



**NSW  
Resources  
Regulator**

COMPLIANCE AUDIT PROGRAM – SUBSIDENCE MANAGEMENT

# DENDROBIUM COLLIERY

Dendrobium Coal Pty Ltd



**Document control**

Published by NSW Resources Regulator

Title: Compliance audit program – Subsidence management: Dendrobium Colliery, Dendrobium Coal Pty Ltd

First published: May 2020

Authorised by: Director Compliance

CM9 reference: DOC20/333668

**AMENDMENT SCHEDULE**

Date	Version	Amendment
April 2020	1	First published

© State of New South Wales through Regional NSW 2020. You may copy, distribute, display, download and otherwise freely deal with this publication for any purpose, provided that you attribute Regional NSW as the owner. However, you must obtain permission if you wish to charge others for access to the publication (other than at cost); include the publication in advertising or a product for sale; modify the publication; or republish the publication on a website. You may freely link to the publication on a departmental website.

Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (April 2020) and may not be accurate, current or complete. The State of New South Wales (including Regional NSW), the author and the publisher take no responsibility, and will accept no liability, for the accuracy, currency, reliability or correctness of any information included in the document (including material provided by third parties). Readers should make their own inquiries and rely on their own advice when making decisions related to material contained in this publication.

# Contents

- 1. Introduction ..... 4
  - 1.1. Background ..... 4
  - 1.2. Audit objectives..... 4
  - 1.3. Audit scope ..... 4
  - 1.4. Audit criteria ..... 5
  - 1.5. Publishing and disclosure of information ..... 6
- 2. Audit methods ..... 7
  - 2.1. Opening meeting..... 7
  - 2.2. Site interviews and inspections ..... 7
    - 2.2.1. Data collection and verification ..... 7
    - 2.2.2. Site inspections..... 7
  - 2.3. Closing meeting..... 8
  - 2.4. Compliance assessment definitions ..... 8
  - 2.5. Reporting ..... 9
- 3. Audit findings..... 10
  - 3.1. Subsidence management plan ..... 10
  - 3.2. Subsidence monitoring program ..... 10
  - 3.3. EMP and associated subplans ..... 11
  - 3.4. Monitoring and impact analysis ..... 11
  - 3.5. Reporting ..... 13
    - 3.5.1. Status reports ..... 13
    - 3.5.2. End of panel report..... 13
    - 3.5.3. End of year report..... 14
  - 3.6. Title holder response to draft audit findings ..... 14
- 4. Audit conclusions..... 15

# 1. Introduction

## 1.1. Background

Dendrobium Colliery operates in Consolidated Coal Lease 768 (CCL768), which is in the southern coalfields of NSW and was held by Illawarra Coal Holdings Pty Ltd. Illawarra Coal had been progressing longwall panels 9 to 13 in Dendrobium Area 3B since approval was granted in February 2013. The extraction of longwall panel 13, the fifth panel to be extracted in Area 3B, commenced on 4 March 2017 and was completed on 19 April 2018. The panel had an extracted length of 2270 metres, a void width of 305 metres, and a cutting height between 3.7 and 3.95 metres.

Cordeaux Colliery is owned and operated by Endeavour Coal Pty Ltd and, although in care and maintenance at the time of writing, it also operated in CCL768. Mining operations at Cordeaux Colliery ceased in March 2001. The Cordeaux Colliery pit top was being used as a base for exploration activity across the Dendrobium and Appin mining leases and exploration licences.

As part of the compliance audit program undertaken by the NSW Resources Regulator, an audit of subsidence management activities associated with the Dendrobium Colliery was undertaken on 28 November 2019.

## 1.2. Audit objectives

The objectives of the audit were to:

- undertake a compliance audit of the Dendrobium and Cordeaux Collieries, operated by Illawarra Coal Holdings Pty Ltd, against the requirements of the *Mining Act 1992*, the conditions of the mining leases and associated subsidence management approvals issued pursuant to that Act, in relation to the management of subsidence impacts
- assess the operational performance of the mining operations, in relation to subsidence management and the ability of the titleholder and/or operator to implement adaptive management and controls, to provide for sustainable management of the operations.

## 1.3. Audit scope

The scope of the audit included:

- the Dendrobium and Cordeaux mining operations and the areas above the longwall panels in Area 3B, focussing on longwall panel 13

- a review of documents and records pertaining to the mining, subsidence management and rehabilitation activities associated with longwall panel 13
- the assessment of compliance between 1 March 2017 and 28 November 2019.

## 1.4. Audit criteria

The audit criteria, against which compliance was assessed, included:

- conditions attached to CCL768 granted on 29 October 1991 and last renewed on 5 December 2014, specifically conditions 2, 3, 4, 5, and 6
- conditions attached to subsidence management plan approval for the Dendrobium Colliery area 3B longwalls 9-13, issued by (then) Department of Trade and Investment, Regional Infrastructure and Services, dated 5 February 2013, specifically conditions 6, 9, 12, 13, 16, 17
- conditions attached to the approval for the Dendrobium Colliery longwalls 9 to 13 environmental management plan, issued by (then) NSW Trade and Investment - Resources and Energy, dated 29 June 2015
- conditions attached to the approval of the Dendrobium Colliery longwall panel 13 subsidence monitoring program, issued by (then) Department of Industry – NSW Resources Regulator, dated 13 January 2017
- commitments made in Dendrobium area 3B – subsidence management plan, volume 2, subsidence management plan
- commitments made in Dendrobium area 3B – longwall 13 subsidence monitoring program dated 6 December 2016
- commitments made in Dendrobium area 3B – swamp impact, monitoring, management and contingency plan, revision 1.4, dated June 2015
- commitments made in Dendrobium area 3B – watercourse impact, monitoring, management and contingency plan, revision 1.4, dated May 2015
- commitments made in Dendrobium area 3B – groundwater management plan dated October 2012.

## 1.5. Publishing and disclosure of information

This audit report will be published on the NSW Resources Regulator's website consistent with Section 365 of the *Mining Act 1992*.

This audit report may be publicly disclosed consistent with the *Government Information (Public Access) Act 2009*.

## 2. Audit methods

The audit process involved interviewing site personnel, reviewing documentation and samples of records provided by the title holder and/or operator and a site inspection of the operations to determine the level of compliance of the operations and assess the status of the operational performance. The audit process and methodology are described in more detail below.

### 2.1. Opening meeting

The opening meeting was held onsite at the Cordeaux Colliery office on 28 November 2019. The audit team was introduced, and the scope of their responsibilities was conveyed to the auditees. The objectives and scope of the audit were outlined. The methods to be used by the team to conduct the audit were explained, including interviewing personnel, reviewing documentation, examining records and a site inspection to assess specific compliance requirements.

### 2.2. Site interviews and inspections

#### 2.2.1. Data collection and verification

Where possible, documents and data collected during the audit process were reviewed on site. All information obtained during the audit process was verified by the audit team where possible. For example, statements made by site personnel were verified by viewing documentation and/or site inspections where possible. Where suitable verification could not be provided, this has been identified in the audit findings as not determined.

#### 2.2.2. Site inspections

A site inspection was undertaken of the following impact sites over LW13:

- DA3B\_LW13\_005 – level 2 soil cracking on access track 6AA
- DA3B\_LW13\_006 – level 2 rock fracturing at WC21\_Pool 48
- DA3B\_LW13\_010 – level 2 rock fracturing with flow diversion at WC21\_Pool 53
- DA3B\_LW13\_014 – level 1 soil cracking on access track
- DA3B\_LW13\_027 – level 1 soil cracking on fire road 6P.

## 2.3. Closing meeting

The closing meeting was held onsite at the Cordeaux Colliery office on 28 November 2019. The objectives of this meeting were to discuss any outstanding matters, present preliminary findings and outline the process for finalising the audit report.

## 2.4. Compliance assessment definitions

Reporting the results of the compliance audit was determined on the definitions presented in Table 1.

Table 1 Audit assessment categories

ASSESSMENT	CRITERIA
<b>Compliance</b>	Sufficient and appropriate evidence is available to demonstrate that the particular requirement has been complied with.
<b>Non-compliance</b>	<p>Clear evidence was collected to demonstrate that the particular requirement was not complied with. There are three subcategories of non-compliance reflecting the severity and level of risk associated with the non-compliance:</p> <p><b>NC1</b> – the absence of planning or implementation of a required operational element, which has the potential to result in a significant risk.</p> <p><b>NC2</b> – an isolated lapse or absence of control in the implementation of an operational element which is unlikely to result in a significant risk.</p> <p><b>NC3</b> – an administrative or reporting non-compliance which does not have a direct environmental or safety significance.</p> <p>Note: The identification of a non-compliance during this audit may or may not constitute a breach of, or offence under, the <i>Mining Act 1992</i>. Non-compliances identified in this audit report may be further investigated by the NSW Resources Regulator and regulatory actions may be undertaken.</p>
<b>Observation of concern</b>	<p>Where an auditee may be compliant at the time of the audit but there are issues that exist that could result in the potential for future non-compliance if not addressed.</p> <p>Observation of concern was also used where an issue may not have particular compliance requirements, but which was not conducive to good management or best practice.</p>



ASSESSMENT	CRITERIA
<b>Suggestion for improvement</b>	Where changes in processes or activities inspected or evaluated at the time of the audit could deliver improvement in relation to risk minimisation, sustainable outcomes and management practices.
<b>Not determined</b>	<p>The necessary evidence was not collected to enable an assessment of compliance to be made within the scope of the audit.</p> <p>Reasons why the audit team could not collect the required information include:</p> <ul style="list-style-type: none"> <li>■ insufficient information on the file relating to the period covered by the audit or insufficient evidence collected to reach a conclusion</li> <li>■ the wording on the criteria (approval condition) meant that no evidence could be gathered, or it was too difficult to gather the evidence.</li> </ul> <p>A 'not determined' assessment was also made where the condition was outside the scope of the audit.</p>
<b>Not applicable</b>	<p>The circumstances of the authorisation or title holder have changed and are no longer relevant (i.e. no longer mining, mining equipment and plant has been removed).</p> <p>An invoking element in the criteria was not activated within the scope of the audit.</p>

## 2.5. Reporting

Following the site audit, the audit checklists were completed and audit notes were reviewed to compile a list of outstanding matters to be noted in the audit report. This report was prepared to provide an overview of the operational performance of the site, in relation to the mining operations, and identify any non-compliances or observations of concern noted by the auditors during the site inspections and interviews.

The draft audit findings were forwarded to Dendrobium Coal for comment. Consideration was given to the representations made during the finalisation of the audit report as discussed in the audit findings.

## 3. Audit findings

### 3.1. Subsidence management plan

An amendment to the conditions of title for CCL768 in December 2009, required the title holder to obtain the approval of the Director-General and comply with any requirements before undertaking any underground mining that may cause subsidence. Dendrobium Coal submitted a subsidence management plan (SMP) application for Dendrobium Colliery area 3B longwalls 9-13 for approval in October 2012. The plan was approved by the (then) Director-General, Department of Trade and Investment, Regional Infrastructure and Services on 5 February 2013, subject to a range of conditions.

Several variations to the approved SMP were subsequently approved. The final approved plan for longwall 13 was plan DEN-01-6151 Rev 6, which was approved on 11 January 2017. Plans provided by Dendrobium Coal in the end of panel report confirm that mining was generally undertaken in accordance with the approved plan.

### 3.2. Subsidence monitoring program

Condition 12 of the SMP approval required the leaseholder to prepare, and submit for approval, a subsidence monitoring program. The leaseholder could not commence longwall mining before the subsidence monitoring program was approved. Dendrobium Coal submitted three plans on 8 December 2016 that outlined the subsidence monitoring program for LW13. The details of the program elements were described in Volume 2 - subsidence management plan submitted with the original application for approval of LW9-LW13 in 2012. These plans were approved by the department's Principal Subsidence Engineer on 13 January 2017, subject to six standard conditions. Extraction began in LW13 on 4 March 2017.

Evidence was available in the form of survey data, inspection reports and plans to indicate that the monitoring program was generally implemented as approved. Details of all surveys and monitoring were included in the LW13 end of panel report.

### 3.3. EMP and associated subplans

Condition 13 of the SMP approval required the leaseholder to prepare and submit for approval an environmental management plan (EMP) that addressed subsidence impacts on a range of landscape elements. The EMP was originally submitted as part of the SMP. The EMP component was approved by the Acting Director Environmental Sustainability Unit on 5 February 2013 as part of the approvals for longwalls 9-13. As each longwall in the series progressed, additional data was gathered, and impact analysis was completed. Based on this data analysis, the EMP was revised and resubmitted for each subsequent panel. For longwall 13, the EMP was revised by letter, submitted on 25 June 2015 and was approved by the (then) Division of Resources and Energy by letter, dated 29 June 2016, before the mining of LW13 commenced in March 2017.

The EMP referenced a series of management subplans, three of which were reviewed and assessed as part of the audit as follows:

- Dendrobium Mine, groundwater management plan, October 2012
- Swamp impact, monitoring, management and contingency plan, revision 1.4, June 2015
- Watercourse impact, monitoring, management and contingency plan, revision 1.4, May 2015.

Dendrobium Coal staff reported that data collected during the mining and monitoring of each panel was used to refine the subsidence modelling and to improve predictions for following panels. The management subplans were then revised and resubmitted for approval for each panel, based on the improved predictions.

Monitoring data, inspection records and impact reports were reviewed during the audit to verify that monitoring and management activities were generally being undertaken in accordance with the requirements of the management subplans. Monitoring programs were established and subsidence surveys were carried out at intervals specified in the plan.

### 3.4. Monitoring and impact analysis

The Illawarra Coal environmental supervisor maintains a spreadsheet of monitoring requirements and coordinates of the activities of the environmental field team to ensure that monitoring is completed as required.

Baseline monitoring was undertaken before the commencement of LW13, as required by condition 13 of the SMP approval. The results of this monitoring were documented as part of the end of panel report. A review of the monitoring results and the end of panel report generally confirmed that monitoring points were installed and monitored in accordance with the approved plan. The plan indicated that

monitoring would be undertaken for two years after each longwall panel was completed. Monitoring for LW13 was ongoing and will continue for another six months.

During discussions with Dendrobium Coal staff, it was identified that a 400-metre monitoring width from the edges of each panel was surveyed by the environmental field team when looking for impacts. As a result, monitoring generally encompassed the panel being mined and the preceding panel (in this case LW12). In this way, a cumulative impact assessment was undertaken.

The trigger action response plans (TARPs) included in each of the management plans specify the trigger levels and actions required when monitoring or inspection identifies that impacts have occurred. During the mining of longwall 13, the TARPs were triggered 43 times. The majority of these were level 1 and 2 triggers, with nine level 3 triggers, mainly related to water quality issues. An impact report was submitted for each impact (or group of impacts) identified, with impact reports also included in the end of the panel report.

A selected sample of level 1 and 2 impact sites from LW13 were inspected by the audit team to confirm impact levels and assessment. No significant issues were identified at any site during the inspections. Observations made on site during the inspections and records reviewed for each of the sample impact sites showed that TARP trigger responses were generally implemented as documented.

Records for a level 3 impact site at WC pool 43 were also reviewed, but the site was not inspected by the audit team in the field. For the level 3 trigger, the impact reports and TARP actions required further investigation and reporting. As a result of the impact at site WC pool 43, two additional investigation reports were prepared:

- Hgeo Pty Ltd: assessment of water level, stream flow and water chemistry at Wongawilli Creek, February 2018.
- Watershed Hydrogeo Pty Ltd: analysis of low flow and pool levels in Wongawilli Creek, 2018.

Copies of the Hgeo report and the Watershed Hydrogeo report were reviewed by the auditors on site. Evidence was provided by Dendrobium Coal to demonstrate that recommendations from the consultant reports were implemented. For example, additional pressure transducers were installed in two pools along Wongawilli Creek to provide additional data. The Watershed Hydrogeo report was prepared to redefine the TARP triggers based on the additional data collected.

It was noted that the Hgeo report was submitted to some government agencies, including the (then) Department of Planning, Industry and Environment (Planning Compliance) but was not submitted directly to the Regulator. It is preferable that Dendrobium Coal provide copies of additional specialist reports directly to the Regulator to facilitate a timely review.

During discussions with Illawarra Coal environmental staff, it was identified that there was no formal process for level 1 trigger sites to be reinspected, unless they were at one of the regular monitoring sites. There were examples where a level 1 trigger had escalated to a level 2 trigger and updated impact reports were provided. However, without a defined process for reinspection, it appears that these may have been identified opportunistically during inspections. As **suggestion for improvement no. 1**, Dendrobium Coal should consider the development of a formal process for reinspecting all level 1 and 2 impact sites to monitor any escalation in impact level, including documented photographic evidence.

The impact reports provided assess each impact individually. However, it was noted that a comprehensive analysis of data was undertaken during the preparation of the end of the panel report. Review of this report showed that analysis of data for longwall 13 was undertaken to assess the cumulative impacts across the panel, but there was also evidence that a cumulative assessment was undertaken for the impact of LW13, in conjunction with the preceding panels LW9-12.

## 3.5. Reporting

### 3.5.1. Status reports

Evidence was available in the Regulator's records to verify that status reports were prepared, maintained and submitted as required by condition 17 of the SMP approval. Each report provided a summary of impacts identified, actions undertaken in response to impacts, and discussed the monitoring results in relation to the performance measures specified in condition 13 of the SMP approval. Evidence was available to demonstrate an adaptive management approach based on ongoing analysis of monitoring data (i.e. reduction in maximum height of extraction to 3.9 metres).

### 3.5.2. End of panel report

Condition 18 of the EMP approval required the submission of an end of panel report in accordance with conditions 9 and 10 of the development consent issued by the (then) Department of Planning, Industry and Environment. The end of panel report submitted as required by the SMP approval provided a discussion of the impacts identified during mining of LW13 and assessed these in terms of the specified performance measures.

### **3.5.3. End of year report**

An end of year environmental report was not required to be provided by the conditions of the SMP approval. However, information on subsidence management, impacts and performance measures was noted to be included in the annual environmental management reports (AEMR) submitted each year by Illawarra Coal. A review of the AEMR between 1 July 2017 and 30 June 2018 (which included the extraction of LW13) confirmed that subsidence management was included in section 6.14 and table 21 of the AEMR. The 2018 annual review was approved by the Regulator.

## **3.6. Title holder response to draft audit findings**

Dendrobium Coal was provided with a copy of the draft audit report and invited to submit a response to the draft audit findings. A copy of the response is in Appendix 1.

Dendrobium Coal's response provided evidence that the Hgeo report was submitted to the (then) Department of Planning, Industry and Environment through the Planning Compliance team. Accordingly, the observation of concern has been removed. However, it was noted that it was preferable that Dendrobium Coal also provide a copy directly to the Regulator, when those reports were sent to other agencies.

## 4. Audit conclusions

From the evidence reviewed during the audit and observations made during the audit site inspections, it was concluded that Dendrobium Coal Pty Ltd has achieved a high level of compliance with the requirements of the SMP approval and environmental management plans associated with the management of subsidence impacts at the Dendrobium Colliery.

No non-compliances were identified for the subsidence management activities subject to audit. One suggestion for improvement was noted by the auditor as summarised in Table 2. Regulatory actions may be undertaken in relation to the non-compliances and observations of concern identified during the audit.

*Table 2 Summary of suggestions for improvement*

SUGGESTIONS FOR IMPROVEMENT	DESCRIPTION OF ISSUE
1	During discussions with Illawarra environmental staff, it was identified that there was no formal process for level 1 trigger sites to be reinspected, unless they were at one of the regular monitoring sites. There were examples when a level 1 trigger escalated to a level 2 trigger and updated impact reports were provided. However, without a defined process for reinspection, it appeared that these were identified opportunistically during inspections. As suggestion for improvement number 1, Dendrobium Coal should consider the development of a formal process for reinspecting all level 1 and 2 impact sites to monitor for any escalation in impact level.

## Jenny Ehmsen

---

**From:** Brassington, Gary <Gary.M.Brassington@south32.net>  
**Sent:** Tuesday, 21 January 2020 1:01 PM  
**To:** Resources Regulator; Carlon, Josh  
**Cc:** jenny.ehmsen@planning.nsw.gov.au  
**Subject:** RE: ASMT0007044 | PP0001466 | Targeted Assessment Plan | Subsidence  
**Attachments:** Wongawilli Ck and SRRP follow-up.pdf

Hi Jenny

Thank you for allowing South32 the opportunity to provide feedback on the draft audit report. Additional information is provided below. Should you require further information or to discuss let me know.

Gary

Observation of concern 1:

The report Hgeo Pty Ltd, Assessment of water level stream flow and water chemistry at Wongawilli Creek February 2018, was submitted to Senior Compliance Officer Resources Assessments and Compliance 28<sup>th</sup> February 2018.

---

**From:** Resources Regulator <nswresourcesregulator@service-now.com>  
**Sent:** Tuesday, 7 January 2020 12:59 PM  
**To:** Carlon, Josh <Josh.Carlon@south32.net>; Brassington, Gary <Gary.M.Brassington@south32.net>  
**Cc:** jenny.ehmsen@planning.nsw.gov.au  
**Subject:** ASMT0007044 | PP0001466 | Targeted Assessment Plan | Subsidence

Dear Mr Brassington

An audit of the subsidence management activities associated with the Dendrobium Colliery was undertaken on 28 November 2019 as part of the compliance audit program undertaken by the Department of Planning, Industry & Environment (DPIE) – Resources Regulator (the Regulator).

We now offer you the opportunity to review the draft compliance audit report and submit any comments you may have regarding the content of the report by 24 January 2020 so that they may be considered in finalising the report. Your response should be submitted by replying to this email without changing the subject line.

We further advise that any comments provided by you will be attached to the final report as an Appendix. If, however, we have not received a response by the above date, we will assume that you are satisfied with the report and it will then be finalised. A copy of the final report will then be forwarded to you.

You should note that the Regulator will be publishing the final audit report on its website, which will include any response you provide to the draft audit report.



If you require further information or clarification on any matters regarding this audit, please do not hesitate to contact Jenny Ehmsen on 02 4063 6443.

Regards,

**Jennifer Ehmsen**  
Principal Compliance Auditor  
Compliance Coordination | Resources Regulator  
T 4063 6443 M 0438 735 010

[resourcesregulator.nsw.gov.au](http://resourcesregulator.nsw.gov.au)



Subscribe to our [information alerts](#)

*The Department of Planning, Industry and Environment acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.*



Ref:MSG0145628\_Z9p4JeVljvG2QINs57P1

---

This message and any attached files may contain information that is confidential and/or subject of legal privilege intended only for use by the intended recipient. If you are not the intended recipient or the person responsible for delivering the message to the intended recipient, be advised that you have received this message in error and that any dissemination, copying or use of this message or attachment is strictly forbidden, as is the disclosure of the information therein. If you have received this message in error please notify the sender immediately and delete the message.