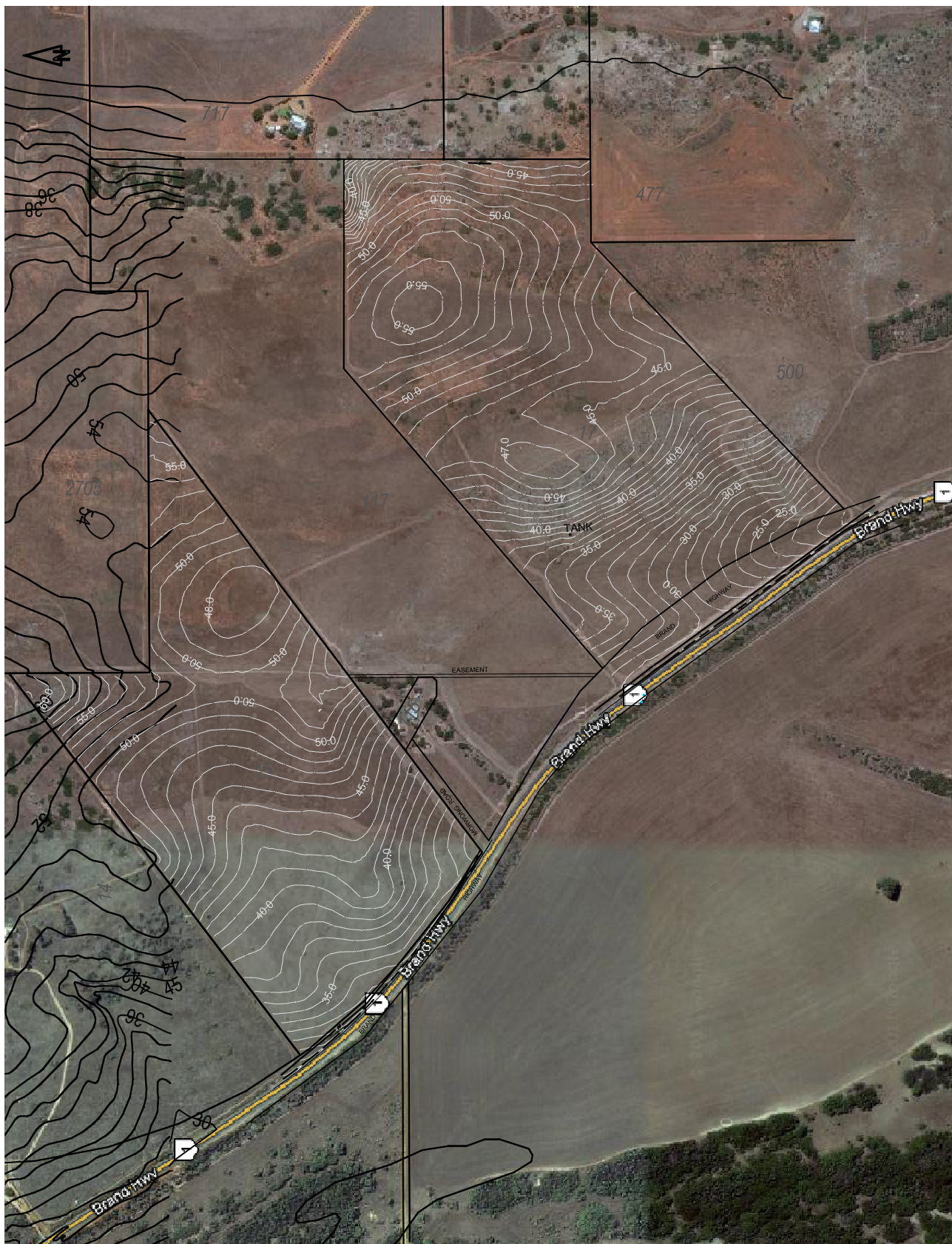


APPENDICES



Appendix A – Survey Data





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TITLE
Survey Data

SCALE N/A	SIZE A4	DRAWING No 10128 - Appendix A	REV A
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Appendix B – Groundwater Data

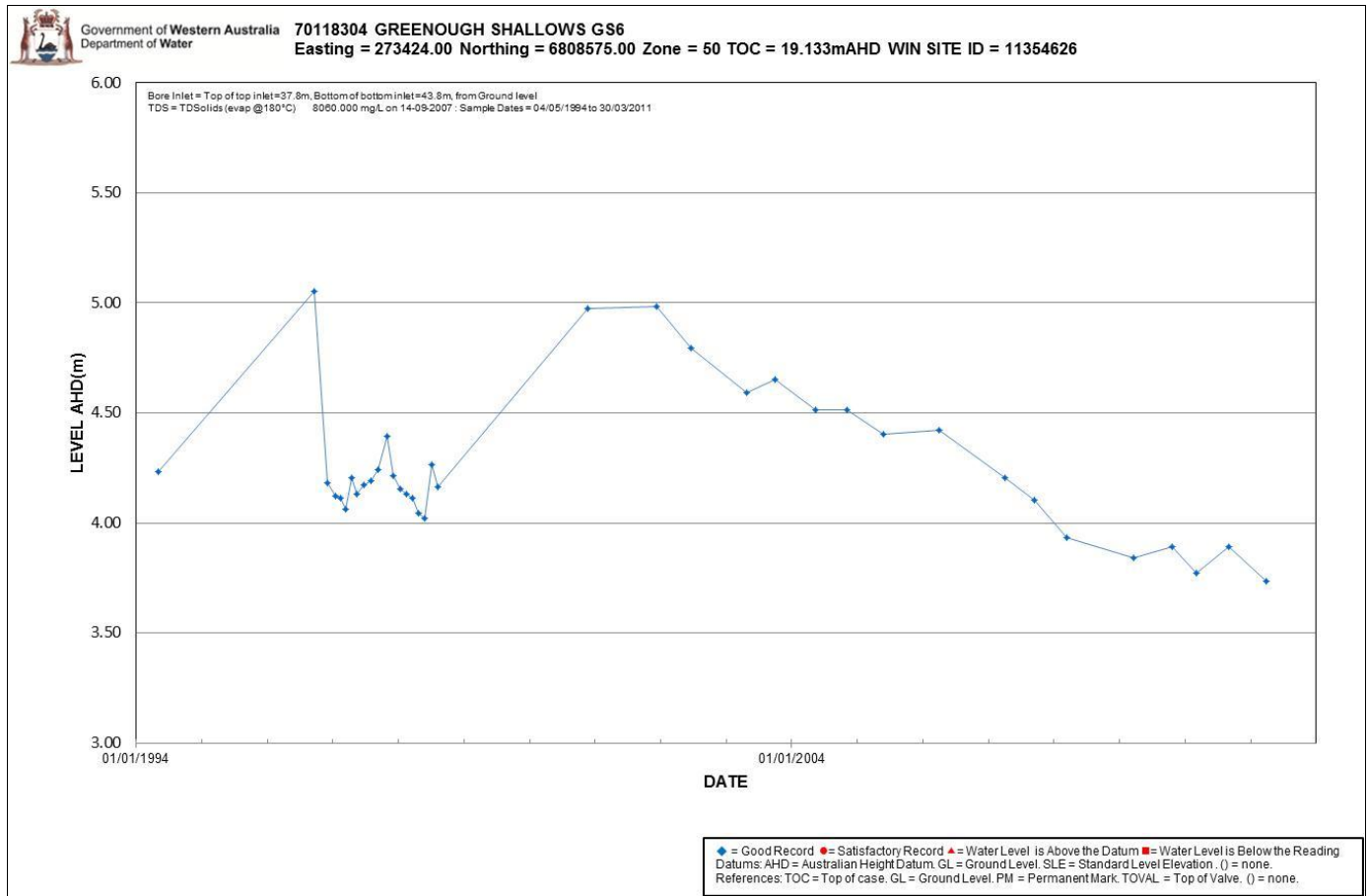




CLIENT
Australian Minerals Investors Pty Ltd

SCALE N/A	SIZE A4	DRAWING No 10128 - Appendix B	REV A
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Data of Station from Department of Water



AAMGL and MGL of the Monitoring Bore Station

WIN ID	Bore Site	Bore Location		Sample Dates	AAMGL	95% UCL	MGL
		Easting	Northing				
		MGA -50	MGA -50		mAHD	mAHD	mAHD
11354626	70118304	273424	6808575	04/05/1994 to 30/03/2011	4.41	4.62	5.05

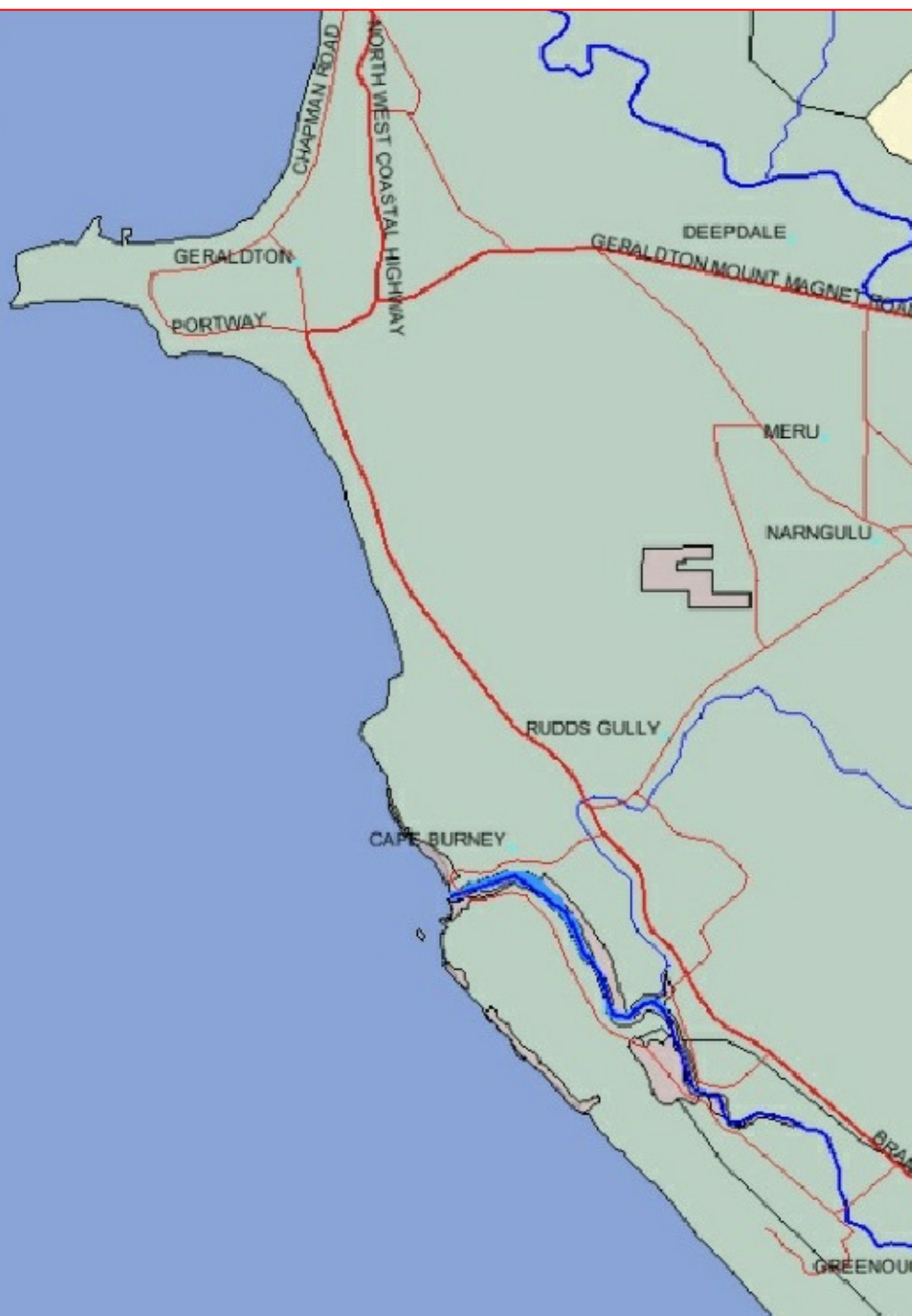


Appendix C – Acid Sulphate Soil Mapping



LEGEND

- Locations
- Roads (1:250K)**
- Highway
- Other Roads
- Streams**
- Major
- Minor
- Inland Water Bodies
- ASS Reference Sites
- National ASS Atlas**
- A1 High Probability/High Confidence
- A2 High Probability/Moderate Confidence
- A3 High Probability/Low Confidence
- A4 High Probability/Very Low Confidence
- B1 Low Probability/High Confidence
- B2 Low Probability/Moderate Confidence
- B3 Low Probability/Low Confidence
- B4 Low Probability/Very Low Confidence
- C1 Extremely Low Probability/High Confidence
- C2 Extremely Low Probability/Moderate Confidence
- C3 Extremely Low Probability/Low Confidence
- C4 Extremely Low Probability/Very Low Confidence
- Base-Map



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TITLE

Acid Sulphate Soil Risk Mapping

SCALE
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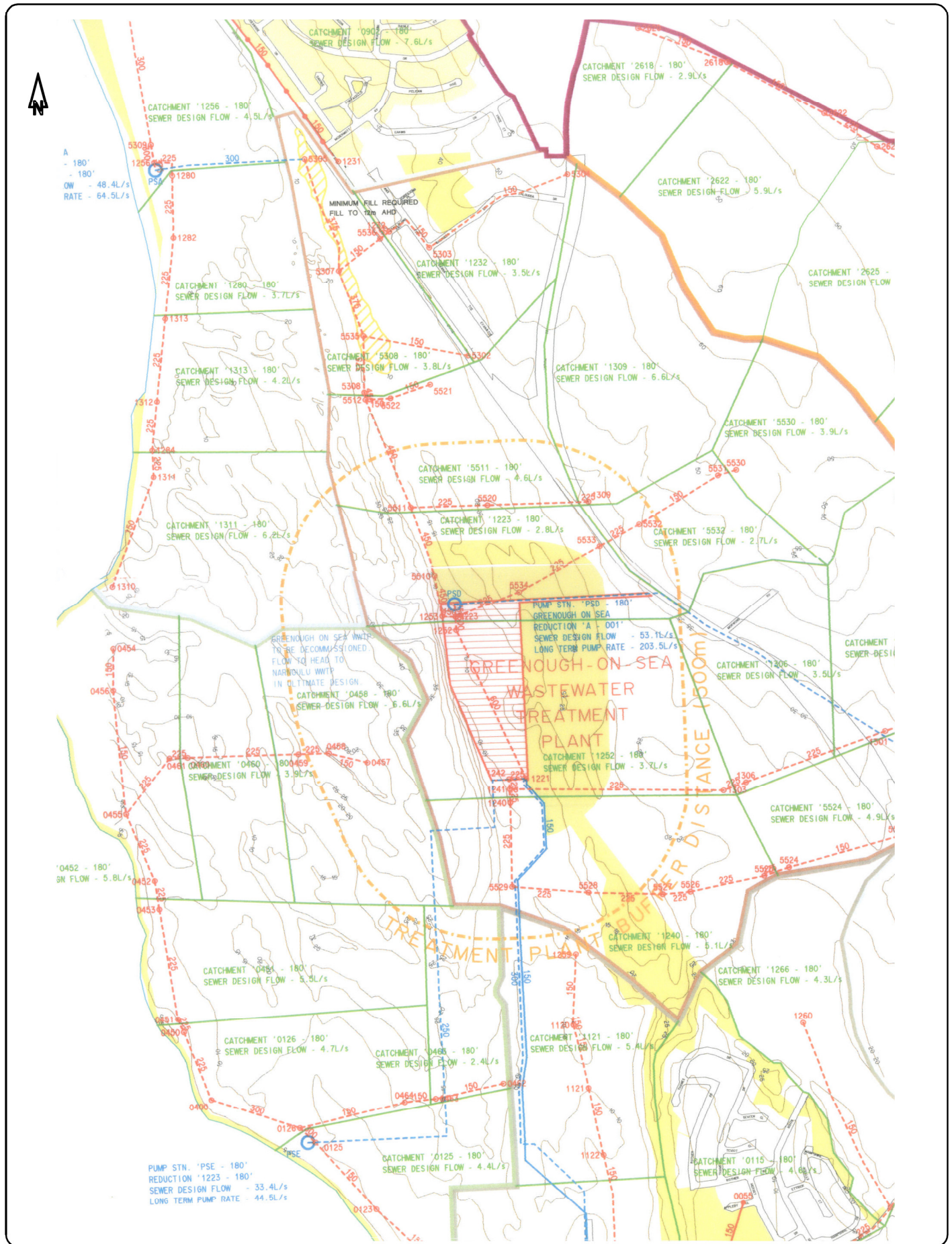
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10128 - Appendix C

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Appendix D – Sewer Reticulation Plan





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PROJECT
PROPOSED SUBDIVISION LOT 15 & 17 BRAND HWY, RUDDS GULLY

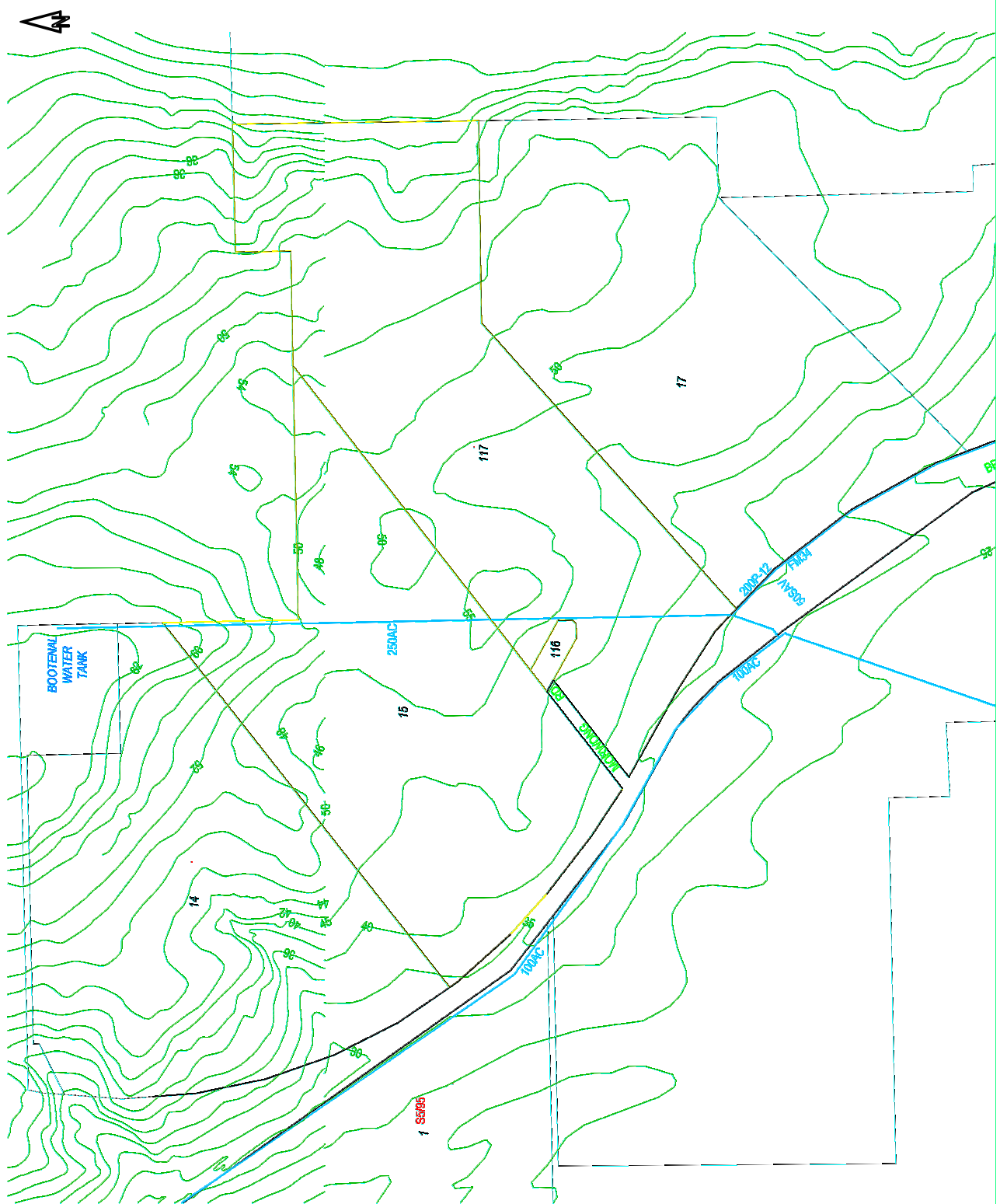
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Australian Minerals Investors Pty Ltd

TITLE
Sewer Reticulation Plan

SCALE	SIZE	DRAWING No	REV
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Appendix E – Water Reticulation Plan





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**PROPOSED SUBDIVISION LOT 15 &
17 BRAND HWY, RUDDS GULLY**

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TITLE
Water Reticulation Plan

SCALE	SIZE	DRAWING No	REV
N/A	A4	10128 - Appendix E	A

Appendix F – CID Drawings





LOT 14

BATTER 1:20

Drainage Area
= 4370m²

Drainage Area
= 8240m²

Drainage Area
= 1150m²

BATTER 1:20

Drainage Area
= 1600m²

LOT 117

LEGEND

- Catchment Area
- Area for Drainage
- Retaining Walls
- Proposed Levels
- Batter

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PROJECT
LOT 15 BRAND HIGHWAY
RUDDS GULLY

DATE	DATE
DESIGNED BY B.CIPUTRA	APPROVED FOR ISSUE
DRAWN BY B.CIPUTRA	DATE

TITLE
EARTHWORKS LEVEL AND
DRAINAGE LOCATION

SCALE 1:1500	SHEET A1	DRAWING NO. 10128 - SK1	REV B
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REV	DATE	BY	DESCRIPTION
1	10/12/2018	BC	ISSUED FOR CLIENT REVIEW
2	10/12/2018	BC	ISSUED FOR CLIENT REVIEW
3	10/12/2018	BC	ISSUED FOR CLIENT REVIEW
4	10/12/2018	BC	ISSUED FOR CLIENT REVIEW
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76	10/12/2018	BC	ISSUED FOR CLIENT REVIEW
77	10/12/2018	BC	ISSUED FOR CLIENT REVIEW
78	10/12/2018	BC	ISSUED FOR CLIENT REVIEW
79	10/12/2018	BC	ISSUED FOR CLIENT REVIEW
80	10/12/2018	BC	ISSUED FOR CLIENT REVIEW
81	10/12/2018	BC	ISSUED FOR CLIENT REVIEW
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89	10/12/2018	BC	ISSUED FOR CLIENT REVIEW
90	10/12/2018	BC	ISSUED FOR CLIENT REVIEW
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96	10/12/2018	BC	ISSUED FOR CLIENT REVIEW
97	10/12/2018	BC	ISSUED FOR CLIENT REVIEW
98	10/12/2018	BC	ISSUED FOR CLIENT REVIEW
99	10/12/2018	BC	ISSUED FOR CLIENT REVIEW
100	10/12/2018	BC	ISSUED FOR CLIENT REVIEW

[illegible]

CLIENT

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PROJECT		LOT 17 BRAND HIGHWAY RUDDS GULLY	
© 2011			
DESIGN	B.CAMERER	REVIEWED	DATE
DESIGN	B.CIPUTRA	APPROVED FOR ISSUE	DATE
DIRECTOR			

TITLE			
CATCHMENT AREAS			
SCALE	SIZE	DRAWING No	REV
1:1500	A1	10128 - SK2	B

