INVINCIBLE COLLIERY AND CULLEN VALLEY MINE

MODIFICATIONS TO EXISTING DEVELOPMENT APPROVALS

BSAL SITE VERIFICATION ASSESSMENT PROCESS – CULLEN VALLEY MINE

1 INTRODUCTION

1.1 PURPOSE

Coalpac Pty Ltd (Administrators Appointed) (Coalpac) owns and operates the Invincible Colliery and Cullen Valley Mine. Invincible Colliery has been owned and operated by Coalpac since 1988 and Cullen Valley Mine was acquired in 2008. Each mine operates as a separate entity with individual planning approvals under the *Environmental Planning and Assessment Act 1979* (EP&A Act).

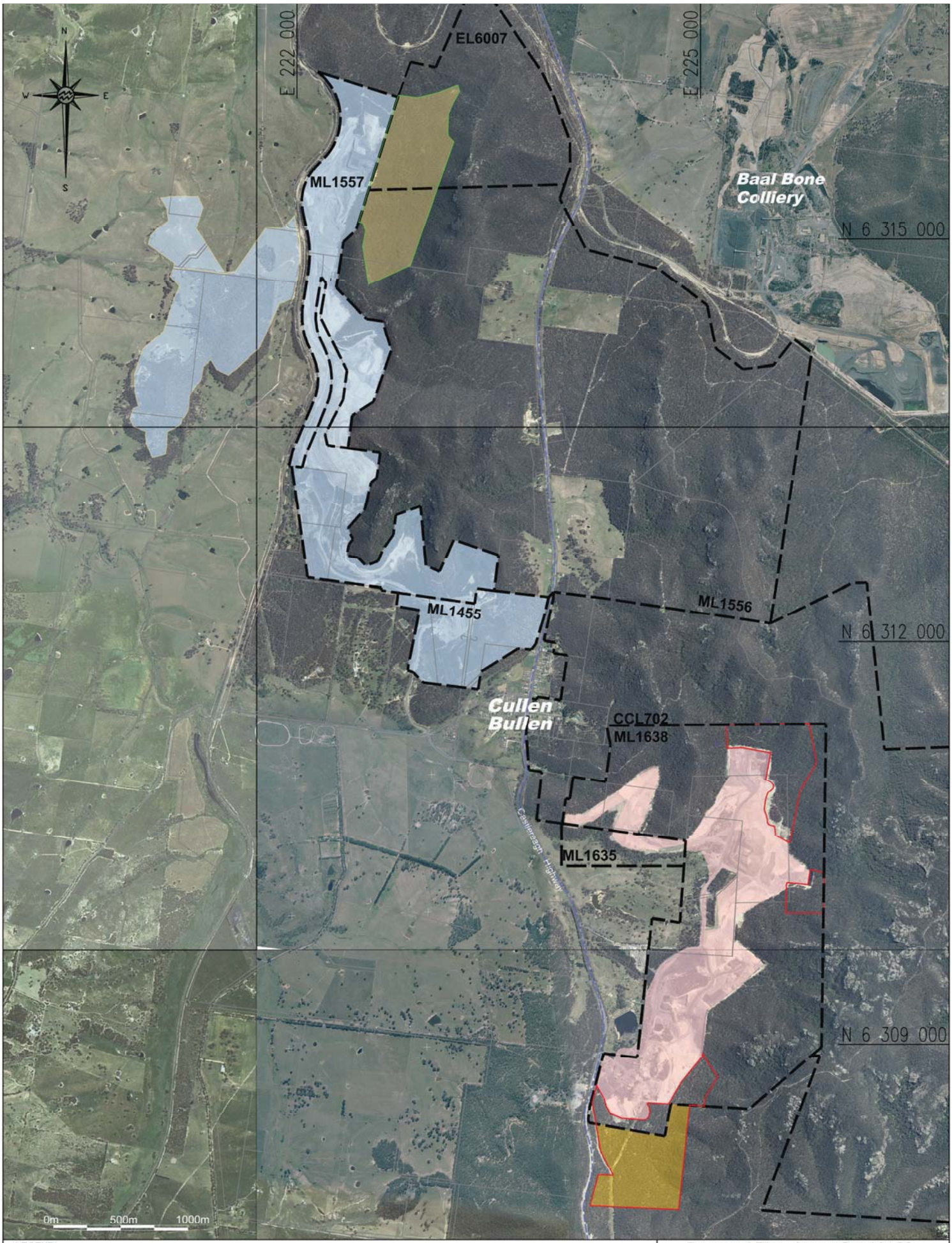
Coalpac is seeking to modify both planning approvals under Section 75W of the former Part 3A of the EP&A Act. These modifications are sought to facilitate the extension to the respective approved mining areas via open cut and highwall mining methods. This extension to mining operations will provide a short term, competitively priced fuel source to Mount Piper Power Station whilst at the same time creating a free draining, stable final land form to ensure the orderly rehabilitation of the existing mining areas.

This document undertakes a review against the '*Biophysical Strategic Agricultural Land* (BSAL) *Verification Process*' as it applies to the Modification proposed for the Cullen Valley Mine. A separate document for the Invincible Colliery Modification has also been submitted.

1.2 ASSESSMENT REQUIREMENTS

The NSW government guideline for the verification and mapping requirements to determine the presence of BSAL is included in the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (State of NSW, 2013) (Interim Protocol). The Interim Protocol provides a number of criteria for BSAL and the process to verify that land subject to development outside of an existing surface mining authority does not meet those criteria.

As noted in the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (SEPP Mining), the areas proposed to be disturbed by the Modifications (both inside and outside of the existing mining lease) would need to be assessed against the BSAL site verification process. The extent of these areas as applicable to Invincible Colliery and Cullen Valley Mine is outlined in **Figure 1**. A summary of the soils and landscape assessment process from the Interim Protocol that is to be applied to the Modifications is outlined in **Figure 2**. The proposed mining operations for the Modifications are located entirely within the Ben Bullen State Forest. No known agricultural enterprises exist or have existed within these areas.



LEGEND

- Invincible Colliery Approved Disturbance
- Cullen Valley Mine Approved Disturbance
- Coalpac Leases
- Castlereagh Highway
- Invincible Colliery Additional Disturbance Without Surface ML
- Cullen Valley Mine Additional Disturbance Without Surface ML
- Invincible Colliery Total Additional Modification Disturbance
- Cullen Valley Mine Total Additional Modification Disturbance

Proposed Disturbance Outside Of Coalpac Surface Mining Auithorities

Coalpac Pty. Ltd.
Proprietors of Invincible Colliery and Cullen Valley Mine

Figure: 1

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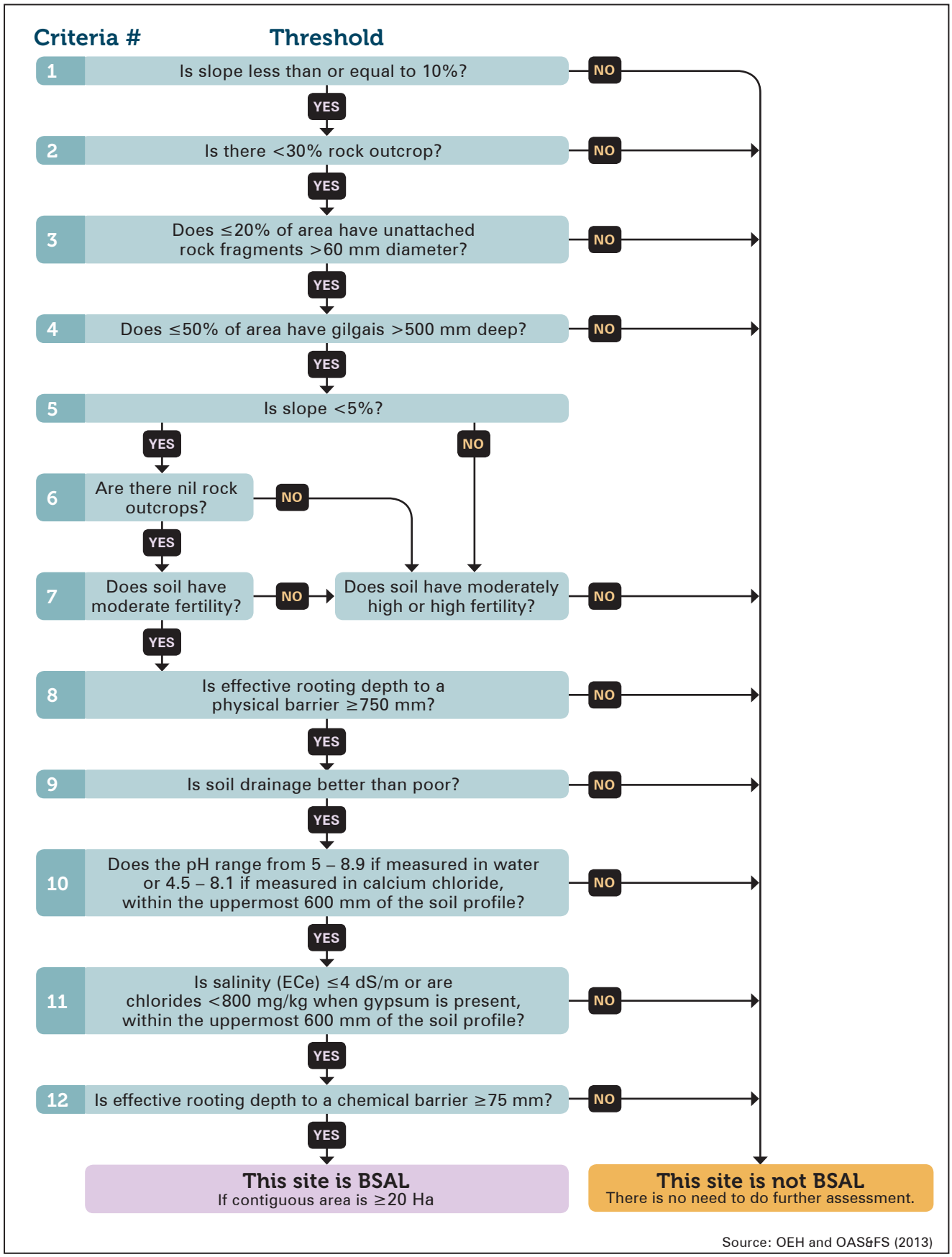
D.E	13/12/13	23.4.6 S75W	B	MGA Zone 56



Source: OEH and OAS&FS (2013)

COALPAC PTY LTD MODIFICATION

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

Site Assessment BSAL Verification Process

FIGURE **2**

1.3 BACKGROUND

1.3.1 Invincible Colliery Modification

The Invincible Colliery Modification will seek approval for the following activities that are not approved under its current Project Approval (PA 07_0127):

- Extension to the life of PA 07_0127 for four years from December 2016 to December 2020;
- Extension of 88 ha to the area approved for open cut mining;
- Extension of 86 ha to the area approved for highwall mining. These highwall mining operations will not result in additional surface disturbance;
- Installation of a water pipeline which will result in the ability to transfer water between Invincible Colliery and Cullen Valley Mine. The pipeline alignment will largely remain on or adjacent to existing access tracks within the Ben Bullen State Forest; and
- Backfilling of the residual final voids resulting from existing mining operations and the rehabilitation of areas affected by subsidence from historic underground mining operations in the area to create a free draining final land form.

All other aspects of operations on site, including coal production and processing, coal transport, operational hours and employment would remain generally consistent with those approved under PA 07_0127.

1.3.2 Cullen Valley Mine Modification

The Cullen Valley Mine Modification will seek approval for the following activities that are not approved under its current Development Consent (DA 200-5-2003):

- Extension of 62 ha to areas approved for open cut mining;
- Extension of 79 ha to areas approved for highwall mining. These highwall mining operations will not result in additional surface disturbance;
- Ability to benefit from the transfer of water to and from Invincible Colliery; and
- Backfilling and rehabilitation of the residual final void resulting from existing mining operations to create a free-draining final land form.

All other aspects of operations, including coal production and processing, coal transport, operational hours and employment would remain generally consistent with those approved under DA 200-5-2003.

2 ASSESSMENT AGAINST THE EP&A ACT

Clause 20 of Schedule 6A "*Transitional arrangements – repeal of Part 3A*" of the EP&A Act confirms that:

> *"This clause applies to the following requests and applications:*
>
> *(a) a request to modify an approved project,* [this applies to the Invincible Colliery Modification]
>
> *(b) an application for the modification of a development consent referred to in clause 8J (8) of the Environmental Planning and Assessment Regulation 2000, but only if the request or application relates to mining or petroleum development on the following land* [this applies to the Cullen Valley Mine Modification]*:*
>
> *(c) land shown on the Strategic Agricultural Land Map* [this applies to both Modifications]*,*
>
> *(d) any other land that is the subject of a site verification certificate.*

Clause 20(4) of Schedule 6A of the EP&A Act also states that:

> *A request or application to which this clause applies must be accompanied by:*
>
> *(a) in relation to land shown on the Strategic Agricultural Land Map as critical industry cluster land—a current gateway certificate in respect of the proposed development to be carried out under the modified approval or consent, or*
>
> *(b) in relation to any other land:*
>
> *(i) a current gateway certificate in respect of the proposed development to be carried out under the modified approval or consent or*
>
> *(ii) a site verification certificate that certifies that the land concerned is not biophysical strategic agricultural land.*

Applications for both Modifications are therefore required to be accompanied by either:

a) A Gateway Certificate; or

b) A site verification certificate certifying the land is not BSAL (according to the Site Verification Protocol).

3 ASSESSMENT AGAINST SEPP MINING

Clauses 17C and 17D of SEPP Mining outline the processes for determination as to whether land subject to development is or is not BSAL.

3.1 CLAUSE 17C

Clause 17C of SEPP Mining 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.

2) The owner of land may apply to the Director-General for a site verification certificate in respect of the land if:

(a) any one or more of the following has occurred:

i. written notice of an intention to obtain an access arrangement in relation to the land under section 142 of the Mining Act 1992 has been served,

ii. an access arrangement in relation to the land under Division 2 of Part 8 of the Mining Act 1992 has been agreed or determined,

iii. written notice of an intention to obtain an access arrangement in relation to the land under section 69E of the Petroleum (Onshore) Act 1991 has been served,

iv. an access arrangement in relation to the land under Part 4A of the Petroleum (Onshore) Act 1991 has been agreed or determined, and …

(b) the land is not subject to a pending development application (or modification application) for mining or petroleum development.

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.

5) In this clause:

modification application means an application to modify a development consent and includes:

(a) a request to modify an approved project within the meaning of Schedule 6A to the Act, and

(b) an application for the modification of a development consent referred to in clause 8J (8) of the Environmental Planning and Assessment Regulation 2000.

owner of land, in relation to land subject to a mining lease under the Mining Act 1992, does not include the holder of the lease.

In accordance with Clause 17C above, this document provides an overview of the Site Verification Process in relation to BSAL to support an application to the Director-General of the Department of Planning and Infrastructure for the issuance of a Site Verification Certificate in respect of the Invincible Colliery Modification. A separate document is being prepared in support of an application for the issuance of a Site Verification Certificate for the Cullen Valley Mine. The Site Verification Certificate for the Invincible Colliery will provide the Director-General's determination as to whether the land proposed to be developed for the Modification is or is not BSAL.

Neither the Invincible Colliery or Cullen Valley Mine Modifications are proposed on land currently mapped as BSAL or as a Critical Industry Cluster shown on the relevant Strategic Agricultural Land Maps accompanying SEPP Mining (Map 32 and Map 33). Public notification of the application or written notice to the owner of the land (the Crown) is therefore required. **Appendix A** provides a copy of the written letter sent to the Forestry Corporation of NSW in relation to Coalpac's intention to lodge this application for a Site Verification Certificate.

3.2 CLAUSE 17D

Clause 17D of SEPP Mining provides the specific requirements for an application for a Site Verification Certificate and 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."*

This document will support a formal application for a Site Verification Certificate and provides the information required to address Clause 17D of SEPP Mining.

4 SITE VERIFICATION ASSESSMENT FOR CULLEN VALLEY MINE MODIFICATION

4.1 PROJECT BACKGROUND

The proposed extension to open cut mining operations at Cullen Valley Mine will be undertaken in an area of approximately 62 ha immediately to the east of the northern extent of the currently approved open cut mining area.

The entirety of this proposed extension area falls outside of an existing mining lease (see **Figure 1**). **Figure 3** illustrates the proposed Cullen Valley Mine areas in relation to the vegetation and other natural features within the Study Area. **Figure 4** illustrates the soils mapping which was completed as part of the field testing component by SLR Consulting Australia as discussed further in **Section 4.4**.

For the purpose of this Site Verification Assessment, a Study Area has been developed based on the various components of the Modification with an additional 100 m buffer included. The Study Area covers approximately 181 ha of land as illustrated in **Figure 3**.

4.2 RELIABLE WATER SUPPLY

Under the Interim Protocol, the first requirement of the BSAL site verification process is to determine whether the proposed development area has access to a "*reliable water supply*". In the case of the Modification, Invincible Colliery is confirmed to have access to a "*reliable water supply*", being located in an area mapped by the NSW Office of Water as receiving rainfall of 350 mm or more per annum in 9 out of 10 years.

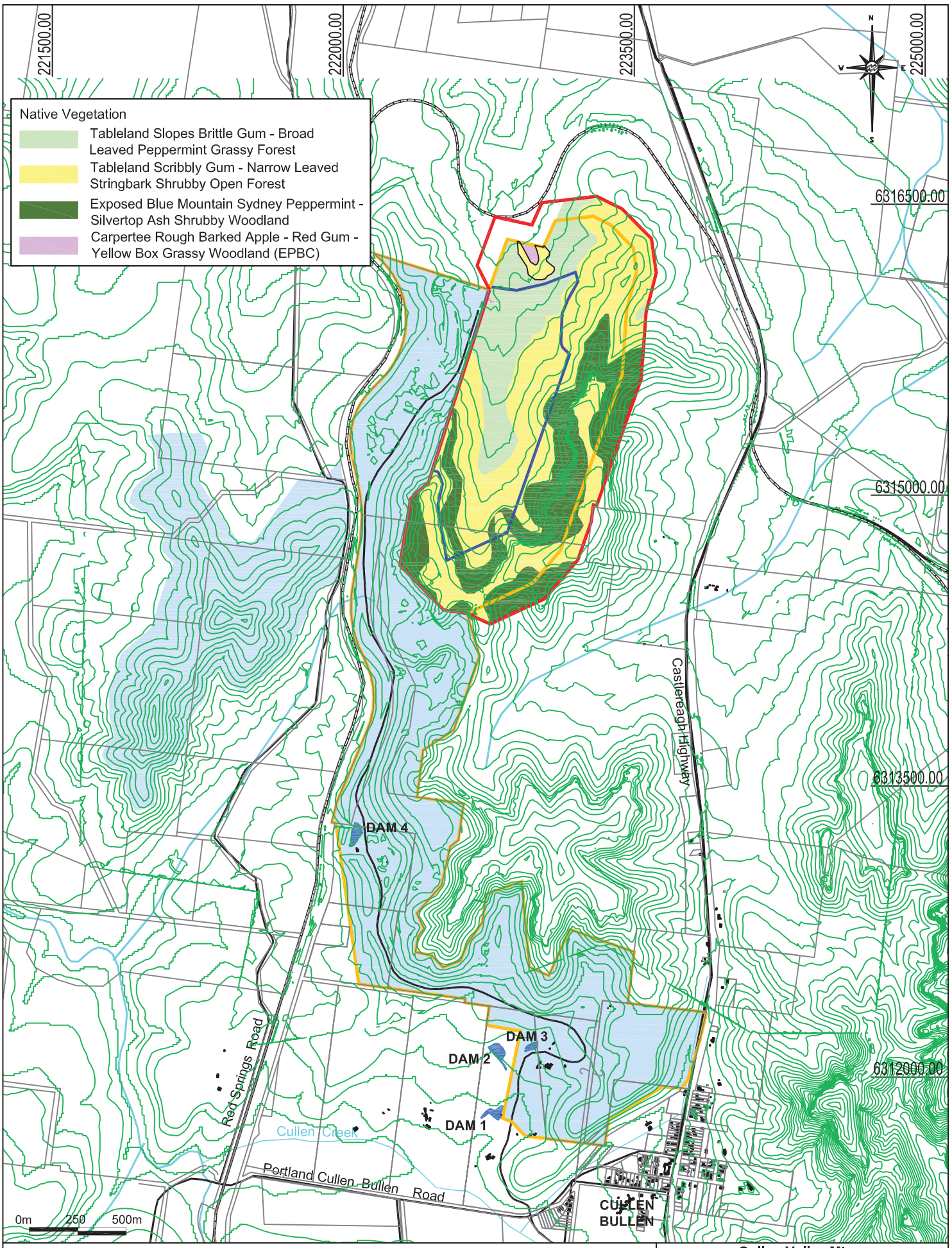
With confirmation over the reliable water supply, the site verification process requires the consideration of soils and landscape values.

4.3 SLOPE & AREA ANALYSIS

To determine whether this area meets the soils and landscape values criteria for BSAL, the first analysis against the criteria from **Figure 2** was undertaken. The topography of the area was independently surveyed in November 2011, using digital aerial photography generated by GeoSpectrum Australia Pty Limited. The area was flown as 5 runs of 87 frames at 1:25,000 scale with 80% overlap. The ground sampling distance of the topographic data was at 0.3 m.

Photogrammetric mapping was produced at a scale of 1:5,000 from the aerial photo and pre targeted ground control points laid down by surveyors. The areas subject to the BSAL Site Verification Process have not been disturbed since the time of survey.

The analysis of this topographic data within the study area has confirmed that a significant proportion of the land within the study area does not meet the criteria for slope percentages of 10% or less.



LEGEND

- Cullen Valley Mine Modification Boundary
- Cullen Valley Mine Modification Disturbance Boundary
- Cullen Valley Mine Approved Disturbance
- BSAL Area Of Assesment
- Water Management Structure
- Creeks
- Road
- Rail
- Building
- Cadastre
- 10m Contours

GDA94 Scale=1:25,000@A4

Cullen Valley Mine
BSAL Assesment Area

Coalpac Pty. Ltd.
Proprietors of Invincible Colliery and Cullen Valley Mine

Figure: 3

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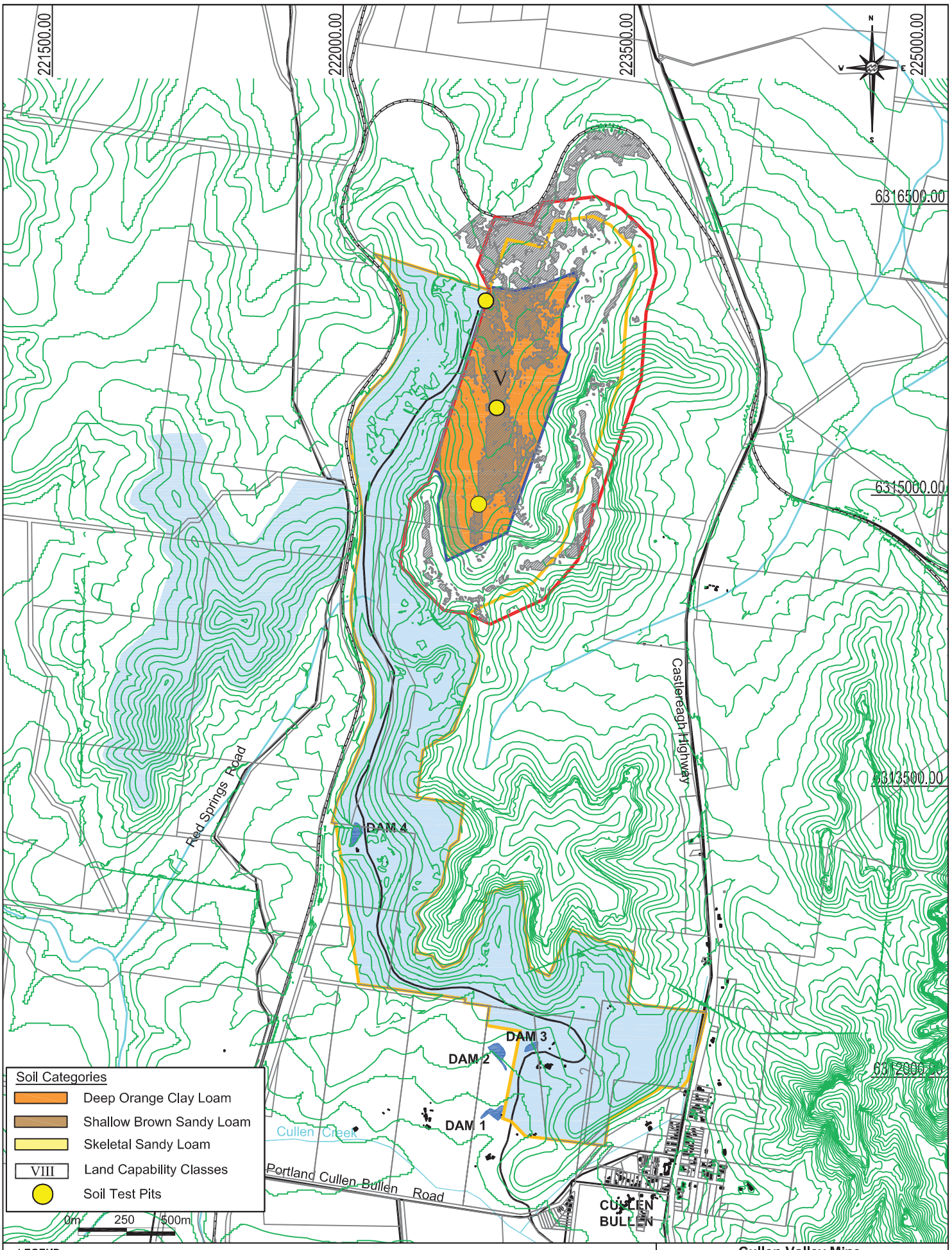

Cullen Valley Mine
BSAL Soil Mapping

Coalpac Pty. Ltd.
Proprietors of Invincible Colliery and Cullen Valley Mine

Figure: 4

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D.E	24/02/14	23.4.6.12.4A	A	MGA Zone 56

Figure 5 illustrates the results of the slope analysis and area assessment that has been completed using the existing topographic data throughout the Study Area. Of the areas where slope has been identified to be less than 10%, there is one contiguous area of land (24.2 ha) (i.e. of 20 ha or more) that satisfies this relevant criteria and is therefore subject to the remaining soils and landscape criteria.

As required under Section 9.4.1 of the Interim Protocol, a number of Exclusion Sites have been developed across the Study Area to verify the detailed topographic information that has been utilised for the purposes of the slope analysis.

Coalpac completed the relevant level of survey to validate the topographic data that was utilised for the slope analysis according to the Interim Protocol. The report prepared by the Coalpac describing the methodology and results of the survey is provided in **Appendix B** with a summary provided below.

A total of nine Exclusion Sites (see **Figure 6**) were assessed across the Cullen Valley Mine Modification Study Area in areas from where slopes were identified to be greater than and less than 10 degrees in slope according to the topographic data. The slope at each site was verified utilising a clinometer according to the following process:

1) A clinometer was mounted on an adjustable tripod such that it could be set at a constant height above the ground level (1,385 mm);

2) A staff was marked at the same height (1,385 mm) such that it could be sighted through the clinometer and used as a reference point;

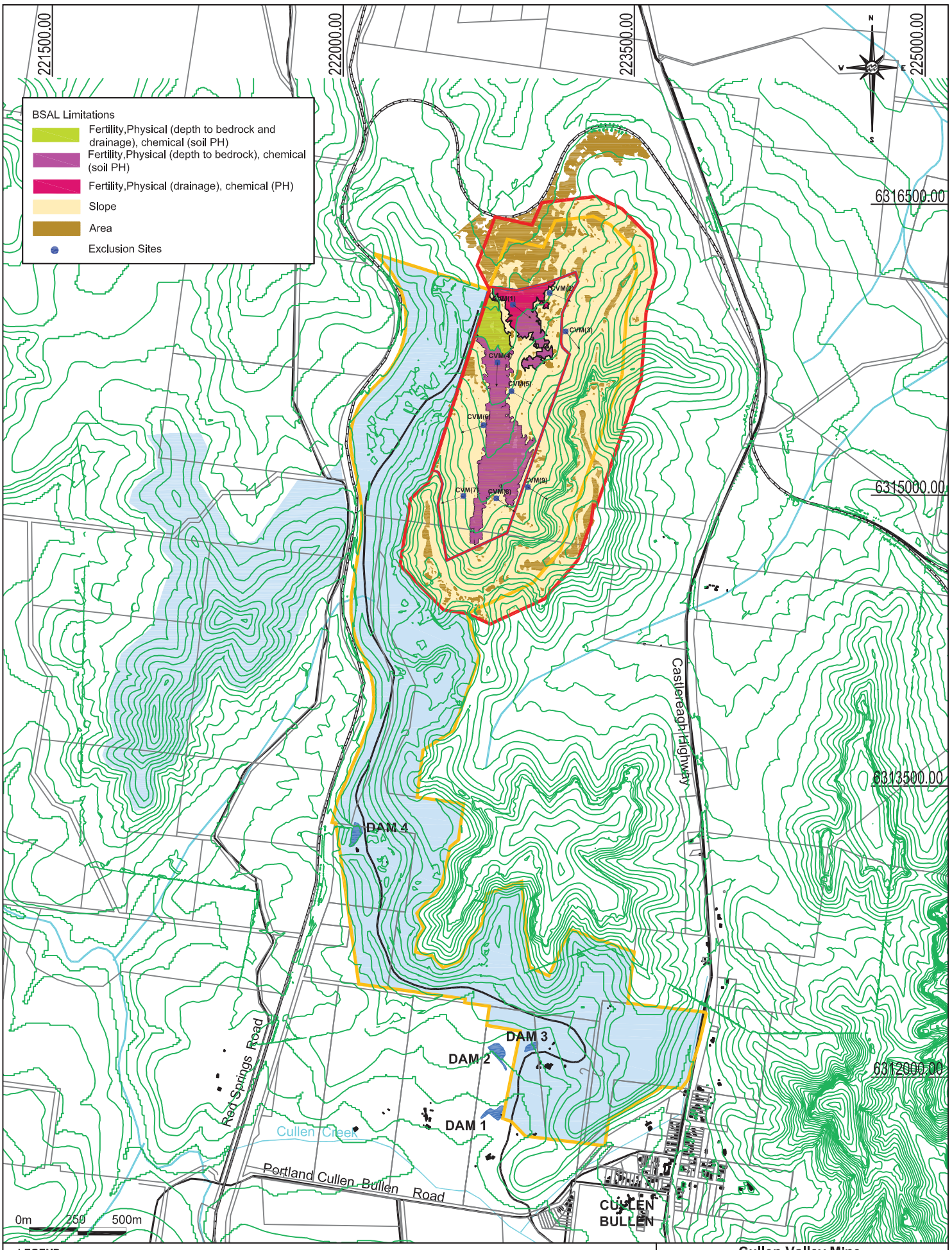
3) Staff was advanced between 20 and 30 metres up the slope from each Exclusion Site;

4) The GPS coordinates, magnetic bearing and clinometer reading were recorded for each Exclusion Site; and

5) Photographs were taken together with general observations of the local conditions.

This methodology has been endorsed by a qualified statutory mining surveyor (Craven Elliston and Hayes (CEH)) for the purpose of estimating the angle of the slope of the land. A copy of the endorsement letter by CEH is provided in **Appendix B**.

In addition to the slope analysis results, other site specific information was recorded from each Exclusion Site for inclusion into the spreadsheet entitled *Profile_BSAL_profile_template_v1.1.xls* that was provided by Office of Environment and Heritage (OEH) to support this Site Certificate Verification application as opposed to completing Site Data Cards. Information for addressing the site specific soil profile information for the spreadsheet was available from the field assessment work completed by SLR Consulting Australia as discussed in **Section 4.4**.



LEGEND

- Cullen Valley Mine Modification Boundary
- Cullen Valley Mine Modification Disturbance Boundary
- Cullen Valley Mine Approved Disturbance
- BSAL Area Of Assesment
- Water Management Structure
- Creeks
- Road
- Rail
- Building
- Cadastre
- 10m Contours

GDA94 Scale=1:25,000@A4

Cullen Valley Mine
BSAL Limitations

Coalpac Pty. Ltd.
Proprietors of Invincible Colliery and Cullen Valley Mine

Figure: 5

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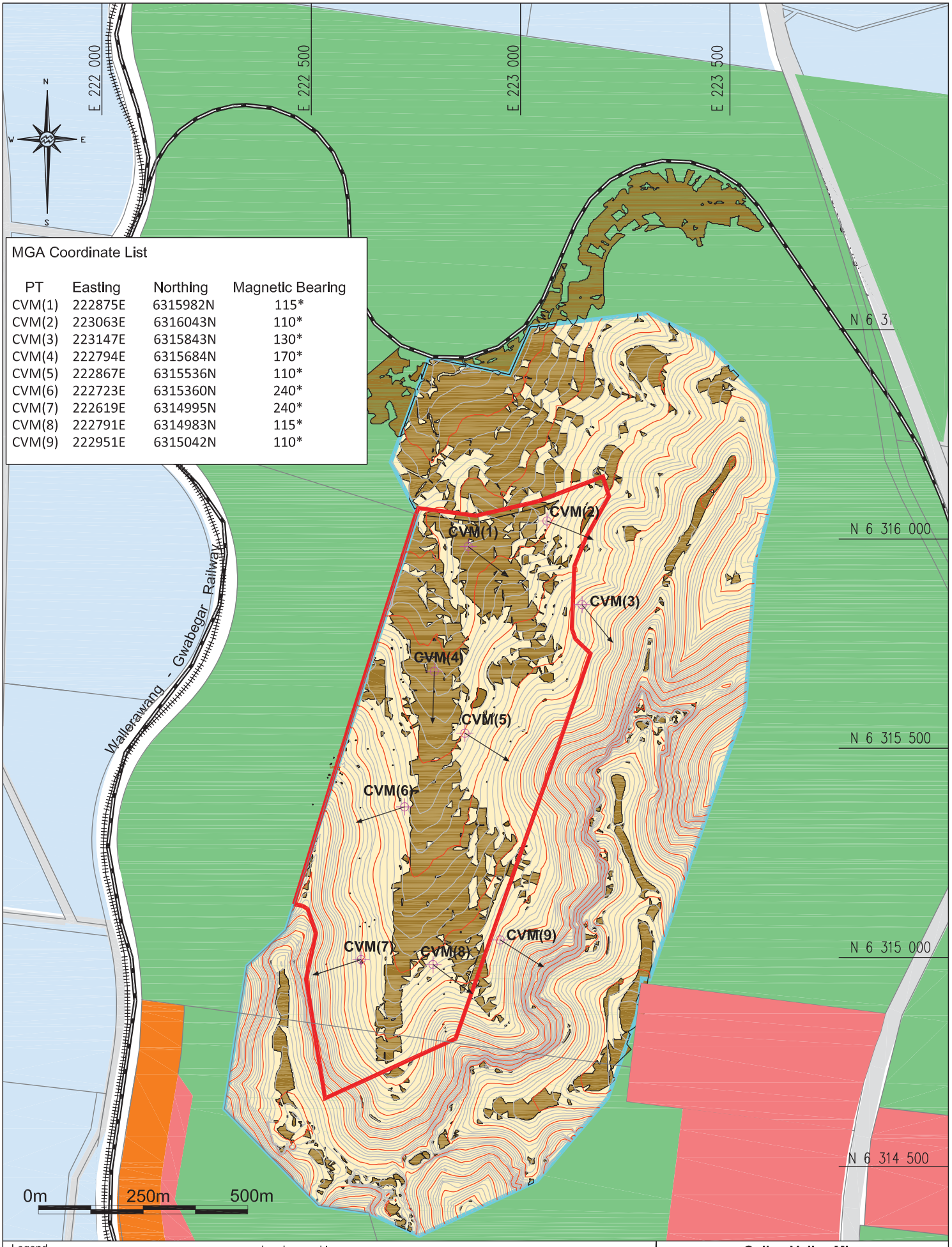

MGA Coordinate List

PT	Easting	Northing	Magnetic Bearing
CVM(1)	222875E	6315982N	115*
CVM(2)	223063E	6316043N	110*
CVM(3)	223147E	6315843N	130*
CVM(4)	222794E	6315684N	170*
CVM(5)	222867E	6315536N	110*
CVM(6)	222723E	6315360N	240*
CVM(7)	222619E	6314995N	240*
CVM(8)	222791E	6314983N	115*
CVM(9)	222951E	6315042N	110*

Legend

- Modification Disturbance Boundary
- Area Subject To BSAL
- Gradient Less Than 10%
- Gradient More Than 10%
- 2m Contour
- 10m Contour

Landownership

- State Forest
- Private Freehold
- Coalpac/Coalpac Shareholders
- Crown

Cullen Valley Mine
Exclusion Sites Survey

Coalpac Pty. Ltd.
Proprietors of Invincible Colliery and Cullen Valley Mine

Figure: 6

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D.E	25/02/14	23.4.6.51-A	B	MGA Zone 56

The validation survey identified slopes between 2% (at CVM06) and 25% (at CVM09). All results demonstrated that the topographic data that was utilised for the slope assessment are accurate and can be relied upon across the Cullen Valley Mine Study Area.

On this basis, it is concluded that a majority of the land within the Study Area does not conform to BSAL and does not require further soils analysis against other criteria within the Interim Protocol. However one area of 24.2 ha was subject to further soils analysis as discussed further in **Section 4.4**.

4.4 FIELD WORK ASSESSMENT

In light of an area of contiguous land greater than 20 ha (24.2 ha) with slope less than 10%, Hansen Bailey commissioned SLR Consultants Australia to complete the relevant soils analysis for the Cullen Valley Mine Study Area according to the Interim Protocol. A copy of SLRs assessment report is provided in full as **Appendix C**.

To identify the appropriate level of soil survey effort required a risk assessment was conducted in accordance with the Interim Protocol. The risk to agricultural resources has been assessed as being low primarily due to the Study Area being located in a State Forest, there are no existing agricultural activities undertaken in the study area and there is low potential for commercial agricultural land uses. A survey scale of 1:50,000 to 1:100,000 is considered appropriate under the BSAL guidelines, however a more detailed survey scale of 1:25,000 was adopted for the purpose of this report. This survey scale required the collection of a minimum of four field observations.

The field work was completed on 19 February 2014 and included eight field observations, three of these involved detailed observations using a trailer mounted core sampler. The three detailed observation sites and one further observation site included 12 soil samples which were analysed under laboratory conditions to assist in the classification of soil taxonomic classes and assess the soil type against the BSAL classification criteria.

Soil samples were collected from each major soil horizon and at appropriate depths. Typically depths of soil analysed were at 0-10 cm, 20-30 cm, 50-60 cm and 89-90 cm. Check sites were assessed and comprised of cuttings, soil exposures of up to 0.3 m using a spade and exposed soil profiles from tree roots. The applicable technical standard for naming the units of soil was the ASC system (Isbell, 1996).

The reference information identified that the Study Area contained mottled texture contrast soils that have acidic subsoils. The field assessment has confirmed that the soils in the Study Area are texture contrast, significantly mottled and strongly acidic.

Three soil types were identified during the assessment within the Cullen Valley Mine Study Area and are described in **Table 1**.

Table 1
Soil Types found in Study Area

No.	Soil Type	Description
1	Yellow Kurosol	The Yellow Kurosols have strong texture contrast between A and B horizons and strongly acidic B horizons. This soil unit is composed of four distinct soil horizons and is characterised by loamy sand overlying sandy clay loam grading into medium clay. Soil pH is very strongly acidic and non-saline throughout the profile. This soil type has moderately low inherent fertility.
2	Brown Kurosol	This soil unit is comprised of three distinct soil horizons and is characterised by clay loam overlying light clay to medium clay overlaying bedrock. Soil pH is very strongly acidic and non-saline throughout the profile. This soil type has moderately low inherent fertility.
3	Grey Kurosol	This soil unit is comprised of four distinct soil horizons and is characterised by clay loam overlying light clay to medium clay. Soil pH is very strongly acidic and non-saline throughout the profile. This soil type has moderately low inherent fertility.

The key finding from the Phase 2 BSAL verification criteria assessment across the Study Area is that all three soil types identified within the Study Area failed to be classified as BSAL (see **Table 2**).

All soil types failed the soil fertility criteria (criteria 7) as Kurosols are classified as having '*Moderately Low*' fertility by the BSAL Verification Guideline.

Further, Soil Type 1 failed the physical criteria of depth to bedrock (criteria 8) and internal drainage (criteria 9) as the soil profile encountered a weathering zone at 0.6 m and the subsoil was poorly drained. Soil Type 1 also failed the pH criteria (criteria 10) and the chemical barrier criteria (criteria 12) as the topsoil horizon (A1) exhibited pH values less than pH 5.0.

Soil Type 2 failed the physical criteria of depth to bedrock (criteria 8) with bedrock encountered at 0.6 m. Soil Type 3 failed the internal drainage (criteria 9) as the subsoil was very poorly drained.

Table 2
Applied BSAL Criteria According to Interim Protocol

Soil Type		Site Verification Step												BSAL
No	Name	1	2	3	4	5	6	7	8	9	10	11	12	
1	Yellow Kurosol	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✓	✗	No
2	Brown Kurosol	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	No
3	Grey Kurosol	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	No

The 24.2 ha of land within the Study Area that was less than 10 degree slopes and was subject to further soils and landscape analysis has proven to fail multiple criteria according to the Interim Protocol including soil fertility, drainage, physical barrier, pH and chemical barrier.

Therefore all the land within the Cullen Valley Mine Study Area is not considered to be BSAL.

5 CONCLUSION

Desktop analysis, field work and laboratory analysis has been completed in excess of the minimum assessment criteria provided in the Interim Protocol for the proposed Modification to Cullen Valley Mine. The Cullen Valley Mine site falls within an area that has been identified to exhibit a reliable water supply with a rainfall of greater than the 350 mm per annum in accordance with the Interim Protocol.

A desktop analysis of detailed topographic information concluded that a vast majority of the Study Area is heavily undulating with slopes generally greater than 10%. There are a few contiguous areas where slope is less than 10% and these areas are generally less than the 20 ha threshold. However, one contiguous area of approximately 24.2 ha (greater than 20 ha threshold) was identified which exhibits slopes of less than 10% and is therefore subject to the Soils and Landscape Verification Criteria.

Coalpac completed a site survey of the Study Area to validate the topographic data and associated slope analysis utilising a total of nine Exclusion Sites. The methodology that was utilised in the field was endorsed by a registered land surveyor for the purposes of surveying the slope of the land at the Exclusion Sites. The site survey supported the slope analysis which was completed utilising the detailed topographic information.

The review of the contiguous 24.2 ha of land with slopes less than 10 degrees within the Cullen Valley Mine Study Area against the assessment criteria provided in the Interim Protocol has found that the site does not have the required soils and landscape values to meet the definition of BSAL (against multiple criteria).

Coalpac is therefore seeking the issuance of a Site Verification Certificate for the Cullen Valley Mine Study Area from the Director-General of DP&I confirming concurrence with this document and that the land to be developed as part of the Cullen Valley Mine Modification is not BSAL.

Please do not hesitate contact James Bailey on 02 6575 2000 should you have any questions or require any further information.

* * *

For
HANSEN BAILEY

James Bailey

Director

APPENDIX A

Notification to Landowners

Coalpac

Proprietors of Invincible Colliery and Cullen Valley Mine

ABN 91 003 558 914

Coalpac Pty. Ltd. (Administrators Appointed)
Invincible Colliery,
Castlereagh Highway,
Cullen Bullen, NSW 2790, Australia.

Telephone: +61 2 6359 0600
Facsimile: +61 2 6359 0608
Email: Coalpac@cetresources.com

February 18, 2014

Forestry Corporation of NSW
Attn: Geoff Coggins
Assets & Estates Manager
121-131 Oratava Ave.,
West Pennant Hills,
2125 NSW

Dear Geoff,

Re: Notification of Application for Site Verification Certificate for Proposed Modification to Cullen Valley Mine Planning Approval

At our meeting on the 10th February 2014 I outlined our pending application to modify the current planning approval for Cullen Valley Mine to recommence mining operations in the Ben Bullen State Forest.

This letter is to notify you, as required by Clause 17C(3)(a) of the SEPP Mining, of our intention to lodge an application to the Director General of the Department of Planning and Infrastructure for a site verification certificate for part of the Ben Bullen State Forest.

If you have any questions or concerns regarding the above please do not hesitate to contact me.

Yours sincerely,

Ian Follington
CEO

APPENDIX B

BSAL Exclusion Sites and Methodology

Coalpac
Proprietors of Invincible Colliery and Cullen Valley Mine
ABN 91 003 558 914

Coalpac Pty Ltd (Administrators Appointed)
Invincible Colliery, Castlereagh Highway,
Cullen Bullen NSW 2790

Telephone: +61 7 3054 0800
Facsimile: +61 7 3054 0801
Email: Coalpac@cetresources.com

BSAL Exclusion Sites Methodology and Results

25th February 2014

1.0 Background

These Exclusion Sites support the Site Verification Certificate Applications for both the Cullen Valley Mine and Invincible Colliery sites to address the requirements of the New South Wales (NSW) Government's Strategic Regional Land Use Policy (the Policy) ((Department of Planning Department of Planning & Infrastructure (DP&I)).

A key component of the Policy is the identification and mapping of strategic agricultural land (SAL). One category of SAL is biophysical strategic agricultural land (BSAL), which is land containing "a rare combination of natural resources and is considered highly suitable for agriculture" (DP&I, 2012). Under the Policy, State Significant Development (SSD) proposals related to mining are required to undertake a site verification assessment in accordance with the Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land ((Office of Environment & Heritage (OEH) and Department of Primary Industries - Office of Agricultural Sustainability and Food Security (DPI-OASFS), 2013)) (BSAL Interim Protocol 2013).

The Exclusion Sites support digital elevation model (DEM) data already provided as part of the Site Verification Certificate Applications.

2.0 Survey Methodology

The procedure adopted in the field to assess the slope angle at the exclusion sites and provide observation site data was as follows;

1. A clinometer was mounted on an adjustable tripod such that it could be set at a constant height above the ground level (1,385mm),
2. A staff was marked at the same height such that it could be sighted through the inclinometer and used as a reference point,
3. The staff was advanced between 20 and 30 metres up the slope from the observation point
4. The GPS coordinates, magnetic bearing and clinometer reading were recorded for each observation site and
5. Photographic records were also taken together with general observations of the local conditions.

The general arrangement for monitoring the angle of the slope is illustrated in **Figure 1**.

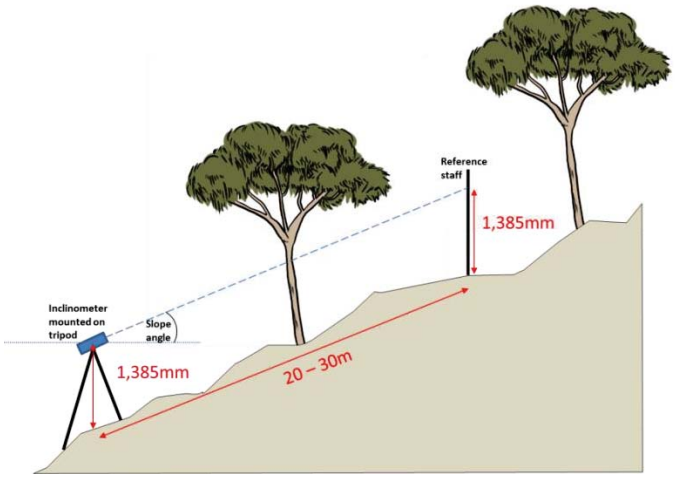


Figure 1 – General arrangement for measurement of slope angle

The adopted methodology for estimating the angle of the slope was confirmed to be suitable for the purpose of the task by qualified statutory mining surveyors Craven Elliston and Hayes (CEH). A letter from CEH confirming the adequacy of the survey procedure and methodology is provided in **Appendix A**.

Exclusion Sites have been relatively evenly distributed across the survey area. As determined by the slope analysis, a soil survey is not required for the Invincible Colliery as the majority of area is excluded due to slopes ≥10% gradient and no remaining contiguous areas ≥20 ha of <10% slope exist. In the absence of any soil map polygons for Invincible Colliery 11 Exclusion Sites were spread relatively evenly across the exclusion area, to confirm the slope analysis from the DEM (See **Figure 2**).

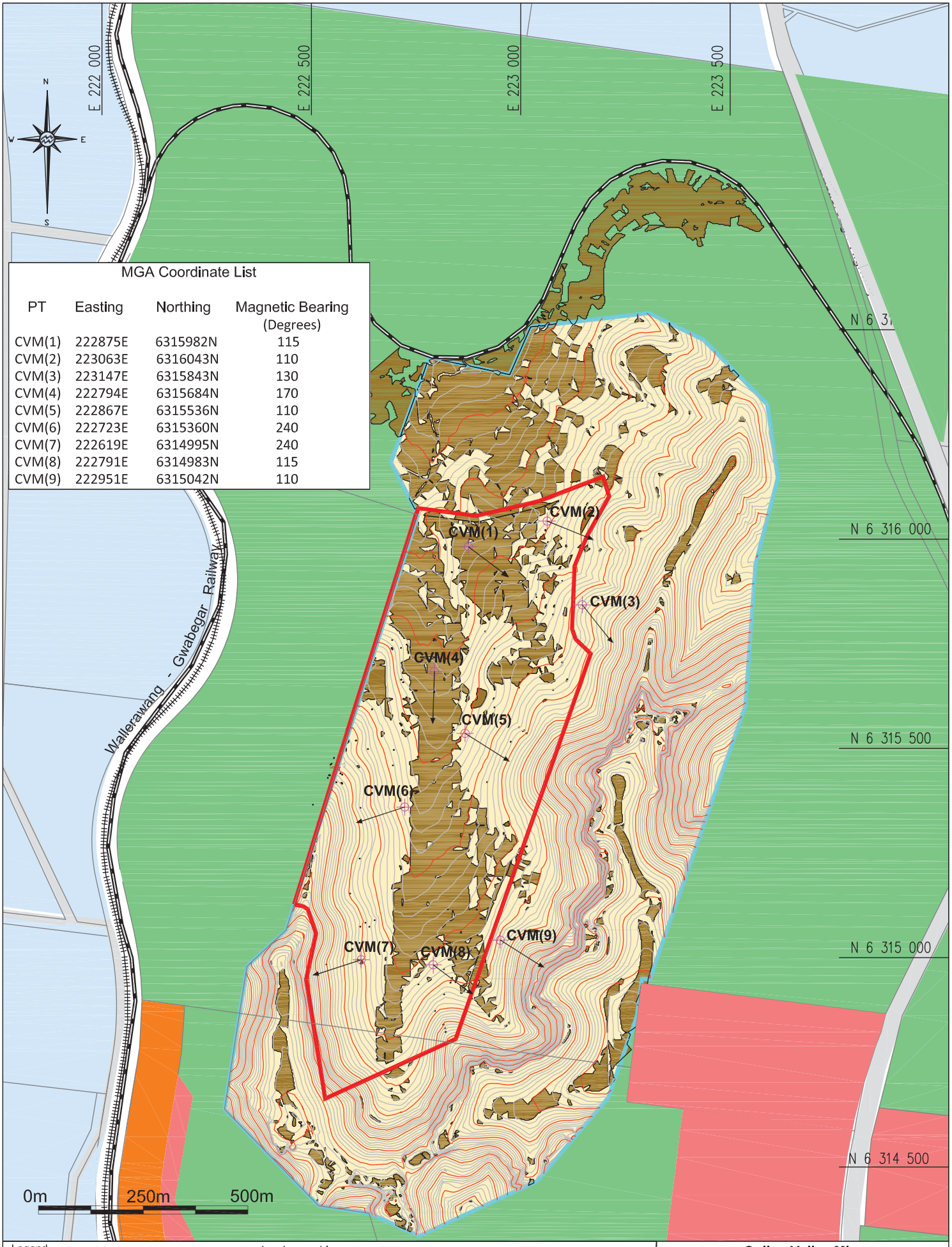
The same methodology was applied to the Cullen Valley Mine site as well to confirm the slope analysis from the DEM even though soil survey data has been provided (See **Figure 3**). Photographs of each Exclusion Site are provided in **Appendix B**. Data used from the DEM to measure the gradient in relation to the Exclusion Sites is shown in **Figure 2** and **Figure 3**.

3.0 Results

The results for the Exclusion Sites for both sites are summarised in **Table 1**. The maximum gradient recorded for Exclusion Sites at Cullen Valley Mine was 25% at CVM09 and 30% at Invincible Colliery at INV11. The minimum gradient recorded for Exclusion Sites at Cullen Valley Mine was 2% at CVM06 and 4% at INV07 at Invincible Colliery. Recorded measurements from the clinometer have been rounded to the nearest whole number as per the BSAL Interim Protocol 2013 guideline.

Table 1: Summary of Results of Exclusion Sites

ID No.	Easting	Northing	Date	GPS Site Photo	Magnetic Bearing (°)	Clinometer Reading (%)	Inclinometer Photo	Site Photo	Site Observations (surface rock, land cover, landform)
CVM01	222875	6315982	24/02/2014	Y	115	5	Y	Y	Grass, branches, leaf litter, small rocks (<5cm)
CVM02	223063	6316043	24/02/2014	Y	110	10	Y	Y	Sandy soil, patchy grass, sticks
CVM03	223147	6315843	24/02/2014	Y	130	20	Y	Y	Rocky surface
CVM04	222794	6315684	24/02/2014	Y	170	20	Y	Y	Leaf litter/sticks/grass, no rocks
CVM05	222867	6315536	24/02/2014	Y	110	10	Y	Y	Sandy/gravel surface & grass
CVM06	222723	6315360	24/02/2014	Y	240	11	Y	Y	Sandy/gravel surface & grass
CVM07	222619	6314995	24/02/2014	Y	240	18	Y	Y	Some rocks, leaf litter/sticks
CVM08	222791	6314983	24/02/2014	Y	115	11	Y	Y	Leaf litter/sticks/grass, some rocks
CVM09	222951	6315042	24/02/2014	Y	110	25	Y	Y	leaf litter, Sticks
INV01	224383	6308319	25/02/2014	Y	250	13	Y	Y	Thick grass cover
INV02	224509	6308131	25/02/2014	Y	180	6	Y	Y	Open ground, grass/sticks
INV03	224687	6308237	25/02/2014	Y	80	13	Y	Y	High grass cover, timber branches
INV04	224772	6308468	25/02/2014	Y	90	18	Y	Y	Some stones, grass, leaf litter
INV05	225100	6309052	25/02/2014	Y	105	18	Y	Y	Leaf litter, sticks, small shrubs
INV06	225808	6310069	25/02/2014	Y	140	20	Y	Y	Leaf litter, sticks, medium rocks (6 - 20cm)
INV07	225617	6311062	25/02/2014	Y	75	4	Y	Y	Thick grass cover, branches
INV08	225598	6311195	25/02/2014	Y	55	23	Y	Y	leaf litter, sticks, patchy grass
INV09	225390	6311290	25/02/2014	Y	10	20	Y	Y	leaf litter, sticks
INV10	225161	6311229	25/02/2014	Y	240	30	Y	Y	leaf litter, some small surface rocks (<5cm)
INV11	224955	6311658	25/02/2014	Y	230	30	Y	Y	leaf litter, grass



MGA Coordinate List

PT	Easting	Northing	Magnetic Bearing (Degrees)
CVM(1)	222875E	6315982N	115
CVM(2)	223063E	6316043N	110
CVM(3)	223147E	6315843N	130
CVM(4)	222794E	6315684N	170
CVM(5)	222867E	6315536N	110
CVM(6)	222723E	6315360N	240
CVM(7)	222619E	6314995N	240
CVM(8)	222791E	6314983N	115
CVM(9)	222951E	6315042N	110

Legend

- Modification Disturbance Boundary
- Area Subject To BSAL
- Gradient Less Than 10%
- Gradient More Than 10%
- 2m Contour
- 10m Contour

Landownership

- State Forest
- Private Freehold
- Coalpac/Coalpac Shareholders
- Crown

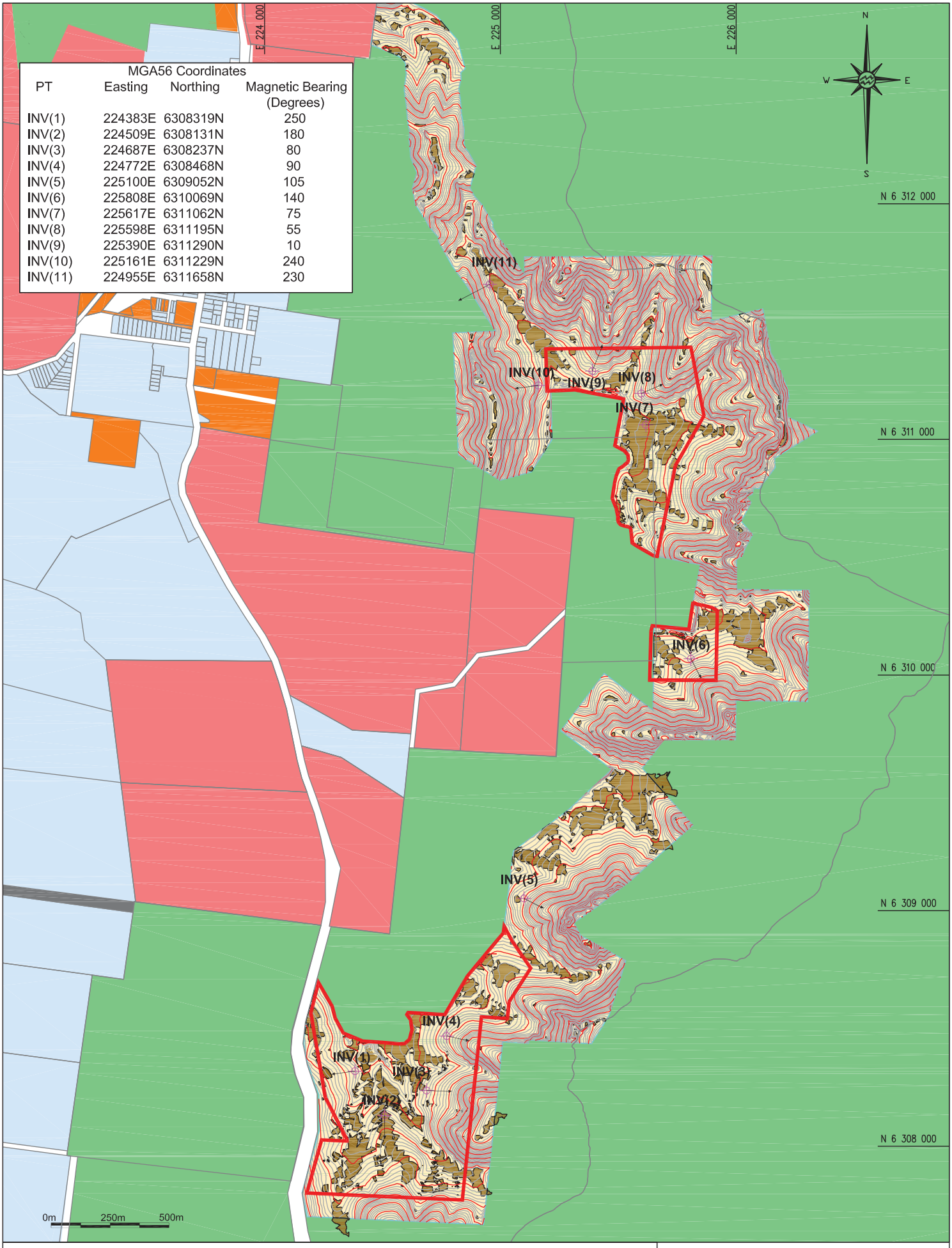
Exclusion Site

Cullen Valley Mine
Exclusion Sites Survey

Coalpac Pty. Ltd.
Proprietors of Invincible Colliery and Cullen Valley Mine

Figure: 2

Drawn By:	Date:	Drawing No.:	Revision:	
D.E	26/02/14	23.4.6.51-A	B	MGA Zone 56



MGA56 Coordinates

PT	Easting	Northing	Magnetic Bearing (Degrees)
INV(1)	224383E	6308319N	250
INV(2)	224509E	6308131N	180
INV(3)	224687E	6308237N	80
INV(4)	224772E	6308468N	90
INV(5)	225100E	6309052N	105
INV(6)	225808E	6310069N	140
INV(7)	225617E	6311062N	75
INV(8)	225598E	6311195N	55
INV(9)	225390E	6311290N	10
INV(10)	225161E	6311229N	240
INV(11)	224955E	6311658N	230

Legend

- Modification Disturbance Boundary
- Area Subject To BSAL
- Gradient Less Than 10%
- Gradient More Than 10%
- 2m Contour
- 10m Contour

Landownership

- State Forest
- Private Freehold
- Coalpac/Coalpac Shareholders
- Crown

Exclusion Site

Invincible Colliery Exclusion Sites Survey

Coalpac Pty. Ltd.
Proprietors of Invincible Colliery and Cullen Valley Mine

Figure: 3

Drawn By:	Date:	Drawing No.:	Revision:	
D.E	26/02/14	23.4.6.52-B	B	MGA Zone 56

4. Conclusion

The gradients measured at Exclusion Sites at Cullen Valley Mine and Invincible Colliery were consistent with and support the DEM data used to identify slopes greater than and less than 10%. As such the DEM can be relied upon to accurately represent the topography in the vicinity of Cullen Valley Mine and Invincible Colliery.

COALPC PTY LTD

25.2.14

Ben Eastwood
Environmental Manager

APPENDIX A

CRAVEN ELLISTON & HAYES (LITHGOW) PTY. LIMITED

CONSULTING LAND, ENGINEERING AND MINING SURVEYORS

"Astrolabe" Rutherford Lane, LITHGOW 2790

A.B.N. 68 056 544 551

Telephone: (02) 6351 2281 Facsimile: (02) 6352 1339 Email: survey@ceh.com.au www.ceh.com.au

File Ref: 13738.Cel

25th February 2014

Environmental Manager
Coalpac Pty Ltd
Castlereagh Highway
CULLEN BULLEN NSW 2790

Dear Sir,

RE: BSAL EXCLUSION SITES METHODOLOGY & RESULTS – 25TH FEBRUARY 2014

I have reviewed the above report and I find that the methodology used in the survey is sound and suitable for the intended purpose of estimating the angle of slope.

I am very familiar with the topography of the area surveyed and the results are consistent with the figures I would expect.

Yours sincerely,
CRAVEN ELLISTON & HAYES (LITHGOW) PTY LIMITED

T. Elliston
Registered Land Surveyor
Registered Mining Surveyor

Appendix B

Cullen Valley Mine - Exclusion Sites photographic record, 24 February 2014.

		
CVM01	**CVM02**	**CVM03**
		
CVM04	**CVM05**	**CVM06**

		
CVM07	**CVM08**	**CVM09**

Invincible Colliery - Exclusion Sites photographic record, 25 February 2014.

		
INV01	**INV02**	**INV03**

		
INV04	**INV05**	**INV06**
		
INV07	**INV08**	**INV09**

		Blank
INV10	**INV11**	Blank

APPENDIX C

Cullen Valley Mine Modification

Site Verification Assessment

25 February 2014

630.10813_CullenValleyMine BSAL Report_Final

Nathan Cooper
Senior Environmental Scientist
Hansen Bailey
6/127-129 John Street
Singleton NSW 2330

Attention: **Nathan Cooper**

RE: **Cullen Valley Mine Modification**
Site Verification Assessment

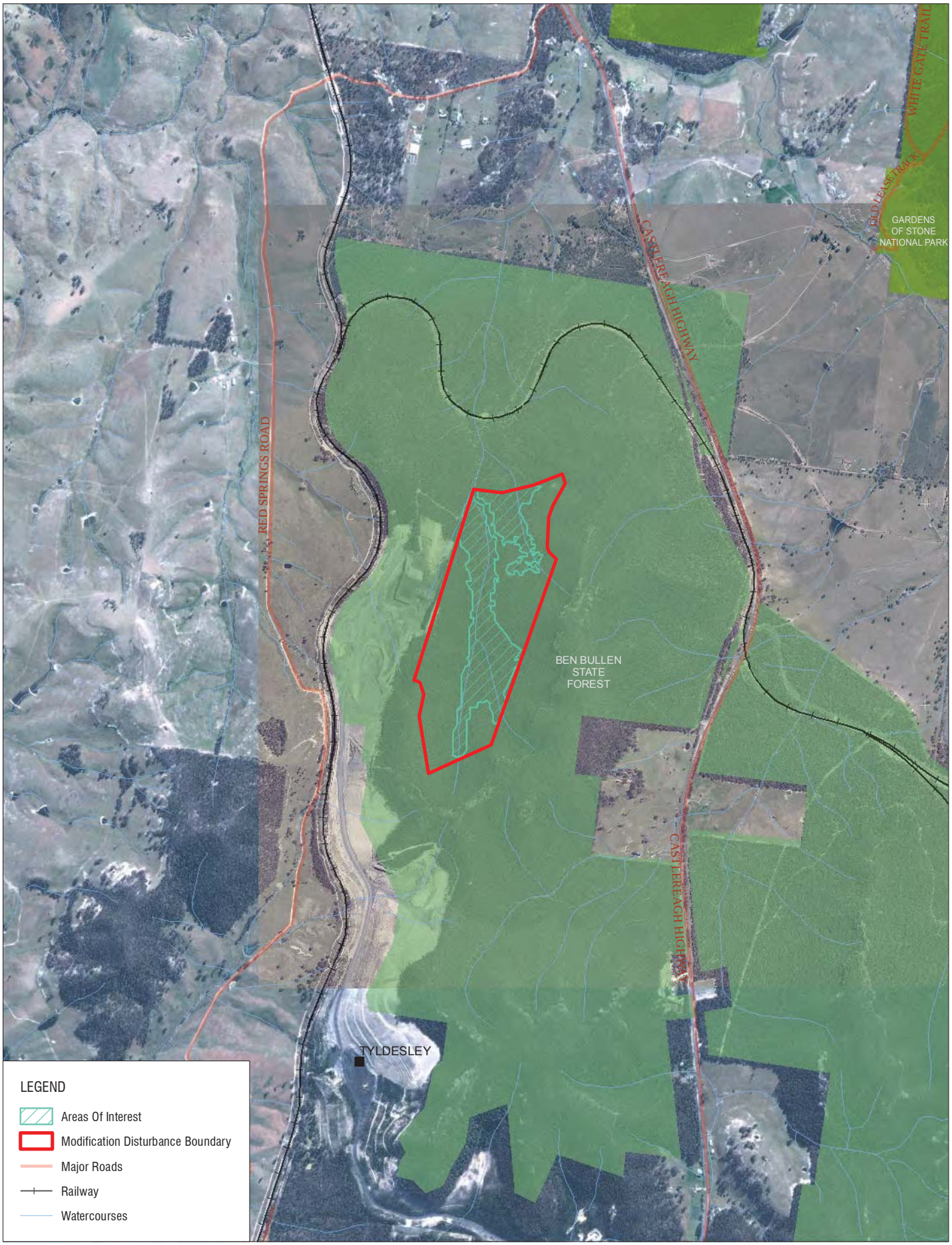
1.0 INTRODUCTION

Hansen Bailey Pty Limited engaged SLR Consulting Australia Pty Ltd on behalf of Coalpac Pty Limited (administrators appointed) to undertake a Site Verification Assessment for the Cullen Valley Mine Modification (the Project). This Site Verification Assessment provides supporting documentation for the Project's Site Verification Certificate Application to address the requirements of the New South Wales (NSW) Government's Strategic Regional Land Use Policy (the Policy) ((Department of Planning Department of Planning & Infrastructure (DP&I)).

A key component of the Policy is the identification and mapping of strategic agricultural land (SAL). One category of SAL is biophysical strategic agricultural land (BSAL), which is land containing "a rare combination of natural resources and is considered highly suitable for agriculture" (DP&I, 2012). Under the Policy, State Significant Development (SSD) proposals related to mining are required to undertake a site verification assessment in accordance with the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* ((Office of Environment & Heritage (OEH) and Department of Primary Industries - Office of Agricultural Sustainability and Food Security (DPI-OASFS), 2013)). This guideline is hereafter referred to as the BSAL Verification Guideline.

If land in the area to be impacted is already mapped as BSAL, then applicants will have a choice of whether to accept or challenge the mapping (via site verification). However, all impacted land that is not mapped as BSAL still requires site verification.

The Study Area for the Project that is subject of this Site Verification Assessment is land that is not mapped as BSAL under the Policy; however, requires verification as it will be impacted upon by the Project. The Study Area (also referred to as the Area of Interest) is located in the Ben Bullen State Forest and is approximately 24.5 ha (**Figure 1**).



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Sheet Size:	A4
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Hansen Bailey

CULLEN VALLEY MINE BSAL ASSESSMENT

Site Layout

FIGURE 1

2.0 METHODOLOGY

2.1 Study Area

The Study Area is approximately 24.5 ha and comprised of land within the Project's modification boundary that have slope inclines of less than 10% (**Figure 2**). Slope inclines have been analysed by the client using a digital elevation model and verified using a hand held clinometer (Hansen Bailey, 2014).

2.2 Risk Assessment and Survey Scale

To identify the potential for a project to impact on agricultural resources and to identify the appropriate level of soil survey required, a risk assessment, in accordance with the BSAL Verification Guideline has been conducted. Although the Project proposes to permanently impact the land, the risk to agricultural resources has been assessed by SLR as low based on the following:

- Study Area is located in a State Forest and is an area where there is no agricultural land uses; and
- Study Area is located on land with a low potential for commercial agricultural land use and there is a low risk of conflict with adjoining agricultural lands.

An appropriate survey scale for a low risk ranking is 1:50,000 to 1:100,000; however to fully demonstrate the site's BSAL characteristics, a high intensity survey scale of 1:25,000 has been applied.

2.3 Soil Assessment Methodology

2.3.1 Reference Documents

An initial soil map (reference map) was developed using the following resources and techniques:

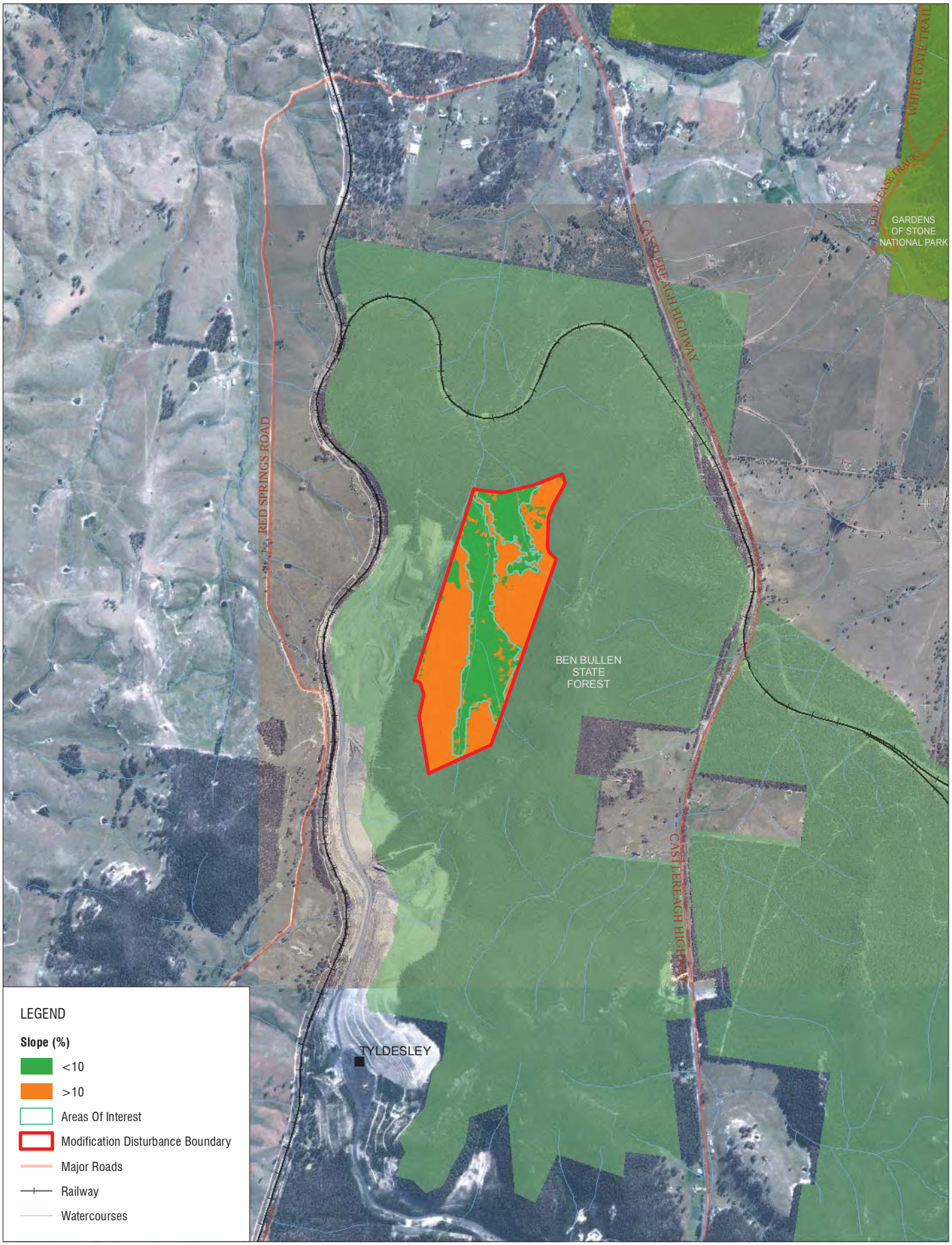
- *Aerial photographs and topographic maps*

  Aerial photo and topographic map interpretation was used as a remote sensing technique allowing detailed analysis of the landscape, and mapping of features expected to be related to the distribution of soils within the Study Area. Aerial and topographical maps were provided by site.

- *Previous reports*

  Previous studies were taken into consideration for soils mapping and land assessment. These include the following:

  - *Soil Landscapes of the Wallerawang 1:100,000 Sheet* (King, 1993);
  - Land and Soil Capability Spatial Data (Department of Natural Resources, 2005); and
  - *Coalpac Consolidation Project Soil Survey and Land Capability Impact Assessment Report* (Ecobiological, 2011).



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Hansen Bailey

CULLEN VALLEY MINE BSAL ASSESSMENT

Slope Analysis

FIGURE 2

2.3.2 Survey Methodology

To satisfy the BSAL Verification Guideline's survey requirements the field survey (**Figure 3**) was comprised of eight observations and included the following:

- Detailed Sites: includes a subset of representative sites that were laboratory analysed; and

- Check Sites: includes profile excavations that are not fully described, soil profile exposures from overturned trees and vegetation associations.

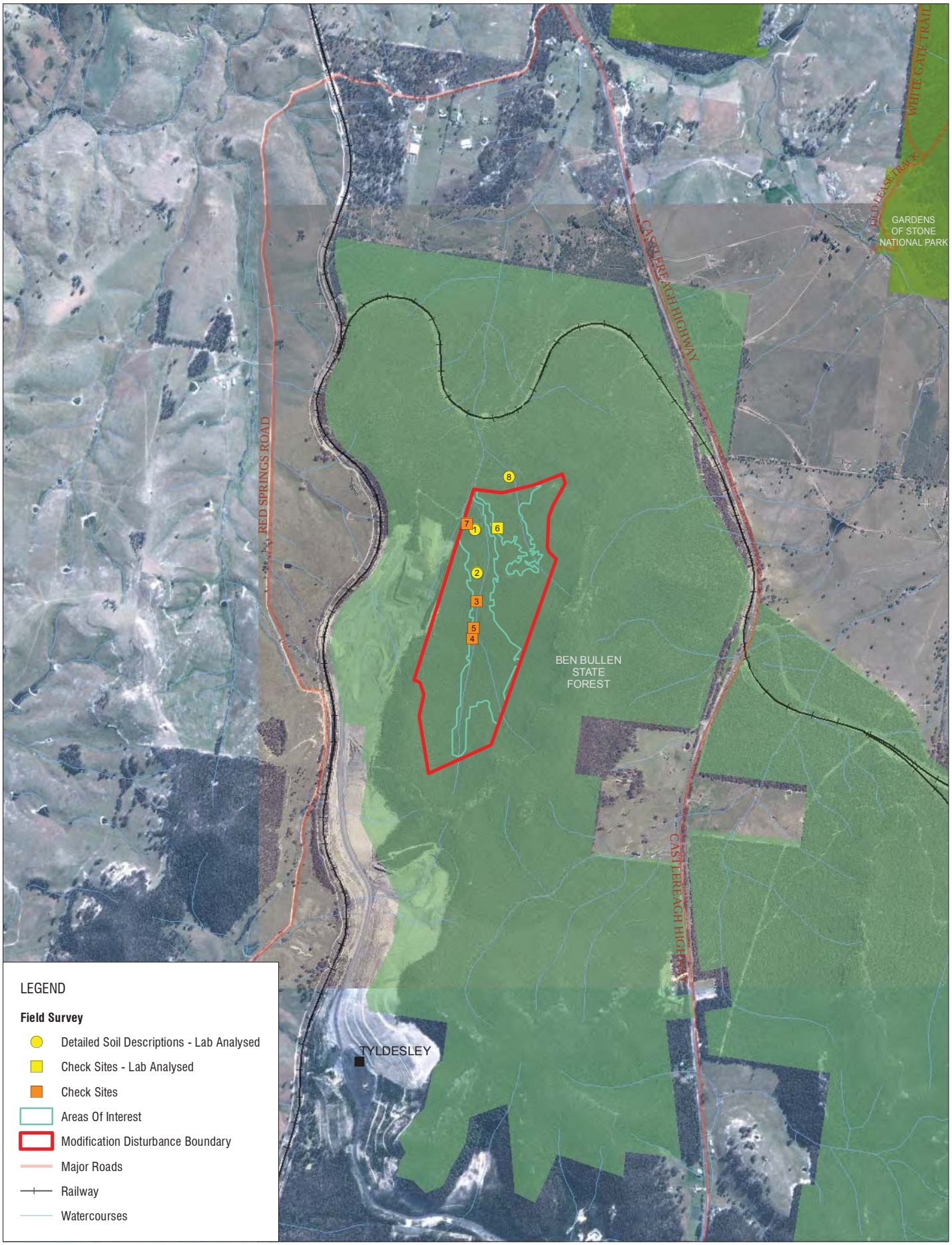
Exclusion sites did not comprise part of the assessment as clear indictors of exclusion sites such as rock outcrop and sleep inclines were not present. The distribution of survey observations was influenced by access as the Study Area, being a State Forest, was heavily wooded. Further, where access was not permissible due to site constraints, field survey observations were collected from contiguous land of similar terrain and slope.

Detailed Sites

Of the eight observations, three sites were detailed observations. Soil profiles were assessed in accordance with the *Australian Soil and Land Survey Field Handbook* (NCST, 2009). Each soil-profile exposure was excavated by a soil corer to the required depth of 1.2 m, or to bedrock. After assessment, soil cores have been backfilled with the remaining soil. Detailed soil profile morphological descriptions recorded information that covered the parameters specified in **Table 1**.

Table 1 – Detailed Soil Profile Description Parameters

Descriptor	Application
Horizon depth	Weathering characteristics, soil development
Field colour	Permeability, susceptibility to dispersion/erosion
Field texture grade	Erodibility, hydraulic conductivity, moisture retention, root penetration
Boundary distinctness and shape	Erosional/dispositional status, textural grade
Consistence force	Structural stability, dispersion, ped formation
Structure pedality grade	Soil structure, root penetration, permeability, aeration
Structure ped and size	Soil structure, root penetration, permeability, aeration
Stones – amount and size	Water holding capacity, weathering status, erosional/depositional character
Roots – amount and size	Effective rooting depth, vegetative sustainability
Ants, termites, worms etc.	Biological mixing depth



LEGEND

Field Survey

- Detailed Soil Descriptions - Lab Analysed
- Check Sites - Lab Analysed
- Check Sites
- Areas Of Interest
- Modification Disturbance Boundary
- Major Roads
- Railway
- Watercourses

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CULLEN VALLEY MINE BSAL ASSESSMENT

Field Survey

FIGURE 3

Soil Laboratory Assessment

Of the eight observations, three detailed sites and one observation site were sent to the laboratory for analysis to:

- Assist in the classification of soil taxonomic classes; and
- Assist in the assessment of BSAL classification.

Soil samples were collected from each major soil horizon and at appropriate depths. Typically depths were 0-10 cm, 20-30 cm, 50-60 cm and 80-90 cm. In total 12 samples have been or are in the process of being analysed for the suite of parameters as listed in **Table 2**. Samples were sent to the Scone Research Centre (NSW, Australia) for analysis; this laboratory is National Association of Testing Authority (NATA) accredited. To date, the available laboratory data includes soil pH and electrical conductivity (**Appendix 1**).

Table 2 – Detailed Soil Profile Description Parameters

Laboratory Analysis
• Electrical conductivity (EC) or Chloride • pH (1:5) • Exchangeable cations – Lab data not included in this report • Cation exchange capacity (CEC) – Lab data not included in this report • Colour – Lab data not included in this report • Particle size Analysis – Lab data not included in this report

Check Sites

Check sites were assessed and comprise of exposed cuttings (such as cut slopes), topsoil exposure of up to 0.3 m using a spade and exposed soil profiles from roots.

Soil Classification Nomenclature

The applicable technical standard for naming the units of soil identified is the ASC system (Isbell, 1996).

2.4 BSAL Assessment Methodology

The published mapping of BSAL (DP&I) indicates broadly where it occurs throughout the NSW region. The mapping has been undertaken at a regional scale and cannot be used for property-level assessments. Although the Study Area is not mapped as containing BSAL at the regional scale, it is important that land within the Study Area is verified against the BSAL criteria to verify the accuracy of the mapping.

The BSAL methodology, in accordance with the BSAL Verification Guideline, uses a two phase verification assessment:

- Phase 1 – Confirm access to reliable water supply; and
- Phase 2 - 12 step site verification criteria.

Phase 1 Assessment – Access to Reliable Water Supply

For land to be classified as BSAL under the BSAL Verification Guideline the land must have access to a reliable water supply. A reliable water supply is defined by the guideline as:

- Greater than 350 mm rainfall per annum (9 out of 10 years data); or
- Within 150 m of a regulated river; or
- Within 150 m of a 5th order unregulated river; or
- Within 150 m of an unregulated river that flows 95% of the time; or
- Access to highly productive groundwater (as defined by NSW Office of Water).

Phase 2 Assessment - Verification Criteria

The 12 step site verification criteria from the *BSAL Verification Guideline* are summarised in **Diagram 1.** If a criterion fails to meet any of the BSAL conditions (except step 5 or step 6), the site is rejected as BSAL.

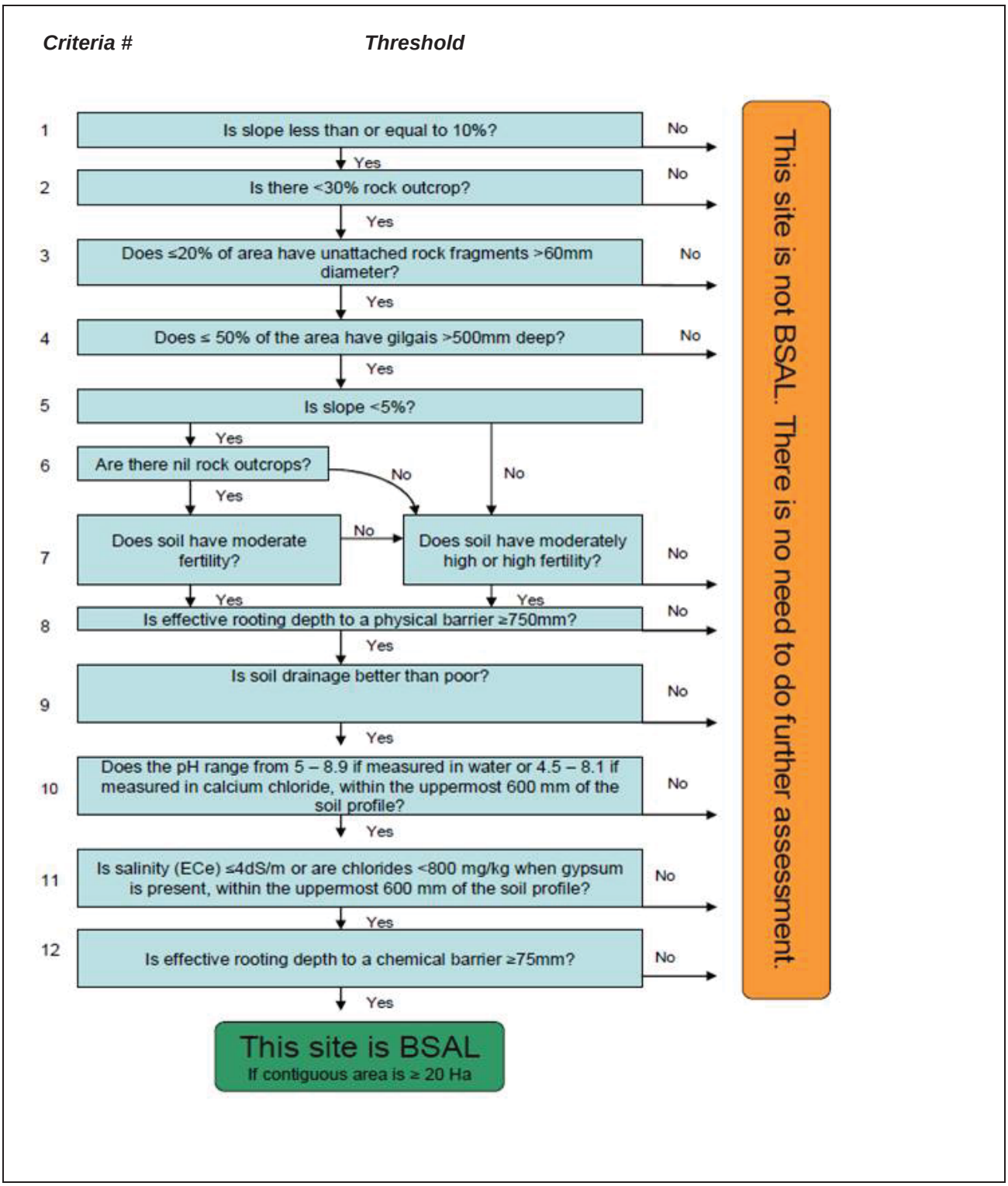


Diagram 1 – BSAL flow chart (DPI-OASFS, 2013)

3.0 SOIL ASSESSMENT

3.1 Summary

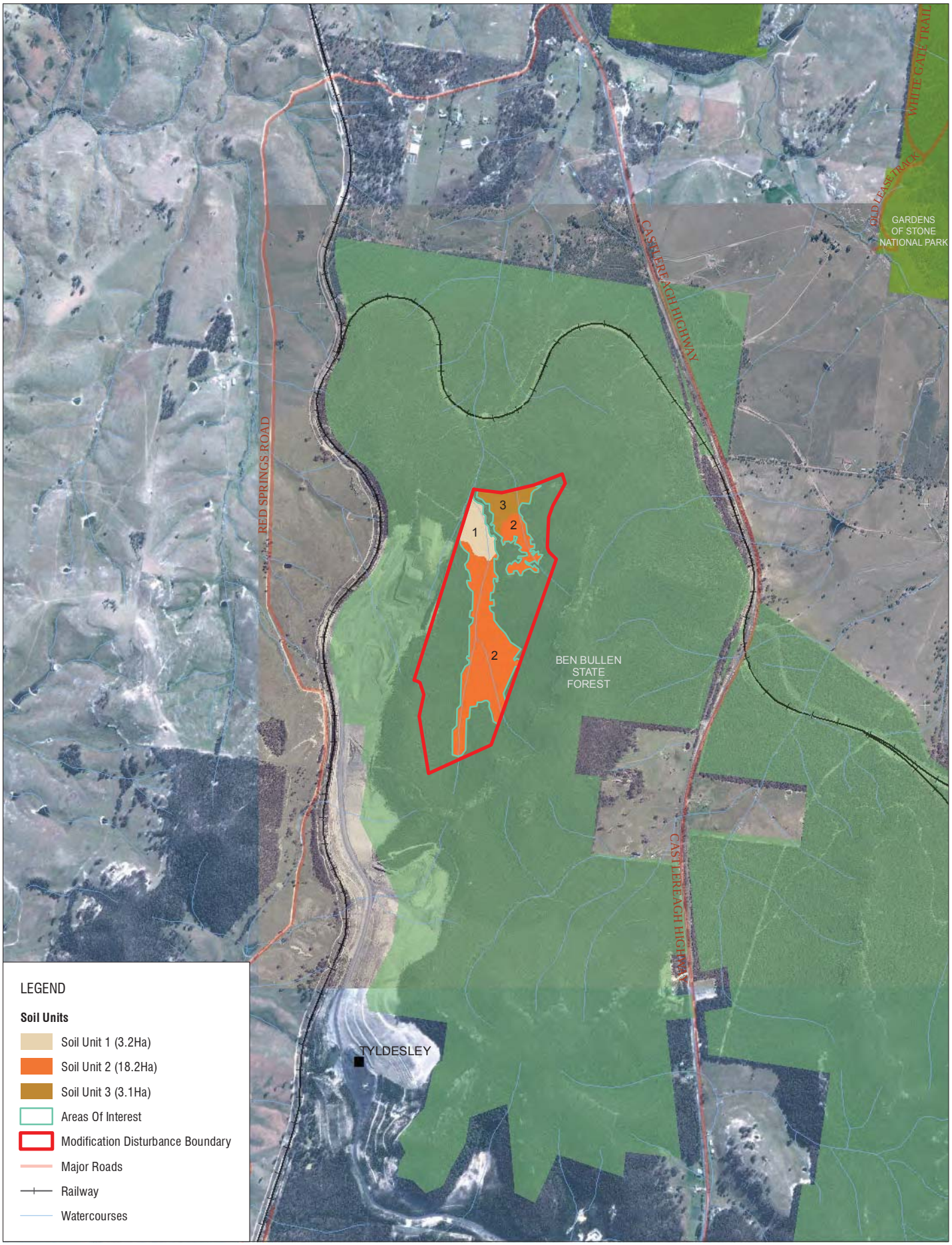
The reference information identified that the Study Area contained mottled, texture contrast soils that have acidic subsoils. The BSAL assessment has confirmed that the soils in the Study Area are texture contrast, significantly mottled and strongly acidic.

Three soil types were identified during the assessment (**Table 3**; **Figure 4**) and are described below.

Table 3 – Soil Types

Soil Type		Area	
No.	**ASC Name**	ha	%
1	Yellow Kurosol	3.2	13.1
2	Brown Kurosol	18.2	74.3
3	Grey Kurosol	3.1	12.6
	Total	**24.5**	**100.0**

Plate 1 – Exposed Profile: Typical Site



LEGEND

Soil Units

- Soil Unit 1 (3.2Ha)
- Soil Unit 2 (18.2Ha)
- Soil Unit 3 (3.1Ha)
- Areas Of Interest
- Modification Disturbance Boundary
- Major Roads
- Railway
- Watercourses

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Projection:	GDA 1994 MGA Zone 56

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Hansen Bailey

CULLEN VALLEY MINE BSAL ASSESSMENT

Soil Units

FIGURE 4

3.1 Soil Type 1: Yellow Kurosol

Soil Type 1 is a Yellow Kurosol. Kurosols have strong texture contrast between A and B horizons and strongly acidic B horizons. This soil unit is comprised of four distinct soil horizons and is characterised by loamy sand overlying sandy clay loam grading into medium clay. Soil pH is very strongly acidic in the topsoil, strongly acidic in the subsoil and non-saline throughout the profile. This soil type has moderately low inherent fertility. **Table 4** provides a summary of this soil type.

Table 4 – Overview: Soil Type 1

Site Description	
 **Plate 2 –** Profile (Site 1)	 **Plate 3 –** Landscape (Site 1)
ASC Name	Yellow Kurosol
Representative Site	Site 1
Dominant Slope Association	Gently inclined (5-10%)
Land Use	State Forest
Soil Fertility	Moderately low
BSAL	No

Horizon	Depth (m)	Description
A1	0.00 – 0.10	Very dark greyish-brown (10YR 3/2) loamy sand with weak structure of 1-2 mm subangular blocky peds and a very weak consistence. Very strongly acidic (pH 5.0); nil mottling; 30-50% <2mm stone content, abundant fine roots and well drained. Clear and even boundary.
B1	0.20 – 0.30	Yellowish-brown (10 YR 5/4) sandy clay loam, moderate structure grade of 2-5 mm subangular blocky peds and a weak consistence. Very strongly acidic (pH 5.0); five percent (5%) yellowish-red (7.5 YR 6/8) mottles, 30% <2 mm stone content; many fine roots and moderately well drained. Even and gradual boundary.
B2	0.30 – 0.60	Brownish-yellow (10 YR 6/6) light clay, moderate structure grade of 2-5 mm subangular blocky peds and a moderate consistence. Very strongly acidic (pH 5.0); thirty percent (30%) yellowish-red (7.5 YR 6/8) mottles; 30% 2 mm stone content; common fine roots and poorly drained. Abrupt and wavy boundary.
B3/BC	0.60 – 0.90+	Brownish-yellow (10 YR 6/6) medium clay, very weak structure grade of 2-5 mm subangular blocky peds and a weak consistence. Very strongly acidic (pH 5.0); fifty percent (50%) yellowish-red (5YR 5/8) mottles; 20% 2 mm stone content and 10% 30-50 mm quartz content; few to nil roots and poorly drained.

Horizon	ECe		Laboratory pH	
	dS/m	Rating	Value	Rating
A1	0.45	Non-saline	4.7	Very strongly acidic
B1	0.05	Non-saline	5.3	Strongly acidic
B2	0.04	Non-saline	5.1	Strongly acidic
B3/BC	0.04	Non-saline	5.3	Strongly acidic

3.2 Soil Type 2: Brown Kurosol

Soil Type 2 is a Brown Kurosol. This soil unit is comprised of three distinct soil horizons and is characterised by clay loam overlying light clay to medium clay overlaying bedrock. Soil pH is moderately acidic in the topsoil, strongly acidic in the subsoil and non-saline throughout the profile. This soil type has moderately low inherent fertility. **Table 5** provides a summary of this soil type.

Table 5 – Overview: Soil Type 2

Site Description	
 **Plate 4 –** Profile (Site 2)	 **Plate 5 –** Landscape (Site 2)
ASC Name	Brown Kurosol
Representative Site	2
Dominant Slope Association	Gently inclined (3-10%)
Land Use	State Forest
Soil Fertility	Moderately low
BSAL	No

Horizon	Depth (m)	Description
A1	0.00 – 0.20	Dark grey brown (2.5 Y 4/2) clay loam with moderately strong structure of 5-10 mm subangular blocky peds and a moderate consistence. Very strongly acidic (pH 5.0); nil mottling; 5-10% <2 mm stone content, abundant fine roots and well drained. Clear and even boundary.
B1	0.20 – 0.40	Brown (10 YR 5/3) light clay, moderate structure grade of 10-20 mm subangular blocky peds and a moderate consistence. Very strongly acidic (pH 5.0); nil mottling; 10 – 20% <2mm stone content; many fine roots and well drained. Gradual and even boundary.
B2	0.40 – 0.60	Brown (10 YR 5/3) medium clay, weak structure grade of 2-5 mm subangular blocky peds and a weak consistence. Very strongly acidic (pH 5.0); thirty percent (30%) yellowish-brown (2.5Y 6/3) mottles; 20-30% 2 -10 mm stone content; few to nil roots and imperfectly drained.
C	0.60+	Weathering bedrock; sandstone

Horizon	ECe		Laboratory pH	
	dS/m	Rating	Value	Rating
A1	0.09	Non-saline	5.6	Moderately acidic
B1	0.09	Non-saline	5.5	Strongly acidic
B2	0.23	Non-saline	5.2	Strongly acidic

3.3 Soil Type 3: Grey Kurosol

Soil Type 3 is a Grey Kurosol. This soil unit is comprised of four distinct soil horizons and is characterised by clay loam overlying light clay to medium clay. Soil pH is strongly acidic and non-saline throughout the profile. This soil type has moderately low inherent fertility. **Table 6** provides a summary of this soil type.

Table 6 – Overview: Soil Type 3

Site Description	
	
Plate 6 – Profile (Site 8)	**Plate 7 –** Landscape (Site 8)
ASC Name	Grey Kurosol
Representative Site	8
Dominant Slope Association	Gently inclined (5-10%)
Land Use	State Forest
Soil Fertility	Moderately low
BSAL	No

Horizon	Depth (m)	Description
A1	0.0 – 0.15	Very dark greyish-brown (10 YR 3/2) clay loam with strong structure of 10-20 mm subangular blocky peds and a moderate consistence. Very strongly acidic (pH 5.0); nil mottling; nil stone content, abundant fine roots and well drained. Clear and abrupt boundary.
B1	0.15 – 0.40	Grey-brown (10 YR 5/2) light clay, moderate structure grade of 5-10 mm subangular blocky peds and a moderate consistence. Very strongly acidic (pH 5.0); ten percent (10%) brownish yellow (10 YR 6/8) mottles; nil stone content; common roots and moderately well drained.
B21	0.40 – 0.60	Light brownish grey (10 YR 6/2) medium clay with moderate structure grade of 2-5 mm subangular blocky peds and a moderate consistence. Very strongly acidic (pH 5.0); thirty percent (30%) brownish-yellow (10 YR 6/8) mottles; nil stone content; common roots and imperfectly drained.
B22	0.40 – 1.00	Light grey (10 YR 7/1) medium clay with moderate structure grade of 2-5 mm subangular blocky peds and a moderate consistence. Very strongly acidic (pH 5.0); fifty percent (50%) brownish-yellow (10 YR 6/8) mottles; nil stone content; few roots and poorly drained.

Horizon	ECe		Laboratory pH	
	dS/m	Rating	Value	Rating
A1	0.52	Non-saline	5.1	Strongly acidic
B1	0.09	Non-saline	5.2	Strongly acidic
B21	0.15	Non-saline	5.4	Strongly acidic
B22	0.23	Non-saline	5.4	Strongly acidic

4.0 BSAL ASSESSMENT

4.1 Phase 1 Assessment

Representative climate data for the area has been obtained from the nearest Bureau of Meteorology (BOM) weather station located at the Lithgow Newnes Forest Centre, (Station 063062; BOM, 2014). The Newnes Forest Centre ceased operation in 1999; however, it is considered to be a reliable and representative dataset for the Study Area.

Data from the Newnes Forest Centre shows that the Study Area experiences a summer dominant rainfall and temperature pattern with an average rainfall of 1,073 millimetres per year and an average maximum temperatures range of 9.4 degrees Celsius in July to 23.5 degrees Celsius in February. The BoM classifies the Lithgow area as having an oceanic climate with warm summers, cool to cold winters and generally steady precipitation year-round.

Therefore the minimum requirement for Phase 1 was met for all soil types with an average annual rainfall of approximately 1,073 millimetres for the Study Area.

4.1 Phase 2 Assessment

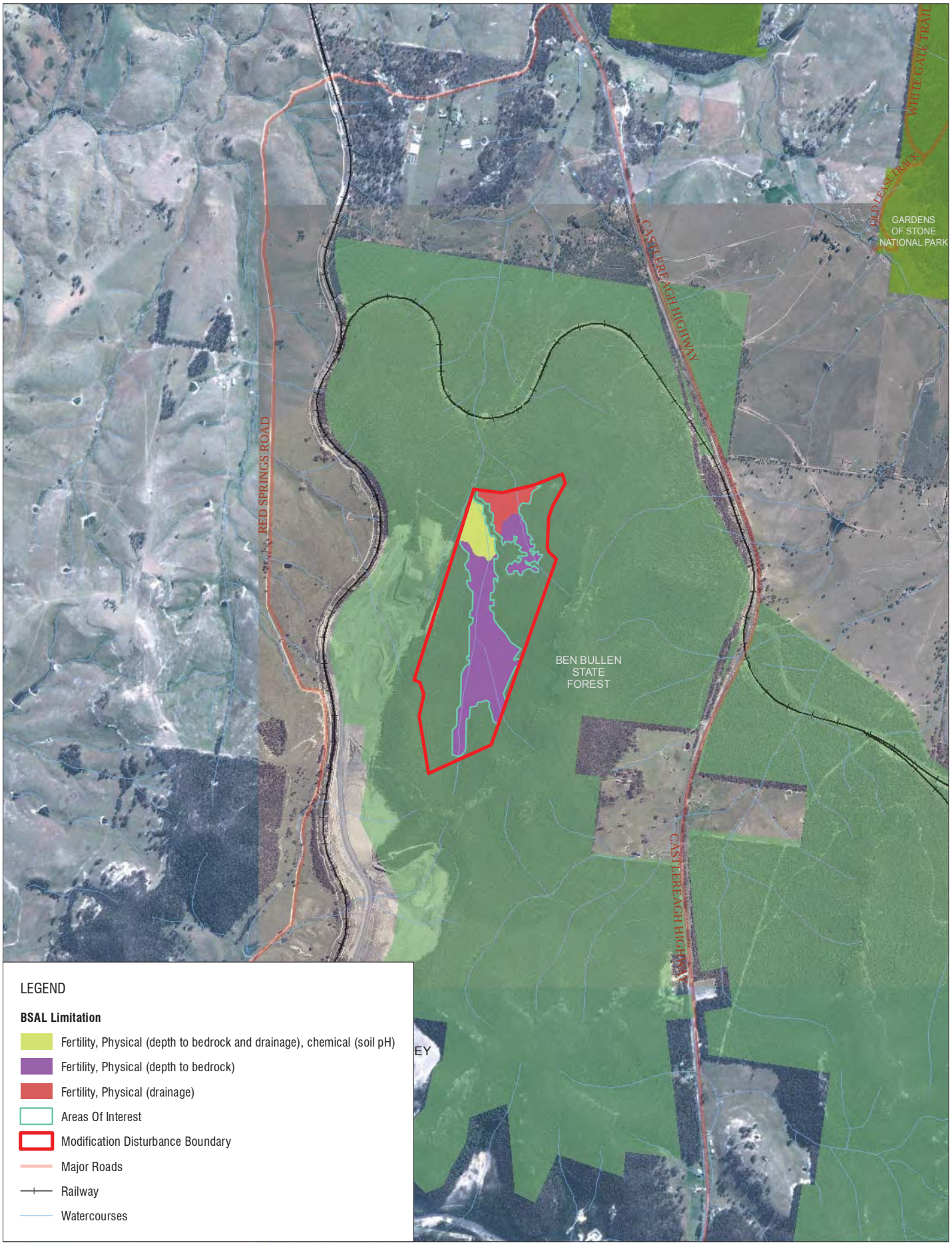
A summary of the Phase 2 BSAL verification criteria assessment across the Study Area is provided in **Table 7** (**Figure 5**). The key finding is that all three soil types within the Study Area failed to be classified as BSAL. All soil types failed the soil fertility criteria (criteria 7) as Kurosols are classified as having 'Moderately Low' fertility by the BSAL Verification Guideline.

Further, Soil Type 1 failed the physical criteria of depth to bedrock (criteria 8) and internal drainage (criteria 9) as the soil profile encountered a weathering zone at 0.6 m and the subsoil was poorly drained. It also failed the pH criteria (criteria 10) and the chemical barrier criteria (criteria 12) as the topsoil horizon (A1) exhibited pH values of less than pH 5.0.

Soil Type 2 failed the physical criteria of depth to bedrock (criteria 8) with bedrock encountered at 0.6 m. Soil Type 3 failed the internal drainage (criteria 9) as the subsoil was very poorly drained.

Table 7 – Applied BSAL Criteria According to *BSAL Verification Guideline*

Soil Type		Site Verification Step												BSAL
No	Name	1	2	3	4	5	6	7	8	9	10	11	12	
1	Yellow Kurosol	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✓	✗	No
2	Brown Kurosol	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	No
3	Grey Kurosol	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	No



LEGEND

BSAL Limitation

- Fertility, Physical (depth to bedrock and drainage), chemical (soil pH)
- Fertility, Physical (depth to bedrock)
- Fertility, Physical (drainage)
- Areas Of Interest
- Modification Disturbance Boundary
- Major Roads
- Railway
- Watercourses

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SLR
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Project No.:	630.10813
Date:	25/02/2014
Drawn by:	NT
Scale:	1:25,000
Sheet Size:	A4
Projection:	GDA 1994 MGA Zone 56

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0 200 400 600 800 1,000 m

Hansen Bailey

CULLEN VALLEY MINE BSAL ASSESSMENT

BSAL Limitations

FIGURE 5

4.0 CONCLUSION

The land within the Study Area has failed multiple criteria according to the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (OEH & DPI-OASFS, 2013) including soil fertility, drainage, physical barrier, pH and chemical barrier and is therefore not considered to be BSAL.

Yours sincerely,

ADELE CALANDRA
Senior Environmental Scientist

BSc MSc (hons) CPSS II

References

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Office of Environment & Heritage and Department of Primary Industries - Office of Agricultural Sustainability and Food Security (2013) *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land*

Appendix 1: Certificate of Analysis

SLR Consulting Australia Pty Ltd **10 Kings Road New Lambton NSW 2305 Australia**
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Department of Primary Industries
Soil Conservation Service

SOIL TEST REPORT

Scone Research Centre

REPORT NO:	SCO14/034R1
REPORT TO:	Adele Calandra SLR Consulting 10 Kings Road New Lambton NSW 2305
REPORT ON:	Twelve soil samples
PRELIMINARY RESULTS ISSUED:	21 February 2014
REPORT STATUS:	Preliminary
DATE REPORTED:	21 February 2014
METHODS:	Information on test procedures can be obtained from Scone Research Centre

TESTING CARRIED OUT ON SAMPLE AS RECEIVED

SR Young
(Laboratory Manager)

Scone Research Centre, PO Box 283 Scone 2337, 709 Gundy Road Scone 2337
Ph: 02 6545 1666 Fax: 02 6545 2520

SOIL CONSERVATION SERVICE
Scone Research Centre

Report No: SCO14/034R1
Client Reference: Adele Calandra
SLR Consulting
10 Kings Road
New Lambton NSW 2305

Lab No	Method	C1A/5	C2A/4	C2B/4
	Sample Id	EC (dS/m)	pH	pH ($CaCl_2$)
1	Site 1 0-10 cm	0.02	4.7	3.7
2	Site 1 20-30 cm	<0.01	5.3	3.8
3	Site 1 50-60 cm	<0.01	5.1	3.9
4	Site 1 80-90 cm	<0.01	5.3	3.7
5	Site 2 0-10 cm	0.01	5.6	4.2
6	Site 2 20-30 cm	0.01	5.5	4.0
7	Site 2 50-60 cm	0.03	5.2	3.9
8	Site 6 10-20 cm	0.01	5.0	4.0
9	Site 8 0-10 cm	0.06	5.1	4.0
10	Site 8 20-30 cm	0.01	5.2	3.9
11	Site 8 50-60cm	0.02	5.4	3.8
12	Site 8 80-90 cm	0.03	5.4	3.8

END OF TEST REPORT