Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3C (DA3C). Extraction of Longwall 21 commenced on 25 April 2023 and as of 6 June 2023 there were four new subsidence impacts identified.

This Version 2 of the report includes a summary of consultation with stakeholders undertaken since the initial report.

DA3C_LW21_001 (E 291811, N 6194163)

DA3C_LW21_001 is located approximately 80m west of *Fire Road 6F* (Figure 1). The impact consists of rock fracturing to an outcrop. The rock fracturing had a total continuous length of 0.56m, with the piece of rock dislodged from the outcrop. The fracturing has minimal impact to vegetation or ground disturbance. (Photo 1 and Photo 2).

DA3C_LW21_001 is a Level 1 trigger as per the Dendrobium Landscape TARP (Table 1), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length;

Photo 1: *DA3C_LW21_001*, showing rock fracture. Taken on 06/06/2023.

Photo 2: *DA3C_LW21_001*, showing detached rock piece.Taken on 06/06/2023.

DA3C_LW21_002 (E 291766, N 6194129)

DA3C_LW21_002 is located approximately 140m west of *Fire Road 6F* (Figure 1). The impact consists of multiple large fractures on a rock outcrop at Landscape Monitoring site *LW21_RO1*. The largest fracture has a maximum continuous length of 16m, a maximum width of 0.265m and a maximum measurable depth of 9m (Photo 3 and Photo 4). Rock movement from boulders directly above the fracturing were displaced by 0.26m with exposed soil (Photo 5). Minimal impact to vegetation however moderate ground disturbance to rock outcrop from additional smaller rock fractures (Photo 6 and Photo 7).

DA3C_LW21_002 is a Level 2 trigger as per the Dendrobium Landscape TARP (Table 1), specifically:

- Crack or fracture between 100mm and 300mm width;
- Crack or fracture between 10m and 50m length

Photo 3: *DA3C_LW21_002*, showing largest rock fracture in series. Taken on 06/06/2023.

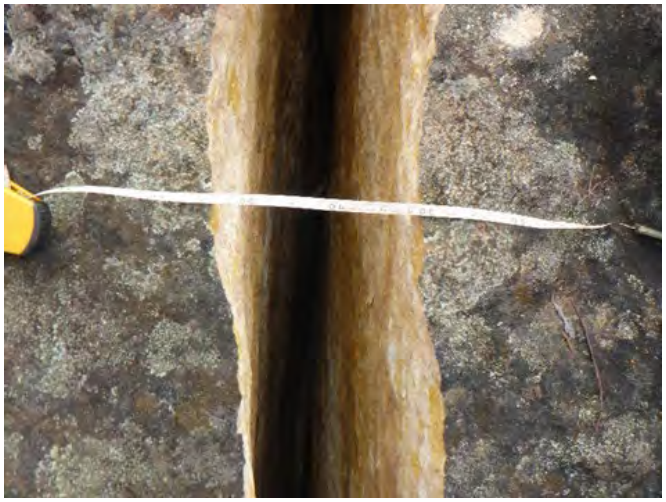

Photo 4: *DA3C_LW21_002*, showing maximum rock fracture width. Taken on 06/06/2023.

Photo 5: *DA3C_LW21_002*, showing rock movement on largest fracture. Taken on 6/06/2023.

Photo 6: *DA3C_LW21_002,* showing rock fracture. Taken on 06/06/2023.

Photo 7: DA3C_LW21_002 showing section of rock fracturing. Taken on 06/06/2023.

DA3C_LW21_003 (E 291739, N 6194104)

DA3C_LW21_003 is located approximately 225m west of *Fire Road 6F* (Figure 1). The impact consists of multiple large rock fractures on a rock outcrop and a rockfall from the edge of a step on the same outcrop. The largest rock fracture has a maximum continuous length of 22m, a maximum width of 0.26m and a maximum measurable depth of 3m. (Photo 8 and Photo 9). One boulder from the step has dislodged with a rockfall volume of less than 0.1m^3 and an approximate debris area of 0.5m^2 (Photo 10 and Photo 11). The impact has minimal impact to vegetation.

DA3C_LW21_003 is a Level 2 trigger as per the Dendrobium Landscape TARP (Table 1), specifically:

- Crack or fracture between 100mm and 300mm width;
- Crack or fracture between 10 and 50m length.

Photo 8: *DA3C_LW21_003*, rock fracture on an outcrop. Taken on 06/06//2023.

Photo 9: *DA3C_LW21_003,* width of rock fracture. Taken on 06/06/2023.

Photo 10: *DA3C_LW21_003,* showing rockfall and fragmentation. Taken on 06/06/2023.

Photo 11: *DA3C_LW21_003*, showing rockfall debris. Taken on 06/06/2023.

DA3C_LW21_004 (E 291763, N 6194057)

DA3C_LW21_004 is located approximately 210m west of *Fire Road 6F* (Figure 1). The impact consists of rock fracturing on an outcrop. The rock fracture has a continuous length of approximately 12m, a maximum width of 0.09m and a maximum measurable depth of 2.4m (Photo 12 and Photo 13).

DA3C_LW21_004 is a Level 2 trigger as per the Dendrobium Area 3A Landscape TARP (Table 1), specifically:

- Crack or fracture between 100mm and 300mm width;
- Crack or fracture between 10 and 50m length.

Photo 12: *DA3C_LW21_004*, rock fracture on an outcrop. Taken on 06/06/2023.

Photo 13: *DA3C_LW21_004*, rock fracture width. Taken on 06/06/2023

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Corrective Management Actions (CMAs)

- Continue Monitoring Program
- Submit an Impact Report to key stakeholders
- Summarise impacts and report in the EoP and the AR
- Review monitoring frequency
- Notify relevant technical specialists and seek advice on any CMA required
- Provide safety signage and barricades as appropriate
- Implement approved repairs to ensure safety and serviceability on fire trails
- Implement agreed CMAs as approved

A list of impacts and triggers recorded during Longwall 21 is presented in Table 2.

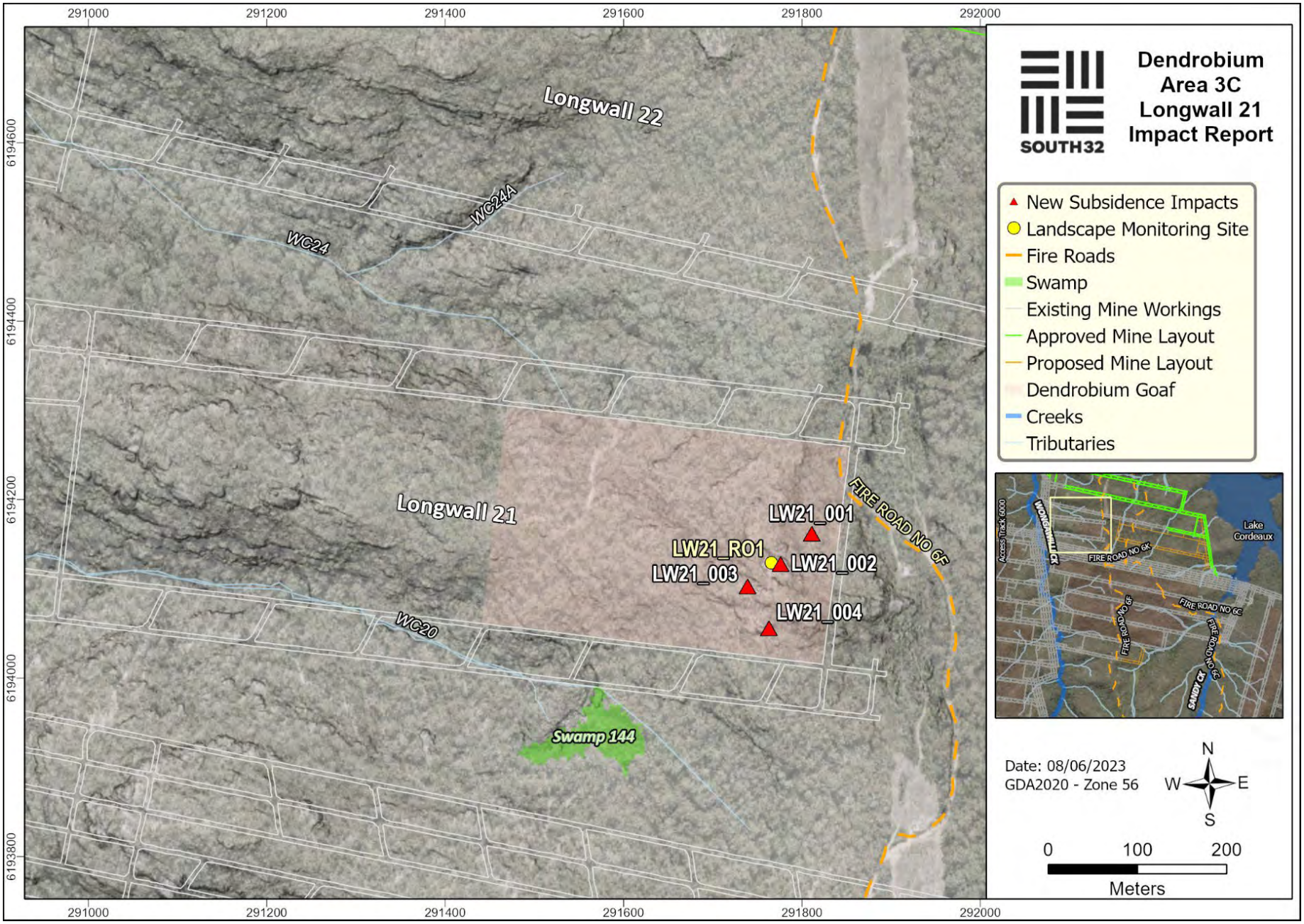


Figure 1: Map showing the latest subsidence impacts. Inset shows main frame of map in relation to Dendrobium mining operations.

Table 1: Extract from Dendrobium Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
AREA 2 **Cliffs** A2-CL1 (above LW4) **Steep Slopes** A2-SL1 and A2-SL2 (above LWs 4 & 5) **Watercourses** A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5) **Swamp** A2-SW1 (above LWs 4 & 5) **4WD Track** A2-FT1 (above LWs 4 & 5) **Crinanite Surface Extent** A2-CN1 & A2-CN2 (above LWs 3 & 4)	***Level 1*** * • Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance • Surface movement or rock displacement with negligible soil surface exposed • Crack at the surface, which should not result in any significant erosion or further ground movement • Crack in a fire trail which should not result in erosion or impede access • Crack or fracture up to 100mm width • Crack or fracture up to 10m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring	• Continue monitoring program • Report impacts to key stakeholders • Summarise impacts and Report in the End of Panel Report and AEMR
AREA 3A **Cliffs** All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites) **Steep Slopes** All mapped steep slopes in subsidence area *Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites* **Watercourses/ Swamps** All mapped watercourse and swamps in subsidence area *Refer to Dendrobium Area 3A SMP Figure 19.3* **Fire Trails** All mapped fire trails in subsidence area *Refer to Dendrobium Area 3A SMP Figure 19.3*	***Level 2*** * • Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance • Surface movement or rock displacement that has exposed significant areas of soil • A crack at the surface, which could result in significant erosion or movement at the surface • A crack at the surface with potential risk to safety and/or fauna entrapment • A crack in the fire trail, which could result in significant erosion or impede vehicle access • Crack or fracture between 100 and 300mm width • Crack or fracture between 10 and 50m length • Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period	• *Actions as stated for Level 1* • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved *Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts*
AREA 3B **Cliffs** All mapped cliff sites in subsidence area *Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites*	***Level 3*** * • Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period	• *Actions as stated for Level 2* • Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required • Site visits with stakeholders if required

Table 2: Summary of Longwall 21 impacts and triggers.

Site ID	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
DA3C_LW21_001	Rock Fracturing	Outcrop	06/06/2023	1	Rock fracturing to a small rock outcrop west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_002	Rock Fracturing and Rock Movement	*Landscape site LW21_RO1*	06/06/2023	2	Rock fracturing and rock movement to a small rock outcrop at Landscape Monitoring Site *LW21_RO1.*	9/06/2023
DA3C_LW21_003	Rock Fracturing and Rockfall	Outcrop and Step	06/06/2023	2	Rock fracturing and rockfall to an outcrop and a step west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_004	Rock Fracturing	Outcrop	06/06/2023	2	Rock fracturing on an outcrop west of *Fire Road 6F.*	9/06/2023

CONSULTATION

Summary of consultation undertaken in relation to the subsidence impact report

The impact report was emailed to DPE, WaterNSW, BCD and the Resources Regulator on 9 June 2023 for review and feedback.

The Resources Regulator responded via email on 9 June 2023 and issued reference number MAAG0016194 indicating that an assessment officer would be in contact should further information be required. No further correspondence was received.

WaterNSW responded via email on 16 June 2023 with comments as detailed below. Evidence is provided in Attachment 1.

BCD responded via email with a letter dated 14 June 2023 requesting further information. Evidence is provided in Attachment 2.

Summary of the comments received during consultation

WaterNSW

WaterNSW noted that:

- Four new impacts over Longwall 21.
- Three out of 4 impacts were assessed at Level 2 with fractures up to 260 mm wide.
- Noted MSEC commented the predicted impacts to steep slopes over Longwalls 20 and 21 as being similar to those observed over Longwalls 1-2.
- At this point, no further comments or questions.

Biodiversity and Conservation Division (BCD)

BCD requested the following monitoring data to be provided for analysis:

- Swamps den 144, den 145, den 07, and den 09.
- Bores S1845 and S1892.

Summary of actions taken by Illawarra Metallurgical Coal in response to comments received during consultation

In response to comments and recommendations from WaterNSW and BCD, IMC have undertaken the following actions:

- IMC responded to WaterNSW via email on 9 June 2023 (refer to Attachment 1) indicating:
    - Soil moisture sites were installed to look at any effect from Longwall 19.

- Performance measures listed in Table 1 (Appendix 1) of the Longwall 19 SIMMCP referring to “minor changes in the ecosystem functionality of swamps” apply to Swamp 15B. However potential impacts are “not linked specifically to a PM and would not be considered a breach if predictions were exceeded”.
- Confirmed there is no mention to specific swamps these TARPs apply to.
- A full version of the TARP was provided. This TARP was proposed by OEH (now BCD) and adopted after discussions with IMC around improving the previous swamp TARP. It is applied to those swamps included in the SMP for the relevant longwall.
- The performance measures in Table 6-1 of the SIMMCP that refer to erosion and fracturing of the controlling rockbar omit groundwater and soil moisture triggers as these are “not linked specifically to a PM and would not be considered a breach if predictions were exceeded”.

- WaterNSW responded indicating they would check the approvals notices for the performance measures for individual swamps. No further correspondence was received.

- IMC provided requested data detailed above to BCD on 30/6/2023. The data file entitled: ***EHG Response Impact Report 09062023.zip*** included the following files:
    - GW_Swamps 7 9 144 145.xlsx
    - S1892_dend 99.xlsx (Note: Hole S1845 was abandoned in 2010)
- IMC clarified via email to BCD on 05/07/2023 that there is an additional sandstone hole over LW21 - S2545. The hole is awaiting survey of the collar.

IMC will implement the corrective management actions (CMAs) as detailed within this impact report.

Email correspondence is provided in the Attachments.

ATTACHMENT 1 – WaterNSW Email Correspondence

From: Maria Dubikova
To: Zanotto, Linda
Cc: Girja Sharma; Juri Jung
Subject: RE: [EXTERNAL] Dendrobium Mine - Subsidence Impact Report 09/06/2023
Date: Friday, 16 June 2023 5:52:51 PM

Hi Linda,

We have noted 4 new impacts over longwall 21. Three out of 4 impacts were assessed at Level 2 with fractures up to 260 mm wide. I've checked the subsidence assessment for longwall 21 and noted that MSEC commented the predicted impacts to steep slopes over longwalls 20 and 21 as being similar to those observed over longwalls 1-2. At this point I don't have any further comments or questions.

Just to let you know that I'll be on annual leave from Monday until the 31st July. As Ravi has extended his leave and Girja is working part time, we will be able to respond to urgent matters only and providing feedback to any compliance reporting issued during this period (subsidence impact reports and/or EOPR) when I'll be back in the office.

Regards,
Maria

From: Zanotto, Linda <Linda.Zanotto@south32.net>
Sent: Friday, June 9, 2023 2:22 PM
To: Ravi Sundaram <ravi.sundaram@waternsw.com.au>; Maria Dubikova <Maria.Dubikova@waternsw.com.au>; Resources Regulator <nswresourcesregulator@service-now.com>; Chris Page <Chris.Page@environment.nsw.gov.au>; Camilla Edmunds <Camilla.Edmunds@waternsw.com.au>; Environmental Assessments <Environmental.Assessments@waternsw.com.au>; rog.illawarra@environment.nsw.gov.au; gabrielle.allan@dpie.nsw.gov.au
Cc: Brassington, Gary <Gary.M.Brassington@south32.net>; Carlon, Josh <Josh.Carlon@south32.net>; Crehan, Amanda <Amanda.Crehan@south32.net>; Schultz, Chris <Chris.Schultz1@south32.net>; Leone, Antony <Antony.Leone@south32.net>; Walsh, Richard <Richard.V.Walsh@south32.net>; Mapstone, Rod <Rod.Mapstone1@south32.net>; Page, James (Agurba) <James.Page@south32.net>
Subject: ARK: [EXTERNAL] Dendrobium Mine - Subsidence Impact Report 09/06/2023

Hi All,

Attached is the latest subsidence impact report (dated 09/06/2023) for Dendrobium Mine regarding recent subsidence impact observations in Area 3C. Please note that the report has not been uploaded to the Major Projects Planning Portal as consultation will be undertaken via

email.

The report will be updated following receipt of your feedback and the final report uploaded to the Major Projects Planning Portal in due course.

Kind Regards,

Linda Zanotto
Principal Mining Approvals
Illawarra Metallurgical Coal

M: +61 409 399 560
E: Linda.Zanotto@South32.net

south32.net

ATTACHMENT 2 – BCD – Email Correspondence

Our ref: DOC23/515378

Ms Linda Zanotto
Illawarra Metallurgical Coal

By email: Linda.Zanotto@South32.net

Re: Dendrobium Area 3C – Impact report – 9th June 2023

Dear Linda

I refer to the Dendrobium 3C Impact Report for 9th June 2023. This Report detailed the following impacts:

- DA3C_LW21_001 Rock fracturing, Level 1 TARP
- DA3C_LW21_002 Rock fracturing and rock movement, Level 2 TARP
- DA3C_LW21_003 Rock fracturing and rockfall, Level 2 TARP
- DA3C_LW21_004 Rock fracturing, Level 2 TARP

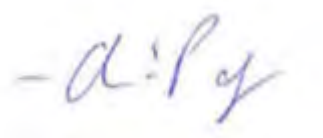
We request further data be provided to us for analysis. Please provide all monitoring data for the following:

- Swamps den144, den145, den07, and den09
- Bores S1845 and S1892.

We also request that you provide clarification on whether there are any hard rock piezometers above longwall 21 or nearby to the north or east of LW 21 to assess groundwater impacts to the regional Hawkesbury sandstone aquifers.

If you wish to discuss, please contact Vanessa Allen, Senior Conservation Planning Officer, on 0242244186 or at Vanessa.Allen@environment.nsw.gov.au.

Yours sincerely



Chris Page date: 14/6/2023

Senior Team Leader (Planning Illawarra)
Biodiversity and Conservation Division

cc: Jessie Evans, Director Energy and Resource Assessment Underground, DPE

From: Zanotto, Linda
To: Chris Page
Cc: Vanessa Allen; Carlon, Josh
Subject: FW: Emailing: EHG Response Impact Report 09062023.pdf
Date: Wednesday, 5 July 2023 9:22:00 AM
Attachments: EHG Response Impact Report 09062023.pdf

Hi Chris,

The data requested for Impact Report dated 09 June 2023 was uploaded to the BCD Moveitcloud folder on 30/06/2023. An email with the link to this was sent to you. Your login details were sent in a separate email. Could you please confirm that you are able to access this data?

In addition, in response to your request to "provide clarification on whether there are any hard rock piezometers above longwall 21 or nearby to the north or east of LW 21 to assess groundwater impacts to the regional Hawkesbury sandstone aquifers", we can confirm that there is an additional sandstone hole over LW21 - S2545. The hole is awaiting survey of the collar.

Kind Regards,
Linda

Linda Zanotto
Principal Mining Approvals
Illawarra Metallurgical Coal

M: +61 409 399 560
E: Linda.Zanotto@South32.net

south32.net

-----Original Message-----
From: Vanessa Allen <Vanessa.Allen@environment.nsw.gov.au>
Sent: Thursday, 15 June 2023 5:04 PM
To: Zanotto, Linda <Linda.Zanotto@south32.net>
Subject: Emailing: EHG Response Impact Report 09062023.pdf

Hi Linda

Please see attached BCD/EHG response to the June Impact Report for Area 3C.

Regards, Vanessa

Vanessa Allen
Senior Conservation Planning Officer

Biodiversity and Conservation Division | Department of Planning and Environment T 02 42244186 | E Vanessa.Allen@environment.nsw.gov.au
Level 1, 84 Crown street, Wollongong NSW 2500 PO Box 514, Wollongong NSW 2520
https://aus01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.dpie.nsw.gov.au%2F&data=05%7C01%7CLinda.Zanotto%40south32.net%7Cd6d800b4cc744ca6753e08db6d6ec7f1%7Cd05d5e5b385d4774b496d0cf85bfa5f4%7C1%7C0%7C638224094915583786%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=ObWtJPYH5FgjFHovdt%2FZsUqxCp7XK8BClvXd0hbBMxI%3D&reserved=0

Office is located on Dharawal Country
The Department of Planning 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.

From: South32 Notification Service
To: Zanotto, Linda
Subject: Upload into Folder "BCD" Confirmed
Date: Friday, 30 June 2023 8:33:07 AM
Attachments: ATT00001.png

File Upload Confirmation

Your file has been saved into the "/ Illawarra Coal - Energy and Engineering / BCD" folder and the appropriate people have been notified.

Name: EHG Response Impact Report 09062023.zip
Tracking ID: 970767672
Original Size: 24,482,469 bytes

For non-repudiation purposes, it has been confirmed that the file received by MOVEit Transfer is IDENTICAL to the file you uploaded.

Please use the following URL and your username/password to view the current status of this file, including its full upload and download history.

(https://south32.moveitcloud.com/human.aspx?OrgID=9904&Arg12=fileview&Arg07=970767672&Arg06=957756355)

Regards,
South32 Notification Service

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3C (DA3C). Extraction of Longwall 21 commenced on 25 April 2023. On 15 June 2023 three new subsidence impacts were identified.

This Version 2 of the report includes a summary of consultation with stakeholders undertaken since the initial report.

DA3C_LW21_005 (E 291640, N 6194122)

DA3C_LW21_005 is located approximately 150m northeast of *WC20*, a tributary of *Wongawilli Creek* (Figure 1). The impact consists of a fracture to a rock outcrop (Photo 1 and Photo 2). The rock fracture has a continuous length of 2.1m, a maximum width of 0.05m and a maximum measurable depth of 1.84m. The fracture also resulted in a displacement of small rock fragments.

DA3C_LW21_005 is a Level 1 Trigger as per the Dendrobium Landscape TARP (Table 1), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length;

Photo 1: *DA3C_LW21_005*, fracture to rock outcrop.Taken on 15/06/2023.

Photo 2: *DA3C_LW21_005, showing* width of rock fracture. Taken on 15/06/2023

DA3C_LW21_006 (E 291661, N 6194107)

DA3C_LW21_006 is located approximately 150m northeast of *WC20*, a tributary of *Wongawilli Creek* (Figure 1). The impact consists of fracturing to a rock outcrop. (Photo 3 and Photo 4). Two intersecting fractures were observed, the longest continuous length measured was 9.0m. The maximum measured width was 0.04m and the maximum measured depth was 1.12m.

DA3C_LW21_006 is a Level 1 trigger as per the Dendrobium Landscape TARP (Table 1), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length;

Photo 3: *DA3C_LW21_006*, fracturing to rock outcrop. Taken on 15/06/2023.

Photo 4: *DA3C_LW21_006*, maximum width of rock fracture. Taken on 15/06/2023.

DA3C_LW21_007 (E 291680, N 6194106)

DA3C_LW21_007 is located approximately 160m northeast of *WC20*, a tributary of *Wongawilli Creek* (Figure 1). The impact consists of two rock fractures and associated rock fall to a rock outcrop (Photo 5). The maximum continuous length of the fractures was 2.74m, with a maximum width of 0.14m (Photo 6). The largest measurable depth was 1.83m. The total volume of the rockfall was less than 0.60m^3 with a total debris area of approximately 3m^2 (Photo 5 and Photo 7).

DA3C_LW21_007 is a Level 2 trigger as per the Dendrobium Landscape TARP (Table 1), specifically:

- Crack or fracture between 100mm and 300mm width.

Photo 5: *DA3C_LW21_007*, fracturing and rock fall to outcrop. Taken on 15/06/2023.

Photo 6: *DA3C_LW21_007*, maximum width of rock fracture. Taken on 15/06/2023.

Photo 7: *DA3C_LW21_007*, rock fall.
Taken on 15/06/2023.

Corrective Management Actions (CMAs)

- Continue Monitoring Program
- Submit an Impact Report to key stakeholders
- Summarise impacts and report in the End of Panel and the Annual Review
- Review monitoring frequency
- Notify relevant technical specialists and seek advice on any Corrective Management Actions (CMAs) required
- Provide safety signage and barricades as appropriate
- Implement approved repairs to ensure safety and serviceability on fire trails
- Implement agreed CMAs as approved

A follow-up inspection of the impact sites will be undertaken following completion of Longwall 21. A list of impacts and triggers recorded during Longwall 21 is presented in Table 2.

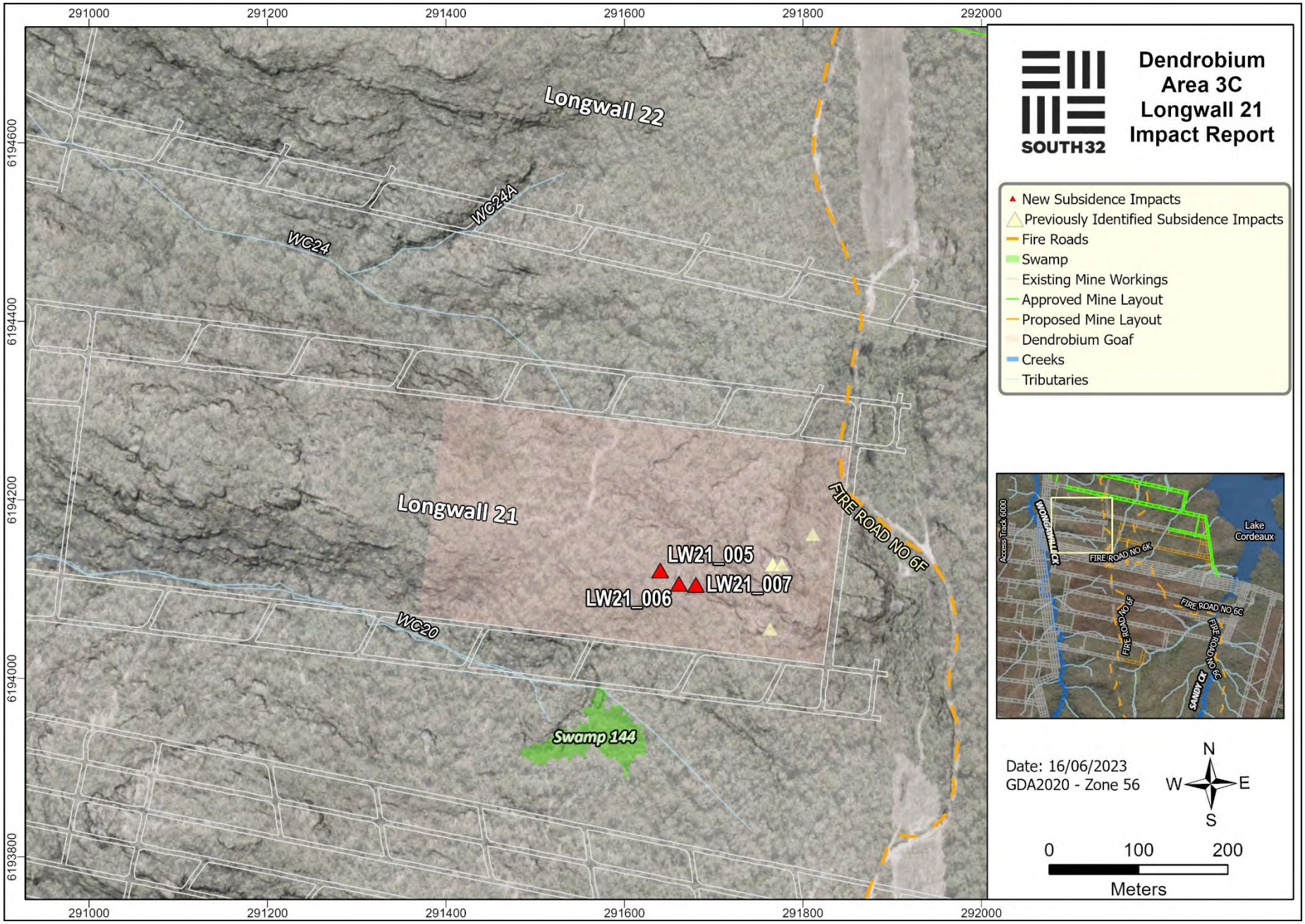


Figure 1: Map showing the latest subsidence impacts. Inset shows main frame of map in relation to Dendrobium mining operations.

Table 1: Extract from Dendrobium Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
AREA 2 **Cliffs** A2-CL1 (above LW4) **Steep Slopes** A2-SL1 and A2-SL2 (above LWs 4 & 5) **Watercourses** A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5) **Swamp** A2-SW1 (above LWs 4 & 5) **4WD Track** A2-FT1 (above LWs 4 & 5) **Crinanite Surface Extent** A2-CN1 & A2-CN2 (above LWs 3 & 4)	***Level 1*** * • Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance • Surface movement or rock displacement with negligible soil surface exposed • Crack at the surface, which should not result in any significant erosion or further ground movement • Crack in a fire trail which should not result in erosion or impede access • Crack or fracture up to 100mm width • Crack or fracture up to 10m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring	• Continue monitoring program • Report impacts to key stakeholders • Summarise impacts and Report in the End of Panel Report and AEMR
AREA 3A **Cliffs** All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites) **Steep Slopes** All mapped steep slopes in subsidence area *Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites* **Watercourses/ Swamps** All mapped watercourse and swamps in subsidence area *Refer to Dendrobium Area 3A SMP Figure 19.3* **Fire Trails** All mapped fire trails in subsidence area *Refer to Dendrobium Area 3A SMP Figure 19.3*	***Level 2*** * • Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance • Surface movement or rock displacement that has exposed significant areas of soil • A crack at the surface, which could result in significant erosion or movement at the surface • A crack at the surface with potential risk to safety and/or fauna entrapment • A crack in the fire trail, which could result in significant erosion or impede vehicle access • Crack or fracture between 100 and 300mm width • Crack or fracture between 10 and 50m length • Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period	• *Actions as stated for Level 1* • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved *Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts*
AREA 3B **Cliffs** All mapped cliff sites in subsidence area *Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites*	***Level 3*** * • Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period	• *Actions as stated for Level 2* • Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required • Site visits with stakeholders if required

Table 2: Summary of Longwall 21 impacts and triggers. Highlighted rows indicate the latest impacts featured in this report.

Site ID	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
DA3C_LW21_001	Rock Fracturing	Outcrop	06/06/2023	1	Rock fracturing to a small rock outcrop west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_002	Rock Fracturing and Rock Movement	*LW21_RO1*	06/06/2023	2	Rock fracturing and rock movement to a small rock outcrop at Landscape Monitoring Site *LW21_RO1.*	9/06/2023
DA3C_LW21_003	Rock Fracturing and Rockfall	Outcrop and Step	06/06/2023	2	Rock fracturing and rockfall to an outcrop and a step west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_004	Rock Fracturing	Outcrop	06/06/2023	2	Rock fracturing on an outcrop west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_005	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracture on a rock outcrop northeast of *WC20.*	19/06/2023
DA3C_LW21_006	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracturing on a rock outcrop northeast of *WC20.*	19/06/2023
DA3C_LW21_007	Rock Fracturing and Rockfall	Outcrop	15/06/2023	2	Rock fracturing and rock fall on an outcrop northeast of *WC20*	19/06/2023

CONSULTATION

Summary of consultation undertaken in relation to the subsidence impact report

The impact report was emailed to DPE, WaterNSW, BCD and the Resources Regulator on 19 June 2023 for review and feedback.

The Resources Regulator responded via email on 20 June 2023 and issued reference number MAAG0016234 indicating that an assessment officer would be in contact should further information be required. No further correspondence was received.

WaterNSW responded via email on 4 July 2023 with comments as detailed below. Evidence is provided in Attachment 1.

BCD responded via email with a letter dated 21 June 2023 requesting further information. Evidence is provided in Attachment 2.

Summary of the comments received during consultation

WaterNSW

WaterNSW responded to impact reports dated 20 and 28 June and 4 July noting the following new impacts over Longwall 21:

- Level 1 impacts – Rock fracturing/Soil Cracking/Rock Movement/Displacement – 7 impacts.
- Level 2 impacts – Rock fracturing and Rockfall to a maximum width of 0.20m – 1 impact.
- Level 3 impacts – Reduction in groundwater and average soil moisture in Swamp 144. The June 28 report states that “average soil moisture value recessed below the lowest level recorded before mining and has not recovered since. This is concerning.

WaterNSW also notes that no corrective actions are specified for exceeding level 3 impacts for Swamp 144 in 28 June impact report.

Biodiversity and Conservation Division (BCD)

BCD indicated no further information was required at this stage, and noted their previous request for data including:

- Swamps den 144, den 145, den 07, and den 09.
- Bores S1845 and S1892.

BCD also requested clarification on whether there are any hard rock piezometers above Longwall 21 or nearby to the north or east of LW21 to assess groundwater impacts to the regional Hawkesbury sandstone aquifers.

Summary of actions taken by Illawarra Metallurgical Coal in response to comments received during consultation

In response to comments and recommendations from WaterNSW and BCD, IMC have undertaken the following actions:

- IMC responded to WaterNSW via email on 13 July 2023 (refer to Attachment 1) indicating:
    - WaterNSW email response included impact report dated 19/6/2023 based on impacts referred to within the email.
    - Noted that no corrective actions are specified in impact reports dated 28/06/2023 and 4/07/2023 and relevant CMAs that would be included in Version 2 of these reports. (Not relevant to this report)
- WaterNSW acknowledged receipt of the email on 13 July 2023.

- IMC provided requested data detailed above to BCD on 30/6/2023. The data file entitled: ***EHG Response Impact Report 09062023.zip*** included the following files:
    - GW_Swamps 7 9 144 145.xlsx
    - S1892_dend 99.xlsx (Note: Hole S1845 was abandoned in 2010)
- IMC clarified via email to BCD on 05/07/2023 that there is an additional sandstone hole over LW21 - S2545. The hole is awaiting survey of the collar.

IMC will implement the corrective management actions (CMAs) as detailed within this impact report.

Email correspondence is provided in the Attachments.

ATTACHMENT 1 – WaterNSW Email Correspondence

From: Girja Sharma
To: Zanotto, Linda
Cc: Ravi Sundaram; Maria Dubikova; Juri Jung; David N. Harris
Subject: RE: Dendrobium Mine - Subsidence Impact Report 04/07/2023
Date: Thursday, 13 July 2023 12:34:01 PM
Attachments: image001.png
image003.png

Thanks, Linda.

From: Zanotto, Linda <Linda.Zanotto@south32.net>
Sent: Thursday, July 13, 2023 8:11 AM
To: Girja Sharma <Girja.Sharma@waternsw.com.au>
Cc: Ravi Sundaram <ravi.sundaram@waternsw.com.au>; Maria Dubikova <Maria.Dubikova@waternsw.com.au>; Juri Jung <Juri.Jung@waternsw.com.au>; David N. Harris <David.N.Harris@waternsw.com.au>
Subject: [EXTERNAL] RE: Dendrobium Mine - Subsidence Impact Report 04/07/2023

Hi Girja,

Thanks for your feedback in regards to the latest impact reports in relation to Longwall 21. I believe your response also includes impacts discussed in impact report dated 19/06/2023, refer to screenshot from impact report dated 4/7/2023:

DA3C_LW21_005	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracture on a rock outcrop northeast of *WC20*.	19/06/2023
DA3C_LW21_006	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracturing on a rock outcrop northeast of *WC20*.	19/06/2023
DA3C_LW21_007	Rock Fracturing and Rockfall	Outcrop	15/06/2023	2	Rock fracturing and rock fall on an outcrop northeast of *WC20*.	19/06/2023
DA3C_LW21_008	Rock Fracturing and Soil Cracking	Rock Step	19/06/2023	1	Rock fracturing/soil cracking to a rock step and bushland northeast of *WC20*.	20/06/2023
DA3C_LW21_009	Rock Fracturing	Rock Step	19/06/2023	1	Rock fracturing to a rock step west of *Fire Road 6F*.	20/06/2023
DA3C_LW21_010	Rock Fracturing and Rock Movement/ Displacement	Outcrop	19/06/2023	2	Rock fracturing and associated rock movement/displacement at an outcrop west of *Fire Road 6F*.	20/06/2023
DA3C_LW21_011	Rock Fracturing, Rock Displacement and Soil Cracking	Outcrop and Bushland	19/06/2023	1	Soil cracking, rock fracturing and associated rock displacement to an outcrop and bushland west of *Fire Road 6F*.	20/06/2023
144_01	Groundwater	Swamp 144	22/06/2023	3	Groundwater recession rate greater than baseline	28/06/2023
S144_01	Soil Moisture	Swamp 144	27/06/2023	3	Average soil moisture level below the baseline level	28/06/2023
DA3C_LW21_012	Rock Fracturing	Rock Step	27/06/2023	1	Rock fracturing to rock step west of Fire Road 6F.	28/06/2023
DA3C_LW21_013	Rock Fracturing	Outcrop	03/07/2023	1	Rock fracturing to rock outcrop west of Fire Road 6F.	04/07/2023

It is noted that no corrective actions are specified in impact reports dated 28/06/2023 and 4/07/2023. The following corrective management actions (CMAs) will be included in version 2 of these reports in relation to the rock fracturing impacts:

Corrective Management Actions (CMAs)

- Continue Monitoring Program
- Submit an Impact Report to key stakeholders
- Summarise impacts and report in the End of Panel and the Annual Review
- Review monitoring frequency
- Notify relevant technical specialists and seek advice on any Corrective Management Actions (CMAs) required
- Provide safety signage and barricades as appropriate
- Implement approved repairs to ensure safety and serviceability on fire trails
- Implement agreed CMAs as approved

A follow-up inspection of the impact sites will be undertaken following completion of Longwall 21.

Regarding CMAs for level 3 impacts in swamp 144, monitoring will continue and analysis of data by relevant technical experts will be provided in the End of Panel report. In addition, we seek your advice in regards to any corrective management actions required.

Kind Regards,

Linda Zanotto
Principal Mining Approvals
Illawarra Metallurgical Coal

M: +61 409 399 560
E: Linda.Zanotto@South32.net

south32.net

SOUTH32

From: Girja Sharma <Girja.Sharma@waternsw.com.au>
Sent: Tuesday, 4 July 2023 4:47 PM
To: Zanotto, Linda <Linda.Zanotto@south32.net>
Cc: Ravi Sundaram <ravi.sundaram@waternsw.com.au>; Maria Dubikova <Maria.Dubikova@waternsw.com.au>; Juri Jung <Juri.Jung@waternsw.com.au>; David N. Harris <David.N.Harris@waternsw.com.au>
Subject: RE: Dendrobium Mine - Subsidence Impact Report 04/07/2023

Hi Linda,

WaterNSW has reviewed Dendrobium Mine – LW21 Subsidence Impact Reports dated 20 and 28 June and 4 July 2023.

WaterNSW has noted the following new impacts over longwall 21:

- Level 1 impacts - Rock fracturing/Soil Cracking/Rock Movement/Displacement – 7 impacts
- Level 2 impacts - Rock Fracturing and Rockfall to a maximum width of 0.20m – 1 impact
- Level 3 impacts - Reduction in groundwater and average soil moisture levels in Swamp 144. The 28 June report states that "average soil moisture value recessed below the lowest level recorded before mining and has not recovered since". This is concerning.

WaterNSW also notes that no corrective actions are specified for exceeding level 3 impacts for swamp 144 in 28 June impact report.

Regards

Girja

Dr Girja Sharma (She/Her)
Catchment Assessments Manager
For noting: *I am working on Tuesday, Wednesday and Part Thursday.*
I am also working remotely. Please reach me via email or 0417099432

WaterNSW

Level 14, 169 Macquarie Street, Parramatta NSW 2150
PO Box 398, Parramatta NSW 2124
T: 02 9865 2501 **M:** 0417 099 432
girja.sharma@waternsw.com.au
www.waternsw.com.au

From: Zanotto, Linda <Linda.Zanotto@south32.net>
Sent: Tuesday, July 4, 2023 7:54 AM
To: Ravi Sundaram <ravi.sundaram@waternsw.com.au>; Maria Dubikova <Maria.Dubikova@waternsw.com.au>; Glen Capararo <Glen.Capararo@waternsw.com.au>; Resources Regulator <nswresourcesregulator@service-now.com>; Chris Page <Chris.Page@environment.nsw.gov.au>; Camilla Edmunds <Camilla.Edmunds@waternsw.com.au>; Environmental Assessments <Environmental.Assessments@waternsw.com.au>; rog.illawarra@environment.nsw.gov.au; gabrielle.allan@dpie.nsw.gov.au
Cc: Brassington, Gary <Gary.M.Brassington@south32.net>; Carlon, Josh <Josh.Carlon@south32.net>; Crehan, Amanda <Amanda.Crehan@south32.net>; Schultz, Chris <Chris.Schultz1@south32.net>; Leone, Antony <Antony.Leone@south32.net>; Walsh, Richard <Richard.V.Walsh@south32.net>; Mapstone, Rod <Rod.Mapstone1@south32.net>; Parkinson, Jack (Agurba) <Jack.Parkinson@south32.net>
Subject: [EXTERNAL] Dendrobium Mine - Subsidence Impact Report 04/07/2023

Hi All,

Please find attached the latest subsidence impact report (dated 04/07/2023) for Dendrobium Mine regarding recent subsidence impact observations in Area 3C.

The report will be updated following receipt of your feedback and the final report uploaded to the Major Projects Planning Portal.

Kind Regards,

Linda Zanotto
Principal Mining Approvals
Illawarra Metallurgical Coal

M: +61 409 399 560
E: Linda.Zanotto@South32.net

south32.net

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.

ATTACHMENT 2 – BCD – Email Correspondence

Our ref: DOC23/541574

Ms Linda Zanotto
Illawarra Metallurgical Coal

By email: Linda.Zanotto@South32.net

Re: Dendrobium Area 3C – Impact report – 19th June 2023

Dear Linda

I refer to the Dendrobium 3C Impact Report for 19th June 2023. This Report detailed the following impacts:

- DA3C_LW21_005 (E 291640, N 6194122), Level 1 TARP
- DA3C_LW21_006 (E 291661, N 6194107), Level 1 TARP
- DA3C_LW21_007 (E 291680, N 6194106), Level 2 TARP

We do not require further information at this stage, however we note our previous request for further data including:

- Swamps den144, den145, den07, and den09
- Bores S1845 and S1892.

We also request that you provide clarification on whether there are any hard rock piezometers above longwall 21 or nearby to the north or east of LW 21 to assess groundwater impacts to the regional Hawkesbury sandstone aquifers.

If you wish to discuss, please contact Vanessa Allen, Senior Conservation Planning Officer, on 0242244186 or at Vanessa.Allen@environment.nsw.gov.au.

Yours sincerely

Vanessa Allen date: 21/6/2023

Senior Conservation Planning Officer (Planning Illawarra)
Biodiversity and Conservation Division

FW: Emailing: EHG Response Impact Report 09062023.pdf

Reply | Reply All | Forward

Wed 5/07/2023 9:22 AM

Zanotto, Linda
To Chris Page
Cc Vanessa Allen; Carlon, Josh

EHG Response Impact Report 09062023.pdf
101 KB

Hi Chris,

The data requested for Impact Report dated 09 June 2023 was uploaded to the BCD Moveitcloud folder on 30/06/2023. An email with the link to this was sent to you. Your login details were sent in a separate email. Could you please confirm that you are able to access this data?

In addition, in response to your request to "provide clarification on whether there are any hard rock piezometers above longwall 21 or nearby to the north or east of LW 21 to assess groundwater impacts to the regional Hawkesbury sandstone aquifers", we can confirm that there is an additional sandstone hole over LW21 - S2545. The hole is awaiting survey of the collar.

Kind Regards,
Linda

Linda Zanotto
Principal Mining Approvals
Illawarra Metallurgical Coal

M: +61 409 399 560
E: Linda.Zanotto@South32.net

south32.net

-----Original Message-----
From: Vanessa Allen <Vanessa.Allen@environment.nsw.gov.au>
Sent: Thursday, 15 June 2023 5:04 PM
To: Zanotto, Linda <Linda.Zanotto@south32.net>
Subject: Emailing: EHG Response Impact Report 09062023.pdf

Hi Linda

Please see attached BCD/EHG response to the June Impact Report for Area 3C.

Regards, Vanessa

Senior Conservation Planning Officer

Biodiversity and Conservation Division | Department of Planning and Environment T 02 42244186 | E Vanessa.Allen@environment.nsw.gov.au
Level 1, 84 Crown street, Wollongong NSW 2500 PO Box 514, Wollongong NSW 2520

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3C (DA3C). Extraction of Longwall 21 commenced on 25 April 2023 and as of 19 June 2023 had progressed approximately 533m. During a recent inspection, four new subsidence impacts were identified.

This Version 2 of the report includes a summary of consultation with stakeholders undertaken since the initial report.

DA3C_LW21_008 (E 291540, N 6194108)

DA3C_LW21_008 is located approximately 120m northeast of *WC20*, a tributary of *Wongawilli Creek* (Figure 1). The impact consists of a vertical rock fracture at a rock step which then transitions upslope into discontinuous soil cracking (Photo 1 to Photo 3). The impact has a maximum continuous length of 7m, a maximum width of 0.022m and a maximum measurable depth of 0.69m.

DA3C_LW21_008 is a Level 1 trigger as per the Dendrobium Landscape TARP (Table 1), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length;

Photo 1: *DA3C_LW21_008*, overview of the rock fracture. Taken on 19/06/2023.

Photo 2: *DA3C_LW21_008*, maximum width of the rock fracture. Taken on 19/06/2023.

Photo 3: *DA3C_LW21_008*, section of the rock fracture. Taken on 19/06/2023.

DA3C_LW21_009 (E 291728, N 6194052)

DA3C_LW21_009 is located approximately 245m west of Fire Road 6F (Figure 1). The impact consists of a rock fracture at a small rock step which disappears upslope into bushland (Photo 4 to Photo 6). The impact has a maximum continuous length of 1.65m, a maximum width of 0.012m and a maximum measurable depth of 0.73m.

DA3C_LW21_009 is a Level 1 trigger as per the Dendrobium Landscape TARP (Table 1), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length;

Photo 4: *DA3C_LW21_009*, section of the rock fracture. Taken on 19/06/2023.

Photo 5: *DA3C_LW21_009*, maximum width of the rock fracture. Taken on 19/06/2023.

Photo 6: *DA3C_LW21_009*, overview of the rock fracture. Taken on 19/06/2023.

DA3C_LW21_010 (E 291772, N 6194167)

DA3C_LW21_010 is located approximately 125m west of Fire Road 6F (Figure 1). The impact consists of rock fracturing at a rock outcrop covered in shallow soil and leaf litter (Photo 8 and Photo 9). Rock movement/displacement is also evident between a large boulder and adjacent soil at the southern extent of the impact (Photo 7). The total impact area is approximately 60m^2. The rock fracture has a maximum continuous length of 7.6m, a maximum width of 0.20m and a maximum measurable depth of 1.4m. Flagging tape barricading is in place at the site as a safety precaution.

DA3C_LW21_010 is a Level 2 trigger as per the Dendrobium Landscape TARP (Table 1), specifically:

- Crack or fracture between 100mm and 300mm width.

Photo 7: *DA3C_LW21_010*, Overview of the rock movement/displacement. Taken on 19/06/2023.

Photo 8: *DA3C_LW21_010*, maximum width of the rock fracture. Taken on 19/06/2023.

Photo 9: *DA3C_LW21_010*, overview of the rock fracture.
Taken on 19/06/2023.

DA3C_LW21_011 (E 291767, N 6194198)

DA3C_LW21_011 is located approximately 95m west of Fire Road 6F (Figure 1). The impact consists of 25m of discontinuous rock fracturing and soil cracking to a rock outcrop and adjacent bushland (Photo 10 to Photo 13). The fracturing has a maximum continuous length of 8m, a maximum width of 0.06m and a maximum measurable depth of 0.44m. The rock fracturing has resulted in the displacement of rock from the edge of the rock outcrop (Photo 12 and Photo 13).

DA3C_LW21_011 is a Level 1 trigger as per the Dendrobium Landscape TARP (Table 1), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length;

Photo 10: *DA3C_LW21_011*, section of rock fracturing. Taken on 19/06/2023.

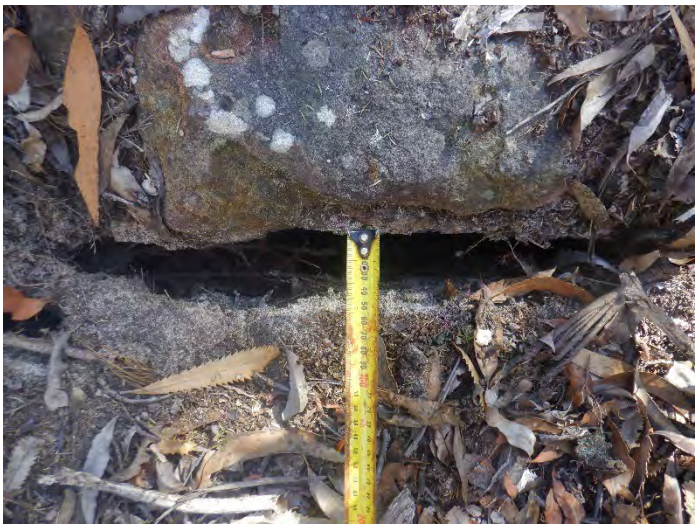


Photo 11: *DA3C_LW21_011*, maximum width of the fracture. Taken on 19/06/2023.

Photo 12: *DA3C_LW21_011*, section of rock fracturing and rock displacement. Taken on 19/06/2023.

Photo 13: *DA3C_LW21_011*, section of rock fracturing and rock displacement. Taken on 19/06/2023.

Corrective Management Actions (CMAs)

- Continue Monitoring Program
- Submit an Impact Report to key stakeholders
- Summarise impacts and report in the End of Panel and the Annual Review
- Review monitoring frequency
- Notify relevant technical specialists and seek advice on any Corrective Management Actions (CMAs) required
- Provide safety signage and barricades as appropriate
- Implement approved repairs to ensure safety and serviceability on fire trails
- Implement agreed CMAs as approved

A follow-up inspection of the impact sites will be undertaken following completion of Longwall 21. A list of impacts and triggers recorded during Longwall 21 is presented in Table 2.

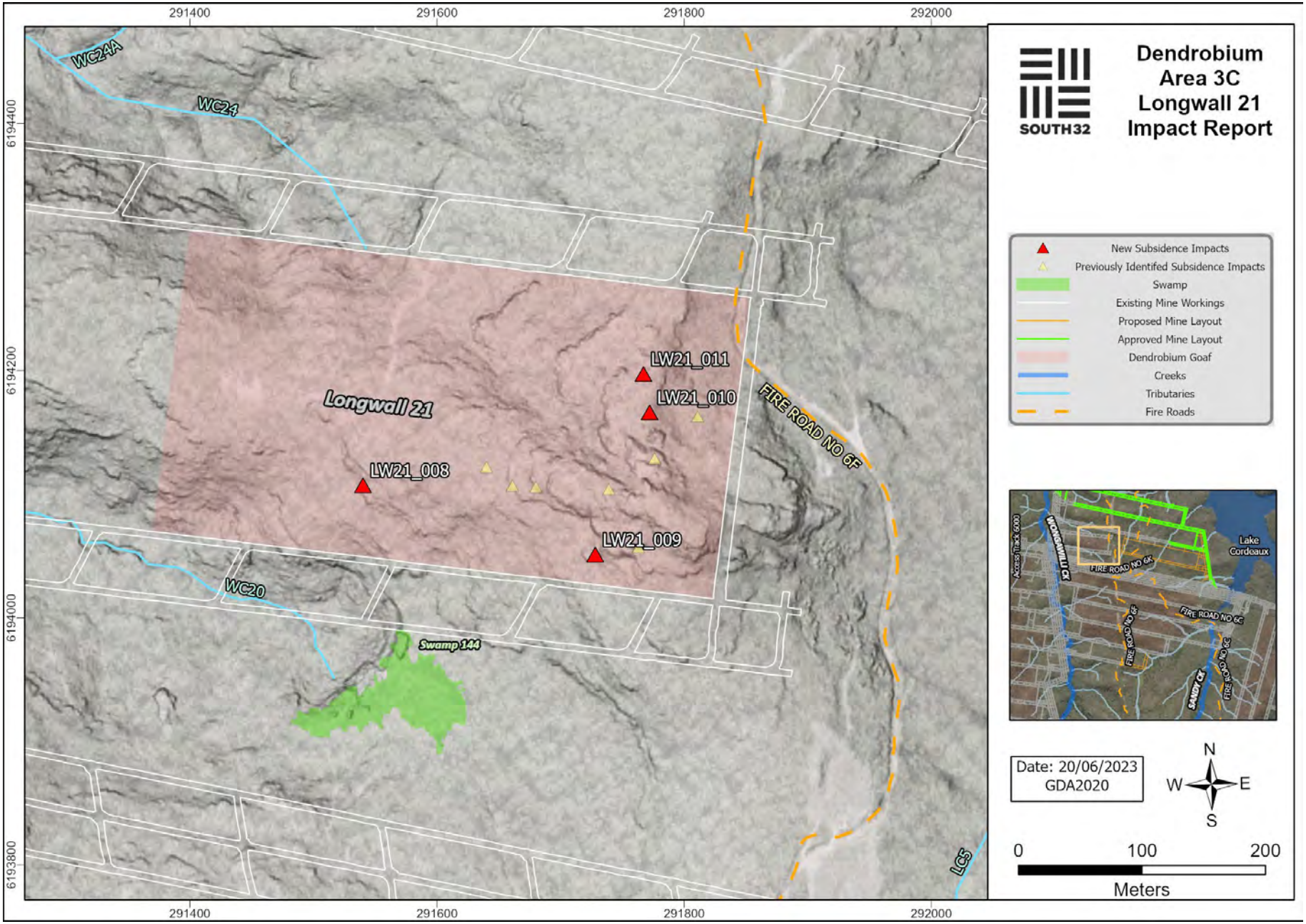


Figure 1: Map showing the latest subsidence impacts. Inset shows main frame of map in relation to Dendrobium mining operations.

Table 1: Extract from Dendrobium Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
AREA 2 **Cliffs** A2-CL1 (above LW4) **Steep Slopes** A2-SL1 and A2-SL2 (above LWs 4 & 5) **Watercourses** A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5) **Swamp** A2-SW1 (above LWs 4 & 5) **4WD Track** A2-FT1 (above LWs 4 & 5) **Crinanite Surface Extent** A2-CN1 & A2-CN2 (above LWs 3 & 4)	***Level 1*** * • Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance • Surface movement or rock displacement with negligible soil surface exposed • Crack at the surface, which should not result in any significant erosion or further ground movement • Crack in a fire trail which should not result in erosion or impede access • Crack or fracture up to 100mm width • Crack or fracture up to 10m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring	• Continue monitoring program • Report impacts to key stakeholders • Summarise impacts and Report in the End of Panel Report and AEMR
AREA 3A **Cliffs** All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites) **Steep Slopes** All mapped steep slopes in subsidence area *Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites* **Watercourses/ Swamps** All mapped watercourse and swamps in subsidence area *Refer to Dendrobium Area 3A SMP Figure 19.3* **Fire Trails** All mapped fire trails in subsidence area *Refer to Dendrobium Area 3A SMP Figure 19.3*	***Level 2*** * • Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance • Surface movement or rock displacement that has exposed significant areas of soil • A crack at the surface, which could result in significant erosion or movement at the surface • A crack at the surface with potential risk to safety and/or fauna entrapment • A crack in the fire trail, which could result in significant erosion or impede vehicle access • Crack or fracture between 100 and 300mm width • Crack or fracture between 10 and 50m length • Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period	• *Actions as stated for Level 1* • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved *Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts*
AREA 3B **Cliffs** All mapped cliff sites in subsidence area *Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites*	***Level 3*** * • Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period	• *Actions as stated for Level 2* • Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required • Site visits with stakeholders if required

Table 2: Summary of Longwall 21 impacts and triggers. Highlighted rows indicate the latest impacts featured in this report.

Site ID	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
DA3C_LW21_001	Rock Fracturing	Outcrop	06/06/2023	1	Rock fracturing to a small rock outcrop west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_002	Rock Fracturing and Rock Movement	*LW21_RO1*	06/06/2023	2	Rock fracturing and rock movement to a small rock outcrop at Landscape Monitoring Site *LW21_RO1.*	9/06/2023
DA3C_LW21_003	Rock Fracturing and Rockfall	Outcrop and Step	06/06/2023	2	Rock fracturing and rockfall to an outcrop and a step west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_004	Rock Fracturing	Outcrop	06/06/2023	2	Rock fracturing on an outcrop west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_005	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracture on a rock outcrop northeast of *WC20.*	19/06/2023
DA3C_LW21_006	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracturing on a rock outcrop northeast of *WC20.*	19/06/2023
DA3C_LW21_007	Rock Fracturing and Rockfall	Outcrop	15/06/2023	2	Rock fracturing and rock fall on an outcrop northeast of *WC20.*	19/06/2023
DA3C_LW21_008	Rock Fracturing and Soil Cracking	Rock Step	19/06/2023	1	Rock fracturing/soil cracking to a rock step and bushland northeast of *WC20.*	20/06/2023
DA3C_LW21_009	Rock Fracturing	Rock Step	19/06/2023	1	Rock fracturing to a rock step west of *Fire Road 6F.*	20/06/2023
DA3C_LW21_010	Rock Fracturing and Rock Movement/ Displacement	Outcrop	19/06/2023	2	Rock fracturing and associated rock movement/displacement at an outcrop west of *Fire Road 6F.*	20/06/2023
DA3C_LW21_011	Rock Fracturing, Rock Displacement and Soil Cracking	Outcrop and Bushland	19/06/2023	1	Soil cracking, rock fracturing and associated rock displacement to an outcrop and bushland west of *Fire Road 6F.*	20/06/2023

CONSULTATION

Summary of consultation undertaken in relation to the subsidence impact report

The impact report was emailed to DPE, WaterNSW, BCD and the Resources Regulator on 20 June 2023 for review and feedback.

The Resources Regulator responded via email on 21 June 2023 and issued reference number MAAG0016245 indicating that an assessment officer would be in contact should further information be required. No further correspondence was received.

WaterNSW responded via email on 4 July 2023 with comments as detailed below. Evidence is provided in Attachment 1.

BCD responded via email with a letter dated 21 June 2023 requesting further information. Evidence is provided in Attachment 2.

Summary of the comments received during consultation

WaterNSW

WaterNSW responded to impact reports dated 20 and 28 June and 4 July noting the following new impacts over Longwall 21:

- Level 1 impacts – Rock fracturing/Soil Cracking/Rock Movement/Displacement – 7 impacts.
- Level 2 impacts – Rock fracturing and Rockfall to a maximum width of 0.20m – 1 impact.
- Level 3 impacts – Reduction in groundwater and average soil moisture in Swamp 144. The June 28 report states that “average soil moisture value recessed below the lowest level recorded before mining and has not recovered since. This is concerning.

WaterNSW also notes that no corrective actions are specified for exceeding level 3 impacts for Swamp 144 in 28 June impact report.

Biodiversity and Conservation Division (BCD)

BCD noted their previous request for data including:

- Swamps den 144, den 145, den 07, and den 09.
- Bores S1845 and S1892.

BCD also requested the following:

- Clarification on whether there are any hard rock piezometers above Longwall 21 or nearby to the north or east of LW21 to assess groundwater impacts to the regional Hawkesbury sandstone aquifers; and
- Monitoring data from the stream gauge on WC20, to the north-east and downstream of Swamp 144.

In an email dated 13/07/2023, BCD indicated that data for the S1892 hard rock piezometer only goes up to 7/8/2022 and requested data up to present time.

Summary of actions taken by Illawarra Metallurgical Coal in response to comments received during consultation

In response to comments and recommendations from WaterNSW and BCD, IMC have undertaken the following actions:

- IMC responded to WaterNSW via email on 13 July 2023 (refer to Attachment 1) indicating:
    - WaterNSW email response included impact report dated 19/6/2023 based on impacts referred to within the email. (Not relevant to this report)
    - Noted that no corrective actions are specified in impact reports dated 28/06/2023 and 4/07/2023 and relevant CMAs that would be included in Version 2 of these reports. (Not relevant to this report)
- WaterNSW acknowledged receipt of the email on 13 July 2023.

- IMC provided requested data detailed above to BCD on 30/6/2023. The data file entitled: ***BCD Response Impact Report 20062023.zip*** included the following files:
    - Flow Data_WC15_WC20_WongaCk.xlsx
- IMC clarified via email to BCD on 05/07/2023 that there is an additional sandstone hole over LW21 - S2545. The hole is awaiting survey of the collar.
- S1892 hard rock piezometer data was provided to BCD in data file entitled S1892_dend 99.xlsx on 13/7/2023.

IMC will implement the corrective management actions (CMAs) as detailed within this impact report.

Email correspondence is provided in the Attachments.

ATTACHMENT 1 – WaterNSW Email Correspondence

From: Girja Sharma
To: Zanotto, Linda
Cc: Ravi Sundaram; Maria Dubikova; Juri Jung; David N. Harris
Subject: RE: Dendrobium Mine - Subsidence Impact Report 04/07/2023
Date: Thursday, 13 July 2023 12:34:01 PM
Attachments: image001.png
image003.png

Thanks, Linda.

From: Zanotto, Linda <Linda.Zanotto@south32.net>
Sent: Thursday, July 13, 2023 8:11 AM
To: Girja Sharma <Girja.Sharma@waternsw.com.au>
Cc: Ravi Sundaram <ravi.sundaram@waternsw.com.au>; Maria Dubikova <Maria.Dubikova@waternsw.com.au>; Juri Jung <Juri.Jung@waternsw.com.au>; David N. Harris <David.N.Harris@waternsw.com.au>
Subject: [EXTERNAL] RE: Dendrobium Mine - Subsidence Impact Report 04/07/2023

Hi Girja,

Thanks for your feedback in regards to the latest impact reports in relation to Longwall 21. I believe your response also includes impacts discussed in impact report dated 19/06/2023, refer to screenshot from impact report dated 4/7/2023:

DA3C_LW21_005	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracture on a rock outcrop northeast of *WC20*.	19/06/2023
DA3C_LW21_006	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracturing on a rock outcrop northeast of *WC20*.	19/06/2023
DA3C_LW21_007	Rock Fracturing and Rockfall	Outcrop	15/06/2023	2	Rock fracturing and rock fall on an outcrop northeast of *WC20*.	19/06/2023
DA3C_LW21_008	Rock Fracturing and Soil Cracking	Rock Step	19/06/2023	1	Rock fracturing/soil cracking to a rock step and bushland northeast of *WC20*.	20/06/2023
DA3C_LW21_009	Rock Fracturing	Rock Step	19/06/2023	1	Rock fracturing to a rock step west of *Fire Road 6F*.	20/06/2023
DA3C_LW21_010	Rock Fracturing and Rock Movement/ Displacement	Outcrop	19/06/2023	2	Rock fracturing and associated rock movement/displacement at an outcrop west of *Fire Road 6F*.	20/06/2023
DA3C_LW21_011	Rock Fracturing, Rock Displacement and Soil Cracking	Outcrop and Bushland	19/06/2023	1	Soil cracking, rock fracturing and associated rock displacement to an outcrop and bushland west of *Fire Road 6F*.	20/06/2023
144_01	Groundwater	Swamp 144	22/06/2023	3	Groundwater recession rate greater than baseline	28/06/2023
S144_01	Soil Moisture	Swamp 144	27/06/2023	3	Average soil moisture level below the baseline level	28/06/2023
DA3C_LW21_012	Rock Fracturing	Rock Step	27/06/2023	1	Rock fracturing to rock step west of Fire Road 6F.	28/06/2023
DA3C_LW21_013	Rock Fracturing	Outcrop	03/07/2023	1	Rock fracturing to rock outcrop west of Fire Road 6F.	04/07/2023

It is noted that no corrective actions are specified in impact reports dated 28/06/2023 and 4/07/2023. The following corrective management actions (CMAs) will be included in version 2 of these reports in relation to the rock fracturing impacts:

Corrective Management Actions (CMAs)

- Continue Monitoring Program
- Submit an Impact Report to key stakeholders
- Summarise impacts and report in the End of Panel and the Annual Review
- Review monitoring frequency
- Notify relevant technical specialists and seek advice on any Corrective Management Actions (CMAs) required
- Provide safety signage and barricades as appropriate
- Implement approved repairs to ensure safety and serviceability on fire trails
- Implement agreed CMAs as approved

A follow-up inspection of the impact sites will be undertaken following completion of Longwall 21.

Regarding CMAs for level 3 impacts in swamp 144, monitoring will continue and analysis of data by relevant technical experts will be provided in the End of Panel report. In addition, we seek your advice in regards to any corrective management actions required.

Kind Regards,

Linda Zanotto
Principal Mining Approvals
Illawarra Metallurgical Coal

M: +61 409 399 560
E: Linda.Zanotto@South32.net

south32.net

SOUTH32

From: Girja Sharma <Girja.Sharma@waternsw.com.au>
Sent: Tuesday, 4 July 2023 4:47 PM
To: Zanotto, Linda <Linda.Zanotto@south32.net>
Cc: Ravi Sundaram <ravi.sundaram@waternsw.com.au>; Maria Dubikova <Maria.Dubikova@waternsw.com.au>; Juri Jung <Juri.Jung@waternsw.com.au>; David N. Harris <David.N.Harris@waternsw.com.au>
Subject: RE: Dendrobium Mine - Subsidence Impact Report 04/07/2023

Hi Linda,

WaterNSW has reviewed Dendrobium Mine – LW21 Subsidence Impact Reports dated 20 and 28 June and 4 July 2023.

WaterNSW has noted the following new impacts over longwall 21:

- Level 1 impacts - Rock fracturing/Soil Cracking/Rock Movement/Displacement – 7 impacts
- Level 2 impacts - Rock Fracturing and Rockfall to a maximum width of 0.20m – 1 impact
- Level 3 impacts - Reduction in groundwater and average soil moisture levels in Swamp 144. The 28 June report states that "average soil moisture value recessed below the lowest level recorded before mining and has not recovered since". This is concerning.

WaterNSW also notes that no corrective actions are specified for exceeding level 3 impacts for swamp 144 in 28 June impact report.

Regards

Girja

Dr Girja Sharma (She/Her)
Catchment Assessments Manager
For noting: *I am working on Tuesday, Wednesday and Part Thursday.*
I am also working remotely. Please reach me via email or 0417099432

WaterNSW

Level 14, 169 Macquarie Street, Parramatta NSW 2150
PO Box 398, Parramatta NSW 2124
T: 02 9865 2501 **M:** 0417 099 432
girja.sharma@waternsw.com.au
www.waternsw.com.au

From: Zanotto, Linda <Linda.Zanotto@south32.net>
Sent: Tuesday, July 4, 2023 7:54 AM
To: Ravi Sundaram <ravi.sundaram@waternsw.com.au>; Maria Dubikova <Maria.Dubikova@waternsw.com.au>; Glen Capararo <Glen.Capararo@waternsw.com.au>; Resources Regulator <nswresourcesregulator@service-now.com>; Chris Page <Chris.Page@environment.nsw.gov.au>; Camilla Edmunds <Camilla.Edmunds@waternsw.com.au>; Environmental Assessments <Environmental.Assessments@waternsw.com.au>; rog.illawarra@environment.nsw.gov.au; gabrielle.allan@dpie.nsw.gov.au
Cc: Brassington, Gary <Gary.M.Brassington@south32.net>; Carlon, Josh <Josh.Carlon@south32.net>; Crehan, Amanda <Amanda.Crehan@south32.net>; Schultz, Chris <Chris.Schultz1@south32.net>; Leone, Antony <Antony.Leone@south32.net>; Walsh, Richard <Richard.V.Walsh@south32.net>; Mapstone, Rod <Rod.Mapstone1@south32.net>; Parkinson, Jack (Agurba) <Jack.Parkinson@south32.net>
Subject: [EXTERNAL] Dendrobium Mine - Subsidence Impact Report 04/07/2023

Hi All,

Please find attached the latest subsidence impact report (dated 04/07/2023) for Dendrobium Mine regarding recent subsidence impact observations in Area 3C.

The report will be updated following receipt of your feedback and the final report uploaded to the Major Projects Planning Portal.

Kind Regards,

Linda Zanotto
Principal Mining Approvals
Illawarra Metallurgical Coal

M: +61 409 399 560
E: Linda.Zanotto@South32.net

south32.net

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ATTACHMENT 2 – BCD – Email Correspondence

Department of Planning and Environment

Our ref: DOC23/541598

Ms Linda Zanotto
Illawarra Metallurgical Coal

By email: Linda.Zanotto@South32.net

Re: Dendrobium Area 3C – Impact report – 20th June 2023

Dear Linda

I refer to the Dendrobium 3C Impact Report for 19th June 2023. This Report detailed the following impacts:

- DA3C_LW21_008 (E 291540, N 6194108); Level 1 TARP
- DA3C_LW21_009 (E 291728, N 6194052); Level 1 TARP
- DA3C_LW21_010 (E 291772, N 6194167); Level 2 TARP
- DA3C_LW21_011 (E 291767, N 6194198); Level 1 TARP

We note our previous request for further data including:

- Swamps den144, den145, den07, and den09
- Bores S1845 and S1892.

We requested that you provide clarification on whether there are any hard rock piezometers above longwall 21 or nearby to the north or east of LW 21 to assess groundwater impacts to the regional Hawkesbury sandstone aquifers.

We also request monitoring data from the stream gauge on WC20, to the north-east and downstream of swamp 144 (approximate location, E 291483, N 6193999).

If you wish to discuss, please contact Vanessa Allen, Senior Conservation Planning Officer, on 0242244186 or at Vanessa.Allen@environment.nsw.gov.au.

Yours sincerely

Vanessa Allen date: 21/6/2023

Senior Conservation Planning Officer (Planning Illawarra)
Biodiversity and Conservation Division

From: South32 Notification Service
To: Zanotto, Linda
Subject: Upload into Folder "BCD" Confirmed
Date: Friday, 30 June 2023 8:34:10 AM
Attachments: ATT00001.png

File Upload Confirmation

Your file has been saved into the "/ Illawarra Coal - Energy and Engineering / BCD" folder and the appropriate people have been notified.

Name: BCD Response Impact Report 20062023.zip
Tracking ID: 970881702
Original Size: 375,311 bytes

For non-repudiation purposes, it has been confirmed that the file received by MOVEit Transfer is IDENTICAL to the file you uploaded.

Please use the following URL and your username/password to view the current status of this file, including its full upload and download history.

(https://south32.moveitcloud.com/human.aspx?OrgID=9904&Arg12=fileview&Arg07=970881702&Arg06=957756355)

Regards,
South32 Notification Service

From: South32 Notification Service
To: Zanotto, Linda
Subject: Delivery Receipt for "S1892_dend 99.xlsx"
Date: Thursday, 13 July 2023 4:09:42 PM
Attachments: ATT00001.png

File Delivery Receipt

It was confirmed that Vanessa Allen DOWNLOADED "S1892_dend 99.xlsx" from the "/ Illawarra Coal - Energy and Engineering / BCD" folder. (Download recorded at 7/13/2023 6:09:33 AM.)

For non-repudiation purposes, it cannot be confirmed that Vanessa Allen received a file identical to the one you uploaded because the client used to download this file (Microsoft Edge 114.0.1823.79) either does not support integrity checking, or doesn't have its integrity checking option enabled. Please use a Progress file transfer product that supports integrity checking and enable the integrity checking option in future transfers if delivery with non-repudiation is important.

You are receiving this email because our records show you uploaded "S1892_dend 99.xlsx" into the "/ Illawarra Coal - Energy and Engineering / BCD" folder with tracking ID #974425639 at , and delivery receipts have been enabled for this folder.

Please use the following URL and your username/password to view the complete history of this file:

(https://south32.moveitcloud.com/human.aspx?OrgID=9904&Arg12=fileview&Arg06=957756355&Arg07=974425639)

Regards,
South32 Notification Service

From:	Vanessa Allen
To:	Zanotto, Linda
Subject:	RE: Hardrock data for Dendrobium S1892
Date:	Thursday, 13 July 2023 4:07:42 PM
Attachments:	image004.png

Thanks Linda

From: Zanotto, Linda <Linda.Zanotto@south32.net>
Sent: Thursday, 13 July 2023 4:05 PM
To: Vanessa Allen <Vanessa.Allen@environment.nsw.gov.au>
Subject: RE: Hardrock data for Dendrobium S1892

Hi Vanessa,

Data uploaded to MoveitCloud folder:
S1892_dend 99.xlsx

Kind Regards,
Linda

Linda Zanotto
Principal Mining Approvals
Illawarra Metallurgical Coal

M: +61 409 399 560
E: Linda.Zanotto@South32.net

south32.net

SOUTH32

From: Vanessa Allen <Vanessa.Allen@environment.nsw.gov.au>
Sent: Thursday, 13 July 2023 1:53 PM
To: Zanotto, Linda <Linda.Zanotto@south32.net>
Subject: Hardrock data for Dendrobium S1892

Hi Linda
We have started looking at the data you sent through last week and we noticed that data for the S1892 hard rock piezometer only goes up to 7/5/2022. Could you please provide data up to the present time?

Thanks, Vanessa

Vanessa Allen
Senior Conservation Planning Officer

Biodiversity and Conservation Division | Department of Planning and Environment
T 02 42244186 | **E** Vanessa.Allen@environment.nsw.gov.au

Level 1, 84 Crown street, Wollongong NSW 2500
PO Box 514, Wollongong NSW 2520
www.dpie.nsw.gov.au

-

Office is located on Dharawal Country

The Department of Planning 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.

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Any views expressed in this email are those of the individual sender except where the sender expressly and with authority states them to be the views of the NSW Office of Environment, Energy and Science.

PLEASE CONSIDER THE ENVIRONMENT BEFORE PRINTING THIS EMAIL

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining, weekly during mining and again monthly during post-mining period. Monitoring is conducted in accordance with the approved Longwall 21 Subsidence Management Plan (SMP). Extraction of Longwall 21 started on 25 April 2023 and as of 28 June 2023 had progressed approximately 615m. Recent analysis of groundwater data in Swamp 144 identified a shallow groundwater trigger in piezometer *144_01* and in soil moisture probe S*144_01*. During the latest inspection a new subsidence impact was also identified.

This Version 2 of the report includes a summary of consultation with stakeholders undertaken since the initial report.

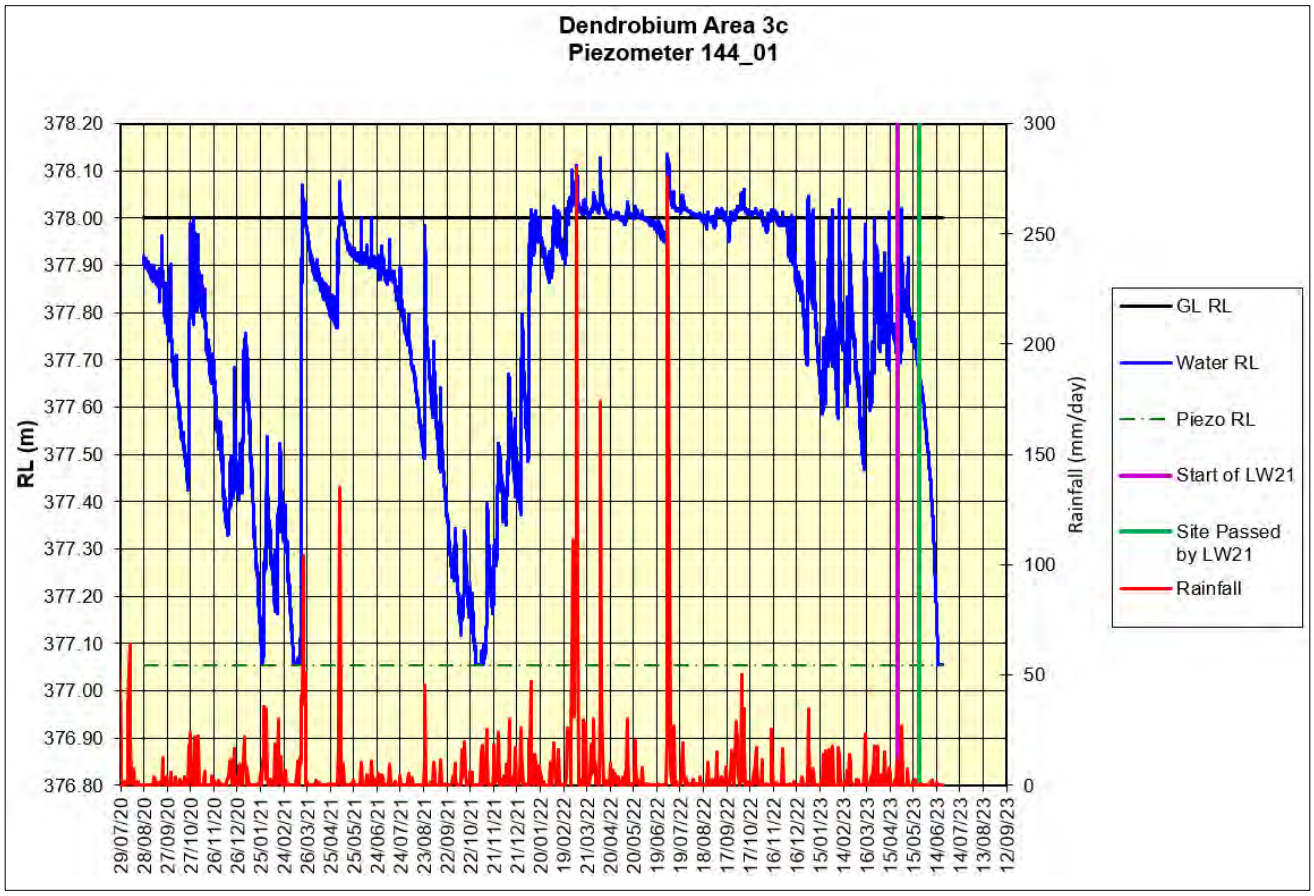
Swamp 144

A near-surface groundwater trigger was recorded in Swamp 144 (piezometer *144_01* and soil moisture probe S*144_01)* during recent analysis of groundwater data for the swamp. The site 144_01 is located 277m to the south-west of the start of Longwall 21 (Figure 1), i.e. within the Longwall 21 mining area (400 m buffer zone) since the start of mining. The site was passed by Longwall 21 on 22 May 2023 at a distance of 120 m and as of the time of this report still remains within the buffer. The post mining rate of water level recession (34.96 mm/day calculated between 3/06/23 13:00 and 16/06/23 6:00) has exceeded the rate recorded at the same depth interval before mining (29.79 mm/day calculated between 12/01/21 12:00 and 27/01/21 11:00). Similarly, on 21 June 2023 the average soil moisture value recessed below the lowest level recorded before mining and has not recovered since (Graph 1 and 2). These results contribute to a Level 3 trigger according to the Dendrobium Swamps TARP (Table 1), specifically:

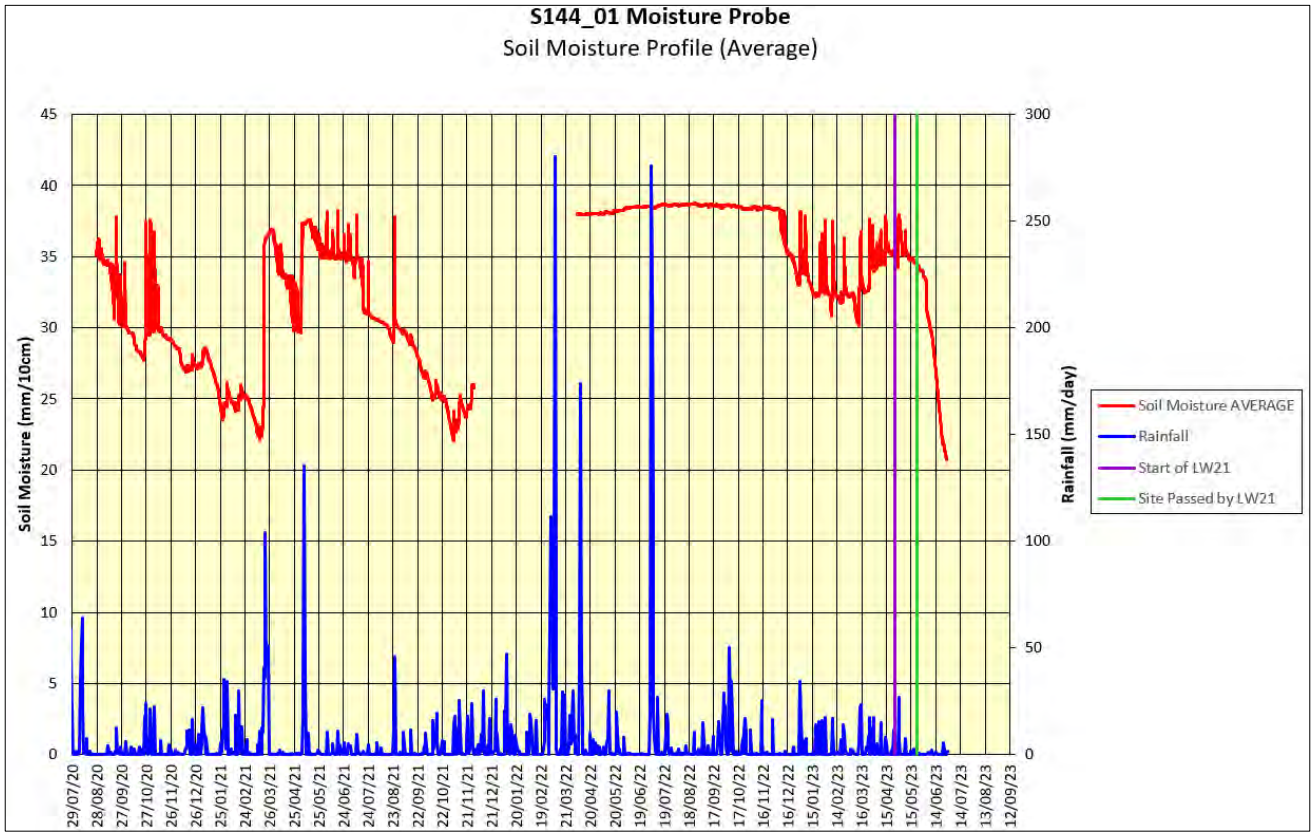
> **Level 3:** Groundwater level lower than baseline level at >80% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps); and/or rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at >80% of monitoring sites (within 400 m of mining) within the swamp; and
>
> **Level 3:** Soil moisture level lower than baseline level at >80% of monitoring sites (within 400 m of mining) within a swamp (in comparison to reference swamps[#]).

[#] Comparison with reference swamps is undertaken as part of details End of Panel assessment.

It should be noted that there is only one shallow borehole/piezometer and one soil moisture probe in Swamp 144, therefore only a Level 3 trigger can apply.



Graph 1: Near-surface groundwater levels at 144_01, logged hourly, date range: 28/08/2020 to 27/06/2023



Graph 2: Average soil moisture levels at S144_01, logged hourly, date range: 28/08/2020 to 27/06/2023

DA3C_LW21_012 (E 291605, N 6194206)

DA3C_LW21_012 is located approximately 240m west of Fire Road 6F (Figure 1). The impact consists of a rock fracture at a small rock step which disappears upslope into bushland (Photo 1 to Photo 3). The impact has a maximum continuous length of 2.65m, a maximum width of 0.01m and a maximum measurable depth of 0.30m.

DA3C_LW21_012 is a Level 1 trigger as per the Dendrobium Landscape TARP (Table 2), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length;

Photo 1: *DA3C_LW21_012*, section of the rock fracture. Taken on 27/06/2023.

Photo 2: *DA3C_LW21_012*, maximum width of the rock fracture. Taken on 27/06/2023.

Photo 3: *DA3C_LW21_012*, overview of the rock fracture. Taken on 27/06/2023.

Corrective Management Actions (CMAs)

- Continue Monitoring Program

- Submit an Impact Report to key stakeholders
- Analysis of Swamp 144 data by relevant technical experts and results provided in End of Panel Report
- Summarise impacts and report in the End of Panel and the Annual Review
- Review monitoring frequency
- Notify relevant technical specialists and seek advice on any Corrective Management Actions (CMAs) required
- Provide safety signage and barricades as appropriate
- Implement approved repairs to ensure safety and serviceability on fire trails
- Implement agreed CMAs as approved

A follow-up inspection of the impact sites will be undertaken following completion of Longwall 21. A list of impacts and triggers recorded during Longwall 21 is presented in Table 3.

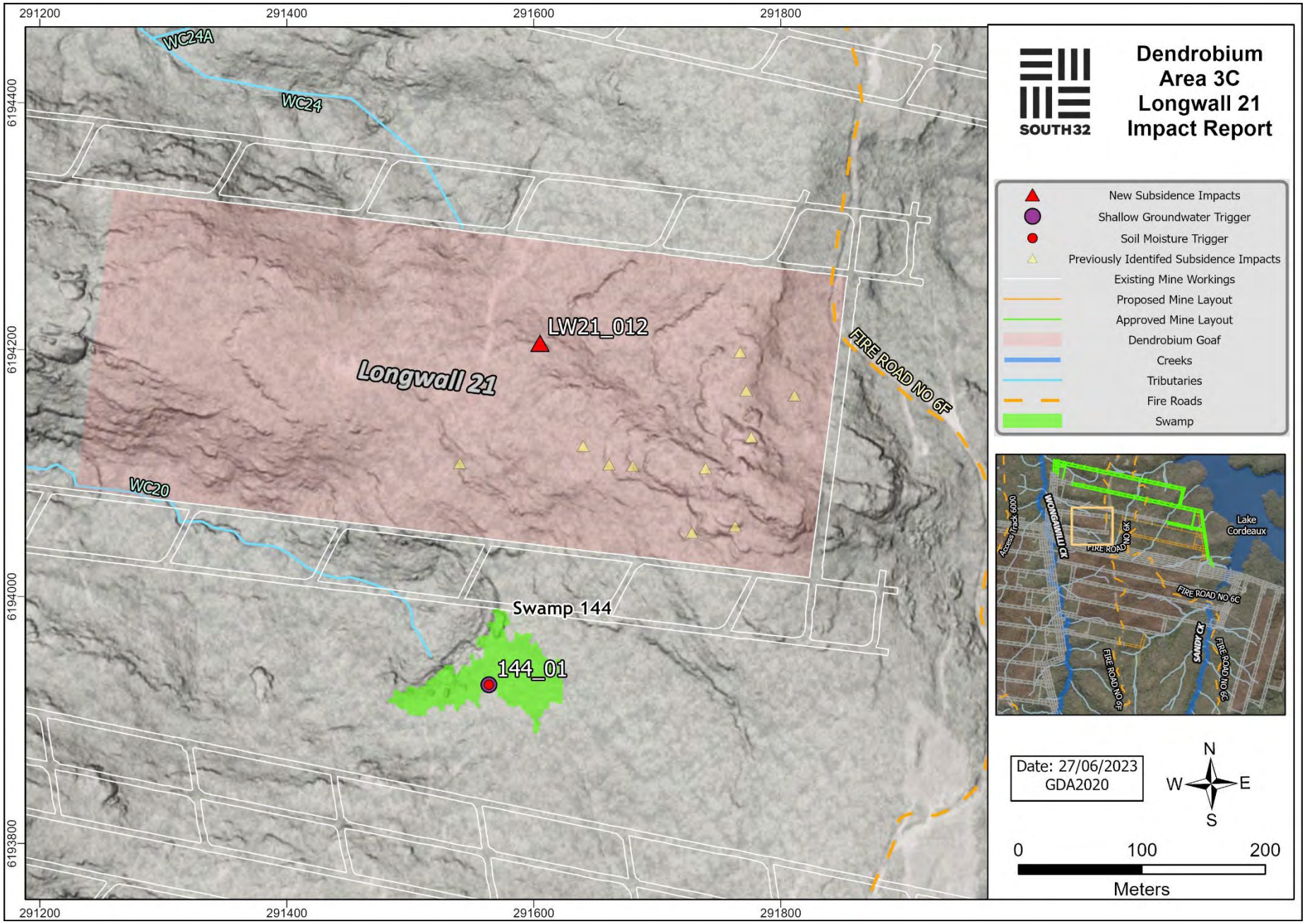


Figure 1: Map Showing latest subsidence impacts. Inset shows frame in relation to DA3A and DA3B mining operations.

Table 1: Extract from Swamp Impact, Monitoring, Management and Contingency Plan.

Performance Measures	*Potential Impacts*	*Performance Triggers*	*Management Strategies*	*Offsets*	*Other Actions*
Minor changes in the ecosystem functionality of the swamps	Falls in surface or near-surface groundwater levels in swamps *NB. Not linked specifically to a PM and would not be considered a breach if predictions were exceeded.*	*Level 1:* Groundwater level lower than baseline level at any monitoring site within a swamp (in comparison to reference swamps); and/or Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at any monitoring site (measured as average mm/day during the recession curve). *Level 2:* Groundwater level lower than baseline level at **50%** of monitoring sites (within 400 m of mining) within a swamp (in comparison to reference swamps); and/or Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at a **50%** of monitoring sites (within 400m of mining) within the swamp. *Level 3:* Groundwater level lower than baseline level at **>80%** of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps); and/or Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at **>80%** of monitoring sites (within 400 m of mining) within the swamp.	a) upfront mine planning b) groundwater monitoring c) implementation of swamp research program d) weeding e) fire management f) reporting g) update future predictions		Triggers for groundwater decline result in increased intensity and frequency of vegetation monitoring and/or further investigations of subsidence impacts on bedrock base and rockbars
Minor changes in the ecosystem functionality of the swamps	Falls in soil moisture levels in swamps *NB. Not linked specifically to a PM and would not be considered a breach if predictions were exceeded.*	*Level 1:* Soil moisture level lower than baseline level at **any** monitoring sites (within 400 m of mining) within a swamp (in comparison to reference swamps). *Level 2:* Soil moisture level lower than baseline level at **50%** of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps). *Level 3:* Soil moisture level lower than baseline level at **>80%** of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps).	a) upfront mine planning b) soil moisture monitoring c) water spreading d) weeding e) fire management f) reporting g) update future predictions		Triggers of soil moisture decline result in increased intensity and frequency of vegetation monitoring and/or further investigations of subsidence impacts on bedrock base and rockbars

Table 2: Extract from Dendrobium Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
AREA 2 **Cliffs** A2-CL1 (above LW4) **Steep Slopes** A2-SL1 and A2-SL2 (above LWs 4 & 5) **Watercourses** A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5) **Swamp** A2-SW1 (above LWs 4 & 5) **4WD Track** A2-FT1 (above LWs 4 & 5) **Crinanite Surface Extent** A2-CN1 & A2-CN2 (above LWs 3 & 4) **AREA 3A** **Cliffs** All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites) **Steep Slopes** All mapped steep slopes in subsidence area *Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites* **Watercourses/ Swamps** All mapped watercourse and swamps in subsidence area *Refer to Dendrobium Area 3A SMP Figure 19.3* **Fire Trails** All mapped fire trails in subsidence area *Refer to Dendrobium Area 3A SMP Figure 19.3* **AREA 3B** **Cliffs** All mapped cliff sites in subsidence area *Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites*	***Level 1*** * • Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance • Surface movement or rock displacement with negligible soil surface exposed • Crack at the surface, which should not result in any significant erosion or further ground movement • Crack in a fire trail which should not result in erosion or impede access • Crack or fracture up to 100mm width • Crack or fracture up to 10m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring	• Continue monitoring program • Report impacts to key stakeholders • Summarise impacts and Report in the End of Panel Report and AEMR
	Level 2 * • Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance • Surface movement or rock displacement that has exposed significant areas of soil • A crack at the surface, which could result in significant erosion or movement at the surface • A crack at the surface with potential risk to safety and/or fauna entrapment • A crack in the fire trail, which could result in significant erosion or impede vehicle access • Crack or fracture between 100 and 300mm width • Crack or fracture between 10 and 50m length • Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period	• *Actions as stated for Level 1* • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved *Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts*
	Level 3 * • Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period	• *Actions as stated for Level 2* • Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required • Site visits with stakeholders if required

Table 3: Summary of Longwall 21 impacts and triggers. Highlighted rows indicate observations featured in this report.

Site ID	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
DA3C_LW21_001	Rock Fracturing	Outcrop	06/06/2023	1	Rock fracturing to a small rock outcrop west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_002	Rock Fracturing and Rock Movement	*LW21_RO1*	06/06/2023	2	Rock fracturing and rock movement to a small rock outcrop at Landscape Monitoring Site *LW21_RO1.*	9/06/2023
DA3C_LW21_003	Rock Fracturing and Rockfall	Outcrop and Step	06/06/2023	2	Rock fracturing and rockfall to an outcrop and a step west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_004	Rock Fracturing	Outcrop	06/06/2023	2	Rock fracturing on an outcrop west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_005	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracture on a rock outcrop northeast of *WC20.*	19/06/2023
DA3C_LW21_006	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracturing on a rock outcrop northeast of *WC20.*	19/06/2023
DA3C_LW21_007	Rock Fracturing and Rockfall	Outcrop	15/06/2023	2	Rock fracturing and rock fall on an outcrop northeast of *WC20.*	19/06/2023
DA3C_LW21_008	Rock Fracturing and Soil Cracking	Rock Step	19/06/2023	1	Rock fracturing/soil cracking to a rock step and bushland northeast of *WC20.*	20/06/2023
DA3C_LW21_009	Rock Fracturing	Rock Step	19/06/2023	1	Rock fracturing to a rock step west of *Fire Road 6F.*	20/06/2023
DA3C_LW21_010	Rock Fracturing and Rock Movement/ Displacement	Outcrop	19/06/2023	2	Rock fracturing and associated rock movement/displacement at an outcrop west of *Fire Road 6F.*	20/06/2023
DA3C_LW21_011	Rock Fracturing, Rock Displacement and Soil Cracking	Outcrop and Bushland	19/06/2023	1	Soil cracking, rock fracturing and associated rock displacement to an outcrop and bushland west of *Fire Road 6F.*	20/06/2023
144_01	Groundwater	Swamp 144	22/06/2023	3	Groundwater recession rate greater than baseline	28/06/2023
S144_01	Soil Moisture	Swamp 144	27/06/2023	3	Average soil moisture level below the baseline level	28/06/2023
DA3C_LW21_012	Rock Fracturing	Rock Step	27/06/2023	1	Rock fracturing to rock step west of Fire Road 6F.	28/06/2023

CONSULTATION

Summary of consultation undertaken in relation to the subsidence impact report

The impact report was emailed to DPE, WaterNSW, BCD and the Resources Regulator on 29 June 2023 for review and feedback.

The Resources Regulator responded via email on 30 June 2023 and issued reference number MAAG0016287 indicating that an assessment officer would be in contact should further information be required. No further correspondence was received.

WaterNSW responded via email on 4 July 2023 with comments as detailed below. Evidence is provided in Attachment 1.

BCD responded via email with a letter dated 11 July 2023 requesting further information. Evidence is provided in Attachment 2.

Summary of the comments received during consultation

WaterNSW

WaterNSW responded to impact reports dated 20 and 28 June and 4 July noting the following new impacts over Longwall 21:

- Level 1 impacts – Rock fracturing/Soil Cracking/Rock Movement/Displacement – 7 impacts.
- Level 2 impacts – Rock fracturing and Rockfall to a maximum width of 0.20m – 1 impact.
- Level 3 impacts – Reduction in groundwater and average soil moisture in Swamp 144. The June 28 report states that “average soil moisture value recessed below the lowest level recorded before mining and has not recovered since. This is concerning.

WaterNSW also notes that no corrective actions are specified for exceeding level 3 impacts for Swamp 144 in 28 June impact report.

Biodiversity and Conservation Division (BCD)

BCD noted their previous request for data including:

- Swamps den 144, den 145, den 07, and den 09.
- Bores S1845 and S1892.

BCD also requested that IMC continue to provide ongoing data for these sites on a three-monthly basis indicated current data received is up until May/June 2023.

Summary of actions taken by Illawarra Metallurgical Coal in response to comments received during consultation

In response to comments and recommendations from WaterNSW and BCD, IMC have undertaken the following actions:

- IMC responded to WaterNSW via email on 13 July 2023 (refer to Attachment 1) indicating:
    - WaterNSW email response included impact report dated 19/6/2023 based on impacts referred to within the email. (Not relevant to this report)
    - Noted that no corrective actions are specified in impact reports dated 28/06/2023 and 4/07/2023 and relevant CMAs that would be included in Version 2 of these reports.
- WaterNSW acknowledged receipt of the email on 13 July 2023.

- IMC confirmed via email to BCD on 18/07/2023 that requested data will continue to be provided on a three-monthly basis and noted the next set of data will be provided in September 2023.

IMC will implement the corrective management actions (CMAs) as detailed within this impact report.

Email correspondence is provided in the Attachments.

ATTACHMENT 1 – WaterNSW Email Correspondence

From: Girja Sharma
To: Zanotto, Linda
Cc: Ravi Sundaram; Maria Dubikova; Juri Jung; David N. Harris
Subject: RE: Dendrobium Mine - Subsidence Impact Report 04/07/2023
Date: Thursday, 13 July 2023 12:34:01 PM
Attachments: image001.png
image003.png

Thanks, Linda.

From: Zanotto, Linda <Linda.Zanotto@south32.net>
Sent: Thursday, July 13, 2023 8:11 AM
To: Girja Sharma <Girja.Sharma@waternsw.com.au>
Cc: Ravi Sundaram <ravi.sundaram@waternsw.com.au>; Maria Dubikova <Maria.Dubikova@waternsw.com.au>; Juri Jung <Juri.Jung@waternsw.com.au>; David N. Harris <David.N.Harris@waternsw.com.au>
Subject: [EXTERNAL] RE: Dendrobium Mine - Subsidence Impact Report 04/07/2023

Hi Girja,

Thanks for your feedback in regards to the latest impact reports in relation to Longwall 21. I believe your response also includes impacts discussed in impact report dated 19/06/2023, refer to screenshot from impact report dated 4/7/2023:

DA3C_LW21_005	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracture on a rock outcrop northeast of *WC20*.	19/06/2023
DA3C_LW21_006	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracturing on a rock outcrop northeast of *WC20*.	19/06/2023
DA3C_LW21_007	Rock Fracturing and Rockfall	Outcrop	15/06/2023	2	Rock fracturing and rock fall on an outcrop northeast of *WC20*.	19/06/2023
DA3C_LW21_008	Rock Fracturing and Soil Cracking	Rock Step	19/06/2023	1	Rock fracturing/soil cracking to a rock step and bushland northeast of *WC20*.	20/06/2023
DA3C_LW21_009	Rock Fracturing	Rock Step	19/06/2023	1	Rock fracturing to a rock step west of *Fire Road 6F*.	20/06/2023
DA3C_LW21_010	Rock Fracturing and Rock Movement/ Displacement	Outcrop	19/06/2023	2	Rock fracturing and associated rock movement/displacement at an outcrop west of *Fire Road 6F*.	20/06/2023
DA3C_LW21_011	Rock Fracturing, Rock Displacement and Soil Cracking	Outcrop and Bushland	19/06/2023	1	Soil cracking, rock fracturing and associated rock displacement to an outcrop and bushland west of *Fire Road 6F*.	20/06/2023
144_01	Groundwater	Swamp 144	22/06/2023	3	Groundwater recession rate greater than baseline	28/06/2023
S144_01	Soil Moisture	Swamp 144	27/06/2023	3	Average soil moisture level below the baseline level	28/06/2023
DA3C_LW21_012	Rock Fracturing	Rock Step	27/06/2023	1	Rock fracturing to rock step west of Fire Road 6F.	28/06/2023
DA3C_LW21_013	Rock Fracturing	Outcrop	03/07/2023	1	Rock fracturing to rock outcrop west of Fire Road 6F.	04/07/2023

It is noted that no corrective actions are specified in impact reports dated 28/06/2023 and 4/07/2023. The following corrective management actions (CMAs) will be included in version 2 of these reports in relation to the rock fracturing impacts:

Corrective Management Actions (CMAs)

- Continue Monitoring Program
- Submit an Impact Report to key stakeholders
- Summarise impacts and report in the End of Panel and the Annual Review
- Review monitoring frequency
- Notify relevant technical specialists and seek advice on any Corrective Management Actions (CMAs) required
- Provide safety signage and barricades as appropriate
- Implement approved repairs to ensure safety and serviceability on fire trails
- Implement agreed CMAs as approved

A follow-up inspection of the impact sites will be undertaken following completion of Longwall 21.

Regarding CMAs for level 3 impacts in swamp 144, monitoring will continue and analysis of data by relevant technical experts will be provided in the End of Panel report. In addition, we seek your advice in regards to any corrective management actions required.

Kind Regards,

Linda Zanotto
Principal Mining Approvals
Illawarra Metallurgical Coal

M: +61 409 399 560
E: Linda.Zanotto@South32.net

south32.net

SOUTH32

From: Girja Sharma <Girja.Sharma@waternsw.com.au>
Sent: Tuesday, 4 July 2023 4:47 PM
To: Zanotto, Linda <Linda.Zanotto@south32.net>
Cc: Ravi Sundaram <ravi.sundaram@waternsw.com.au>; Maria Dubikova <Maria.Dubikova@waternsw.com.au>; Juri Jung <Juri.Jung@waternsw.com.au>; David N. Harris <David.N.Harris@waternsw.com.au>
Subject: RE: Dendrobium Mine - Subsidence Impact Report 04/07/2023

Hi Linda,

WaterNSW has reviewed Dendrobium Mine – LW21 Subsidence Impact Reports dated 20 and 28 June and 4 July 2023.

WaterNSW has noted the following new impacts over longwall 21:

- Level 1 impacts - Rock fracturing/Soil Cracking/Rock Movement/Displacement – 7 impacts
- Level 2 impacts - Rock Fracturing and Rockfall to a maximum width of 0.20m – 1 impact
- Level 3 impacts - Reduction in groundwater and average soil moisture levels in Swamp 144. The 28 June report states that "average soil moisture value recessed below the lowest level recorded before mining and has not recovered since". This is concerning.

WaterNSW also notes that no corrective actions are specified for exceeding level 3 impacts for swamp 144 in 28 June impact report.

Regards

Girja

Dr Girja Sharma (She/Her)
Catchment Assessments Manager
For noting: *I am working on Tuesday, Wednesday and Part Thursday.*
I am also working remotely. Please reach me via email or 0417099432

WaterNSW

Level 14, 169 Macquarie Street, Parramatta NSW 2150
PO Box 398, Parramatta NSW 2124
T: 02 9865 2501 **M:** 0417 099 432
girja.sharma@waternsw.com.au
www.waternsw.com.au

From: Zanotto, Linda <Linda.Zanotto@south32.net>
Sent: Tuesday, July 4, 2023 7:54 AM
To: Ravi Sundaram <ravi.sundaram@waternsw.com.au>; Maria Dubikova <Maria.Dubikova@waternsw.com.au>; Glen Capararo <Glen.Capararo@waternsw.com.au>; Resources Regulator <nswresourcesregulator@service-now.com>; Chris Page <Chris.Page@environment.nsw.gov.au>; Camilla Edmunds <Camilla.Edmunds@waternsw.com.au>; Environmental Assessments <Environmental.Assessments@waternsw.com.au>; rog.illawarra@environment.nsw.gov.au; gabrielle.allan@dpie.nsw.gov.au
Cc: Brassington, Gary <Gary.M.Brassington@south32.net>; Carlon, Josh <Josh.Carlon@south32.net>; Crehan, Amanda <Amanda.Crehan@south32.net>; Schultz, Chris <Chris.Schultz1@south32.net>; Leone, Antony <Antony.Leone@south32.net>; Walsh, Richard <Richard.V.Walsh@south32.net>; Mapstone, Rod <Rod.Mapstone1@south32.net>; Parkinson, Jack (Agurba) <Jack.Parkinson@south32.net>
Subject: [EXTERNAL] Dendrobium Mine - Subsidence Impact Report 04/07/2023

Hi All,

Please find attached the latest subsidence impact report (dated 04/07/2023) for Dendrobium Mine regarding recent subsidence impact observations in Area 3C.

The report will be updated following receipt of your feedback and the final report uploaded to the Major Projects Planning Portal.

Kind Regards,

Linda Zanotto
Principal Mining Approvals
Illawarra Metallurgical Coal

M: +61 409 399 560
E: Linda.Zanotto@South32.net

south32.net

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.

ATTACHMENT 2 – BCD – Email Correspondence

Our ref: DOC23/616149

Ms Linda Zanotto
Illawarra Metallurgical Coal

By email: Linda.Zanotto@South32.net

Re: Dendrobium Area 3C – Impact report – 28th June 2023

Dear Linda

I refer to the Dendrobium 3C Impact Report for 28th June 2023. This Report detailed the following impacts:

- 144_01 Groundwater; Level 3 TARP
- S144_01 Soil Moisture; Level 3 TARP
- DA3C_LW21_012 Rock fracturing (E 291605, N 6194206); Level 1 TARP

We previously requested the following data which you recently provided including:

- Swamps den144, den145, den07, and den09
- Bores S1845 and S1892.

Given the impacts to Swamp 144 as described in this Report, we request that you continue to provide ongoing data for these sites on a three-monthly basis. We currently have data up until May/June 2023. We will provide further advice/requirements once this data has been analysed and outcomes confirmed.

If you wish to discuss, please contact Vanessa Allen, Senior Conservation Planning Officer, on 0242244186 or at Vanessa.Allen@environment.nsw.gov.au.

Yours sincerely

Vanessa Allen date: 11/7/2023

Senior Conservation Planning Officer (Planning Illawarra)
Biodiversity and Conservation Division

cc. Jessie Evans, Director, Energy and Resource Assessment Underground, DPE Planning

From:	Zanotto, Linda
To:	"Vanessa Allen"
Subject:	RE: Dendrobium Area 3C Impact report 28th June 2023
Date:	Tuesday, 18 July 2023 11:03:00 AM
Attachments:	BCD Response - Dendrobium Area 3C - 28th June 2023.pdf image004.png

Hi Vanessa,

Just confirming that IMC will continue to provide ongoing data for the sites as requested in your letter dated 11/7/2023 (attached) on a three-monthly basis. I note that the next set of data will be provided in September 2023.

Kind Regards,
Linda

Linda Zanotto
Principal Mining Approvals
Illawarra Metallurgical Coal

M: +61 409 399 560
E: Linda.Zanotto@South32.net

south32.net

From: Vanessa Allen <Vanessa.Allen@environment.nsw.gov.au>
Sent: Tuesday, 11 July 2023 11:59 AM
To: Zanotto, Linda <Linda.Zanotto@south32.net>
Subject: Dendrobium Area 3C Impact report 28th June 2023

Hi Linda

Please see BCD response to 28th June Impact Report (and thanks for sending data through for those other responses).

Regards, Vanessa

Vanessa Allen
Senior Conservation Planning Officer

Biodiversity and Conservation Division | Department of Planning and Environment
T 02 42244186 | **E** Vanessa.Allen@environment.nsw.gov.au
Level 1, 84 Crown street, Wollongong NSW 2500
PO Box 514, Wollongong NSW 2520
www.dpie.nsw.gov.au

Office is located on Dharawal Country

The Department of Planning 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.

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining, weekly during mining and again monthly during post-mining period. Monitoring is conducted in accordance with the approved Longwall 21 Subsidence Management Plan (SMP). Extraction of Longwall 21 started on 25 April 2023 and as of 28 June 2023 had progressed approximately 615m. During the latest inspection one new subsidence impact was identified.

This Version 2 of the report includes a summary of consultation with stakeholders undertaken since the initial report.

DA3C_LW21_013 (E 291260, N 6194232)

DA3C_LW21_013 is located approximately 600m west of fire Road 6F (Figure 1). The impact consists of rock fracturing to a rock outcrop with some minor soil cracking/rock displacement associated with impact. The impact has a maximum continuous length of 3.7m, a maximum width of 0.02m and a maximum measured depth of 0.7m.

DA3C_LW21_013 is a Level 1 trigger as per the Dendrobium Landscape TARP (Table 1), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length.

Photo 1: *DA3C_LW21_013*, section of the rock fracture. Taken on 03/07/2023.

Photo 2: *DA3C_LW21_013*, maximum width of the rock fracture. Taken on 03/07/2023.

Photo 3: *DA3C_LW21_013*, overview of section of impact. Taken on 03/07/2023.

Corrective Management Actions (CMAs)

- Continue Monitoring Program
- Submit an Impact Report to key stakeholders
- Summarise impacts and report in the End of Panel and the Annual Review
- Review monitoring frequency
- Notify relevant technical specialists and seek advice on any Corrective Management Actions (CMAs) required
- Provide safety signage and barricades as appropriate
- Implement approved repairs to ensure safety and serviceability on fire trails
- Implement agreed CMAs as approved

A follow-up inspection of the impact sites will be undertaken following completion of Longwall 21. A list of impacts and triggers recorded during Longwall 21 is presented in Table 2.

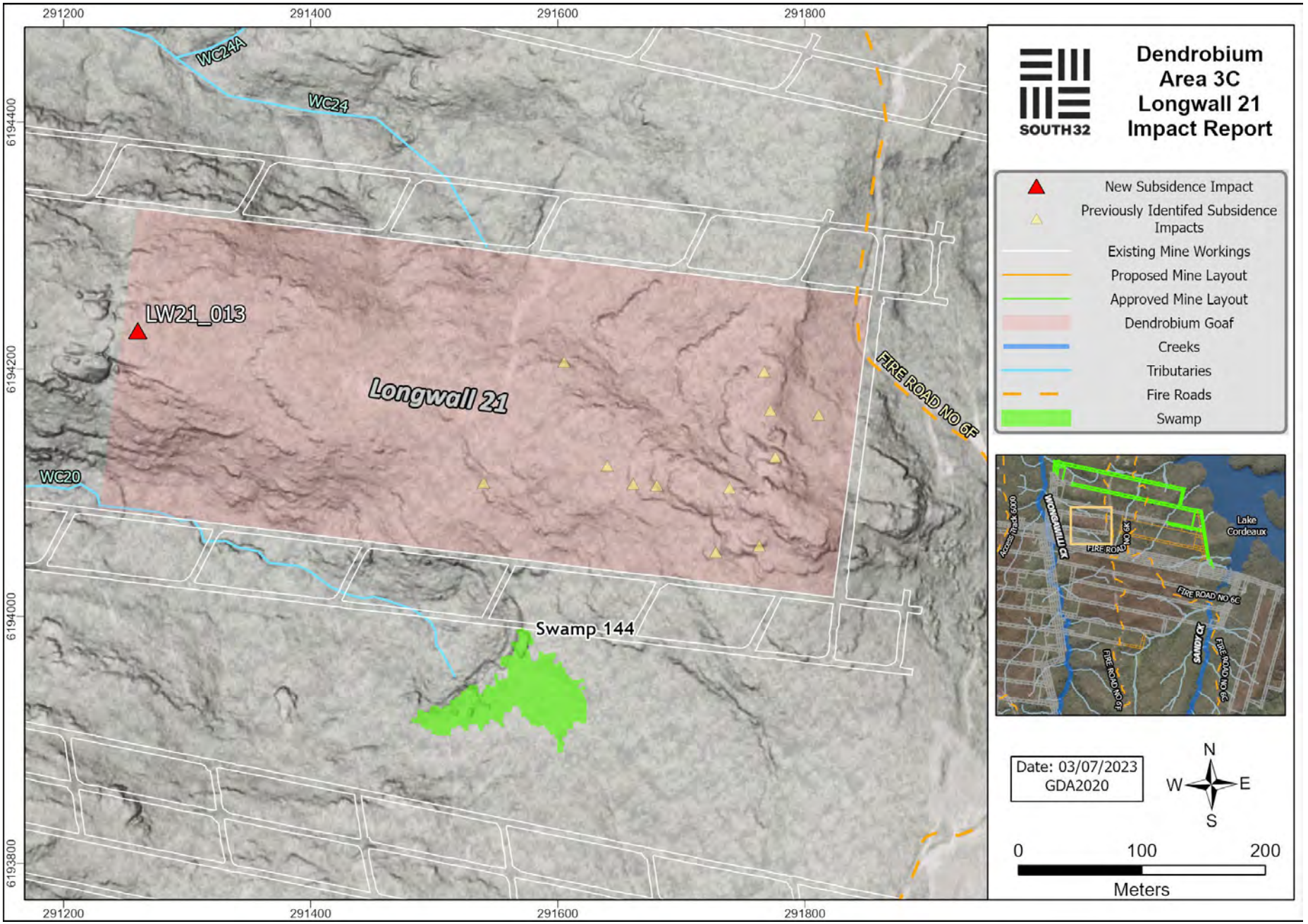


Figure 1: Map Showing latest subsidence impact. Inset shows frame in relation to Dendrobium mining operations.

Table 1: Extract from Dendrobium Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
AREA 2 **Cliffs** A2-CL1 (above LW4) **Steep Slopes** A2-SL1 and A2-SL2 (above LWs 4 & 5) **Watercourses** A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5) **Swamp** A2-SW1 (above LWs 4 & 5) **4WD Track** A2-FT1 (above LWs 4 & 5) **Crinanite Surface Extent** A2-CN1 & A2-CN2 (above LWs 3 & 4) **AREA 3A** **Cliffs** All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites) **Steep Slopes** All mapped steep slopes in subsidence area *Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites* **Watercourses/ Swamps** All mapped watercourse and swamps in subsidence area *Refer to Dendrobium Area 3A SMP Figure 19.3* **Fire Trails** All mapped fire trails in subsidence area *Refer to Dendrobium Area 3A SMP Figure 19.3* **AREA 3B** **Cliffs** All mapped cliff sites in subsidence area *Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites*	***Level 1*** * • Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance • Surface movement or rock displacement with negligible soil surface exposed • Crack at the surface, which should not result in any significant erosion or further ground movement • Crack in a fire trail which should not result in erosion or impede access • Crack or fracture up to 100mm width • Crack or fracture up to 10m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring	• Continue monitoring program • Report impacts to key stakeholders • Summarise impacts and Report in the End of Panel Report and AEMR
	Level 2 * • Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance • Surface movement or rock displacement that has exposed significant areas of soil • A crack at the surface, which could result in significant erosion or movement at the surface • A crack at the surface with potential risk to safety and/or fauna entrapment • A crack in the fire trail, which could result in significant erosion or impede vehicle access • Crack or fracture between 100 and 300mm width • Crack or fracture between 10 and 50m length • Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period	• *Actions as stated for Level 1* • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved *Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts*
	Level 3 * • Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period	• *Actions as stated for Level 2* • Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required • Site visits with stakeholders if required

Table 2: Summary of Longwall 21 impacts and triggers. Highlighted row indicates observations featured in this report.

Site ID	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
DA3C_LW21_001	Rock Fracturing	Outcrop	06/06/2023	1	Rock fracturing to a small rock outcrop west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_002	Rock Fracturing and Rock Movement	*LW21_RO1*	06/06/2023	2	Rock fracturing and rock movement to a small rock outcrop at Landscape Monitoring Site *LW21_RO1.*	9/06/2023
DA3C_LW21_003	Rock Fracturing and Rockfall	Outcrop and Step	06/06/2023	2	Rock fracturing and rockfall to an outcrop and a step west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_004	Rock Fracturing	Outcrop	06/06/2023	2	Rock fracturing on an outcrop west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_005	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracture on a rock outcrop northeast of *WC20.*	19/06/2023
DA3C_LW21_006	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracturing on a rock outcrop northeast of *WC20.*	19/06/2023
DA3C_LW21_007	Rock Fracturing and Rockfall	Outcrop	15/06/2023	2	Rock fracturing and rock fall on an outcrop northeast of *WC20.*	19/06/2023
DA3C_LW21_008	Rock Fracturing and Soil Cracking	Rock Step	19/06/2023	1	Rock fracturing/soil cracking to a rock step and bushland northeast of *WC20.*	20/06/2023
DA3C_LW21_009	Rock Fracturing	Rock Step	19/06/2023	1	Rock fracturing to a rock step west of *Fire Road 6F.*	20/06/2023
DA3C_LW21_010	Rock Fracturing and Rock Movement/ Displacement	Outcrop	19/06/2023	2	Rock fracturing and associated rock movement/displacement at an outcrop west of *Fire Road 6F.*	20/06/2023
DA3C_LW21_011	Rock Fracturing, Rock Displacement and Soil Cracking	Outcrop and Bushland	19/06/2023	1	Soil cracking, rock fracturing and associated rock displacement to an outcrop and bushland west of *Fire Road 6F.*	20/06/2023
144_01	Groundwater	Swamp 144	22/06/2023	3	Groundwater recession rate greater than baseline	28/06/2023
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DA3C_LW21_013	Rock Fracturing	Outcrop	03/07/2023	1	Rock fracturing to rock outcrop west of Fire Road 6F.	04/07/2023

CONSULTATION

Summary of consultation undertaken in relation to the subsidence impact report

The impact report was emailed to DPE, WaterNSW, BCD and the Resources Regulator on 4 July 2023 for review and feedback.

The Resources Regulator responded via email on 4 July 2023 and issued reference number MAAG0016310 indicating that an assessment officer would be in contact should further information be required. No further correspondence was received.

WaterNSW responded via email on 4 July 2023 with comments as detailed below. Evidence is provided in Attachment 1.

BCD responded via email with a letter dated 11 July 2023. Evidence is provided in Attachment 2.

Summary of the comments received during consultation

WaterNSW

WaterNSW responded to impact reports dated 20 and 28 June and 4 July noting the following new impacts over Longwall 21:

- Level 1 impacts – Rock fracturing/Soil Cracking/Rock Movement/Displacement – 7 impacts.
- Level 2 impacts – Rock fracturing and Rockfall to a maximum width of 0.20m – 1 impact.
- Level 3 impacts – Reduction in groundwater and average soil moisture in Swamp 144. The June 28 report states that “average soil moisture value recessed below the lowest level recorded before mining and has not recovered since. This is concerning.

WaterNSW also notes that no corrective actions are specified for exceeding level 3 impacts for Swamp 144 in 28 June impact report.

Biodiversity and Conservation Division (BCD)

BCD indicated no further action is required regarding this impact at this stage.

Summary of actions taken by Illawarra Metallurgical Coal in response to comments received during consultation

In response to comments and recommendations from WaterNSW and BCD, IMC have undertaken the following actions:

- IMC responded to WaterNSW via email on 13 July 2023 (refer to Attachment 1) indicating:

    - WaterNSW email response included impact report dated 19/6/2023 based on impacts referred to within the email. (Not relevant to this report)
    - Noted that no corrective actions are specified in impact reports dated 28/06/2023 and 4/07/2023 and relevant CMAs that would be included in Version 2 of these reports.
- WaterNSW acknowledged receipt of the email on 13 July 2023.

IMC will implement the corrective management actions (CMAs) as detailed within this impact report.

Email correspondence is provided in the Attachments.

ATTACHMENT 1 – WaterNSW Email Correspondence

From: Girja Sharma
To: Zanotto, Linda
Cc: Ravi Sundaram; Maria Dubikova; Juri Jung; David N. Harris
Subject: RE: Dendrobium Mine - Subsidence Impact Report 04/07/2023
Date: Thursday, 13 July 2023 12:34:01 PM
Attachments: image001.png
image003.png

Thanks, Linda.

From: Zanotto, Linda <Linda.Zanotto@south32.net>
Sent: Thursday, July 13, 2023 8:11 AM
To: Girja Sharma <Girja.Sharma@waternsw.com.au>
Cc: Ravi Sundaram <ravi.sundaram@waternsw.com.au>; Maria Dubikova <Maria.Dubikova@waternsw.com.au>; Juri Jung <Juri.Jung@waternsw.com.au>; David N. Harris <David.N.Harris@waternsw.com.au>
Subject: [EXTERNAL] RE: Dendrobium Mine - Subsidence Impact Report 04/07/2023

Hi Girja,

Thanks for your feedback in regards to the latest impact reports in relation to Longwall 21. I believe your response also includes impacts discussed in impact report dated 19/06/2023, refer to screenshot from impact report dated 4/7/2023:

DA3C_LW21_005	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracture on a rock outcrop northeast of *WC20*.	19/06/2023
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DA3C_LW21_012	Rock Fracturing	Rock Step	27/06/2023	1	Rock fracturing to rock step west of Fire Road 6F.	28/06/2023
DA3C_LW21_013	Rock Fracturing	Outcrop	03/07/2023	1	Rock fracturing to rock outcrop west of Fire Road 6F.	04/07/2023

It is noted that no corrective actions are specified in impact reports dated 28/06/2023 and 4/07/2023. The following corrective management actions (CMAs) will be included in version 2 of these reports in relation to the rock fracturing impacts:

Corrective Management Actions (CMAs)

- Continue Monitoring Program
- Submit an Impact Report to key stakeholders
- Summarise impacts and report in the End of Panel and the Annual Review
- Review monitoring frequency
- Notify relevant technical specialists and seek advice on any Corrective Management Actions (CMAs) required
- Provide safety signage and barricades as appropriate
- Implement approved repairs to ensure safety and serviceability on fire trails
- Implement agreed CMAs as approved

A follow-up inspection of the impact sites will be undertaken following completion of Longwall 21.

Regarding CMAs for level 3 impacts in swamp 144, monitoring will continue and analysis of data by relevant technical experts will be provided in the End of Panel report. In addition, we seek your advice in regards to any corrective management actions required.

Kind Regards,

Linda Zanotto
Principal Mining Approvals
Illawarra Metallurgical Coal

M: +61 409 399 560
E: Linda.Zanotto@South32.net

south32.net

SOUTH32

From: Girja Sharma <Girja.Sharma@waternsw.com.au>
Sent: Tuesday, 4 July 2023 4:47 PM
To: Zanotto, Linda <Linda.Zanotto@south32.net>
Cc: Ravi Sundaram <ravi.sundaram@waternsw.com.au>; Maria Dubikova <Maria.Dubikova@waternsw.com.au>; Juri Jung <Juri.Jung@waternsw.com.au>; David N. Harris <David.N.Harris@waternsw.com.au>
Subject: RE: Dendrobium Mine - Subsidence Impact Report 04/07/2023

Hi Linda,

WaterNSW has reviewed Dendrobium Mine – LW21 Subsidence Impact Reports dated 20 and 28 June and 4 July 2023.

WaterNSW has noted the following new impacts over longwall 21:

- Level 1 impacts - Rock fracturing/Soil Cracking/Rock Movement/Displacement – 7 impacts
- Level 2 impacts - Rock Fracturing and Rockfall to a maximum width of 0.20m – 1 impact
- Level 3 impacts - Reduction in groundwater and average soil moisture levels in Swamp 144. The 28 June report states that "average soil moisture value recessed below the lowest level recorded before mining and has not recovered since". This is concerning.

WaterNSW also notes that no corrective actions are specified for exceeding level 3 impacts for swamp 144 in 28 June impact report.

Regards

Girja

Dr Girja Sharma (She/Her)
Catchment Assessments Manager
For noting: *I am working on Tuesday, Wednesday and Part Thursday.*
I am also working remotely. Please reach me via email or 0417099432

WaterNSW

Level 14, 169 Macquarie Street, Parramatta NSW 2150
PO Box 398, Parramatta NSW 2124
T: 02 9865 2501 **M:** 0417 099 432
girja.sharma@waternsw.com.au
www.waternsw.com.au

From: Zanotto, Linda <Linda.Zanotto@south32.net>
Sent: Tuesday, July 4, 2023 7:54 AM
To: Ravi Sundaram <ravi.sundaram@waternsw.com.au>; Maria Dubikova <Maria.Dubikova@waternsw.com.au>; Glen Capararo <Glen.Capararo@waternsw.com.au>; Resources Regulator <nswresourcesregulator@service-now.com>; Chris Page <Chris.Page@environment.nsw.gov.au>; Camilla Edmunds <Camilla.Edmunds@waternsw.com.au>; Environmental Assessments <Environmental.Assessments@waternsw.com.au>; rog.illawarra@environment.nsw.gov.au; gabrielle.allan@dpie.nsw.gov.au
Cc: Brassington, Gary <Gary.M.Brassington@south32.net>; Carlon, Josh <Josh.Carlon@south32.net>; Crehan, Amanda <Amanda.Crehan@south32.net>; Schultz, Chris <Chris.Schultz1@south32.net>; Leone, Antony <Antony.Leone@south32.net>; Walsh, Richard <Richard.V.Walsh@south32.net>; Mapstone, Rod <Rod.Mapstone1@south32.net>; Parkinson, Jack (Agurba) <Jack.Parkinson@south32.net>
Subject: [EXTERNAL] Dendrobium Mine - Subsidence Impact Report 04/07/2023

Hi All,

Please find attached the latest subsidence impact report (dated 04/07/2023) for Dendrobium Mine regarding recent subsidence impact observations in Area 3C.

The report will be updated following receipt of your feedback and the final report uploaded to the Major Projects Planning Portal.

Kind Regards,

Linda Zanotto
Principal Mining Approvals
Illawarra Metallurgical Coal

M: +61 409 399 560
E: Linda.Zanotto@South32.net

south32.net

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.

ATTACHMENT 2 – BCD – Email Correspondence

Department of Planning and Environment

Our ref: DOC23/616348

Ms Linda Zanotto
Illawarra Metallurgical Coal

By email: Linda.Zanotto@South32.net

Re: Dendrobium Area 3C – Impact report – 4th July 2023

Dear Linda

I refer to the Dendrobium 3C Impact Report for 4th July 2023. This Report detailed the following impact:

- DA3C_LW21_013 (E 291260, N 6194232) - rock fracture; Level 1 TARP

We do not require further action regarding this impact at this stage.

If you wish to discuss, please contact Vanessa Allen, Senior Conservation Planning Officer, on 0242244186 or at Vanessa.Allen@environment.nsw.gov.au.

Yours sincerely

Vanessa Allen date: 11/7/2023

Senior Conservation Planning Officer (Planning Illawarra)
Biodiversity and Conservation Division

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining, weekly during mining and again monthly during post-mining period. Monitoring is conducted in accordance with the approved Longwall 21 Subsidence Management Plan (SMP). Longwall 19 in Dendrobium Area 3A (DA3A) was completed on 29 March 2023. Extraction of Longwall 21 started on 25 April 2023 and as of 9 July 2023 had progressed approximately 710m. During the latest inspection over Longwall 21 three new subsidence impacts were identified. Swamp groundwater and soil moisture triggers have also been recorded.

This Version 2 of the report includes a summary of consultation with stakeholders undertaken since the initial report.

DA3C_LW21_014 (E 291465, N 6194006)

Impact *DA3C_LW21_014* consists of rock fracturing on tributary WC20 (Figure 1). The fracturing was observed on Rockbar 22 (Photo 1 and Photo 2), with damage to the concrete footing of flow monitoring site WC20S2 observed directly upstream (Photo 3). The fracturing on the rockbar has a maximum continuous length of 3.45m, a maximum width of 0.06m and a maximum measured depth of 0.57m. There was no surface flow at the site during this inspection and flow diversion is likely.

DA3C_LW21_014 is a Level 2 trigger as per the Dendrobium Watercourse TARP (Table 1), specifically:

- …fracture that results in observable loss of surface water or erosion.

Photo 1: *DA3C_LW21_014*, section of the rock fracturing. Taken on 11/07/2023.

Photo 2: *DA3C_LW21_014*, width of the rock fracture. Taken on 11/07/2023.

Photo 3: *DA3C_LW21_014*, damage to concreate footing of flow monitoring site WC20S2. Taken on 11/07/2023.

DA3C_LW21_015 (E 291421, N 6194021)

Impact *DA3C_LW21_015* consists of rock fracturing on tributary WC20 (Figure 1). The fracturing was observed on Channel 8 and has a maximum length of 2.26m, a maximum width of 0.02 and maximum measurable depth of 0.37m (Photo 4 to Photo 6). No surface flow or pooling was observed at the site during this inspection and flow diversion is likely.

DA3C_LW21_015 is a Level 2 trigger as per the Dendrobium Watercourse TARP (Table 1), specifically:

- …fracture that results in observable loss of surface water or erosion.

Photo 4: *DA3C_LW21_015*, section of rock fracturing. Taken on 11/07/2023.

Photo 5: DA3C_LW21_015, other section of rock fracturing. Taken on 11/07/2023.

Photo 6: *DA3C_LW21_015*, width of the rock fracture. Taken on 11/07/2023.

DA3C_LW21_016 (E 291248, N 6194087)

Impact *DA3C_LW21_016* consists of a small rockfall to a step on tributary WC20 (Figure 1). The fracturing was observed beneath the overhang of the step and has an approximate volume of 0.14m^3 (Photo 7 and Photo 8).

DA3C_LW21_016 is a Level 1 trigger as per the Dendrobium Landscape TARP (Table 2), specifically:

- Rockfall from a cliff (step) which is mostly left intact, resulting in insignificant ground disturbance.

Photo 7: *DA3C_LW21_016*, fragments of rockfall from step. Taken on 11/07/2023.

Photo 8: DA3C_LW21_016, underside of step from which rock fragments fell. Taken on 11/07/2023.

Swamp 15a

Near-surface groundwater and soil moisture triggers were recorded in Swamp 15a during recent analysis of groundwater data for the swamp. These include soil moisture triggers at sites S15a_07, S15a_15 and S15a_19, and groundwater trigger at 15a_19 (Figure 2). Sites with a an 'S' prefix denote soil moisture triggers at those sites.

Site 15a_19 is located approximately 140m south-west from the start of Longwall 19 i.e., within the longwall's 400 m mining area since the start of mining. The site was passed by Longwall 19 on 11 July 2022 at a distance of approximately 70 m and exited the mining area 9 September 2022. Water level in the borehole receded below the level of the piezometer on 31 December 2022 and the borehole remains dry since (Graph 1). Similarly, on 12 September 2022 the average soil moisture value receded below the lowest level recorded during the monitoring period before mining and has not recovered since (Graph 2). Site 15a_19 is not part of the Longwall 19 SIMMCP. This site was installed relatively recently to investigate distance of groundwater response from longwall goaf and will be featured in subsequent specialist reports (in-prep.). The relatively recent installation date means it has a very short baseline period and while it is being included in this TARP assessment, this should be considered.

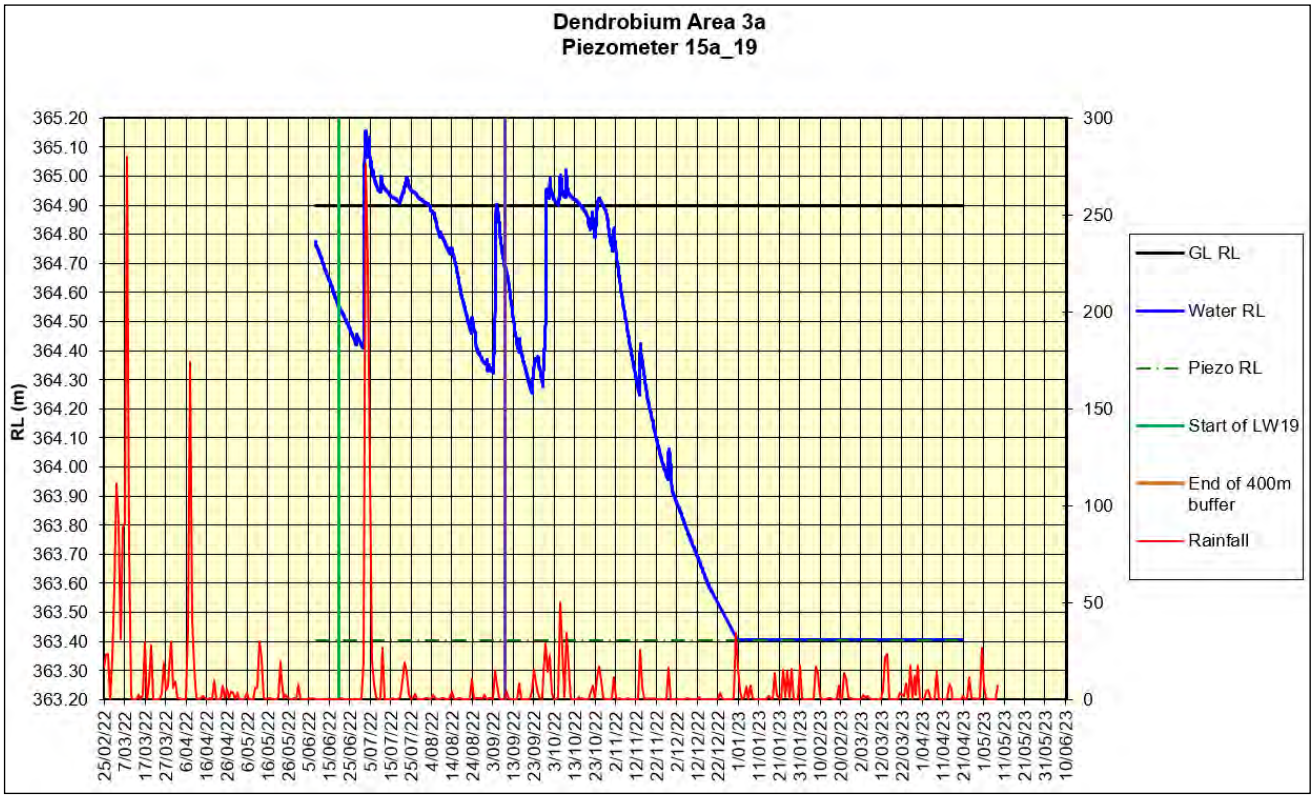
Site 15a_07 is located approximately 245m south-west from the start of Longwall 19 (Figure 2) i.e., within the longwall's 400 m mining area since the start of mining. The site was passed by Longwall 19 on 17 July 2022 at a distance of approximately 173 m and exited the mining area 14 September 2022. On 24 December 2022 the average soil moisture value receded below the lowest level recorded during the monitoring period before mining (Graph 3). Below average rainfall has also been observed through this period.

Site 15a_15 is located approximately 335m south-west from the start of Longwall 19, within the longwall's 400 m mining area since the start of mining. The site was passed by Longwall 19 on 13 July 2022 at a distance of approximately 303 m and exited the mining area 21 August 2022. On 11 March 2023 the average soil moisture value receded below the lowest level recorded during the monitoring period before mining (Graph 4). Below average rainfall has also been observed through this period.

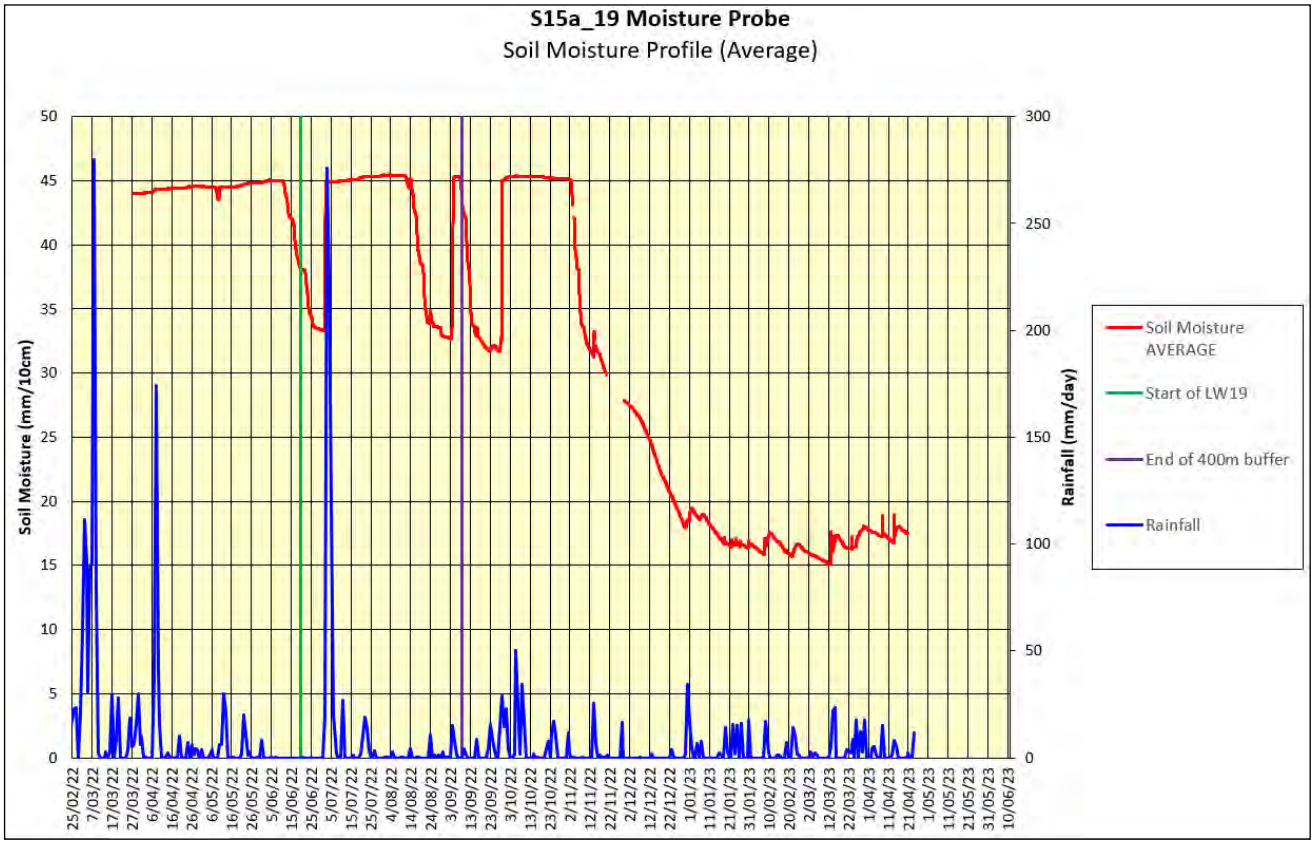
These results contribute to a Level 1 trigger for groundwater and Level 2 trigger for soil moisture, according to the Dendrobium Swamps TARP (Table 3), specifically:

> **Level 1:** Groundwater level lower than baseline level at any monitoring site (within 400 m of mining) within a swamp (in comparison to reference swamps); and
>
> **Level 2:** Soil moisture level lower than baseline level at 50% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps).

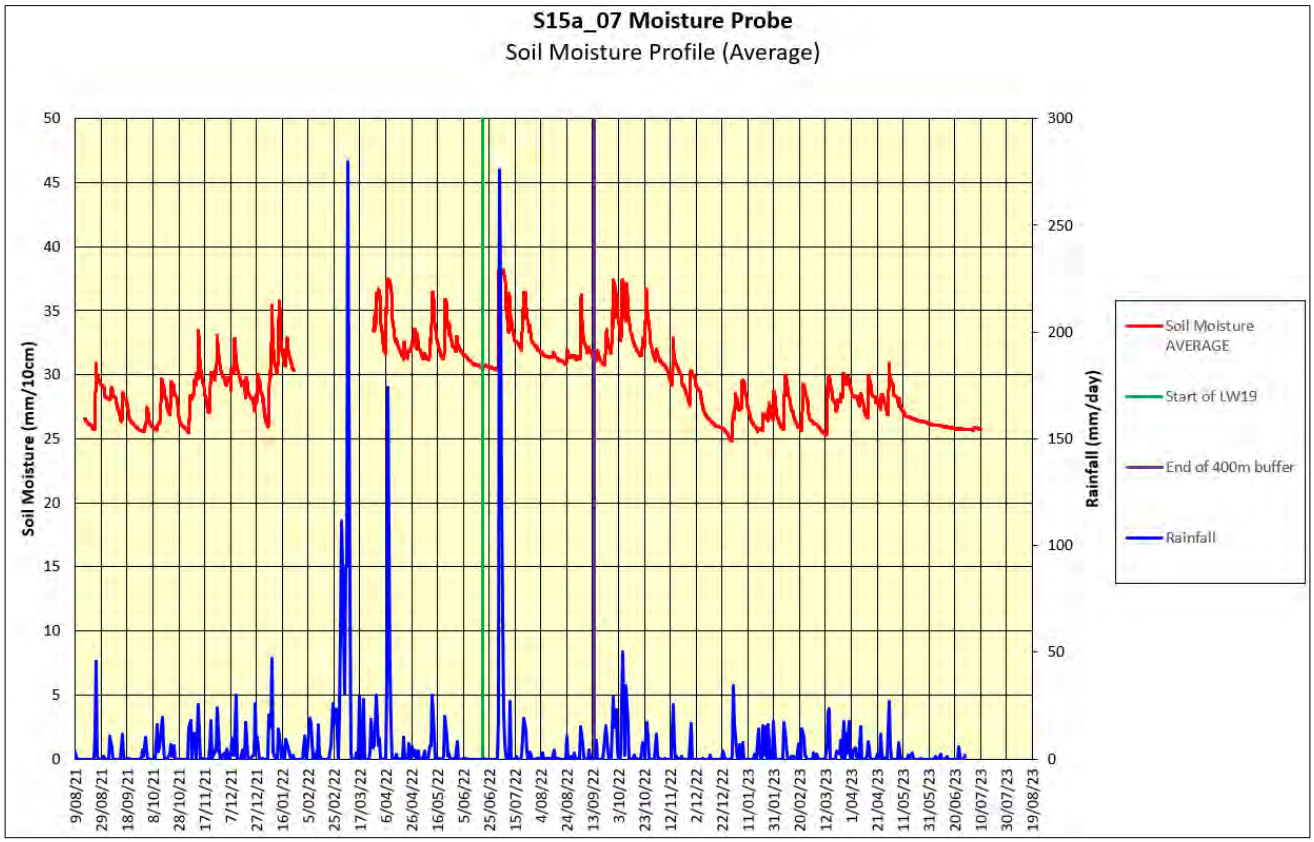
The above assessment should take into consideration the very short baseline monitoring period at site 15a_19 and that the monitoring commenced during a period of high rainfall.



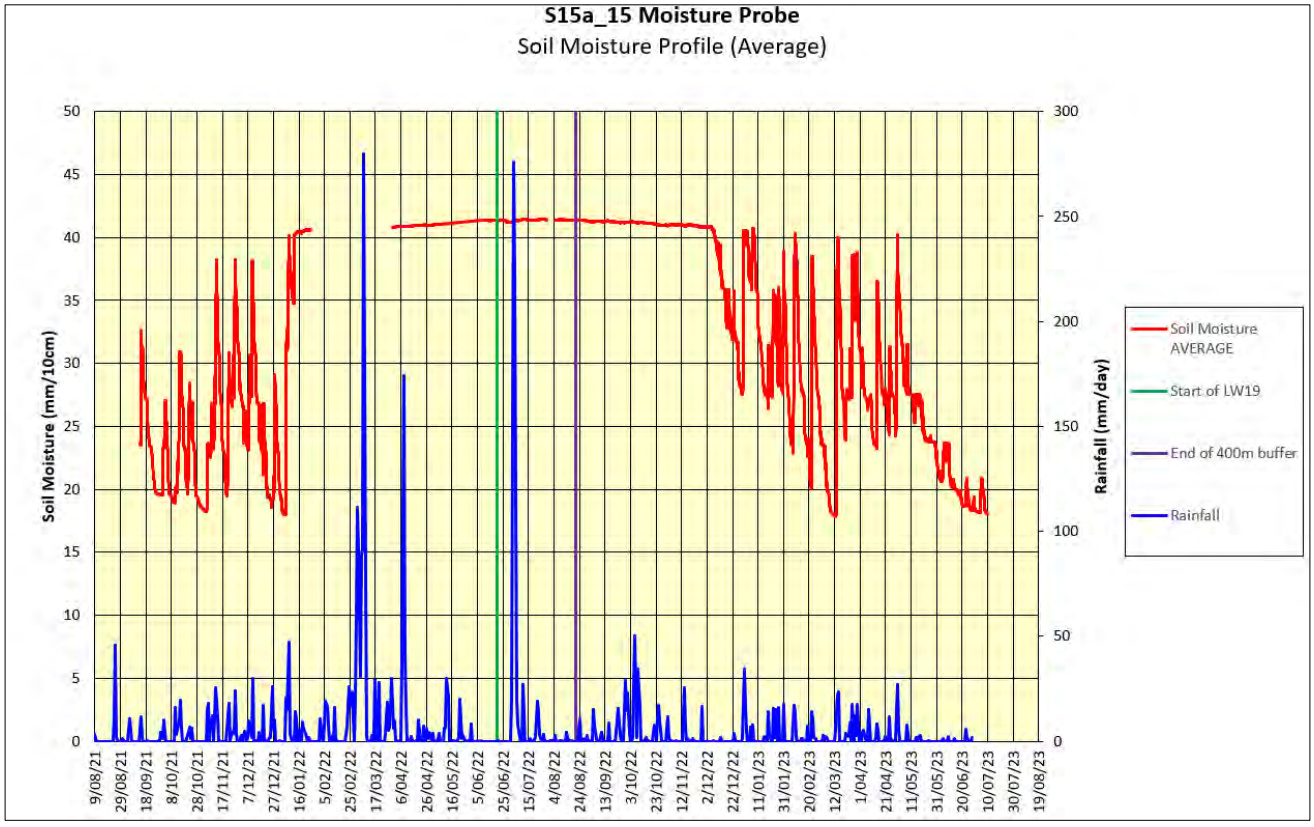
Graph 1: Near-surface groundwater levels at 15a_19, logged hourly, date range: 08/06/2022 to 20/04/2023



Graph 2: Average soil moisture levels at S15a_19, logged hourly, date range: 27/03/2022 to 20/04/2023



Graph 3: Average soil moisture levels at 15a_07, logged hourly, date range: 16/08/2021 to 10/07/2023.



Graph 4: Average soil moisture levels at S15a_15, logged hourly, date range: 13/09/2021 to 10/07/2023.

Corrective Management Actions (CMAs)

The following management actions have been initiated:

- Continue monitoring program
- Submit an Impact Report to key stakeholders – BCD, DPE, Resources Regulator and WaterNSW
- Report in the End of Panel Report
- Summarise actions and monitoring in AEMR
- Review monitoring frequency
- Notify technical specialists and seek advice on any CMA required
- Submit letter report to DPE, BCD, Resource Regulator and WaterNSW and seek advice on any CMA required
- Implement agreed CMAs as approved (subject to agency feedback)

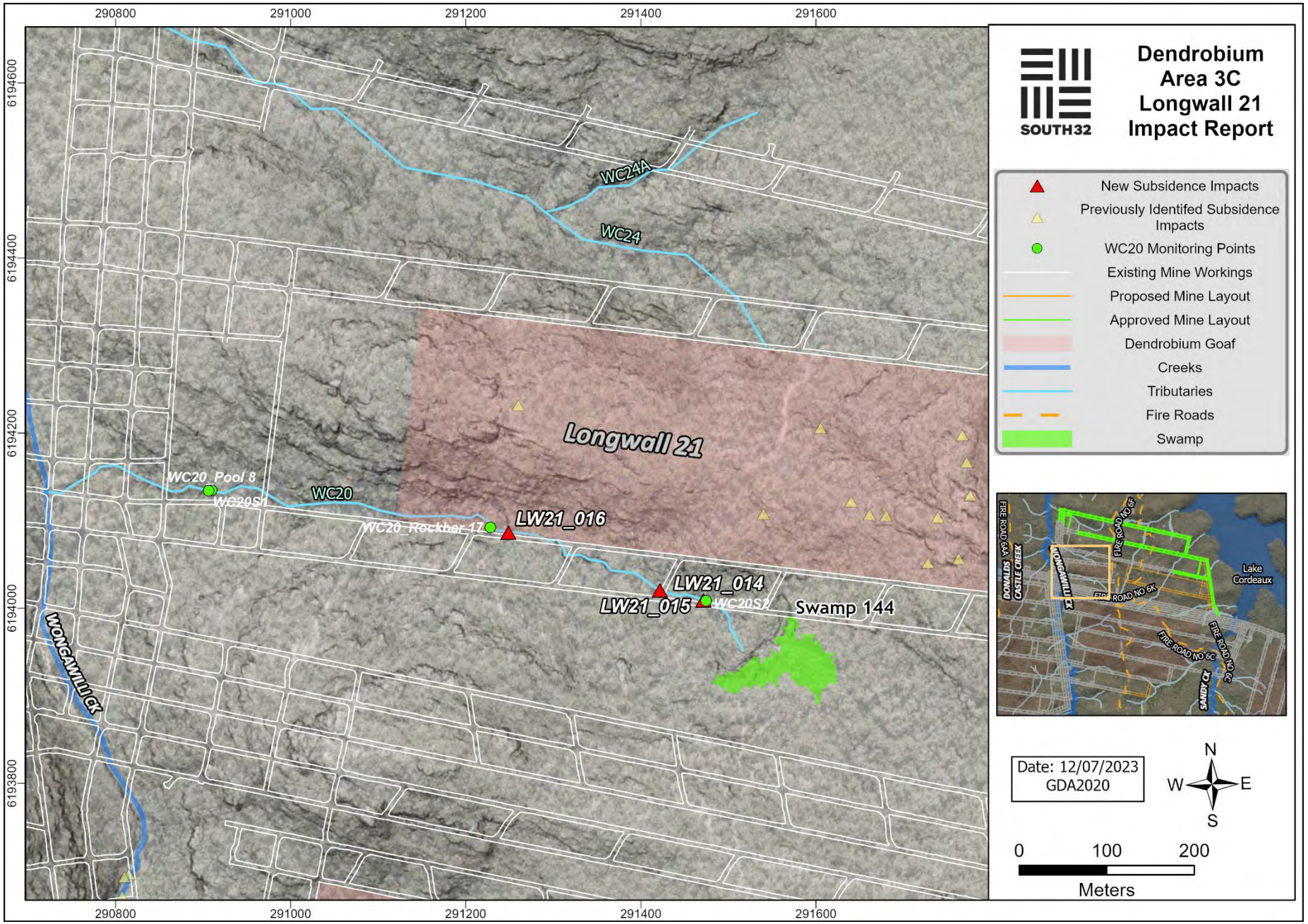


Figure 1: Latest subsidence impacts over Longwall 21 mining area, DA3C. Inset shows frame in relation to Dendrobium mining operations.

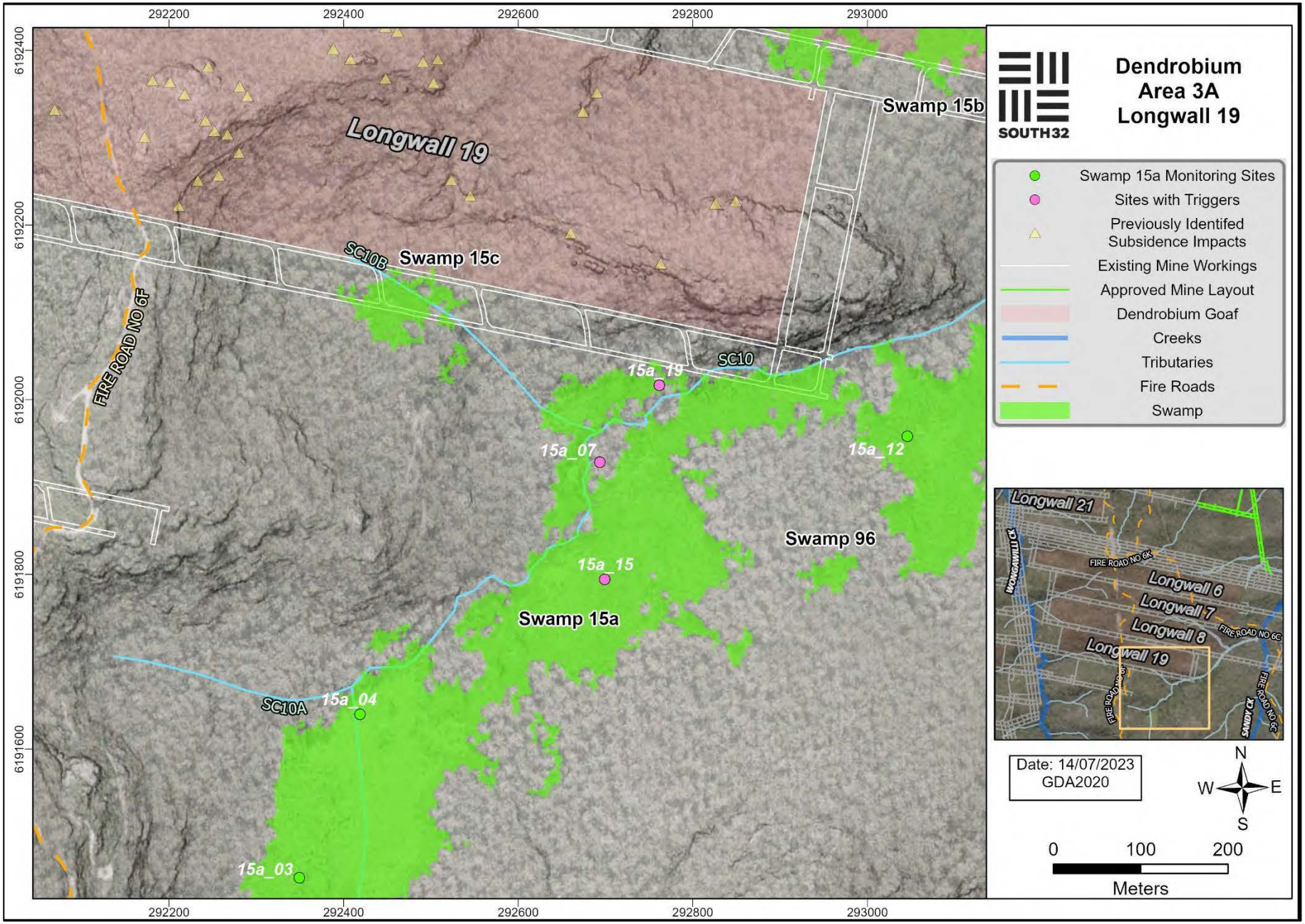


Figure 2: Swamp 15a monitoring sites and triggers in relation to Longwall 19, DA3A. Inset shows frame in relation to Dendrobium mining operations.

Table 1: Extract from Dendrobium Watercourse TARP.

DC13, LC5, WC20, WC21, WC22, WC23, WC24, WC25, WC26, WC27 and WC29 General observation of streams in active mining areas when longwall is within 400m	***Level 1*** • Crack or fracture up to 100mm width at its widest point with no observable loss of surface water or erosion • Crack or fracture up to 10m length with no observable loss of surface water or erosion • Erosion in a localised area (not associated with cracking or fracturing) which would be expected to naturally stabilise without CMA and within the period of monitoring • Observable release of strata gas at the surface • Observable increase in iron staining within the mining area	• Continue monitoring program • Submit an Impact Report to BCD, DPE, Resources Regulator, WaterNSW • Report in the End of Panel Report • Summarise actions and monitoring in AEMR
	Level 2 • Crack or fracture between 100 and 300mm width at its widest point or any fracture which results in observable loss of surface water or erosion • Crack or fracture between 10 and 50m length • Soil surface crack that causes erosion that is likely to stabilise within the monitoring period without intervention • Observable increase in iron staining within the mining area continues to outside the mining area i.e. 400m from the longwall	• *Actions as stated for Level 1* • Review monitoring frequency • Submit letter report to DPE, BCD, Resource Regulator and WaterNSW and seek advice on any CMA required • Implement agreed CMAs as approved (subject to agency feedback)
	Level 3 • Crack or fracture over 300mm width at its widest point • Crack or fracture over 50m length • Fracturing observed in the bedrock base of any significant permanent pool which results in observable loss of surface water • Soil surface crack that causes erosion that is unlikely to stabilise within the monitoring period without intervention • Gas release results in vegetation dieback, mortality or loss of aquatic habitat Observable increase in iron staining within the mining area continues more than 600m from the longwall	• *Actions as stated for Level 2* • Offer site visit with BCD, DPE, Resource Regulator, WaterNSW • Implement additional monitoring or increase frequency if required • Develop site CMA (subject to agency feedback). This may include: grouting of rockbar and bedrock base of any significant pool where it is appropriate to do so in consultation with BCD, DPE, Resource Regulator, WaterNSW • Completion of works following approvals and at a time agreed between S32, DPE, Resource Regulator and WaterNSW (i.e. may be after mining induced movements and impacts are complete), including monitoring and reporting on success • Review relevant TARP and Management Plan in consultation with key agencies

Table 2: Extract from Dendrobium Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
AREA 2 **Cliffs** A2-CL1 (above LW4) **Steep Slopes** A2-SL1 and A2-SL2 (above LWs 4 & 5) **Watercourses** A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5) **Swamp** A2-SW1 (above LWs 4 & 5) **4WD Track** A2-FT1 (above LWs 4 & 5) **Crinanite Surface Extent** A2-CN1 & A2-CN2 (above LWs 3 & 4) **AREA 3A** **Cliffs** All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites) **Steep Slopes** All mapped steep slopes in subsidence area *Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites* **Watercourses/ Swamps** All mapped watercourse and swamps in subsidence area *Refer to Dendrobium Area 3A SMP Figure 19.3* **Fire Trails** All mapped fire trails in subsidence area *Refer to Dendrobium Area 3A SMP Figure 19.3* **AREA 3B** **Cliffs** All mapped cliff sites in subsidence area *Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites*	***Level 1 **** • Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance • Surface movement or rock displacement with negligible soil surface exposed • Crack at the surface, which should not result in any significant erosion or further ground movement • Crack in a fire trail which should not result in erosion or impede access • Crack or fracture up to 100mm width • Crack or fracture up to 10m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring	• Continue monitoring program • Report impacts to key stakeholders • Summarise impacts and Report in the End of Panel Report and AEMR
	Level 2 * • Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance • Surface movement or rock displacement that has exposed significant areas of soil • A crack at the surface, which could result in significant erosion or movement at the surface • A crack at the surface with potential risk to safety and/or fauna entrapment • A crack in the fire trail, which could result in significant erosion or impede vehicle access • Crack or fracture between 100 and 300mm width • Crack or fracture between 10 and 50m length • Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period	• *Actions as stated for Level 1* • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved *Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts*
	Level 3 * • Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period	• *Actions as stated for Level 2* • Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required • Site visits with stakeholders if required

Table 3: Extract from Dendrobium Swamp TARP.

Performance Measures	***Potential Impacts***	***Performance Triggers***	a) ***Management Strategies***	***Offsets***	***Other Actions***
Minor changes in the ecosystem functionality of the swamps	Falls in surface or near-surface groundwater levels in swamps *NB. Not linked specifically to a PM and would not be considered a breach if predictions were exceeded.*	*Level 1:* Groundwater level lower than baseline level at any monitoring site within a swamp (in comparison to reference swamps); and/or Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at any monitoring site (measured as average mm/day during the recession curve). *Level 2:* Groundwater level lower than baseline level at **50%** of monitoring sites (within 400 m of mining) within a swamp (in comparison to reference swamps); and/or Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at a **50%** of monitoring sites (within 400m of mining) within the swamp. *Level 3:* Groundwater level lower than baseline level at **>80%** of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps); and/or Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at **>80%** of monitoring sites (within 400 m of mining) within the swamp.	b) upfront mine planning c) groundwater monitoring d) implementation of swamp research program e) weeding f) fire management g) reporting h) update future predictions		Triggers for groundwater decline result in increased intensity and frequency of vegetation monitoring and/or further investigations of subsidence impacts on bedrock base and rockbars
Minor changes in the ecosystem functionality of the swamps	Falls in soil moisture levels in swamps *NB. Not linked specifically to a PM and would not be considered a breach if predictions were exceeded.*	*Level 1:* Soil moisture level lower than baseline level at **any** monitoring sites (within 400 m of mining) within a swamp (in comparison to reference swamps). *Level 2:* Soil moisture level lower than baseline level at **50%** of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps). *Level 3:* Soil moisture level lower than baseline level at **>80%** of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps).	a) upfront mine planning b) soil moisture monitoring c) water spreading d) weeding e) fire management f) reporting g) update future predictions		Triggers of soil moisture decline result in increased intensity and frequency of vegetation monitoring and/or further investigations of subsidence impacts on bedrock base and rockbars

Table 4: Summary of Longwall 21 impacts and triggers. Highlighted rows indicate observations featured in this report.

Site ID	Impact/Trigger Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
DA3C_LW21_001	Rock Fracturing	Outcrop	06/06/2023	1	Rock fracturing to a small rock outcrop west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_002	Rock Fracturing and Rock Movement	*LW21_RO1*	06/06/2023	2	Rock fracturing and rock movement to a small rock outcrop at Landscape Monitoring Site *LW21_RO1.*	9/06/2023
DA3C_LW21_003	Rock Fracturing and Rockfall	Outcrop and Step	06/06/2023	2	Rock fracturing and rockfall to an outcrop and a step west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_004	Rock Fracturing	Outcrop	06/06/2023	2	Rock fracturing on an outcrop west of *Fire Road 6F.*	9/06/2023
DA3C_LW21_005	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracture on a rock outcrop northeast of *WC20.*	19/06/2023
DA3C_LW21_006	Rock Fracturing	Outcrop	15/06/2023	1	Rock fracturing on a rock outcrop northeast of *WC20.*	19/06/2023
DA3C_LW21_007	Rock Fracturing and Rockfall	Outcrop	15/06/2023	2	Rock fracturing and rock fall on an outcrop northeast of *WC20.*	19/06/2023
DA3C_LW21_008	Rock Fracturing and Soil Cracking	Rock Step	19/06/2023	1	Rock fracturing/soil cracking to a rock step and bushland northeast of *WC20.*	20/06/2023
DA3C_LW21_009	Rock Fracturing	Rock Step	19/06/2023	1	Rock fracturing to a rock step west of *Fire Road 6F.*	20/06/2023
DA3C_LW21_010	Rock Fracturing and Rock Movement/ Displacement	Outcrop	19/06/2023	2	Rock fracturing and associated rock movement/displacement at an outcrop west of *Fire Road 6F.*	20/06/2023
DA3C_LW21_011	Rock Fracturing, Rock Displacement and Soil Cracking	Outcrop and Bushland	19/06/2023	1	Soil cracking, rock fracturing and associated rock displacement to an outcrop and bushland west of *Fire Road 6F.*	20/06/2023
144_01	Groundwater	Swamp 144	22/06/2023	3	Groundwater recession rate greater than baseline	28/06/2023
S144_01	Soil Moisture	Swamp 144	27/06/2023	3	Average soil moisture level below the baseline level	28/06/2023
DA3C_LW21_012	Rock Fracturing	Rock Step	27/06/2023	1	Rock fracturing to rock step west of Fire Road 6F.	28/06/2023
DA3C_LW21_013	Rock Fracturing	Outcrop	03/07/2023	1	Rock fracturing to rock outcrop west of Fire Road 6F.	04/07/2023

Site ID	Impact/Trigger Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
DA3C_LW21_014	Rock Fracturing	Watercourse	11/07/2023	2	Rock fracturing to rockbar on tributary WC20.	17/07/2023
DA3C_LW21_015	Rock Fracturing	Watercourse	11/07/2023	2	Rock fracturing to channel on tributary WC20.	17/07/2023
DA3C_LW21_016	Rockfall	Watercourse	11/07/2023	1	Small rockfall to step on tributary WC20.	17/07/2023
Swamp 15a (Longwall 19)	Groundwater	Swamp	12/07/2023	1	Groundwater trigger at one site in Swamp 15a.	17/07/2023
Swamp 15a (Longwall 19)	Soil Moisture	Swamp	12/07/2023	2	Soil moisture triggers at three sites within Swamp 15a.	17/07/2023

CONSULTATION

Summary of consultation undertaken in relation to the subsidence impact report

The impact report was emailed to DPE, WaterNSW, BCD and the Resources Regulator on 17 July 2023 for review and feedback.

The Resources Regulator responded via email on 19 July 2023 and issued reference number MAAG0016372 indicating that an assessment officer would be in contact should further information be required. No further correspondence was received.

WaterNSW responded via email with a letter dated 30 August 2023 with a combined response to three impact reports from 17 and 31 July and 18 August 2023 as detailed below. The correspondence is provided in Attachment 1.

BCD responded via email with a letter dated 20 July 2023 requesting further data. The correspondence is provided in Attachment 2.

Summary of the comments received during consultation

WaterNSW

WaterNSW responded to impact reports dated 17 and 31 July and 18 August 2023 noting impacts to Swamp 144 and Swamp 15a:

- Level 3 trigger for Swamp 144 (Longwall 21) - groundwater recession rate greater than baseline and average soil moisture level below the baseline level. There is one monitoring location in Swamp 144.
- Level 2 trigger for Swamp 15a (Longwall 19) - soil moisture level lower than baseline level at 50% of monitoring sites reported on 31 July; and
- Level 3 trigger for Swamp 15a (Longwall 19) - soil moisture level lower than baseline level at 80% of monitoring sites reported on 18 August.

WaterNSW expressed concern that the performance measures for Swamps 144 and 15a will be exceeded and that these Level 3 triggers occurred at distances greater than 61 m from Longwall 21 and 19 footprints suggesting the 61 m setback distance from Longwalls is inadequate to prevent hydrological impacts to swamps over Dendrobium Mine and warrant further and more rigorous assessment.

Biodiversity and Conservation Division (BCD)

BCD responded via email with a letter dated 20 July 2023 requesting further data:

- For WC20 and swamp 144, all monitoring data, including groundwater, soil moisture and pool data.
- For Swamp 15A, all monitoring data, including groundwater, soil moisture and hard rock piezometer data both in the swamp and nearby.
- All vegetation data from all swamps at Dendrobium Area 3, especially Swamp 15A, S144, S 148, S34, S35a, S35b, S7, S150, S151.

Summary of actions taken by Illawarra Metallurgical Coal in response to comments received during consultation

In response to comments and recommendations from WaterNSW and BCD, IMC have undertaken the following actions:

- IMC responded to WaterNSW by providing supporting reports by Watershed HydroGeo regarding a review of distance to swamp impacts on 8 September 2023. Note: This review and supporting reports were also provided in response to previous WaterNSW concerns in regard to Impact Report dated 14 March 2023. These reports were also uploaded to the Major Projects Planning Portal.
- Data requested by BCD in the letter dated 20 July 2023 was uploaded to the BCD MoveItCloud folder on 3 October 2023.

IMC will implement the corrective management actions (CMAs) as detailed within this impact report.

Email correspondence is provided in the Attachments.

ATTACHMENT 1 – Correspondence with WaterNSW

PO Box 398, Parramatta NSW 2124
Level 14, 169 Macquarie Street
Parramatta NSW 2150
www.waternsw.com.au
ABN 21 147 934 787

30 August 2023

Contact: *Maria Dubikova*
email: *environmental.assessments@waternsw.com.au*
Our ref: *D2023/63840*

Linda Zanotto
Principal Approvals
Illawarra Metallurgical Coal

Email: Linda.Zanotto@South32.net

Dear Ms Zanotto

Subsidence Impact Reports - Swamps 144 and 15a

According to the TARP action plan IMC is required to report all identified landscape impacts to key stakeholders. WaterNSW has received Subsidence Impacts Reports dated 17/07/2023, 31/07/2023 and 18/08/2023 that identified:

- Level 3 trigger for Swamp 144 (Longwall 21) - groundwater recession rate greater than baseline and average soil moisture level below the baseline level. There is one monitoring locations in Swamp 144.
- Level 2 trigger for Swamp 15a (Longwall 19) - soil moisture level lower than baseline level at 50% of monitoring sites reported on 31 July; and
- Level 3 trigger for Swamp 15a (Longwall 19) - soil moisture level lower than baseline level at 80% of monitoring sites reported on 18 August.

While soil moisture and groundwater levels are not specifically linked to a swamp performance measure, WaterNSW considers that observed decline in soil moisture and groundwater levels are early and reliable indicators of irreversible changes in swamp hydrology on which ecosystem functionality is dependent. WaterNSW is concerned that a performance measure of minor environmental consequences for Swamp 144 and negligible environment consequences for Swamp 15a will be exceeded.

Moreover, the reported Level 3 exceedances for Swamp 144 and Swamp 15a occurred at distances greater than 61 m from Longwall 21 and Longwall 19 footprints. These monitoring results indicate that the 61m setback distance from longwalls is inadequate to prevent hydrological impacts to swamps over Dendrobium mine and warrant further and more rigorous assessment.

Please feel free to contact Maria Dubikova if you would like to discuss any of the above matters further.

Yours sincerely

Girja Sharma

Girja Sharma
Catchment Assessments Manager