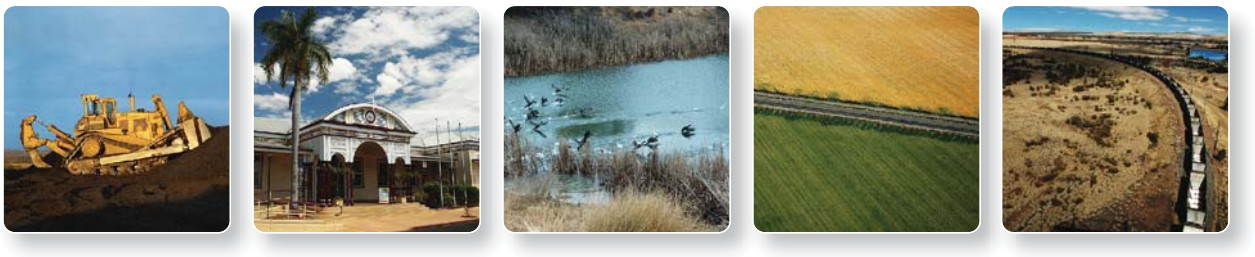


INTEGRA UNDERGROUND MINE

APPLICATION FOR Site Verification Certificate

for

HV Coking Coal Pty Limited

August 2017

Hansen Bailey

ENVIRONMENTAL CONSULTANTS

INTEGRA UNDERGROUND MINE

APPLICATION FOR A SITE VERIFICATION CERTIFICATE

Prepared by:

HANSEN BAILEY
6 / 127-129 John Street
SINGLETON NSW 2330

August 2017

for

HV Coking Coal Pty Limited
PO Box 534
SINGLETON NSW 2330

TABLE OF CONTENTS

LIST OF FIGURES

INTEGRA UNDERGROUND MINE – MODIFICATION 8

APPLICATION FOR A SITE VERIFICATION CERTIFICATE

1 INTRODUCTION

1.1 PURPOSE

HV Coking Coal Pty Limited (HVCC) operates the Integra Underground Mine (Integra) in the Upper Hunter Valley of New South Wales (NSW). HVCC is a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore).

Hansen Bailey is currently preparing an application on behalf of HVCC to modify Integra's Project Approval (PA 08_0101). This modification application will be made under section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act). HVCC is seeking approval to continue longwall mining of the Middle Liddell Seam further to the north of the currently approved longwall panels (the Modification). The Modification also involves the construction and operation of ancillary surface infrastructure (see **Figure 1**).

The application under section 75W of the EP&A Act triggers the requirement for a Site Verification Certificate. This document assesses the relevant land in accordance with the *Interim protocol for site verification and mapping of biophysical strategic agricultural land* (NSW Government, 2013) (Interim Protocol). The legislative requirement for a Site Verification Certificate is discussed further in **Section 2**.

1.2 MODIFICATION DESCRIPTION

The Modification includes the following components:

- Adjustments to the approved mine plan for the Middle Liddell Seam including:
  - Realignment and extension of main headings further to the north-west;
  - Increases to the lengths and widths of the approved LWs 15-17; and
  - Mining of additional longwall panels within the Modification Underground Extraction Area.
- Construction and use of additional surface infrastructure including:
  - The Underground Services Infrastructure Site, including shafts for ventilation and materials delivery to the underground, and associated ancillary infrastructure;
  - Auxiliary fans in the maingate of each longwall panel to assist in the efficient ventilation of the longwall mining area;
  - The Underground Goaf Dewatering Site, including dewatering boreholes and associated infrastructure;
  - Additional electricity transmission lines and distribution lines;

- Additional gas drainage boreholes;
- Increased usage of the currently approved gas flares;
- Relocation of the existing store facility and the construction and use of an additional access road off Middle Falbrook Road; and

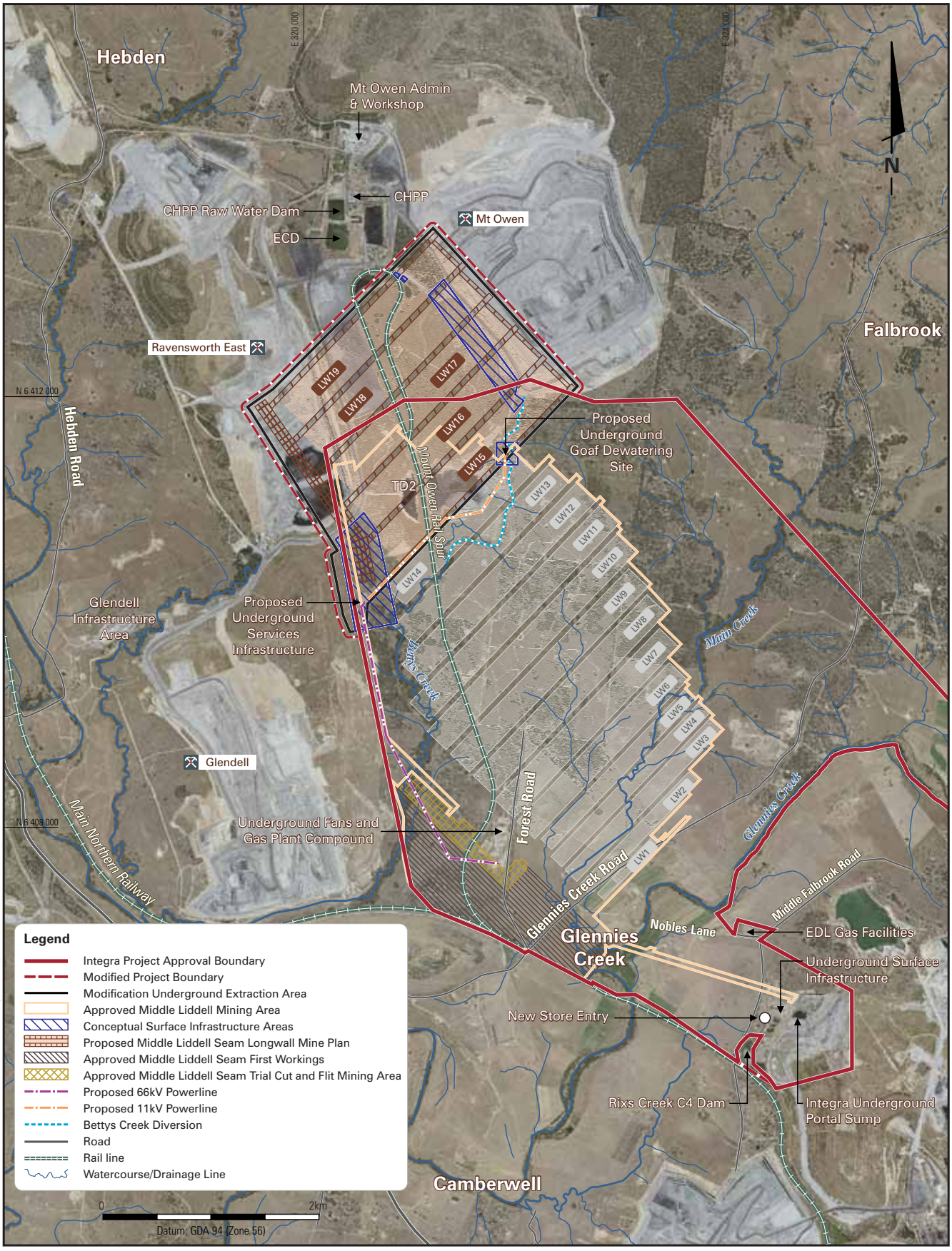
- Use of the C4 Dam (at Rix's Creek North Mine) to store raw water from Glennies Creek.

The proposed mining activities and ancillary surface infrastructure associated with the Modification are shown in **Figure 1**.

1.3 DOCUMENT STRUCTURE

This application for a Site Verification Certificate is structured as follows:

- **Section 2** outlines the legislative provisions that are relevant to the application;
- **Section 3** identifies the land that is the subject of this application and assesses this land against the criteria for Biophysical Strategic Agricultural Land (BSAL) in accordance with the Interim Protocol; and
- **Section 4** summarises the outcomes of the assessment.



HB INTEGRA MOD8 Verification Certificate 1702 F1 Conceptual Modification Overview 17 08 2017 Rev B

INTEGRA UNDERGROUND MINE

GLENCORE | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Conceptual Modification Overview

FIGURE 1

2 REGULATORY FRAMEWORK

2.1 MINING ACT

Section 5 of the *Mining Act 1992* (Mining Act) states that mining can only be conducted in accordance with a mining lease (ML) issued under the Mining Act. **Figure 2** shows the mining leases held by Glencore's subsidiaries (including HVCC) that apply to the Middle Liddell seam. The proposed longwall panels are partially located within these mining leases. However, there is an area of the Middle Liddell seam that is not currently subject to any mining leases. ML 1561 and ML 1475 apply to this area, but only include the land surface and the underlying strata to a depth of 15.24 m. Therefore, a new mining lease is required in order to enable mining of the Middle Liddell Seam in this area.

Authorisation 268 (A268) applies to the Middle Liddell seam in the area of the proposed mining lease (see **Figure 2**). A268 is held by Mt Owen Pty Limited, a subsidiary of Glencore. In accordance with section 60 of the Mining Act, HVCC will obtain the written consent of Mt Owen Pty Limited (also a wholly owned subsidiary of Glencore) prior to applying for a mining lease.

2.2 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT

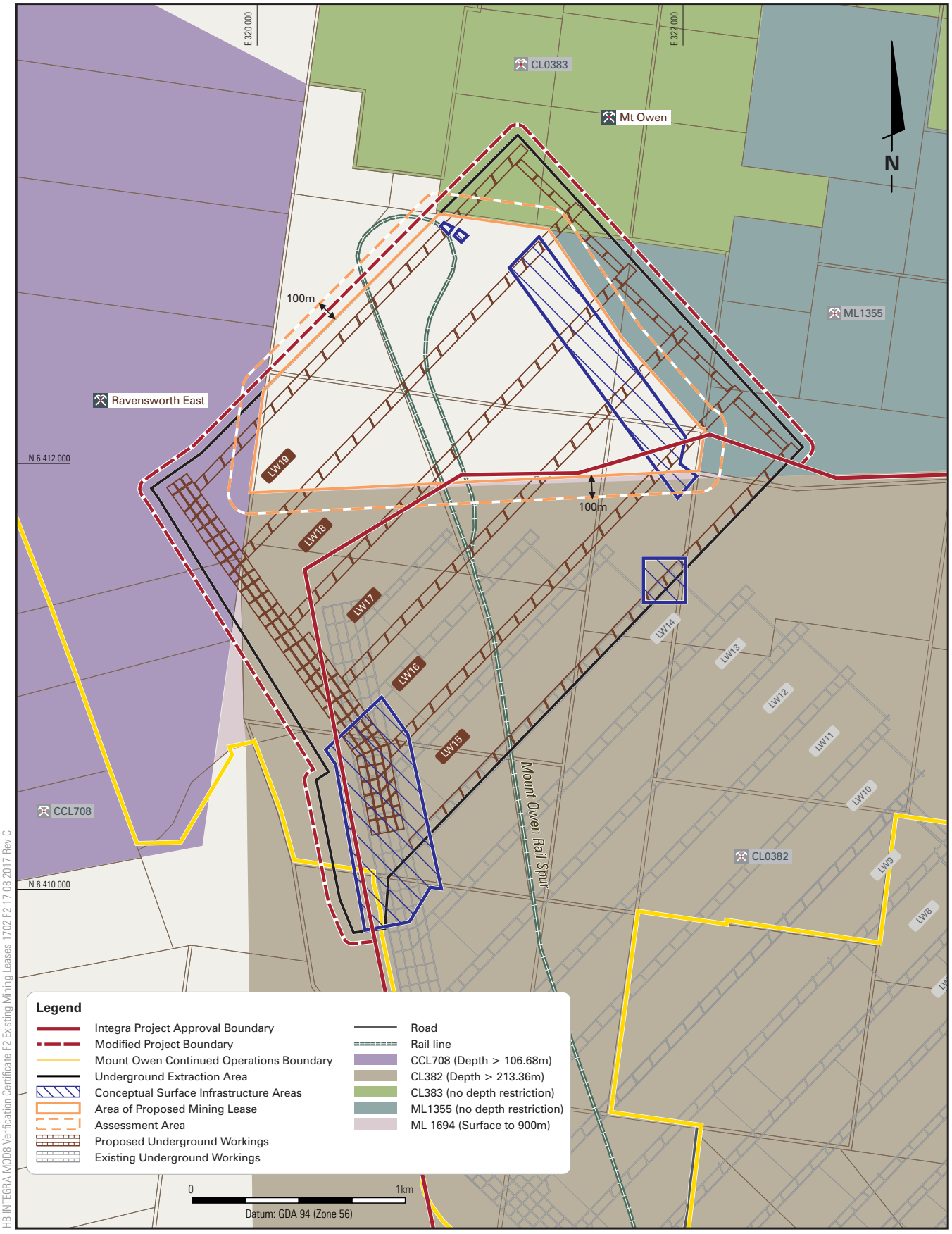
Integra currently operates under a Project Approval (PA 08_0101) granted under Part 3A of the EP&A Act on 26 November 2010. Part 3A of the EP&A Act was repealed on 1 October 2011. However, Schedule 6A of the EP&A Act provides that the provisions of Part 3A will continue to apply to "*transitional Part 3A projects*". Clause 2 under Schedule 6A provides that any project approved under Part 3A constitutes a "*transitional Part 3A project*". Given that PA 08_0101 was granted under Part 3A, the provisions of Part 3A will continue to apply. Accordingly, PA 08_0101 may be modified under the former section 75W of the EP&A Act.

Clause 20 under Schedule 6A of the EP&A Act imposes additional requirements upon proposed modifications of transitional Part 3A projects that are located on Strategic Agricultural Land. This clause provides that the modification application must be accompanied by either a Gateway Certificate or a Site Verification Certificate if the application relates to "*mining or petroleum development*" on the following land:

(a) Land shown on the Strategic Agricultural Land Map; or

(b) Land that is the subject of a Site Verification Certificate.

The definition of "*mining or petroleum development*" is limited to proposed developments that are located outside of existing mining leases (and therefore require a new mining lease). As explained in **Section 2.1**, a new mining lease is required for the proposed mining activities in the Middle Liddell seam. As such, the Modification constitutes "*mining and petroleum development*".



HB INTEGRA MOD8 Verification Certificate F2 Existing Mining Leases 1702 F2 17 08 2017 Rev C

INTEGRA UNDERGROUND MINE

GLENCORE | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Existing Mining Leases

FIGURE 2

Clause 17A(2) states that "*mining or petroleum development*" does not include development outside the mining area of a proposed mining lease. That is, "*mining or petroleum development*" only includes the aspects of a proposed development that require a new mining lease. The area of the proposed mining lease is shown in **Figure 2**.

The Modification is located on land that is shown on the Strategic Agricultural Land Map, thereby triggering the requirement for a Site Verification Certificate. The land that is the subject of the Modification is shown on Map 4 for the Upper Hunter Region. There are areas of mapped BSAL in the vicinity of the Modification, but not within the Assessment Area (see **Figure 3**).

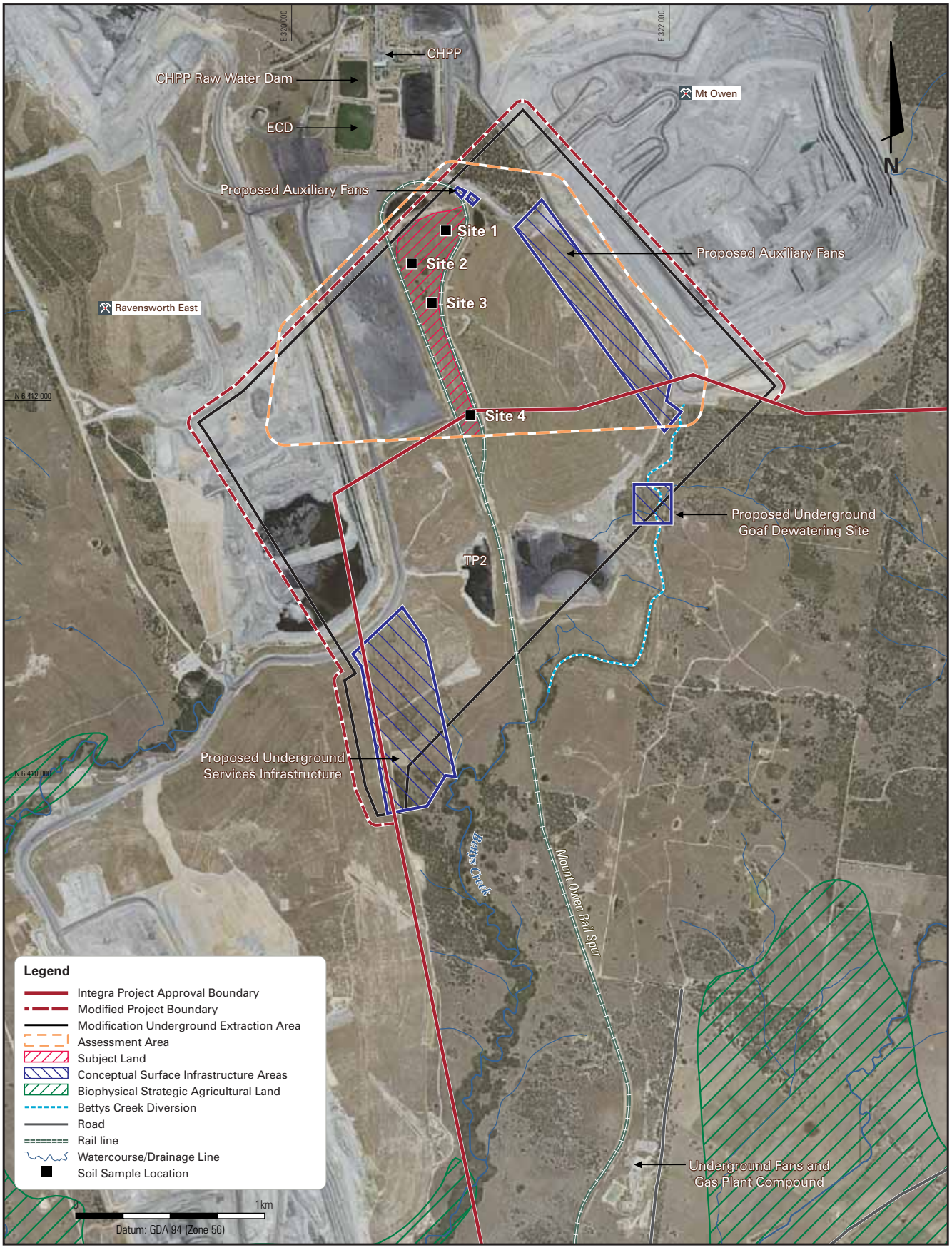
2.3 MINING SEPP

Clause 17C of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) identifies the persons that can apply for a Site Verification Certificate. Clause 17C relevantly states:

> *"**17C Site verification certificates — biophysical strategic agricultural land***
>
> *1) The Director-General may issue a site verification certificate in respect of specified land certifying, in the Director-General's opinion, that the land is or is not biophysical strategic agricultural land.*
>
> *…*
>
> *3) A person who proposes to carry out mining or petroleum development on land shown on the Strategic Agricultural Land Map may apply to the Director-General for a site verification certificate in respect of the land, but only if the person gives notice of the application:*
>
> *(a) by written notice to the owner of the land before the application is made, or*
>
> *(b) by advertisement published in a newspaper circulating in the area in which the development is to be carried out no later than 30 days before the application is made.*
>
> *4) Only one certificate may be issued under this clause in respect of the same land."*

The land that is the subject of this application is owned by Mt Owen Pty Limited and Ravensworth Operations Pty Limited, both of which are subsidiaries of Glencore. In accordance with clause 17C(3) of the Mining SEPP, HVCC provided written notice of the application to the landowners on 4 August 2017 (see **Appendix A**).

The land that is the subject of this application has not been the subject of any previously issued Site Verification Certificates.



HB INTEGRA MOD8 Verification Certificate F3 Assessment Area 1702 F3 Assessment Area 17 08 2017 Rev D

INTEGRA UNDERGROUND MINE

GLENCORE | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Assessment Area and Subject Land

FIGURE 3

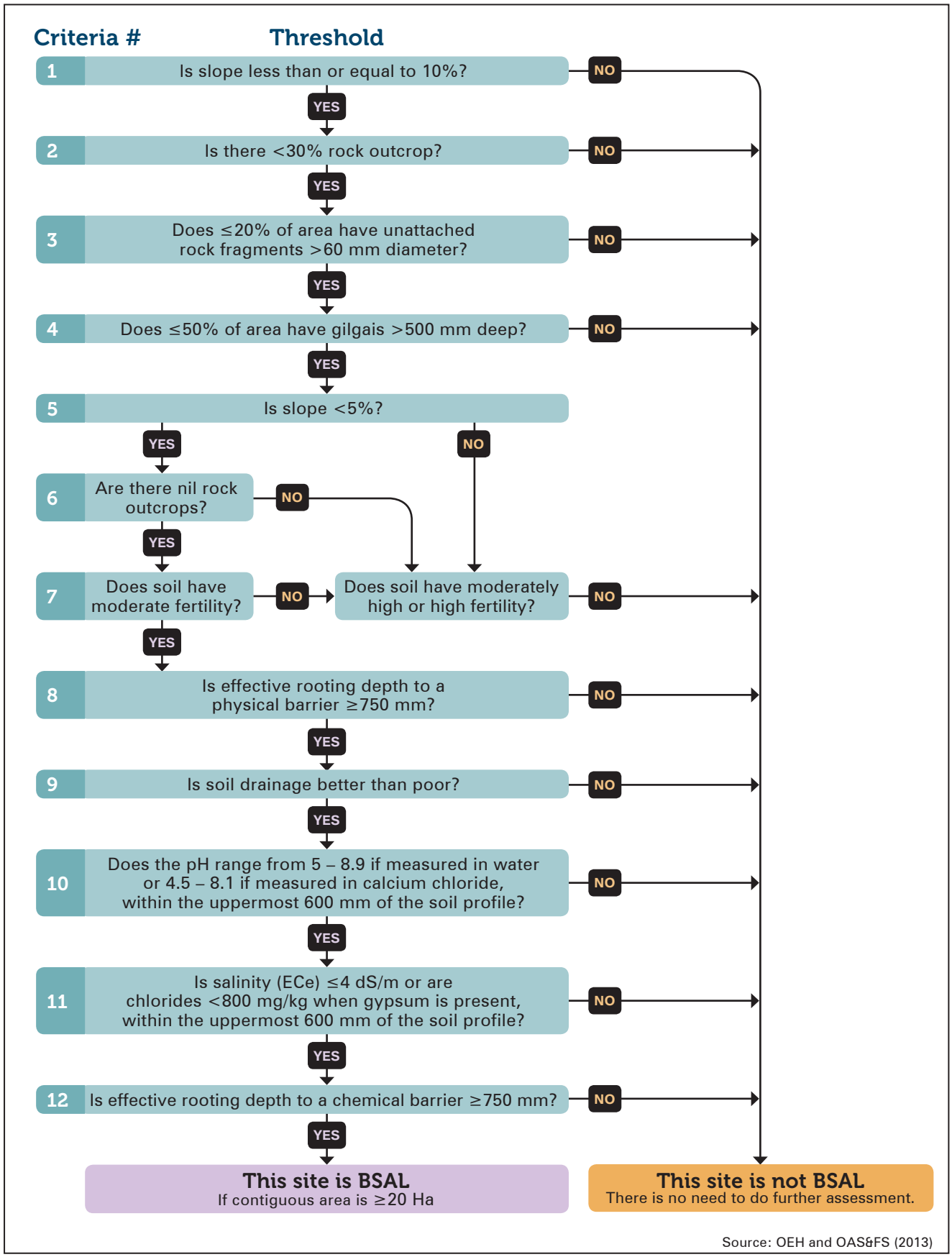
Clause 17D of the Mining SEPP outlines the prescribed form and content of an application for a Site Verification Certificate. Clause 17D relevantly states:

> *"**17D Applications for site verification certificates***
>
> *1) An application for a site verification certificate must:*
>
> *(a) be in writing and include the following information:*
>
> *i. the name and address of the applicant,*
>
> *ii. the address, and particulars of title, of the subject land,*
>
> *iii. whether the land is shown as biophysical strategic agricultural land on the Strategic Agricultural Land Map, and*
>
> *(b) be in the form (if any) approved by the Director-General from time to time, and*
>
> *(c) be accompanied by the relevant fee (if any) specified in the regulations.*
>
> *2) The Director-General must have regard to the criteria set out in the Site Verification Protocol when determining an application for a site verification certificate.*
>
> *3) The Director-General is to determine an application within 21 days of it being made."*

The Interim Protocol states that applications for Site Verification Certificates are to be made via the electronic form on the DP&E website. The required particulars regarding the applicant and the Subject Land are provided in the application form. An assessment of the land in accordance with the Interim Protocol is provided in **Section 3**.

2.4 INTERIM PROTOCOL

The Interim Protocol outlines the criteria that must be satisfied in order for land to be verified as BSAL. If any of the criteria are not satisfied, that land does not constitute BSAL. The prescribed process for the verification of BSAL is shown in **Figure 4**.



Source: OEH and OAS&FS (2013)

INTEGRA UNDERGROUND MINE

GLENCORE | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Site Assessment BSAL Verification Process

FIGURE 4

3 SITE VERIFICATION ASSESSMENT

3.1 ASSESSMENT AREA

The area that is the subject of a proposed mining lease is shown on **Figure 2**. The parts of the proposed longwall layout that are within existing mining leases do not need to be considered in this application because they do not conform to the definition of "*mining or petroleum development*".

The Interim Protocol advises that the "*assessment area should include the entire project area and include at least a 100 m buffer to take into account changes in design, surrounding disturbance and minor expansion*". In accordance with this recommendation, the Assessment Area for this application is defined by a 100 m buffer around the area of the proposed mining lease (see **Figure 2**).

The landforms within the Assessment Area are shown on **Figure 3**. The majority of the Assessment Area is comprised of open cut mining areas and rehabilitated emplacement areas associated with the Mount Owen Complex (MOC). The land disturbance that has occurred within the Assessment Area is evident in historical aerial photographs (see **Appendix B**). The western portion of the Assessment Area consists of the West Pit and Tailings Pit 1, both of which are active mining areas. The eastern portion of the Assessment Area consists of the rehabilitated Eastern Rail Pit. The active mining areas and rehabilitated land within the Assessment Area have been excluded from the BSAL verification assessment.

An area of undisturbed land exists within the Mt Owen Rail Spur. This is the only land that has been considered for BSAL verification and will be referred to as the "Subject Land" (see **Figure 3**).

The Interim Protocol (p. 5) states:

> *"The minimum area for BSAL is 20 hectares. If the area subject to assessment falls below 20 hectares at any point of the assessment because of exclusion of land that does not meet the criteria, then the land is not BSAL and there is no need to continue the assessment".*

The Subject Land has an area of approximately 19.3 ha. There are other small areas of undisturbed land within the Assessment Boundary that are outside of the Mt Owen Rail Spur. Neither the Subject Land nor these other areas of undisturbed land will meet the minimum area for BSAL. As such, an assessment against the remaining criteria in the Interim Protocol is not required. Nevertheless, an assessment against the BSAL verification criteria is provided below for completeness.

The assessment against the BSAL verification criteria included a desktop assessment and soil sampling program. The soil sampling program consisted of four sampling locations within the Subject Land (see **Figure 3**).

The results of the laboratory tests for the soil samples are provided in **Appendix C** and summarised in the following sections. A detailed report will be included in the Environmental Assessment (EA) for the Modification.

3.2 RELIABLE WATER SUPPLY

Under the Interim Protocol, the first step of the BSAL site verification process is to determine whether the proposed development area has access to a "*reliable water supply*". The Interim Protocol declares that the entire Upper Hunter Region has access to a "*reliable water supply*".

3.3 SLOPE

The Interim Protocol states that the surface gradient must be less than 10° in order for the land to be BSAL. The gradient of the land within the Assessment Area is shown in **Figure 5**. The topographic data used in the slope analysis was sourced from aerial surveys (LIDAR) of the pre-mining landscape. The Subject Land has not been substantially modified by mining activities and as such, still resembles the pre-mining topography. As shown in **Figure 5**, the gradient of the Subject Land is less than 10°. Therefore, the Subject Land satisfies the slope criteria for BSAL.

3.4 ROCK OUTCROP AND SURFACE ROCKINESS

The Interim Protocol states that in order to be BSAL, land must satisfy the following criteria:

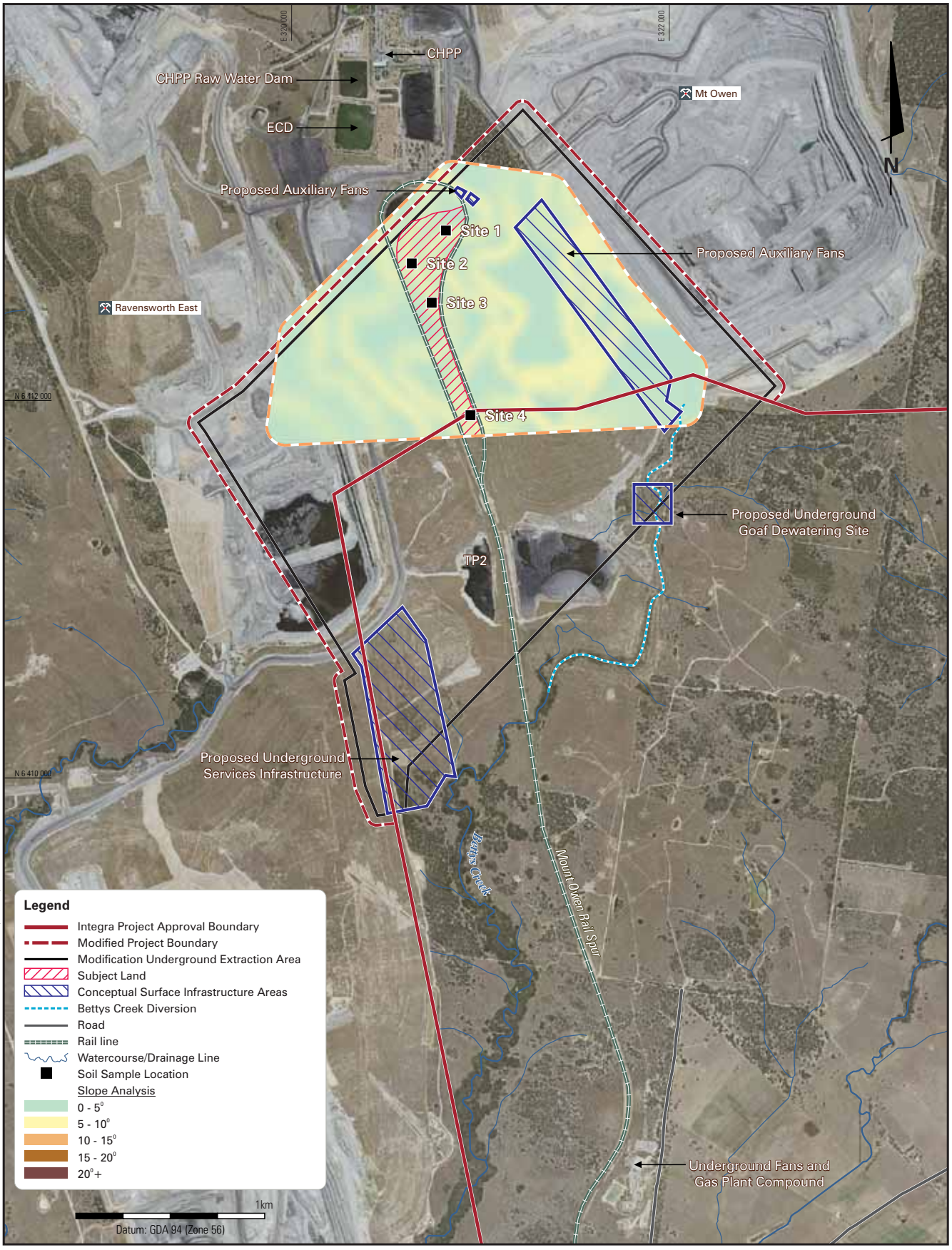
- Less than 30% rock outcrop; and
- Less than 20% of the surface area contains unattached rock fragments greater than 60 mm diameter.

The soil sampling program confirmed that the Subject Land satisfied the criteria for rock outcrop and surface rockiness.

3.5 GILGAI MICRORELIEF

The Interim Protocol states that if gilgai depressions are present, depressions with a depth of greater than 500 mm must account for less than 50% of the mapped area of gilgai. Otherwise, the land does not constitute BSAL.

Gilgai microrelief is commonly associated with vertosols (Isbell, 2002). The soil sampling program determined that the Subject Land was comprised of sodosols, which are not characterised by gilgai depressions. Therefore, the Subject Land satisfies the criteria regarding gilgai microrelief.



HB INTEGRA MOD8 Verification Certificate F3 Assessment Area 1702 F5 Slope Analysis 17 08 2017 Rev B

INTEGRA UNDERGROUND MINE

GLENCORE | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Pre-Mining Topography Slope Analysis

FIGURE 5

3.6 SOIL FERTILITY

The Interim Protocol states that BSAL must be of a soil type that is characterised as having high, moderately high or moderate fertility.

Appendix 2 of the Interim Protocol provides fertility rankings for each of the Australian Soil Classification (ASC) orders. Appendix 2 of the Interim Protocol provides that sodosols are of moderately low fertility. Therefore, the Subject Land does not satisfy the soil fertility criteria for BSAL.

3.7 EFFECTIVE ROOTING DEPTH

The effective rooting depth of a soil is the depth from the surface to a physical or chemical barrier. The Interim Protocol states that in order for land to be BSAL, the effective rooting depth to a physical or chemical barrier must be at least 750 mm.

The soil sampling program determined that the effective rooting depth to a physical barrier is less than 750 mm at Sites 2 and 3 (see **Figure 3**). In addition, the effective rooting depth to a chemical barrier is less than 750 mm at Sites 1, 2 and 4. Therefore, none of the sites satisfy the criteria relating to effective rooting depth.

3.8 DRAINAGE

The Interim Protocol states that poorly drained soils, as defined in the *Australian Soil and Land Survey Field Handbook* (NCST, 2009), do not constitute BSAL.

NCST (2009) explains that “poorly drained” and “very poorly drained” soils generally exhibit significant groundwater and subsurface flow, and tend to support a perched water table. The results of the soil sampling program indicate poor drainage characteristics at all four sampling sites.

3.9 PH

The Interim Protocol states that in order for land to be BSAL, the soil pH must be in the range of:

- 5.0 to 8.9 when measured in water; or
- 4.5 to 8.1 when measured in calcium chloride.

The *Environmental Impact Statement: Mount Owen Continued Operations Project* (Umwelt, 2015) (MOCO EIS) determined that the Brown Sodosol soils present at MOC were slightly acidic (pH of approximately 5.5). The pH levels presented in the MOCO EIS are within the prescribed range for BSAL. The results of the soil sampling program also confirmed that the pH of the Brown Sodosol soils within the prescribed range for BSAL (see **Appendix C**).

3.10 SOIL SALINITY

The Interim Protocol states that BSAL must satisfy one of the following criteria regarding soil salinity:

- Electrical Conductivity (EC) in a saturated extract (ECe) of less than 4 dS/m; or
- Chloride concentration of less than 800 mg/kg (if gypsum is present).

The MOCO EIS determined that the soils present at MOC exhibited EC levels that were within the salinity criteria for BSAL. The soil sampling program determined that Site 4 did not exhibit an ECe of less than 4 dS/m. The other three sites satisfied the salinity criteria for BSAL.

4 CONCLUSION

HVCC proposes to modify PA 08_0101 under section 75W of the EP&A to continue mining of the Middle Liddell seam further to the north-west of the currently approved mine plan. The Modification proposes mining in an area of the Middle Liddell seam that is not currently the subject of a mining lease. Glencore holds mining leases in respect of the land surface overlying the proposed underground extraction area.

Pursuant to Clause 20 under Schedule 6A of the EP&A Act, the modification application must be accompanied by a Site Verification Certificate because the following elements are satisfied:

- The Modification constitutes "*mining and petroleum development*" because a new mining lease is required for the development to be carried out; and
- The Modification is proposed to be carried out on land that is shown on the Strategic Agricultural Land Map.

In accordance with the Interim Protocol, the Assessment Area for this Site Verification Certificate application is the area of the proposed mining lease plus a 100 m buffer. The majority of the land within the Assessment Area has been disturbed by previous surface mining activities and as such, has been excluded from the BSAL verification process. The BSAL verification process has only been undertaken for the Subject Land, which is the undisturbed land within the Mt Owen Rail Spur that falls within the Assessment Area (see **Figure 3**).

The Subject Land has an area of 19.3 ha, which is less than the minimum area for BSAL (20 ha). Nevertheless, an assessment of the Subject Land against the BSAL verification criteria has been undertaken for completeness. This assessment consisted of a desktop review and soil sampling program. This assessment determined that the Subject Land did comply with the soil fertility criteria, which states that the soil must be of high, moderately high or moderate fertility. The Subject Land is comprised of Brown Sodosol soils, which the Interim Protocol classifies as a moderately low fertility soil. It was also demonstrated that the soils within the Subject Land do not satisfy the criteria for drainage and effective rooting depth. Full results of the soil sampling program will be provided in a separate report, which will be included in the EA for the Modification.

This Site Verification Certificate application confirms that there is no BSAL within the Assessment Area because the majority of this area has been subject to disturbance by surface mining activities and the previously undisturbed Subject Land has an area of less than 20 ha, which is the minimum area for BSAL.

We trust that this document provides sufficient information for the Secretary of DP&E to issue a Site Verification Certificate certifying that the land within the Assessment Area is not BSAL.

* * *

For
HANSEN BAILEY

Andrew Wu
Senior Environmental Engineer

Nathan Cooper
Principal

5 REFERENCES

- Isbell R. F. (2002), *The Australian Soil Classification*. Revised 1st Edition. Prepared for the CSIRO.
- National Committee on Soil and Terrain (2009), *Australian Soil and Land Survey Field Handbook*.
- NSW Government (2013), *Interim protocol for site verification and mapping of biophysical strategic agricultural land.*
- Umwelt (2015), *Environmental Impact Statement: Mount Owen Continued Operations Project*.

APPENDIX A

Stakeholder Consultation

INTEGRA
UNDERGROUND

GLENCORE

4 August 2017

Mr Stephen Hubert
General Manager
Ravensworth Operations Pty Ltd
PO Box 294
MUSWELLBROOK NSW 2330

Dear Stephen

Integra Underground Mine
Application for a Site Verification Certificate

HV Coking Coal Pty Ltd (HVCC) proposes to modify its Project Approval (PA 08_0101) under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act). HVCC is seeking to continue its longwall mining operations in the Middle Liddell Seam beyond the currently approved mine plan and to develop ancillary surface infrastructure (the Modification). Pursuant to Clause 20 under Schedule 6A of the EP&A Act, the modification application is required to be accompanied by a Site Verification Certificate.

HVCC is applying for a Site Verification Certificate in respect of the Subject Land shown in Figure 1. The Subject Land includes the following parcels of land owned by Ravensworth Operations Pty Ltd:

- Lot 3 DP 859544; and
- Lot 3 DP 1180252.

Clause 17C(3) of *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* states that an applicant for a Site Verification Certificate must provide written notice of the application to the land owner. HVCC hereby notifies Ravensworth Operations Pty Ltd of the Site Verification Application in respect of the aforementioned land.

Should you have any queries in relation to this letter, please do not hesitate to contact myself on 02 6577 4200.

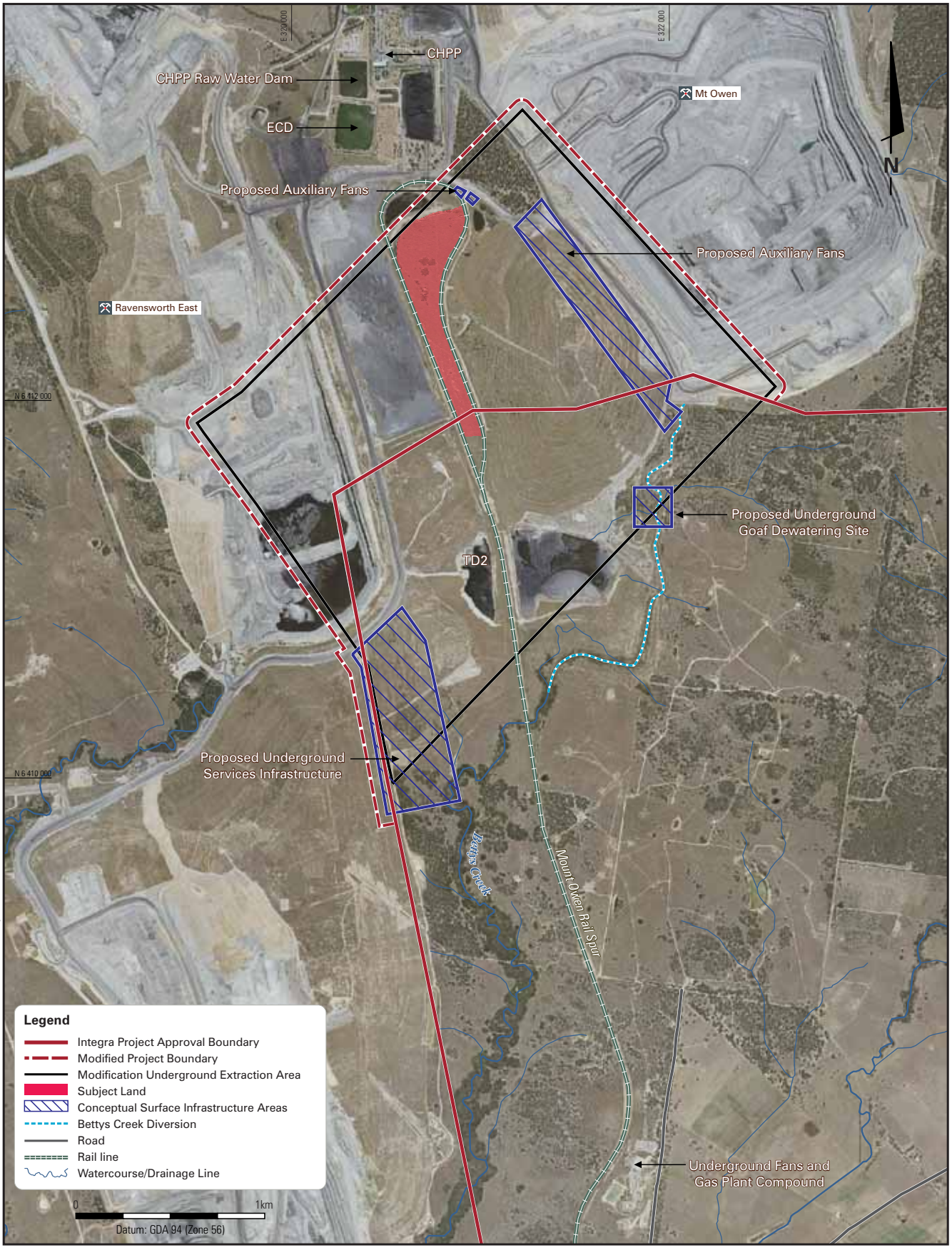
Yours sincerely

Chloe Piggford

Environment and Community Manager

PO Box 534, Singleton, NSW 2330
640 Middle Falbrook Road, Glennies Creek, NSW 2330
T + 61 2 6577 4200 www.glencore.com

HV Coking Coal Pty Ltd ABN 45 605 492 804



HB INTEGRA MOD8 Verification Certificate F3 Assessment Area 1702 F1 Subject Land 20 07 2017

INTEGRA UNDERGROUND MINE

GLENCORE | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Subject Land

FIGURE 1

INTEGRA
UNDERGROUND

GLENCORE

4 August 2017

Mr Stephen Hubert
General Manager
Mt Owen Pty Ltd
PO Box 320
SINGLETON NSW 2330

Dear Stephen

Integra Underground Mine
Application for a Site Verification Certificate

HV Coking Coal Pty Ltd (HVCC) proposes to modify its Project Approval (PA 08_0101) under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act). HVCC is seeking to continue its longwall mining operations in the Middle Liddell Seam beyond the currently approved mine plan and to develop ancillary surface infrastructure (the Modification). Pursuant to Clause 20 under Schedule 6A of the EP&A Act, the modification application is required to be accompanied by a Site Verification Certificate.

HVCC is applying for a Site Verification Certificate in respect of the Subject Land shown in Figure 1. The Subject Land includes the following parcels of land owned by Mt Owen Pty Limited:

- Lot 2 DP 1072124;
- Lot 4 DP 859544; and
- Lot 5 DP 859544.

Clause 17C(3) of *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* states that an applicant for a Site Verification Certificate must provide written notice of the application to the land owner. HVCC hereby notifies Mt Owen Pty Ltd of the Site Verification Application in respect of the aforementioned land.

Should you have any queries in relation to this letter, please do not hesitate to contact myself on 02 6577 4200.

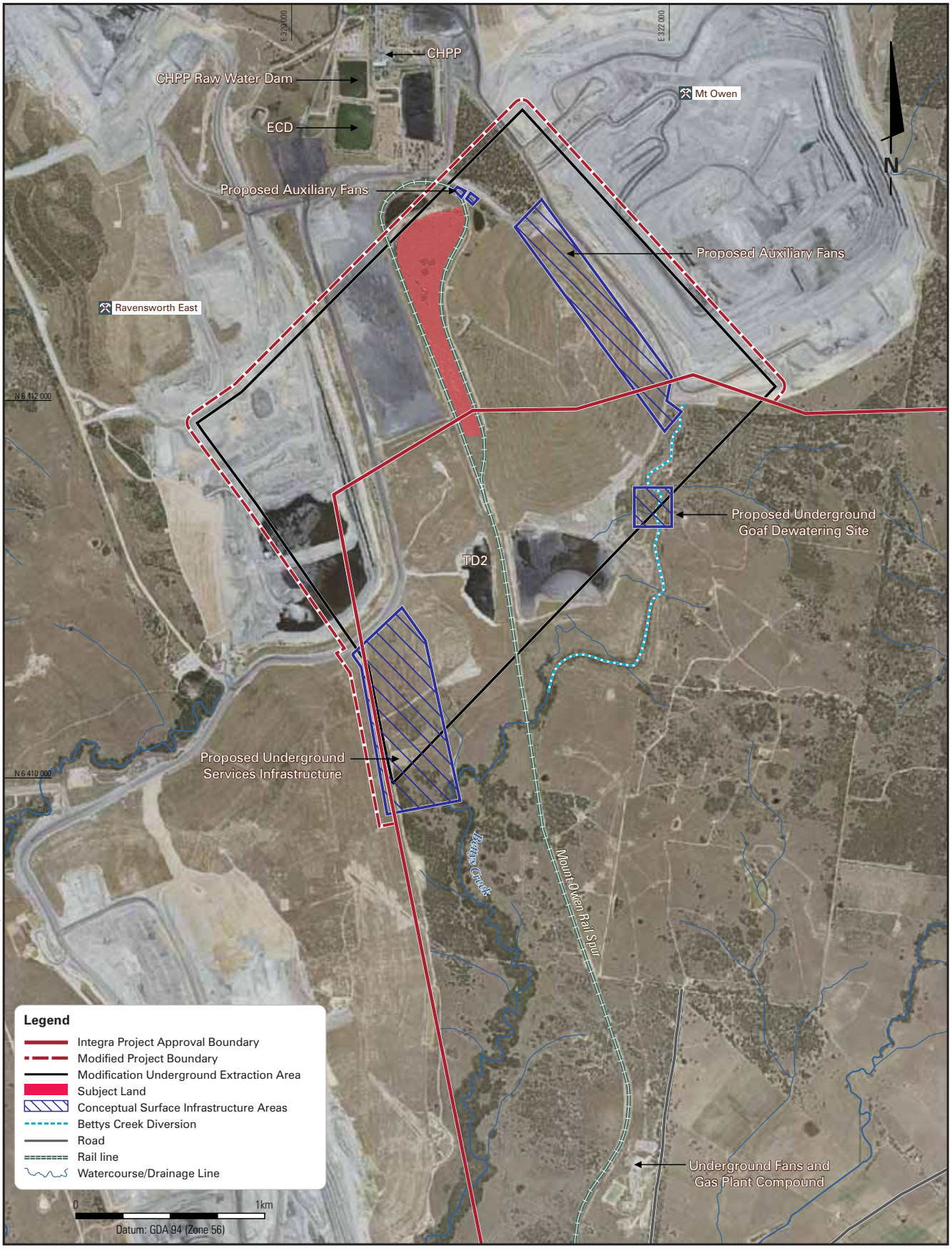
Yours sincerely

Chloe Piggford

Environment and Community Manager

PO Box 534, Singleton, NSW 2330
640 Middle Falbrook Road, Glennies Creek, NSW 2330
T + 61 2 6577 4200 www.glencore.com

HV Coking Coal Pty Ltd ABN 45 605 492 804



HB INTEGRA MOD8 Verification Certificate F3 Assessment Area 1702 F1 Subject Land 20 07 2017

INTEGRA UNDERGROUND MINE

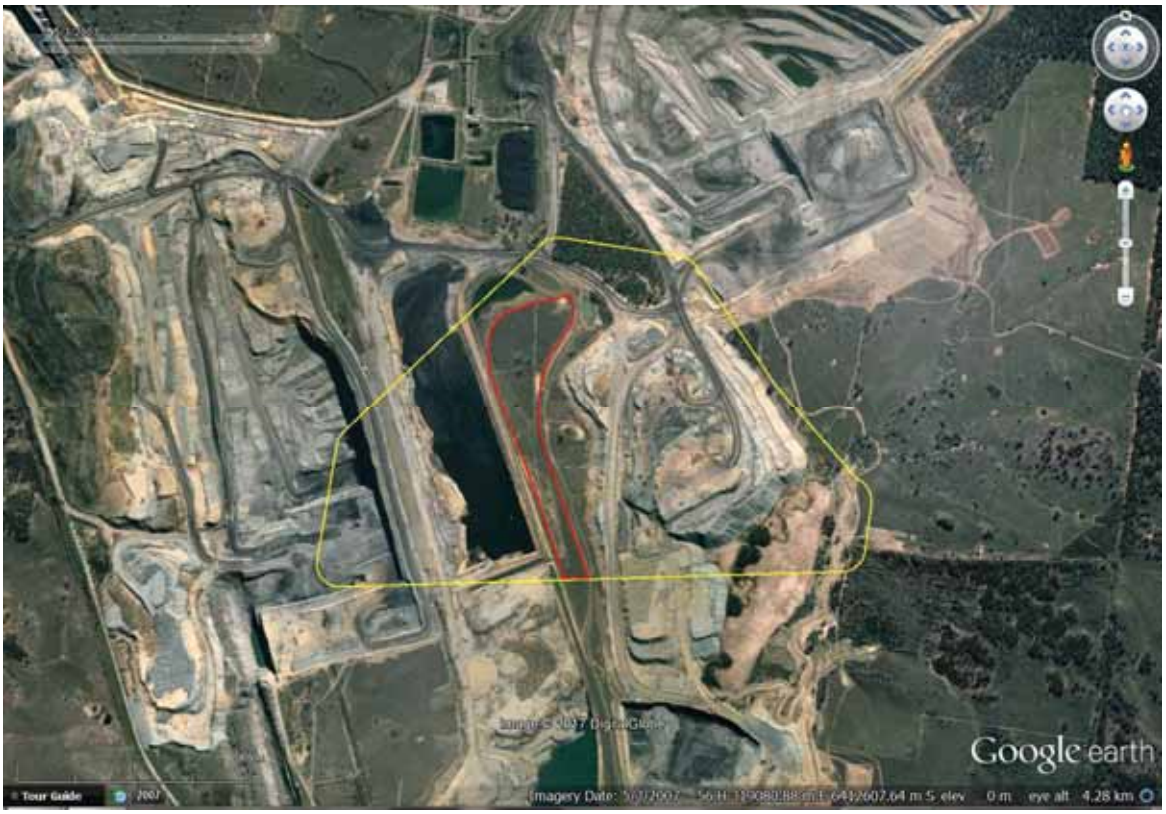
GLENCORE | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Subject Land

FIGURE 1

APPENDIX B

Historical Aerial Photographs



Aerial image from 3 May 2007 (Source: Google Earth)

Aerial image from 13 January 2009 (Source: Google Earth)

Aerial image from 15 May 2009 (Source: Google Earth)

Aerial image from 11 October 2013 (Source: Google Earth)

Aerial image from 17 November 2015 (Source: Google Earth)

APPENDIX C

Laboratory Testing Results

Department of Industry
Soil Conservation Service

SOIL TEST REPORT

Scone Research Centre

REPORT NO:	SCO17/127R2
REPORT TO:	Murray Fraser SLR Consulting 10 Kings Rd New Lambton NSW 2305
REPORT ON:	Fourteen soil samples Your ref: Integra Soil Assessment 630.12151
PRELIMINARY RESULTS ISSUED:	4 August 2017
REPORT STATUS:	Final
DATE REPORTED:	7 August 2017
METHODS:	Information on test procedures can be obtained from Scone Research Centre

TESTING CARRIED OUT ON SAMPLE AS RECEIVED

L Dunn
Scone Laboratory

SOIL CONSERVATION SERVICE
Scone Research Centre

Report No: SCO17/127R2
Client Reference: Murray Fraser
SLR Consulting
10 Kings Rd
New Lambton NSW 2305

Lab No	Method	C1A/5	C2A/4	C2B/4	Colour		P7B/2 Particle Size Analysis (%)				
	Sample Id	EC (dS/m)	pH	pH ($CaCl_2$)	Dry	Moist	clay	silt	f sand	c sand	gravel
1	1 0-10cm	0.02	6.2	4.9	10YR 5/3	7.5YR 3/3	15	31	41	11	2
2	1 10-20cm	0.07	6.4	5.0	10YR 6/3	10YR 4/3	17	30	37	11	5
3	1 40-50cm	0.35	7.5	6.3	10YR 6/4	10YR 5/6	51	23	20	6	0
4	1 65-75cm	0.67	7.9	6.8	10YR 6/4	10YR 5/6	56	22	17	5	0
5	2 0-10cm	0.02	6.5	5.4	10YR 5/3	7.5YR 3/3	13	31	44	8	4
6	2 15-25cm	0.07	6.9	5.7	10YR 5/6	7.5YR 4/6	44	23	29	4	0
7	2 50-60cm	0.42	7.0	6.2	10YR 6/4	10YR 5/4	48	28	21	3	0
8	3 0-10cm	0.02	6.4	5.4	10YR 5/3	7.5YR 3/3	16	33	41	6	4
9	3 15-25cm	0.05	6.1	4.9	7.5YR 6/6	7.5YR 4/6	55	24	19	2	0
10	3 50-60cm	0.37	8.6	7.4	10YR 5/3	10YR 5/4	51	27	17	3	2
11	4 0-5cm	0.02	6.2	5.5	10YR 4/2	7.5YR 3/2	16	20	38	15	11
12	4 10-20cm	008	7.3	6.2	10YR 5/4	10YR 4/4	45	19	22	14	0
13	4 40-50cm	0.57	7.7	6.8	10YR 5/4	10YR 4/4	50	22	17	11	<1
14	4 65-75cm	0.87	6.7	6.2	10YR 6/6	7.5YR 5/4	38	24	28	10	0

nt=not tested

END OF TEST REPORT

NSW GOVERNMENT Department of Primary Industries

Biosecurity Laboratory Operations
Environmental Laboratory
1243 Bruxner Highway, WOLLONGBAR NSW 2477
Phone: 02 6626 1103 Email: wollongbar.csu@dpi.nsw.gov.au

Report No. **WN180106**

Lynn Dunn
Soil Conservation Service
PO Box 283
SCONE NSW 2337

Soil Analysis Report

14 Sample(s) received on 7/08/17 . Tested as per the following methods.

Method	Method Description
S273	Gillman & Sumpter Exchangeable Cations

Notes:

Results relate only to the items tested.

- *When required, samples air dried at 40°C as per Soil Chemical Methods - Australasia (Rayment and Lyons 2011).*
- *Results are expressed on an air-dry weight basis unless otherwise stated.*
- *This report should not be reproduced except in full.*
- *Samples will be retained for one calendar month from the date of the final report. Samples will then be discarded.*
- *Clients wishing to recover their samples must contact the laboratory within this period. This laboratory will return residual samples at client expense.*

Date of issue 10/08/17

NATA ACCREDITED FOR TECHNICAL COMPETENCE

Accredited for compliance with ISO/IEC 17025 – Testing
Accreditation No. 14173

ASPAC

Approved for Release by: Craig Hunt.
Craig Hunt
Technical Officer

Laboratory No. Client's ID	Units	Limit of Reporting	1 SCO17/127 /1	2 SCO17/127 /2	3 SCO17/127 /3	4 SCO17/127 /4	5 SCO17/127 /5
Exchangeable Cations							
Aluminium	cmol(+)/kg	0.1	0.18	0.20	<0.1	<0.1	<0.1
Calcium	cmol(+)/kg	0.03	3.9	2.6	4.2	4.6	3.7
Potassium	cmol(+)/kg	0.01	0.34	0.16	0.15	0.24	0.52
Magnesium	cmol(+)/kg	0.007	4.0	3.6	14	16	4.1
Sodium	cmol(+)/kg	0.03	0.34	0.41	3.9	6.1	0.28
CEC (effective)	cmol(+)/kg	0.20	8.8	7.0	23	27	8.6
Calcium/Magnesium			0.99	0.71	0.29	0.28	0.92
Percent Aluminium Saturation	% of ECEC		2	3	N/A	N/A	N/A
Exchangeable Calcium	% of ECEC		45	37	19	17	43
Exchangeable Potassium	% of ECEC		3.8	2.4	0.65	0.89	6.0
Exchangeable Magnesium	% of ECEC		45	52	63	60	47
Exchangeable Sodium Percentage	% of ECEC		3.8	5.9	17	22	3.2

Laboratory No. Client's ID	Units	Limit of Reporting	6 SCO17/127 /6	7 SCO17/127 /7	8 SCO17/127 /8	9 SCO17/127 /9	10 SCO17/127 /10
Exchangeable Cations							
Aluminium	cmol(+)/kg	0.1	<0.1	<0.1	<0.1	0.44	<0.1
Calcium	cmol(+)/kg	0.03	3.9	4.0	4.1	4.4	6.3
Potassium	cmol(+)/kg	0.01	0.28	0.15	0.53	0.36	0.14
Magnesium	cmol(+)/kg	0.007	10	14	4.8	12	15
Sodium	cmol(+)/kg	0.03	1.5	5.2	0.26	1.2	3.5
CEC (effective)	cmol(+)/kg	0.20	16	23	9.7	18	25
Calcium/Magnesium			0.37	0.29	0.86	0.36	0.41
Percent Aluminium Saturation	% of ECEC		N/A	N/A	N/A	2	N/A
Exchangeable Calcium	% of ECEC		24	17	43	24	25
Exchangeable Potassium	% of ECEC		1.7	0.65	5.5	1.9	0.54
Exchangeable Magnesium	% of ECEC		65	60	49	65	60
Exchangeable Sodium Percentage	% of ECEC		9.1	22	2.7	6.7	14

Laboratory No. Client's ID	Units	Limit of Reporting	11 SCO17/127 /11	12 SCO17/127 /12	13 SCO17/127 /13	14 SCO17/127 /14
Exchangeable Cations						
Aluminium	cmol(+)/kg	0.1	<0.1	<0.1	<0.1	<0.1
Calcium	cmol(+)/kg	0.03	4.3	3.6	2.5	1.8
Potassium	cmol(+)/kg	0.01	0.54	0.38	0.13	0.14
Magnesium	cmol(+)/kg	0.007	4.2	13	14	13
Sodium	cmol(+)/kg	0.03	0.22	1.5	5.0	5.9
CEC (effective)	cmol(+)/kg	0.20	9.2	18	22	21
Calcium/Magnesium			1.0	0.28	0.18	0.14
Percent Aluminium Saturation	% of ECEC		N/A	N/A	N/A	N/A
Exchangeable Calcium	% of ECEC		46	19	12	8.8
Exchangeable Potassium	% of ECEC		5.8	2.1	0.59	0.66
Exchangeable Magnesium	% of ECEC		45	70	65	62
Exchangeable Sodium Percentage	% of ECEC		2.4	8.1	23	28