



END OF PANEL
LANDSCAPE REPORT
DENDROBIUM AREA 3A



DENDROBIUM AREA 3A
LONGWALL 19 END OF PANEL
LANDSCAPE REPORT
JUNE 2023



EXECUTIVE SUMMARY

This report summarises the observed and measured subsidence effects on landscape features resulting from the extraction of Dendrobium Area 3A (DA3A) Longwall 19. Longwall 19 is the fourth panel extracted in DA3A. Extraction began on 20 June 2022 and was completed on 29 March 2023.

The Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) conducts detailed monitoring and inspections of landscape features including swamps, watercourses, and landscape features within the mining area of DA3A. This monitoring was conducted in accordance with:

- Longwall 19 Subsidence Management Plan (SMP);
- Longwall 19 Watercourse Impact, Monitoring, Management and Contingency Plan (WIMMCP) (February 2021);
- Longwall 19 Swamp Impact, Monitoring, Management and Contingency Plan (SIMMCP) (June 2021)

The Watercourse, Swamp and Landscape Trigger Action Response Plans (TARPs) form the basis of the impact assessments in this report.

A total of 63 surface impacts were identified by IMCEFT. There were 57 surface impacts observed on natural features and six surface impacts observed on built features. During the Longwall 19 monitoring period no swamps recorded soil moisture triggers and one swamp, in Dendrobium Area 3B (DA3B), recorded a shallow groundwater trigger. These will be assessed further in the specialist Surface Water and Shallow Groundwater Assessment of the final EoP Report.

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Abbreviations

AEMR – Annual Environmental Management Report (now called Annual Review (AR))

BCD - Biodiversity and Conservation Division

CMA – Corrective Management Action

DPE - Department of Planning and Environment

EoP – End of Panel

IMCEFT – Illawarra Metallurgical Coal Environmental Field Team

OEH - Office of Environment and Heritage (now BCD)

RR – Resources regulator

SIMMCP – Swamp Impact, Monitoring, Management and Contingency Plan

S32 – South32

SMP – Subsidence Management Plan

TARP – Trigger Action Response Plan

WaterNSW – previously Sydney Catchment Authority

WIMMCP – Watercourse Impact, Monitoring, Management and Contingency Plan

Definitions

Active Mining Area – Within 400m of the active longwall.

1 OVERVIEW OF MONITORING PROGRAM

Landscape monitoring was conducted within the Longwall 19 mining area during baseline (pre-mining), active mining and post-mining periods. Baseline inspections were conducted up until the longwall was within 400m of each feature. During the active mining period (400m from the longwall), inspections increased to weekly until the longwall was at least 400m past the feature. Post-mining inspections continue as outlined in the relevant management plans.

1.1 Surface Monitoring for Longwall 19

IMCEFT and other specialists conducted observations and measurements of surface and shallow groundwater levels, swamp soil moisture, surface water flows, surface water quality and inspections of key landscape features. This monitoring included targeted sites within swamps and watercourses as well as steep slopes, clifflines and other landscape features.

Landscape Monitoring Summary

In accordance with the Dendrobium Area 3A SMP Approval, landscape monitoring sites and photo points within the active mining area were monitored at monthly intervals. Monitoring photos from Landscape sites are compared to baseline photos at each site. Landscape monitoring sites (and photo points) were monitored before, during and after the Longwall 19 extraction period (Table 1). Longwall 19 post-mining inspections were undertaken, and impacts were observed at four Landscape monitoring sites.

Table 1: Summary of Landscape monitoring sites associated with Longwall 19.

Site Name	Easting	Northing	Impact Description
LW19_SS1	291135	6192556	No impacts observed
LW19_SS2	291359	6192370	No impacts observed
LW19_SS3	291361	6192322	No impacts observed
LW19_SS4	291389	6192392	Rockfall and fragmentation
LW19_SS5	291460	6192410	Rockfall and fragmentation
LW19_SS6	291515	6192605	No impacts observed
LW19_SS7	291551	6192408	No impacts observed
LW19_SS8	291728	6192671	No impacts observed
LW19_SS9	291754	6192661	No impacts observed
LW19_SS10	292261	6192270	No impacts observed
LW19_SS11	292270	6192301	Rock fracturing
LW19_SS12	292391	6192337	No impacts observed
LW19_SS13	292963	6192058	No impacts observed
LW19_SS14	292941	6192224	No impacts observed
LW19_SS15	292977	6192113	No impacts observed

LW19_CL7	292815	6192101	No impacts observed
LW19_FR6F_1	292053	6192570	No impacts observed
LW19_FR6F_2	293136	6192267	No impacts observed
LW19_AT1	291863	6192549	Soil cracking and rock displacement
LW19_AT2	292197	6192440	No impacts observed

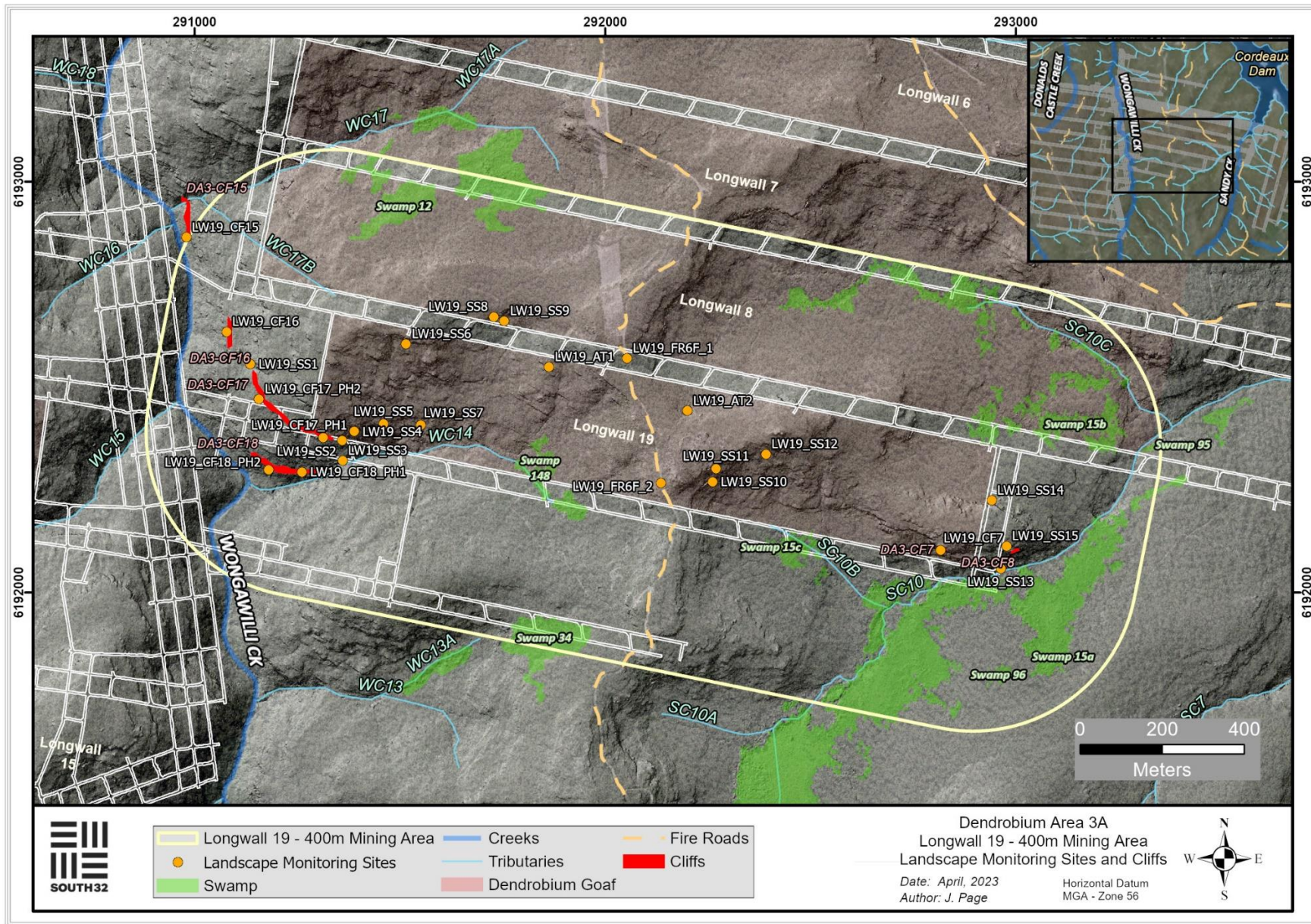


Figure 1: Map showing landscape monitoring and cliffline monitoring sites relevant to Longwall 19.

2 REFERENCE SITE MONITORING

Swamp reference sites are monitored in accordance with the SIMMCP. Photos from reference swamps 24 and 87 are shown below (Photo 1 and Photo 2). Data recorded from reference swamps is compared with data from impact monitoring sites relevant to previously mined and active longwalls. Specialist assessments of swamps, including comparison with reference swamps, will be included in the Terrestrial Ecology Assessment and Surface Water and Shallow Groundwater Assessment, to accompany the Longwall 19 EoP Summary Report.



Photo 1: Reference site S24_S01. Taken on 21/11/2022



Photo 2: Reference site S87_S02. Taken on 25/11/2022.

3 TARP OVERVIEW

Table 2: Management plans referred to for Longwall 19 monitoring and reporting.

Aspect	Management Plan
Swamps	Swamp Impact, Monitoring, Management and Contingency Plan (February 2021; <i>Addendum A- June 2021</i>)
Watercourses	Watercourse Impact Monitoring, Management and Contingency Plan (February 2021)
Landscape	Dendrobium Area 3B Subsidence Management Plan (SMP), Volume 2 – Table 1.2 Dendrobium Landscape Impacts, Triggers and Response (November 2012)

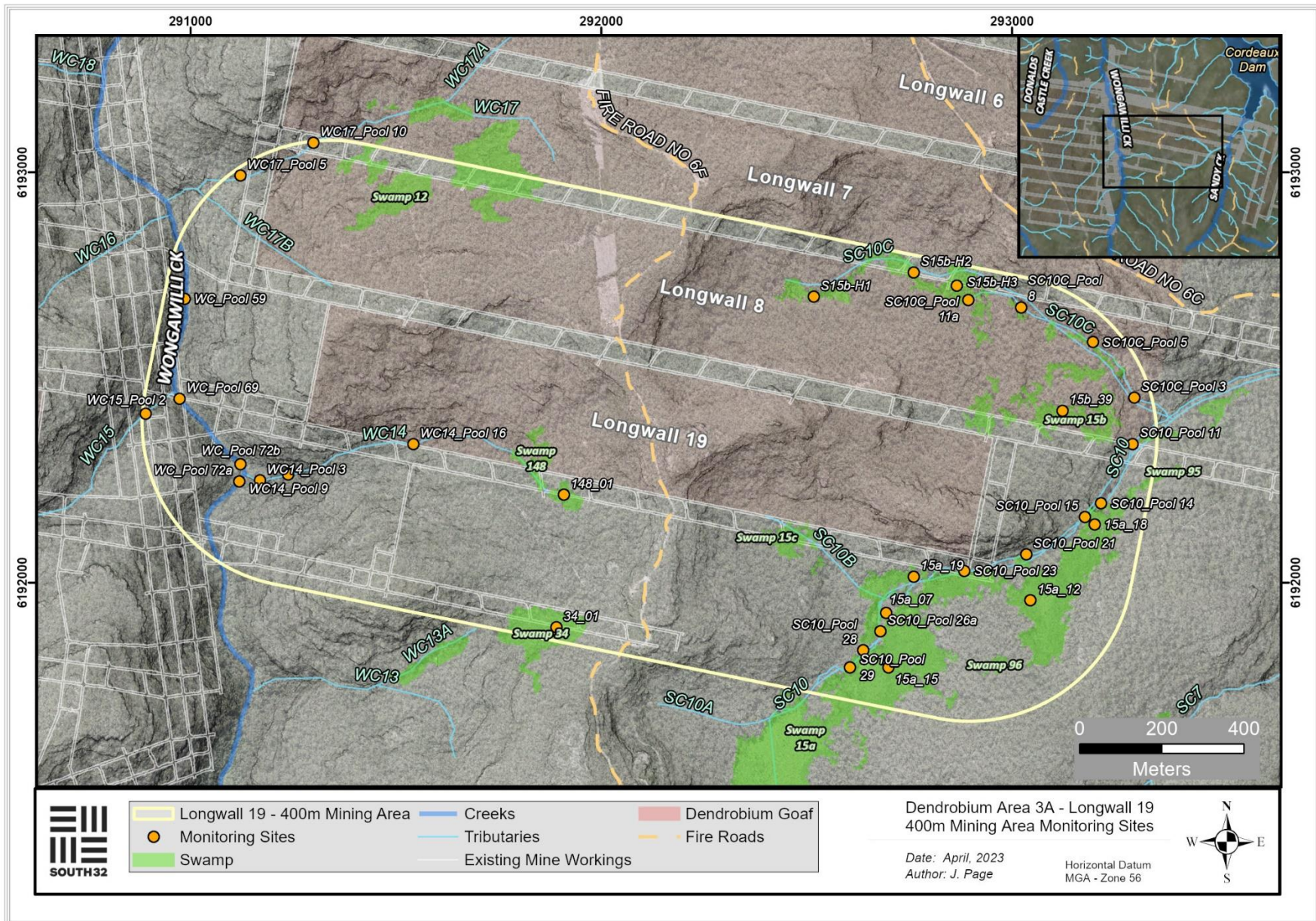


Figure 2: Map showing monitoring sites for the Longwall 19 active mining area.

4 SUMMARY OF IMPACTS

During the extraction of Longwall 19, 57 new surface impacts were identified (Table 3, Figure 3 and Figure 4). Shallow groundwater and soil moisture triggers were also recorded. These triggers will be addressed in the Longwall 19 Surface Water and Shallow Groundwater Assessment.

Impacts to Natural Features

Subsidence includes vertical and horizontal movement of the land surface, which can result in surface and subsurface cracking, uplifting, buckling, dilation and tilting. These impacts can affect watercourse hydrology and morphology, swamp hydrology and ecological function, and other landscape features by means of surface cracking, which can lead to erosion and rockfalls. Potential mine subsidence impacts within Dendrobium Area 3A are discussed in the Longwall 19 SMP, WIMMCP and SIMMCP.

Landscape features

Fractures and cracking observed during the extraction of Longwall 19 were assessed against the relevant TARP (landscape, swamp, or watercourse) and assigned a trigger value (Level 1, Level 2, Level 3 or Exceeding Prediction where applicable).

Table 3: Summary of impacts and triggers associated with Longwall 19. ** From mid-March 2023 a Version 2 of each impact report is submitted to agencies which includes a summary of stakeholder consultation. The date of the initial report is featured below.

Site ID	Eastings	Northings	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
DA3A_LW19_001	292826	6192225	Rock Fracturing	Steep Slope/ Step	3/08/2022	1	Rock fracturing to a steep slope/ step, east of Fire Road 6F.	5/08/2022
DA3A_LW19_002	292849	6192228	Rock Fracturing	Steep Slope/ Step	3/08/2022	2	Rock fracturing to a steep slope/ step, east of Fire Road 6F.	5/08/2022
DA3A_LW19_003	291372	6192315	Iron Staining	WC14	16/08/2022	2	Increase in Iron staining at tributary WC14	17/08/2022
DA3A_LW19_004	292690	6192352	Rock Fracturing and Fragmentation	Steep Slope/ Step	19/08/2022	1	Rock fracturing to a steep slope/ step, west of Swamp 15b.	23/08/2022

Site ID	Eastings	Northings	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
DA3A_LW19_005	292674	6192330	Rock Fracturing	Steep Slope/ Step	19/08/2022	1	Rock fracturing to a steep slope/ step, west of Swamp 15b.	23/08/2022
DA3A_LW19_006	292955	6192582	Soil Cracking	Bushland	31/08/2022	2	Soil cracking to bushland south of tributary SC10C.	5/09/2022
DA3A_LW19_007	292579	6192537	Soil Cracking	Bushland	18/10/2022	1	Soil cracking in bushland between Longwall 19 and Swamp 15b.	20/10/2022
DA3A_LW19_008	292201	6192364	Rock Fracturing	Rock Outcrop	7/11/2022	1	Rock fracturing to rock outcrop east of Fire Road 6F.	9/11/2022
DA3A_LW19_009	292218	6192350	Rock Fracturing	Rock Outcrop	7/11/2022	1	Rock fracturing to rock outcrop east of Fire Road 6F.	9/11/2022
DA3A_LW19_010	292242	6192320	Rock Fracturing	Rock Outcrop	7/11/2022	1	Rock fracturing to rock outcrop east of Fire Road 6F.	9/11/2022
DA3A_LW19_011	292252	6192308	Rock Fracturing	Rock Outcrop	7/11/2022	1	Rock fracturing to rock outcrop east of Fire Road 6F.	9/11/2022
DA3A_LW19_012	292290	6192348	Rock Fracturing	Rock Outcrop	7/11/2022	1	Rock fracturing to rock outcrop east of Fire Road 6F.	9/11/2022
DA3A_LW19_013	292461	6192421	Rock Fracturing and Rock Movement	Steep Slope/ Step	7/11/2022	2	Rock fracturing and rock movement at a steep slope/ step, east of Fire Road 6F. <i>Coordinates shown here are correct, updated from error in initial report.</i>	9/11/2022
DA3A_LW19_014	292448	6192427	Rock Movement	Boulder	7/11/2022	1	Dislodgement of a boulder east of Fire Road 6F.	9/11/2022
DA3A_LW19_015	292738	619127	Rock Fracturing	Steep Slope/ Step	7/11/2022	2	Rock fracturing to a steep slope/ step, north of Swamp 15a.	9/11/2022 and 22/12/2022 (Update)
DA3A_LW19_016	292449	6192346	Rock Fracturing and Rockfall	Steep Slope/ Step	7/11/2022	2	Rock fracturing and small rock fall at a steep slope/ step, east of Fire Road 6F.	9/11/2022 and 22/12/2022 (Update)
DA3A_LW19_017	292245	6192382	Rock Fracturing	Rock Outcrop	13/12/2022	1	Rock fracturing to a rock outcrop, east of Fire Road 6F.	15/12/2022
DA3A_LW19_018	292388	6192402	Rock Displacement	Steep slope	13/12/2022	1	Rock displacement to a steep slope, east of Fire Road 6F.	15/12/2022

Site ID	Eastings	Northings	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
DA3A_LW19_019	292408	6192390	Rock Displacement	Steep slope	13/12/2022	1	Rock displacement to a steep slope, east of Fire Road 6F.	15/12/2022
DA3A_LW19_020	292448	6192368	Soil Cracking	Bushland	13/12/2022	2	Soil cracking at the base of a rock outcrop, east of Fire Road 6F.	15/12/2022
DA3A_LW19_021	292491	6192387	Soil Cracking and Rock Displacement	Boulders	13/12/2022	2	Soil cracking and rock displacement to boulders, east of Fire Road 6F.	15/12/2022
DA3A_LW19_022	292503	6192363	Soil Cracking, Rock Fracturing and Rock Displacement	Bushland/ Rock Outcrop	13/12/2022	2	Soil cracking, rock fracturing and rock displacement in bushland, east of Fire Road 6F.	15/12/2022
DA3A_LW19_023	292508	6192390	Rock Fracturing	Rock Outcrop	13/12/2022	1	Rock fracturing to a rock outcrop, east of Fire Road 6F.	15/12/2022
DA3A_LW19_024	292660	6192191	Rock Fracturing and Soil Cracking	Step/ Bushland	20/12/2022	2	Rock fracturing to a step and soil cracking to bushland, east of Fire Road 6F.	22/12/2022
DA3A_LW19_025	292763	6192156	Rock Displacement	Boulder	20/12/2022	1	Rock displacement away from soil, east of Fire Road 6F.	22/12/2022 and 09/02/2023 (Update)
DA3A_LW19_026	292083	6192457	Soil Cracking	Fire Road 6F	21/12/2022	1	Soil cracking to Fire Road 6F.	22/12/2022
DA3A_LW19_015 (Update)	292545	6192234	Rock Fracturing	Steep Slope/ Step	7/11/2022	2	Rock fracturing to a steep slope/ step, east of Fire Road 6F.	9/11/2022 & 22/12/2022 (Update)
DA3A_LW19_016 (Update)	292523	6192252	Rock Fracturing, Fragmentation and Rockfall	Steep Slope/ Step	7/11/2022	2	Rock fracturing, fragmentation and rock fall at a steep slope/ step, east of Fire Road 6F.	9/11/2022 & 22/12/2022 (Update)
S148_01	291908	6192213	Soil Moisture	Swamp 148	22/12/2022	3	Soil moisture lower than baseline trigger in Swamp 148.	22/12/2022
DA3A_LW19_027	292069	6192332	Rock Fracturing and Rockfall	Step	10/01/2023	1	Rock fracturing and two small rockfalls at a step, west of Fire Road 6F.	11/01/2023

Site ID	Eastings	Northings	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
DA3A_LW19_028	292172	6192301	Rock Fracturing	Rock Outcrop	6/02/2023	1	Rock fracturing to rock outcrop east of Fire Road 6F	09/02/2023
DA3A_LW19_029	290816	6193699	Gas Release	Wongawilli Creek	18/01/2023	1	Gas release in WC_Pool 50, Wongawilli Creek	09/02/2023
DA3A_LW19_025 (Update)	292763	6192156	Rock Displacement, Rock Fracturing and Soil Cracking	Rock Step/Outcrop	20/12/2022, 17/01/2022 (update)	1	Rock displacement away from soil, rock fracturing and soil cracking east of Fire Road 6F. <i>Coordinates shown here are correct, updated from error in initial report.</i>	22/12/2022 and 09/02/2023 (Update)
DA3A_LW19_030	292181	6192366	Rock Fracturing	Rock Outcrop	15/02/2023	2	Rock fracturing to rock outcrop east of Fire Road 6F	17/02/2023
DA3A_LW19_031	292281	6192359	Rock Fracturing	Rock Outcrop	15/02/2023	1	Rock fracturing to rock outcrop east of Fire Road 6F	17/02/2023
DA3A_LW19_032	292267	6192304	Rock Fracturing	Rock Outcrop	15/02/2023	1	Rock fracturing to rock outcrop east of Fire Road 6F	17/02/2023
DA3A_LW19_033	292257	6192257	Rockfall	Rock Step/Outcrop	15/02/2023	1	Rockfall on rock outcrop east of Fire Road 6F	17/02/2023
DA3A_LW19_034	292233	6192251	Rock Fracturing	Rock Outcrop	15/02/2023	1	Rock fracturing to rock outcrop east of Fire Road 6F	17/02/2023
35b_01	289367	6190455	Groundwater	Swamp 35b	27/02/2023	3	Groundwater recession rate greater than baseline	14/03/2023
DA3A_LW19_035	291863	6192548	Soil Cracking	Closed Access Track and Bushland	16/03/2023	2	Soil cracking and rock displacement on a closed vehicle access track and adjacent bushland, west of Fire Road 6F.	17/03/2023
DA3A_LW19_036	291530	6193145	Soil Cracking	Closed Access Track	21/03/2023	1	Soil cracking on a closed access track over Longwall 7.	24/03/2023
DA3A_LW19_037	292211	6192222	Rock Fracturing and Rockfall	Sandy Creek 21 (Cultural Heritage Site)	28/03/2023	2	Rock fracturing and rockfall within proximity to cultural heritage site Sandy Creek 21	29/03/2023
DA3A_LW19_038	291440	6192459	Rock Fracturing and Rockfall	DM15 (Cultural Heritage Site)	28/03/2023	2	Rock fracturing and rockfall at cultural heritage site DM15.	29/03/2023

Site ID	Eastings	Northings	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
DA3A_LW8_003 (Update)	291534	6192335	Rock Fracturing, Rockfall and Fragmentation	WC14	12/04/2023	1	Rock fracturing with associated rockfall and fragmentation on WC14.	29/01/2020 and 17/04/2023 (Update)
DA3A_LW19_039	291495	6192380	Rockfall	Steep Slope/ Step	12/04/2023	1	Rockfall at base of steep slope/step to the north of WC14.	17/04/2023
DA3A_LW19_040	291523	6192422	Rockfall and Fragmentation	Step	12/04/2023	1	Rockfall with some associated fragmentation to the north of WC14.	17/04/2023
DA3A_LW19_041	291460	6192410	Rockfall	LW19_SS5	12/04/2023	2	Large rockfalls with boulders that dislodged and rolled downhill at landscape monitoring site LS19_SS5.	17/04/2023
DA3A_LW19_042	291389	6192392	Rockfall and Fragmentation	LW19_SS4	12/04/2023	1	Small rockfall with some associated fragmentation at landscape monitoring site LW19_SS4.	17/04/2023
DA3A_LW19_043	291507	6192349	Rock Fracturing and Uplift	WC14	17/04/2023	2	Rock fracturing and Uplift on WC14_Rockbar 7 which affects flow diversion.	27/04/2023
DA3A_LW19_044	291000	6192679	Iron Staining	Bushland	19/04/2023	1	Iron staining in bush within proximity but not flowing into Wongawilli Creek.	27/04/2023
DA3A_LW19_045	290884	6192410	Iron Staining	WC15	26/04/2023	1	Iron staining beneath a step that flows in to WC15_Pool 2.	01/05/2023
DA3A_LW19_046	291636	6192624	Rockfall	Steep Slope/ Step	27/04/2023	1	Rockfall on top of steep slope/ step where several boulders have dislodged from the slope face west of Fire Road 6F.	01/05/2023
DA3A_LW19_047	291302	6192673	Rockfall	Steep Slope/ Step	27/04/2023	1	Small rockfall on edge of steep slope/ step to the north of WC14.	01/05/2023
DA3A_LW19_048	291780	6192521	Rock Fracturing and Rock Movement	Closed Access Track	27/04/2023	1	Rock fracturing and rock movement along a closed access track west of Fire Road 6F.	01/05/2023
DA3A_LW19_049	291793	6192541	Soil Cracking	Closed Access Track	27/04/2023	1	Soil Cracking running along a closed access track west of Fire Road 6F.	01/05/2023
DA3A_LW19_050	291820	6192550	Soil Cracking	Closed Access Track	27/04/2023	2	Soil Cracking running along a closed access track west of Fire Road 6F.	01/05/2023
DA3A_LW19_051	291835	6192265	Rock Fracturing	WC14	04/05/2023	1	Rock fracturing on small rockbar (WC14 Channel 17) within Swamp 148.	09/05/2023

Site ID	Eastings	Northings	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
DA3A_LW19_052	291521	6192382	Rock Fracturing and Rockfall	Steep Slope	04/05/2023	1	Rock fracturing and associated rockfall on steep slope to the north of WC14.	09/05/2023
DA3A_LW19_053	291508	6192499	Rock Fracturing and Rockfall	Rock Step	04/05/2023	1	Rock fracturing and associated rockfall at base of a rock step to the north of WC14.	09/05/2023
DA3A_LW19_054	291671	6192546	Rock Fracturing and Fragmentation	Steep Slope	04/05/2023	1	Rock fracturing and fragmentation at base of a steep slope to the west of Fire Road 6F.	09/05/2023
DA3A_LW19_055	291494	6192483	Rock Fracturing and Rockfall	Steep Slope	04/05/2023	1	Rock fracturing and an associated rockfall beneath an overhang to the north of WC14.	09/05/2023
DA3A_LW19_056	291611	6192519	Rock Fracturing and Rockfall	Step/Overhang	05/05/2023	2	Rock fracturing and rockfall on a steep slope to the north of WC14.	09/05/2023
DA3A_LW19_057	291553	6192524	Rockfall	Step	05/05/2023	1	Rockfall at a step to the north of WC14.	09/05/2023
DA3A_LW19_058	291541	6192528	Rock Fracturing and Fragmentation	Rock Outcrop	05/05/2023	1	Rock fracturing and fragmentation on edge of a rock outcrop to the north of WC14.	09/05/2023
DA3A_LW19_059	291458	6192561	Rock Fracturing and Fragmentation	Overhang	05/05/2023	1	Rock fracturing and associated fragmentation beneath an overhang to the north of WC14.	09/05/2023
DA3A_LW19_060	291426	6192566	Rock Fracturing, Displacement and Rockfall	Step/Outcrop	05/05/2023	1	Rock fracturing, displacement and rockfall on a steep slope/ outcrop to the north of WC14.	09/05/2023
DA3A_LW19_061	291404	6192596	Rock Fracturing and Soil Cracking	Step/Outcrop	05/05/2023	2	Rock fracturing and soil cracking on a steep slope/ outcrop to the north of WC14.	09/05/2023
DA3A_LW19_062	291527	6192539	Rock Fracturing	Rock Outcrop	05/05/2023	1	Rock fracturing on the face of an outcrop to the north of WC14.	09/05/2023
DA3A_LW19_063	292280	6192283	Rock Movement	Steep Slope	10/05/2023	1	Boulder shifted downslope, east of Fire Road 6F.	15/05/2023
Swamp 15b	292926	6192599	Soil Moisture	Swamp 15b	29/05/2023	2	Soil moisture trigger at swamp sites S15b_39, S15b_H2 and S15b_H3.	29/05/2023

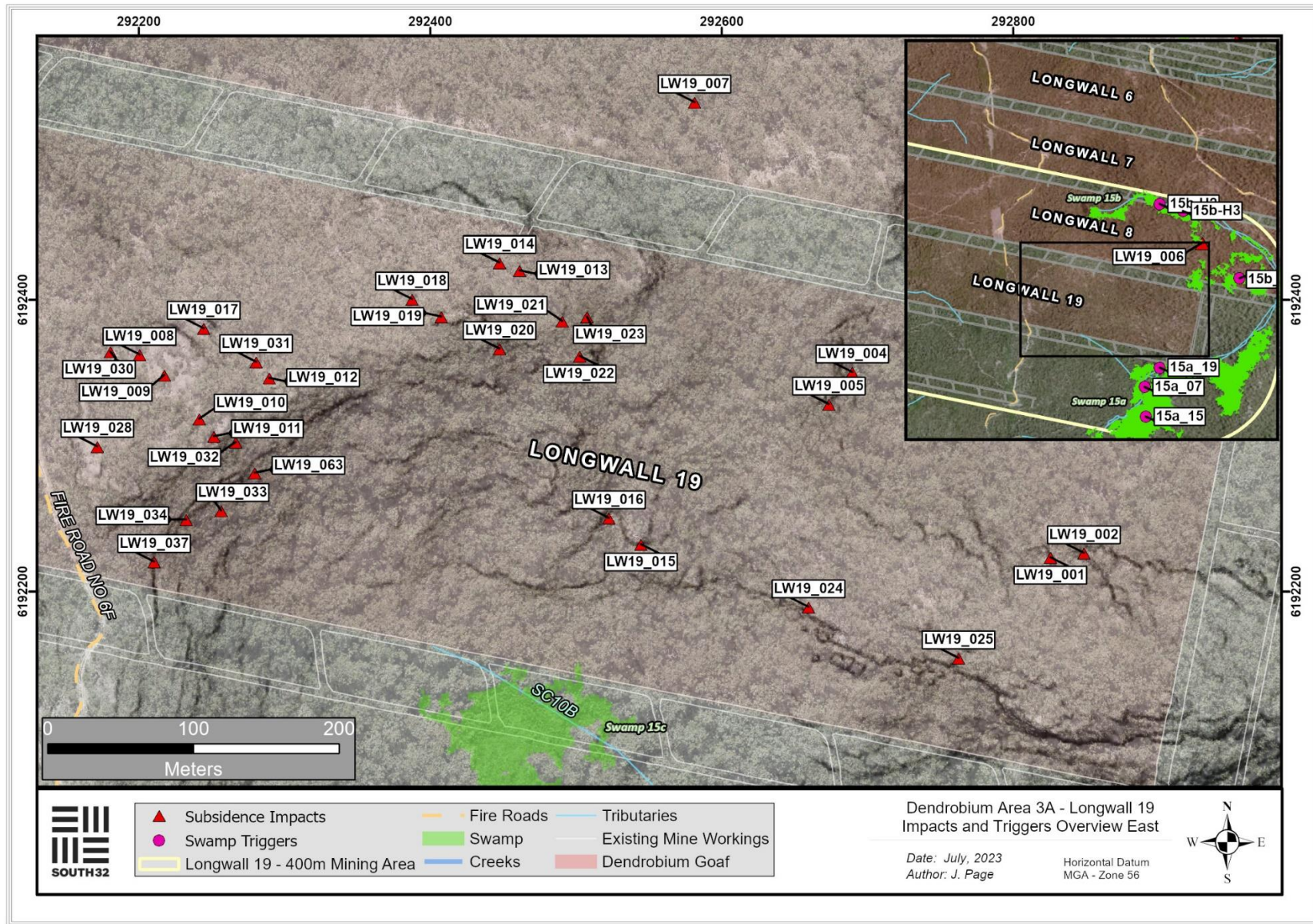


Figure 3: Map showing surface impacts and triggers on the eastern side of Longwall 19 recorded during the monitoring period.

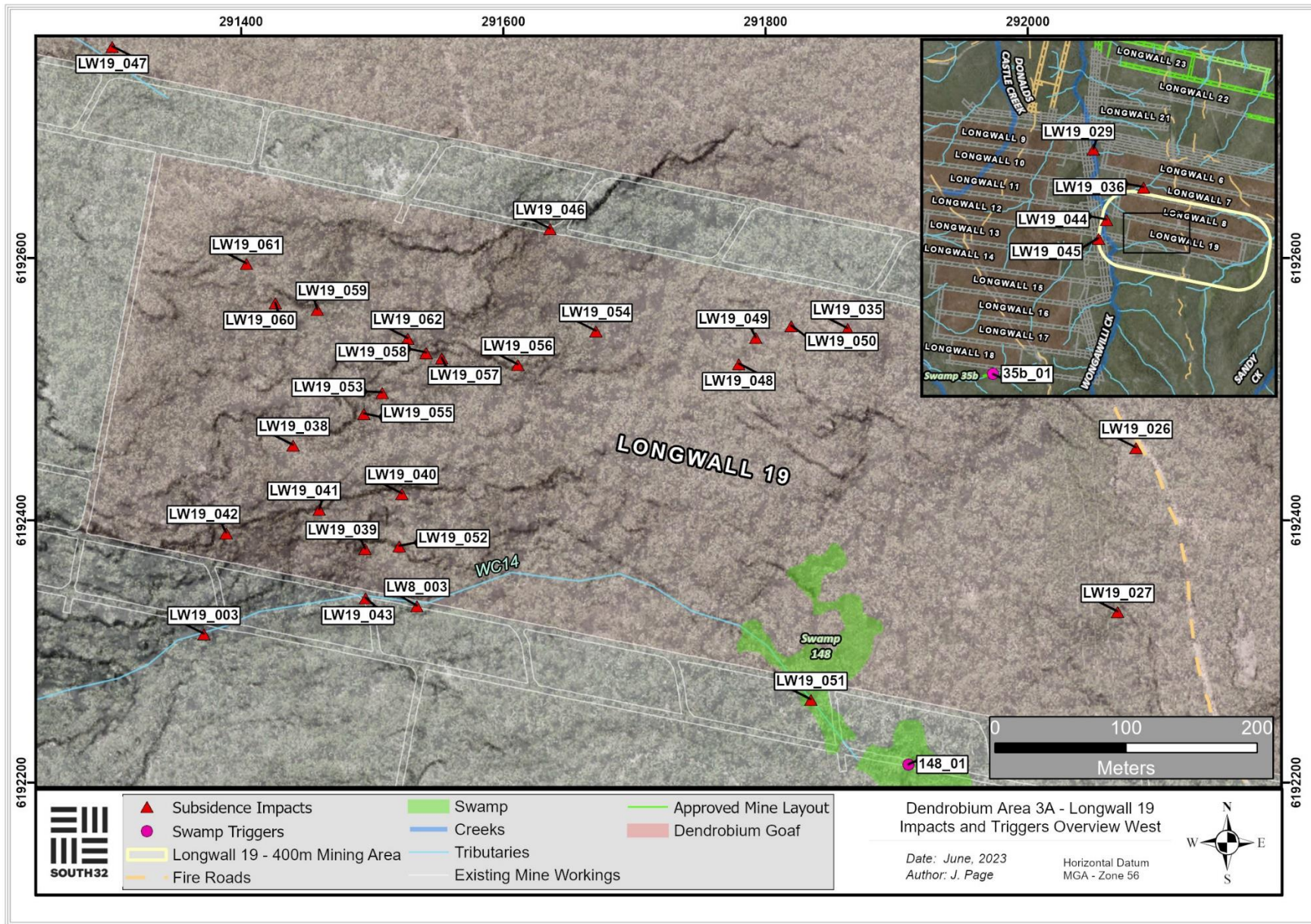


Figure 4: Map showing surface impacts and triggers on the western side of Longwall 19 recorded during the monitoring period.

5 IMPACTS TO WONGAWILLI CREEK

5.1 Wongawilli Creek

DA3A_LW19_029 (E 290816, N 6193699)

A gas release was observed in Wongawilli Creek at WC_Pool 50 on 18 January 2023 (Figure 4). The release was observed originating from the base of a sandstone step on the western side of the pool (Photo 3). The release was constant for approximately 15 seconds and ceased for approximately one minute, before starting again in a similar interval. A period of approximately 10 minutes was then observed without release. Very light, intermittent bubbling was also observed from the centre of the pool however these were very small and not able to be photographed.

A follow-up inspection of the site was undertaken on 1 February 2023 to collect a gas sample for laboratory analysis and to determine whether the release was strata gas, as opposed to, for example, biological decomposition. During this inspection a similar release was observed from the same location on the western side of the pool (Photo 4). A light, intermittent release was observed towards the centre of the pool (Photo 5). A gas sample was taken from the release on the western margin of the pool. The release was intermittent during sampling as a constant release was not observed. Results of the analysis show mostly carbon dioxide and very low levels of methane. Methane content was lower than that expected from strata or in-seam gas. A light sheen was also observed on the surface of the pool during this inspection however this was similar to that observed at other sites around the catchment and is likely the result of natural oils derived from plant material or iron floc, originating upstream from a previously reported iron spring.

A second follow-up inspection of the site was undertaken on 26 April 2023 to collect a water sample for laboratory analysis. During this inspection it was reported that the gas releases were very frequent and consistent along the western side of the pool with no releases in the centre of the pool. These results will be assessed in further detail in the specialist Surface Water and Shallow Groundwater Assessment of the final EoP Report.

DA3A_LW19_029 is a Level 1 trigger as per the Dendrobium Area 3A Watercourse TARP (Table 7), specifically:

- Observable release of strata (*unconfirmed*) gas at the surface.

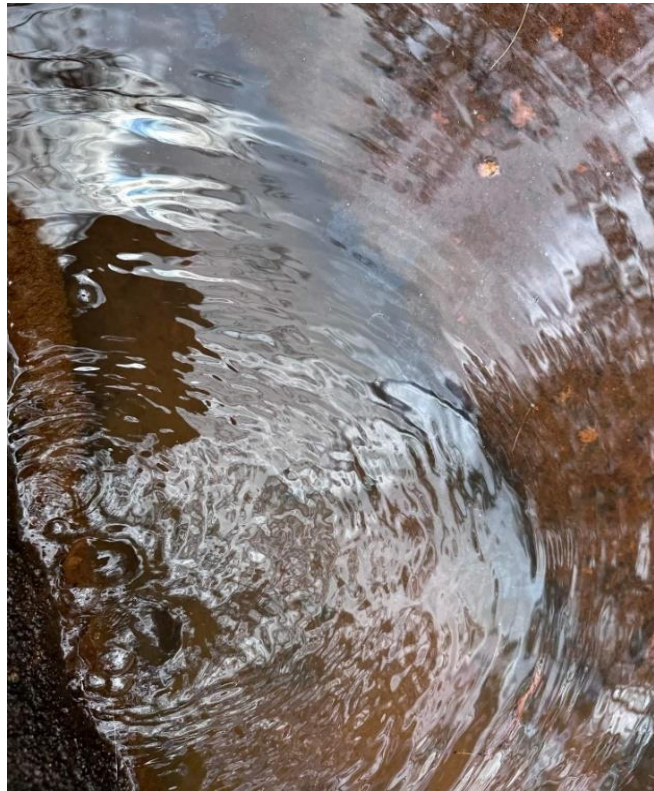


Photo 3: DA3A_LW19_029 - gas release from base of sandstone ledge on the western side of WC_Pool 50, Wongawilli Creek. Taken on 18/01/2023.



Photo 4: DA3A_LW19_029 gas release from base of sandstone ledge on the western side of WC_Pool 50, Wongawilli Creek. Taken on 1/02/2023.



Photo 5: DA3A_LW19_029 small gas release observed towards the centre of WC_Pool 50, Wongawilli Creek. Taken on 1/02/2023.

6 IMPACTS TO FIRST AND SECOND ORDER STREAMS

6.1 WC14

DA3A_LW19_003 (E 291372, N 6192315)

WC14 is a tributary of Wongawilli Creek, that flows westward from DA3A mining operations (Figure 4). Rock fracturing and iron staining on WC14 was previously identified and reported in January 2020, however likely occurred during the extraction of Longwall 8. During recent inspections of WC14, an increase in the extent of the iron staining was observed between WC14_Pool 10 and the confluence of WC14 and Wongawilli Creek (Photo 6 to Photo 21). Iron staining was not evident in Wongawilli Creek (Photo 9). Isolated sections of iron staining were evident upstream between WC14_Pool 10 and WC14_Step 3. Similar observations were recorded during baseline mapping in 2020 (Photo 18 and Photo 19). No iron was observed upstream of WC14_Step 3 (Photo 20 and Photo 21). The impact was re-inspected on 11 May 2023 and no changes were observed.

This observation is a Level 2 trigger as per the DA3A Watercourse Impact, Monitoring Management and Contingency Plan (Table 7Error! Reference source not found.), specifically:

- Observable increase in iron staining within the mining area continues to outside the mining area. i.e. 400 m from the Longwall.



Photo 6: WC14_Pool 3 looking upstream. Taken on 22/12/2021.

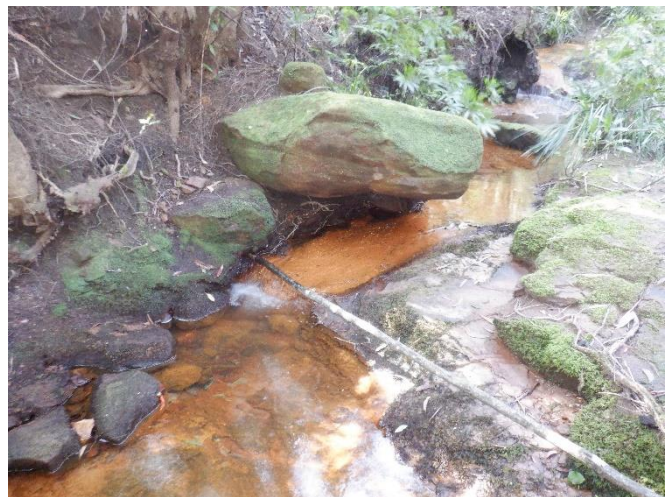


Photo 7: WC14_Pool 3 looking upstream. Taken on 16/08/2022.



Photo 8: WC14_Pool 3 looking downstream towards Wongawilli Creek. Taken on 16/08/2022.



Photo 9: WC14 and Wongawilli Creek confluence, looking downstream. Taken on 16/08/2022.



Photo 10: WC14_Pool 9 looking upstream taken on 11/12/2020



Photo 11: WC14_Pool 9 looking upstream taken on 16/8/2022.



Photo 12: WC14_Boulderfield 1, looking at a section of iron staining. Taken on 17/12/2019.

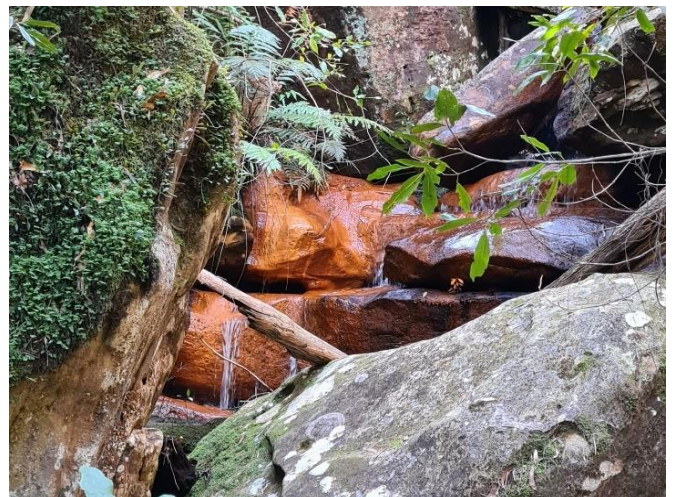


Photo 13: WC14_Boulderfield 1, looking at the same section of iron staining. Taken on 16/08/2022.



Photo 14: WC14_Step 1, looking upstream. Taken on 17/12/2019.



Photo 15: WC14_Step 1, looking upstream. Taken on 16/08/2022.



Photo 16: WC14_Rockbar 3, looking upstream. Taken on 28/01/2020.



Photo 17: WC14_Rockbar 3, looking upstream. Taken on 16/08/2022.



Photo 18: WC14_Step 3, looking at the iron staining. Taken on 28/01/2020.

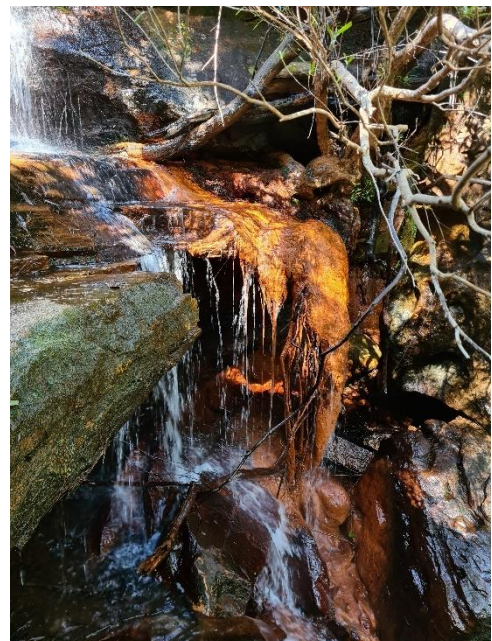


Photo 19: WC14_Step 3, looking at the iron staining. Taken on 16/08/2022.



Photo 20: WC14_Pool 16, looking downstream. Taken on 16/08/2022.



Photo 21: WC14_Pool 18, looking upstream. Taken on 16/08/2022.

DA3A_LW19_043 (E 291495, N 6192342)

DA3A_LW19_043 consists of multiple rock fractures and some associated uplift on *WC14*, a tributary to *Wongawilli Creek* (Figure 4). The largest fracture has a maximum continuous length of 7.7m, a maximum width of 0.08m and a maximum measurable depth of 0.81m (Photo 22 to Photo 25). Some rock fracturing has uplifted on the rockbar with a measured uplift of 0.13m occurring at the downstream end of the impacted rockbar. No flow was present during the inspection however some flow diversion could be expected during surface flow as the fracture runs across the main flow path of the tributary.

DA3A_LW19_043 is a Level 2 trigger as per the DA3A Watercourse Impact, Monitoring Management and Contingency Plan (Table 7), specifically:

- Crack or fracture that (could) result in observable loss of surface water or erosion.



Photo 22: DA3A_LW19_043, looking at rock Fracturing on rockbar. Taken 17/04/2023.



Photo 23: DA3A_LW19_043, looking upstream at rock fracturing on rockbar. Taken 17/04/2023.



Photo 24: DA3A_LW19_043, looking at rock fracturing across rockbar. Taken 17/04/2023.



Photo 25: DA3A_LW19_043, looking at section of uplift. Taken 17/04/2023.

DA3A_LW8_003 (Update) (E 291534, N 6192335)

DA3A_LW8_003 was originally recorded on 28 January 2020, with changes to the impact recently observed. DA3A_LW8_003 is located on WC14, a tributary to Wongawilli Creek (Figure 4). During the initial inspection the impact consisted of rock fracturing and uplift at the top of a step, located approximately 3m south of Longwall 19. The impact site now displays a continuation in rock fracturing which extends beneath a step with small associated rockfalls/fragments. Originally the rock fracturing was recorded with a maximum continuous length of 1.8m and a maximum width of 0.005m. The latest fracturing has a maximum continuous length of 2.73m, a maximum width of 0.04m and maximum measurable depth of 0.49m (Photo 26 to Photo 28). The associated rockfall/fragments dimensions were estimated due to safety concerns, with an approximate rockfall volume of 0.2m³ (Photo 29). No follow up inspection was undertaken as the impact was identified following the completion of Longwall 19.

DA3A_LW8_003 is a Level 1 trigger as per the DA3A Watercourse Impact, Monitoring, Management and Contingency Plan (Table 7), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length;
- Rockfall from a cliff (step) which is left mostly intact (<10% length), resulting in insignificant ground disturbance.



Photo 26: DA3A_LW8_003, looking at the width of rock fracturing. Taken 12/04/2023.



Photo 27: DA3A_LW8_003, looking at the extent of rock fracturing. Taken 12/04/2023.



Photo 28: DA3A_LW8_003, looking at the depth of rock fracturing. Taken 12/04/2023.



Photo 29: DA3A_LW8_003, looking at the rockfall and associated fragments. Taken on 12/04/2023.

DA3A_LW19_051 (E 291835, N 6192265)

DA3A_LW19_051 is located on WC14, a tributary to Wongawilli Creek (Figure 4). The impact consists of multiple rock fractures to a rock outcrop within Swamp 148 with the largest fracture having a maximum continuous length of 1.15m, a maximum width of 0.06m and a maximum measurable depth of 1.27m (Photo 30 and Photo 31). During both the baseline inspection and the recent Longwall 19 impact inspection there was no flow present at the site, therefore the fracture is not associated with loss of surface water. No follow up inspection was undertaken as the impact was identified following the completion of Longwall 19.

DA3A_LW19_051 is a Level 1 trigger as per the DA3A Watercourse Impact, Monitoring, Management and Contingency Plan (Table 7), specifically:

- 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



Photo 30: DA3A_LW19_051, showing rock fracturing to an outcrop on WC14. Taken on 4/5/2023.



Photo 31: DA3A_LW19_051, showing width of rock fracture. Taken on 4/5/2023.

6.2 WC15

DA3A_LW19_045 (E 290884, N 6192410)

WC15 is a tributary of *Wongawilli Creek* that flows eastward towards DA3A mining operations (Figure 4). DA3A_LW19_045 consists of iron staining which appears at the base of a step above WC15_Pool 2 and extends downstream approximately 1.4m, to the pool before disappearing beneath a boulder on the tributary's edge (Photo 32 and Photo 33). Impact DA3B_LW13_046 was previously recorded at the site on 1 April 2019 during Longwall 13, consisting of rock fracturing and displacement at WC15_Pool 2. The iron staining has only appeared during Longwall 19.

DA3A_LW19_045 is a Level 1 trigger as per the DA3A Watercourse Impact, Monitoring, Management and Contingency Plan (Table 7), specifically:

- Observable increase in iron staining within the mining area



Photo 32: DA3A_LW19_045, showing iron staining appearing at base of a step. Taken on 26/04/2023.



Photo 33: DA3A_LW19_045, showing iron staining disappearing beneath a boulder. Taken on 26/04/2023.

7 IMPACTS TO OTHER LANDSCAPE FEATURES

DA3A_LW19_001 (E 292826, N6192225)

DA3A_LW19_001 is located on a steep slope/step east of Fire Road 6F (Figure 3). The impact was identified on 3 August 2022, consisting of rock fracturing and measurements were estimated due to safety concerns. The rock fracturing had an approximate maximum length of 3m and a maximum width of less than 0.1m (Photo 34). The impact was re-inspected on 19 April 2023, with measurements of continuous length at 4.1m and a maximum width of 0.08m (Photo 35).

DA3A_LW19_001 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically;

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



Photo 35: DA3A_LW19_001, showing width of rock fracturing. Taken 19/04/2023.

Photo 34: *DA3A_LW19_001*, showing a section of rock fracturing. Taken 3/08/2022.

DA3A_LW19_002 (E 292849, N 6192228)

DA3A_LW19_002 is located on a steep slope/step east of Fire Road 6F (Figure 3). The impact was identified on 3 August 2022, consisting of two rock fractures approximately 10m apart. During the initial inspection measurements were estimated due to safety concerns. The rock fracturing had an approximate maximum length of 4m and a maximum width of less than 0.1m (Photo 36 to Photo 38). The impact was re-inspected on 19 April 2023, with a measured maximum continuous length of approximately 8m and a maximum width of 0.1m (Photo 39).

DA3A_LW19_002 is a now Level 2 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically;

- Crack or fracture between 100mm and 300mm width



Photo 36: *DA3A_LW19_002*, showing overview of site. Taken 3/08/2022.



Photo 37: *DA3A_LW19_002*, showing a section of rock fracturing. Taken 3/08/2022.



Photo 38: *DA3A_LW19_002*, showing a section of rock fracturing. Taken 3/08/2022.



Photo 39: *DA3A_LW19_002*, showing width of rock fracturing. Taken 19/04/2023.

DA3A_LW19_004 (E 292690, N 6192352)

DA3A_LW19_004 is located on a steep slope/ step west of Swamp 15b (Figure 3). The impact was identified on 19 August 2022, consisting of rock fracturing and fragmentation. Measurements were estimated due to safety concerns. The rock fracturing had an approximate maximum length of 1.5m and a maximum width of 0.05m (Photo 40). The rock fragmentation has an approximate volume of less than 0.1m³. The impact was re-inspected on 19 April 2023. The continuous length remained the same however, the width had decreased after it was measured to 0.035m (initial recordings were estimated due to safety concerns).

DA3A_LW19_004 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 40: *DA3A_LW19_004*, looking at rock fracturing and fragmentation. Taken on 19/08/2022.

DA3A_LW19_005 (E 292674, N 6192330)

DA3A_LW19_005 is located on a steep slope/step west of Swamp 15b (Figure 3). The impact was identified on 19 August 2022, consisting of two rock fractures. The rock fracturing had a maximum continuous length of 2.59m, a width of 0.035m and a maximum measurable depth of 0.37m (Photo 41 to Photo 43). Minor rock displacement from the soil was observed. The impact was re-inspected on 19 April 2023. The dimensions remained the same however, a section had fallen from the fracture (Photo 44).

DA3A_LW19_005 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 41: DA3A_LW19_005, looking at section of rock fracturing. Taken on 19/08/2022.



Photo 42: DA3A_LW19_005, looking at section of rock fracturing. Taken on 19/08/2022.



Photo 43: DA3A_LW19_005, looking at width of rock fracture. Taken on 19/08/2022.



Photo 44: DA3A_LW19_005, looking at rock fracture which has fallen creating a rockfall. Taken on 19/04/2023.

DA3A_LW19_006 (E 292955, N 6192582)

DA3A_LW19_006 is located approximately 150m south of tributary SC10C (Figure 3). The impact was identified on 31 August 2022 and consists of soil cracking. The soil cracking had a maximum continuous length of 2.5m (Photo 45), a maximum discontinuous length of 10m and maximum measurable depth of 1.1m. The soil crack had a maximum width of 0.14m (Photo 47). Surface erosion at the site has a maximum width of 0.7m (Photo 46). Flagging tape is in place as a safety precaution. This impact likely occurred due to the mining of Longwall 8 but was not identified during previous inspections. The impact was re-inspected on 19 April 2023 and no changes were observed.

DA3A_LW19_006 is a Level 2 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Crack or fracture between 100mm and 300mm width



Photo 45: Maximum continuous length of soil cracking (measuring tape set at 2.5m). Taken 31/08/2022.



Photo 46: Width of surface erosion. Taken 31/08/2022.



Photo 47: Width of soil crack. Taken 1/09/2022.

DA3A_LW19_007 (E 292579, N 6192537)

DA3A_LW19_007 was identified on 18 October 2022 and consists of soil cracking, located 100m to the north of Longwall 19 (Figure 3). The soil cracking is situated in bushland and runs parallel to a closed access track. The cracking had a maximum continuous length of 2.4m, a maximum width of 0.08m and maximum measurable depth of 0.4m (Photo 48 to Photo 51). It had a total discontinuous length of approximately 50m. In some sections, the soil is displaced from adjacent rock outcropping (Photo 48). This impact likely occurred during Longwall 8 but was only identified during the latest inspection of the area. Some sections of the soil cracking indicate more recent movements, likely due to Longwall 19. The impact was re-inspected on 19 April 2023. The soil crack's length remained the same however, the width was re-recorded and was measured 0.095m wide (Photo 49).

DA3A_LW19_007 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 48: *DA3A_LW19_007*, width of soil cracking. Taken on 18/10/2022.



Photo 49: *DA3A_LW19_007*, width of soil cracking. Taken on 19/04/2023.



Photo 50: *DA3A_LW19_007*, depth of soil cracking. Taken on 18/10/2022.



Photo 51: *DA3A_LW19_007*, section of soil cracking. Taken on 18/10/2022.

DA3A_LW19_008 (E 292201, N 6192364)

DA3A_LW19_008 is located 80m east of Fire Road 6F and consists of rock fracturing to a rock outcrop (Figure 3). The fracturing had a maximum continuous length of 5.4m, a maximum width of 0.028m and maximum measurable depth of 1.54m (Photo 52 to Photo 53). The fracture had a total discontinuous length of approximately 22m. Flagging tape is in place at the site as a safety precaution. The impact was re-inspected on 9 May 2023 and the rock fracturing then had a maximum continuous length of 6.8m and a maximum width of 0.042m (Photo 54 and Photo 55).

DA3A_LW19_008 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Crack or fracture up to 100mm width;

- Crack or fracture up to 10m length.



Photo 52: DA3A_LW19_008, section of rock fracturing. Taken on 7/11/2022.



Photo 53: DA3A_LW19_008, width of rock fracturing. Taken on 7/11/2022.



Photo 54: DA3A_LW19_008, section of rock fracturing taken on 09/05/2023.



Photo 55: DA3A_LW19_008, width of rock fracturing taken on 09/05/2023.

DA3A_LW19_009 (E 292218, N 6192350)

DA3A_LW19_009 is located 95m east of Fire Road 6F and consists of rock fracturing to a rock outcrop (Figure 3). The fracturing had a maximum continuous length of 7.44m, a maximum width of 0.016m and maximum measurable depth of 0.043m (Photo 56 and Photo 57). The fracture had a total discontinuous length of approximately 48m. Flagging tape is in place at the site as a safety precaution. The impact was re-inspected on 9 May 2023 and the length of rock fracturing remained the same however, the width increased to 0.045m (Photo 58).

DA3A_LW19_009 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 56: DA3A_LW19_009, section of rock fracturing. Taken on 7/11/2022.



Photo 57: DA3A_LW19_009, width of rock fracturing. Taken on 7/11/2022.



Photo 58: DA3A_LW19_009, width of rock fracturing. Taken on 09/05/2023.

DA3A_LW19_010 (E 292242, N 6192320)

DA3A_LW19_010 is located 115m east of Fire Road 6F and consists of rock fracturing to a rock outcrop (Figure 3). The fracturing has a maximum continuous length of 2.8m, a maximum width of 0.012m and maximum measurable depth of 0.29m (Photo 59 and Photo 60). The impact was re-inspected on 9 May 2023 and no changes were observed.

DA3A_LW19_010 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 59: DA3A_LW19_010, section of rock fracturing. Taken on 7/11/2022.



Photo 60: DA3A_LW19_010, width of rock fracturing. Taken on 7/11/2022.

DA3A_LW19_011 (E 292252, N 6192308)

DA3A_LW19_011 is located 115m east of Fire Road 6F and consists of two rock fractures to a rock outcrop (Figure 3). The fracturing has a maximum continuous length of 4m and a maximum width of 0.003m (Photo 61 and Photo 62). Flagging tape is in place at the site as a safety precaution. The impact was re-inspected on 9 May 2023 and no changes were observed.

DA3A_LW19_011 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 61: DA3A_LW19_011, section of rock fracturing. Taken on 7/11/2022.



Photo 62: DA3A_LW19_011, width of rock fracturing. Taken on 7/11/2022.

DA3A_LW19_012 (E 292290, N 6192348)

DA3A_LW19_012 is located 165m east of Fire Road 6F and consists of rock fracturing to a rock outcrop (Figure 3). The fracturing has a maximum continuous length of 5.7m, a maximum width of 0.008m and maximum

measurable depth of 0.17m (Photo 63 and Photo 64). The fracture has a total discontinuous length of approximately 9.5m. The impact was re-inspected on 9 May 2023 and no changes were observed.

DA3A_LW19_012 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 63: *DA3A_LW19_012*, section of rock fracturing. Taken on 7/11/2022.



Photo 64: *DA3A_LW19_012*, width of rock fracturing. Taken on 7/11/2022.

DA3A_LW19_013 (E 292461, N 6192421) (corrected coordinates)

DA3A_LW19_013 is located 120m east of Fire Road 6F and consists of rock fracturing and rock movement to a steep slope/step (Figure 3). The fracturing has a maximum continuous length of 1.8m, a maximum width of 0.105m and maximum measurable depth of 2.3m (Photo 65 and Photo 66). Flagging tape is in place at the site as a safety precaution. The impact was re-inspected on 11 May 2023 and no changes were observed.

DA3A_LW19_013 is a Level 2 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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

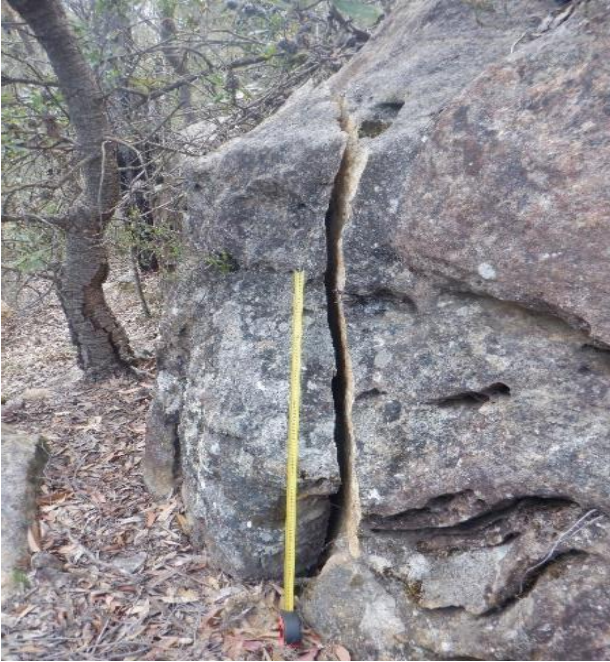


Photo 65: DA3A_LW19_013, section of rock fracturing. Taken on 7/11/2022.



Photo 66: DA3A_LW19_013, width of rock fracturing. Taken on 7/11/2022.

DA3A_LW19_014 (E 292448, N 6192427)

DA3A_LW19_014 is located 350m east of Fire Road 6F and consists of the movement of a boulder (Figure 3). The boulder has been dislodged from its natural position and rolled forward approximately 1m. The boulder has a length of 3.4m, a width of 2.5m, height of 1.1m and an approximate volume less than 9m³ (Photo 67 and Photo 68). Flagging tape is in place at the site as a safety precaution however the boulder now appears stable. The impact was re-inspected on 9 May 2023 and no changes were observed.

DA3A_LW19_014 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Surface movement or rock displacement with negligible soil surface exposed.



Photo 67: DA3A_LW19_014, looking at the displacement of the boulder. Taken on 7/11/2022.



Photo 68: DA3A_LW19_014, looking at the displacement of the boulder. Taken on 7/11/2022.

DA3A_LW19_015 (E 292738, N 619127)

DA3A_LW19_015 is located 100m north of Swamp 15a and consists of a rock fracture to a steep slope/step (Figure 3). The following measurements have been estimated from a distance due to safety concerns. The fracturing had a length of 1m, a maximum width of 0.30m and maximum depth of 3m (Photo 69). Flagging tape is in place at the site as a safety precaution. The impact was re-inspected on 19 April 2023. The impact now extends to 2.3m discontinuous length (Photo 70) and width remained the same.

DA3A_LW19_015 is a Level 2 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Crack or fracture between 100mm and 300mm width



Photo 69: DA3A_LW19_015, section of rock fracturing. Taken on 7/11/2022.



Photo 70: DA3A_LW19_015, section of rock fracturing. Measuring tape set at 2.3m. Taken on 19/04/2023.

DA3A_LW19_016 (E 292449, N 6192346)

DA3A_LW19_016 is located 320m east of Fire Road 6F and consists of two rock fractures and associated displacement at a steep slope/step (Figure 3). The following measurements have been estimated from a distance due to safety concerns. The largest fracture had a length of 2m and a maximum width of 0.1m (Photo 71 and Photo 72). The rock displacement/fragmentation had approximate dimensions of 1.3m x 0.8m x 0.5m. The impact was re-inspected on 19 April 2023. The rock fracturing now has extended to 3.9m and the width reduced to 0.06m (Photo 73) (initial recordings estimated from distance for safety reasons).

DA3A_LW19_016 is a Level 2 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 71: DA3A_LW19_016, section of rock fracturing. Taken on 7/11/2022.



Photo 72: DA3A_LW19_016, section of rock fracturing. Taken on 7/11/2022.



Photo 73: DA3A_LW19_016, showing extent of rock fracturing. Taken on 19/04/2023.

DA3A_LW19_017 (E 292245, N 6192382)

DA3A_LW19_017 is located 130m east of Fire Road 6F and consists of rock fracturing to a rock outcrop (Figure 3). The fracturing has a maximum continuous length of 2.8m and a maximum width of 0.001m (Photo 74 and Photo 75). The impact was re-inspected on 9 May 2023 and no changes were observed.

DA3A_LW19_017 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 74: DA3A_LW19_017, section of rock fracturing. Taken on 13/12/2022.



Photo 75: DA3A_LW19_017, width of rock fracturing. Taken on 13/12/2022.

DA3A_LW19_018 (E 292388, N 6192402)

DA3A_LW19_018 is located approximately 280m east of Fire Road 6F and consists of rock displacement away from soil (Figure 3). The displacement has a maximum continuous length of 1.1m, a maximum width of 0.015m and maximum measurable depth of 0.22m (Photo 76 and Photo 77). The impact was re-inspected on 9 May 2023 and no changes were observed.

DA3A_LW19_018 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 76: DA3A_LW19_018, section of rock displacement. Taken on 13/12/2022.



Photo 77: DA3A_LW19_018, width of rock displacement. Taken on 13/12/2022.

DA3A_LW19_019 (E 292408, N 6192390)

DA3A_LW19_019 is located approximately 290m east of Fire Road 6F and consists of multiple rock displacements away from soil within a 10m x 2m area (Figure 3). The displacement has a maximum continuous length of 2.8m, a maximum width of 0.086m and maximum measurable depth of 1m (Photo 78 and Photo 79). The impact was re-inspected on 9 May 2023 and no changes were observed.

DA3A_LW19_019 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 78: DA3A_LW19_019, section of rock displacement. Taken on 13/12/2022.



Photo 79: DA3A_LW19_019, width of rock displacement. Taken on 13/12/2022.

DA3A_LW19_020 (E 292448, N 6192368)

DA3A_LW19_020 is located approximately 330m east of Fire Road 6F and consists of soil cracking to the base of a rock outcrop (Figure 3). The soil cracking has a discontinuous length of 7m, a maximum continuous length of 3.1m, a maximum width of 0.10m and maximum measurable depth of 1.2m (Photo 80 and Photo 81). Barricading is not appropriate as the site is located in remote bushland. The impact was re-inspected on 9 May 2023 and no changes were observed however, there were some signs of erosion and infilling to the soil crack (Photo 82).

DA3A_LW19_020 is a Level 2 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Crack or fracture between 100 and 300mm width.



Photo 80: DA3A_LW19_020, section of soil cracking. Taken on 13/12/2022.



Photo 81: DA3A_LW19_020, width of soil cracking. Taken on 13/12/2022.



Photo 82: DA3A_LW19_020, showing erosion of soil crack. Taken on 09/05/2023.

DA3A_LW19_021 (E 292491, N 6192387)

DA3A_LW19_021 is located approximately 370m east of Fire Road 6F and consists of soil cracking and rock displacement to boulders (Figure 3). The soil cracking has a maximum continuous length of 3.7m, a maximum width of 0.15m and maximum measurable depth of 1.1m (Photo 83 to Photo 86). The impact was re-inspected on 9 May 2023 and no changes were observed.

DA3A_LW19_021 is a Level 2 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Crack or fracture between 100 and 300mm width



Photo 83: DA3A_LW19_021, section of soil cracking. Taken on 13/12/2022.



Photo 84: DA3A_LW19_021, section of rock displacement. Taken on 13/12/2022.



Photo 85: DA3A_LW19_021, depth of soil cracking. Taken on 13/12/2022.



Photo 86: DA3A_LW19_021, width of soil cracking. Taken on 13/12/2022.

DA3A_LW19_022 (E 292503, N 6192363)

DA3A_LW19_022 is located approximately 380m east of Fire Road 6F and consists of multiple soil cracks, rock fractures and rock displacement (Figure 3). The soil cracking has a discontinuous length of 30m, a maximum continuous length of 3.5m, a maximum width of 0.18m and maximum measurable depth of 6m (Photo 89 and Photo 90). The rock fracturing has a maximum length of 1.2m, a maximum width of 0.13m and maximum measurable depth of 2.4m (Photo 87 and Photo 88). Flagging tape has been placed at the site. The impact was re-inspected on 9 May 2023 and the maximum width remained the same however, the rock fracturing increased to a continuous length of 1.8m.

DA3A_LW19_022 is a Level 2 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Crack or fracture between 100 and 300mm width



Photo 87: *DA3A_LW19_022*, section of rock fracturing. Taken on 13/12/2022.



Photo 88: *DA3A_LW19_022*, width of rock fracturing. Taken on 13/12/2022.



Photo 89: *DA3A_LW19_022*, section of rock displacement. Taken on 13/12/2022.



Photo 90: *DA3A_LW19_022*, section of soil cracking. Taken on 13/12/2022.

DA3A_LW19_023 (E 292508, N 6192390)

DA3A_LW19_023 is located approximately 395m east of Fire Road 6F and consists of rock fracturing (Figure 3). The rock fracturing has a maximum continuous length of 2m (partially cover by sediment), a maximum width of 0.065m and maximum measurable depth of 0.9m (Photo 91 and Photo 92). The impact was re-inspected on 9 May 2023 and no changes were observed.

DA3A_LW19_023 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 91: *DA3A_LW19_023*, section of rock displacement. Taken on 13/12/2022.



Photo 92: *DA3A_LW19_023*, width of rock displacement. Taken on 13/12/2022.

DA3A_LW19_024 (E 292660, N 6192191)

DA3A_LW19_024 is located 490m east of Fire Road 6F and consists of rock fracturing to steep slope/step and soil cracking (Figure 3). The rock fracturing and soil cracking are connected, with a maximum continuous length of 5m, a maximum width of 0.16m and a maximum measurable depth of 1.5m (Photo 93 to Photo 95). Other smaller rock fractures are also present within a 25m² area. The impact was reinspected on 19 April 2023 and there were no recordable changes to the dimensions however, there were some signs of erosion to the soil crack (Photo 96).

DA3A_LW19_024 is a Level 2 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 93: DA3A_LW19_024, section of rock fracturing. Taken on 20/12/2022.



Photo 94: DA3A_LW19_024, section of soil cracking. Taken on 20/12/2022.



Photo 95: DA3A_LW19_024, width of soil cracking. Taken on 20/12/2022.



Photo 96: DA3A_LW19_024, width of soil crack after erosion. Taken 19/04/2023.

DA3A_LW19_025 (E 292763, N 6192156)

DA3A_LW19_025 is located approximately 590m east of Fire Road 6F and consists of rock displacement away from soil (Figure 3). The displacement has a maximum continuous length of 6.2m, a maximum width of 0.07m and maximum measurable depth of 0.32m (Photo 97 and Photo 98). The impact was re-inspected on 19 April 2023 and there were no changes observed.

DA3A_LW19_025 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 97: DA3A_LW19_025, section of rock displacement.
Taken on 20/12/2022.



Photo 98: DA3A_LW19_025, width of rock displacement.
Taken on 20/12/2022.

DA3A_LW19_027 (E 292069, N 6192332)

DA3A_LW19_027 consists of rock fracturing and associated small rockfalls at a step approximately 55m west of Fire Road 6F (Figure 4). The rock fracturing has a discontinuous length of 9m, a maximum continuous length of 2.09m, a maximum width of 0.018m and a maximum measurable depth of 0.76m (Photo 99 and Photo 102). Two small rockfalls are evident at the site, with approximate rockfall volumes of 1m³ and 0.5m³ (Photo 99 to Photo 101) flagging tape is in place at the site as a safety precaution. The impact was re-inspected on 11 May 2023 and no changes were observed.

DA3A_LW19_027 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length.
- Rockfall from a cliff (step) which is left mostly intact (<10% length), resulting in insignificant ground disturbance.



Photo 99: DA3A_LW19_027, section of rock fracturing and rockfall. Taken on 10/01/2023.



Photo 100: DA3A_LW19_027, section of rock fracturing and rockfall. Taken on 10/01/2023.



Photo 101: DA3A_LW19_027, section of rock fracturing and rockfall. Taken on 10/01/2023.



Photo 102: DA3A_LW19_027, section of rock fracturing. Taken on 10/01/2023.

DA3A_LW19_028 (E 292172, N 6192301)

DA3A_LW19_028 consists of rock fracturing to a rock outcrop east of Fire Road 6F (Figure 3). The impact consists of three rock fractures within an area of 25m x 1m. The rock fracturing has a maximum continuous length of 5.86m, a maximum width of 0.016m and a maximum measurable depth of 0.4m (Photo 103 and Photo 104). The site was re-inspected on 11 May 2023 and no changes were observed.

DA3A_LW19_028 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 103: DA3A_LW19_028, section of rock fracturing. Taken on 6/02/2023.



Photo 104: DA3A_LW19_028, width of rock fracturing. Taken on 6/02/2023.

DA3A_LW19_030 (E 292181, N 6192366)

DA3A_LW19_030 consists of rock fracturing to a rock outcrop east of Fire Road 6F (Figure 3). The impact consists of a single rock fracture. The fracture had a maximum continuous length of 9.8m, a maximum width of 0.032m and a maximum measurable depth of 1.1m (Photo 105 and Photo 106). The impact was re-inspected on 9 May 2023 and while the width remained the same the length of fracture increased to 10.5m continuous.

DA3A_LW19_030 is a Level 2 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 105: DA3A_LW19_030, rock fracturing to an outcrop. Taken on 15/2/2023.



Photo 106: DA3A_LW19_030, width of rock fracturing on outcrop. Taken on 15/2/2023.

DA3A_LW19_031 (E 292281, N 6192359)

DA3A_LW19_031 consists of two small rock fractures to a rock outcrop east of Fire Road 6F (Figure 3). The rock fracturing had a maximum continuous length of 0.65m, a maximum width of 0.009m and a maximum

measurable depth of 0.23m (Photo 107 and Photo 108). The impact was re-inspected on 9 May 2023 and while the width remained the same the length of fracture increased to 1.04m continuous (Photo 109).

DA3A_LW19_031 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 107: *DA3A_LW19_031*, rock fracturing to an outcrop. Taken on 15/2/2023



Photo 108: *DA3A_LW19_031*, width of rock fracture on outcrop. Taken on 15/2/2023



Photo 109: *DA3A_LW19_031*, length of fracturing increased. Photo taken on 09/05/2023.

DA3A_LW19_032 (E 292267, N 6192304)

DA3A_LW19_032 consists of a rock fracture that runs vertically up a rock step, to the east of Fire Road 6F and within close proximity to landscape monitoring site *LW19_SS11* (Figure 1 and Figure 3). The rock fracture is not visible at the landscape monitoring site photo point (Photo 111). A baseline photo is provided for pre-mining comparison (Photo 112). The rock fracture has a maximum continuous length of 1.2m, a maximum width of 0.01m and a maximum measurable depth of 0.31m (Photo 110). The impact was re-inspected on 11 May 2023 and no changes were observed.

DA3A_LW19_032 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 110: DA3A_LW19_032, rock fracturing on side of outcrop. Taken on 15/2/2023.



Photo 111: Landscape monitoring site LW19_SS11. Taken 16/06/2022.



Photo 112: Landscape monitoring site LW19_SS11. Taken 15/02/2023.

DA3A_LW19_033 (E 292257, N 6192257)

DA3A_LW19_033 consists of a small rockfall on a step to the east of Fire Road 6F (Figure 3). The rockfall has an approximate rockfall volume of 0.042m³ (Photo 113 and Photo 114). Flagging tape is in place at the site as a safety precaution. The impact was re-inspected on 11 May 2023 and no changes were observed.

DA3A_LW19_033 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Rockfall from a cliff (step) which is left mostly intact (<10% length), resulting in insignificant ground disturbance.



Photo 113: DA3A_LW19_033, rock fall from edge of steep slope. Taken on 15/2/2023.



Photo 114: DA3A_LW19_033, rock fall from edge of steep slope. Taken on 15/2/2023.

DA3A_LW19_034 (E 292233, N 6192251)

DA3A_LW19_034 consists of a thin rock fracture that runs vertically up a rock outcrop east of Fire Road 6F (Figure 3). The rock fracturing has a maximum continuous length of 2.9m, a maximum width of 0.008m and a maximum measurable depth of 0.07m (Photo 115). The impact was re-inspected on 11 May 2023 and no changes were observed.

DA3A_LW19_034 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 115: DA3A_LW19_034, rock fracturing on side of an outcrop. Taken on 15/2/2023.

DA3A_LW19_037 (E 292211, N 6192222)

DA3A_LW19_037 is located 57m east of Fire Road 6F and consists of rock fracturing beneath an overhang with some small associated rockfalls (Figure 3). At the time of inspection, the rock fracture had a length of 5.2m, width of 0.022m, and measurable depth of 0.34m (Photo 116 to Photo 119). The site is registered Aboriginal Heritage site *Sandy Creek 21 (52-5-0273)*. The fracturing is approximately 6m away from the site's recorded artwork.

Some fracturing and rockfalls were identified during the baseline inspection- *Aboriginal Cultural Heritage Assessment Report Longwall 19, DA3A (30 October 2020)*. Recent fracturing and rockfalls were identified in the latest inspection (Photo 120 and Photo 121). The rock fracturing at *Sandy Creek 21* does not directly impact the artwork (Photo 122 and Photo 123). The impact was re-inspected on 11 May 2023 and no changes were observed. This will be addressed further in the Longwall 19 EoP Cultural Heritage Assessment.

DA3A_LW19_037 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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

DA3A_LW19_037 is a Level 2 trigger as per the Aboriginal Cultural Heritage Management Plan Longwall 19, Dendrobium Area 3A TARP, specifically:

- Change in shelter conditions not attributable to natural weathering or preservation- change in drip line or seepage, cracking or exfoliation of overhang or shelter, movement or opening of existing planes and joints in panel, block fall within shelter or overhang, shelter, or overhang collapse.



Photo 116: DA3A_LW19_037, rock fracturing. Taken on 28/03/2023.



Photo 117: DA3A_LW19_037, rock fracturing. Taken on 28/03/2023.



Photo 118: DA3A_LW19_037, rock fall. Taken on 28/03/2023.



Photo 119: DA3A_LW19_037, rock fall. Taken on 28/03/2023.



Photo 120: Baseline photo of Sandy Creek 21. Taken circa October 2020.



Photo 121: DA3A_LW19_037, rock fracturing through overhang at Sandy Creek 21. Taken on 28/03/2023.

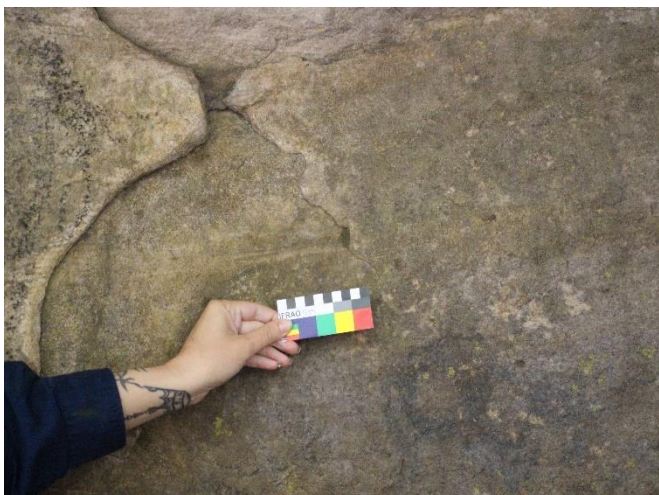


Photo 122: Baseline photo of art at *Sandy Creek 21*. Taken circa October 2020.



Photo 123: *Sandy Creek 21* showing no impacts to artwork following Longwall 19. Taken on 28/03/2023.

DA3A_LW19_038 (E 291440, N 6192459)

DA3A_LW19_038 is located 125m north of tributary WC14 and consists of rock fracturing with some smaller associated rockfalls (Figure 4). Fracture measurements were estimated due to limited site access. At the time of inspection, the fracture had an estimated length of 2m and a maximum width of 0.001m. The fracture extends vertically up from an existing horizontal fracture present in the baseline record. The rockfall at the site has an approximate volume of less than 0.1m³ (Photo 124 to Photo 127).

The site is registered Aboriginal Heritage site *DM15 (52–2–3639)*. The new hairline fracture runs through a part of the artwork and up to the ceiling of the overhang with a small rockfall. Baseline observations prior to mining included one pre-existing fracture through the art (Photo 128 and Photo 129). The impact was re-inspected on 11 May 2023 and no changes were observed. This will be addressed further in the Longwall 19 EoP Cultural Heritage Assessment.

DA3A_LW19_038 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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

DA3A_LW19_038 is a Level 2 trigger as per the Aboriginal Cultural Heritage Management Plan Longwall 19, Dendrobium Area 3A TARP, specifically:

- Change in shelter conditions not attributable to natural weathering or preservation- change in drip line or seepage, cracking or exfoliation of overhang or shelter, movement or opening of existing planes and joints in panel, block fall within shelter or overhang, shelter, or overhang collapse.



Photo 124: DA3A_LW19_038, rock fracturing at artwork. Taken on 28/03/2023.



Photo 125: DA3A_LW19_038, rock fracturing extending to the upper part of overhang. Taken on 28/03/2023.



Photo 126: DA3A_LW19_038, section where rock fall occurred. Taken on 28/03/2023.



Photo 127: DA3A_LW19_038, rock fall on ground. Taken on 28/03/2023.



Photo 128: Art at DM15- baseline image displaying horizontal rock fracture identified prior to mining. Taken circa October 2020.



Photo 129: Art at DM15- image taken in latest inspection showing current fracturing. Recent fracture is circled. Taken on 28/03/2023.

DA3A_LW19_039 (E 291495, N 6192380)

DA3A_LW19_039 is approximately 30m to the north of *WC14*, a tributary to *Wongawilli Creek* (Figure 4). The impact consists of a rockfall at the base of a steep slope. Dimensions were estimated due to safety concerns with a total estimated rockfall volume of 1.3m³ (Photo 130 and Photo 131). No follow up inspection was undertaken as the impact was identified following the completion of Longwall 19.

DA3A_LW19_039 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Rockfall from a cliff (step) which is left mostly intact (<10% length), resulting in insignificant ground disturbance.



Photo 130: *DA3A_LW19_039*, looking at the rockfall.
Taken 12/04/2023



Photo 131: *DA3A_LW19_039*, looking at the rockfall.
Taken 12/04/2023

DA3A_LW19_040 (E 291523, N 6192422)

DA3A_LW19_040 consists of rockfalls and fragmentation at the base of a step, approximately 80m to the north of tributary *WC14* (Figure 4). The rockfall has an approximate rockfall volume of 0.3m³ with some rock fragments spread out in an area of approximately 1m² (Photo 132 and Photo 133). No follow up inspection was undertaken as the impact was identified following the completion of Longwall 19.

DA3A_LW19_040 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Rockfall from a cliff (step) which is left mostly intact (<10% length), resulting in insignificant ground disturbance.



Photo 132: DA3A_LW19_040, looking at rockfall and fragments. Taken 12/04/2023.



Photo 133: DA3A_LW19_040, looking at rockfall and fragments. Taken 12/04/2023.

DA3A_LW19_041 (E 291460, N 6192410)

DA3A_LW19_041 consists of a rockfall that runs horizontally along landscape monitoring site LW19_SS5 (Figure 1 and Figure 4). Two large boulders have become dislodged with one boulder rolling downhill approximately 25m from the steep slope with associated ground disturbance over this distance and extending up to 8m wide (Photo 136 and Photo 137). A baseline photo is provided for pre-mining comparison (Photo 134). The largest boulder was measured with an approximate volume of less than 9m³ (Photo 137). The other slightly smaller boulder was unable to be measured due to safety concerns around the steep slope. The surface area where the boulders detached from the steep slope has an estimated area of 21m² (Photo 135). No follow up inspection was required as the impact was identified following the completion of Longwall 19.

DA3A_LW19_041 is a Level 2 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Rock fall or overhang collapse at cliff (steep slope) site, where characteristics of the cliff (steep slope) have changed, and there has been significant ground disturbance.



Photo 134: Baseline photo taken of *LW10_SS5* pre-mining. Taken 17/06/2022.



Photo 135: *DA3A_LW19_041* looking at the rockfall at landscape site *LW19_SS5*. Taken 12/04/2023.



Photo 136: *DA3A_LW19_041* looking at boulder that has dislodged and rolled downhill from steep slope.



Photo 137: *DA3A_LW19_041* looking at boulder that has dislodged and rolled downhill from steep slope.

DA3A_LW19_042 (E 291389, N 6192392)

DA3A_LW19_042 consists of a very small rockfall/fragmentation from the ceiling and side of an overhang at landscape monitoring site *LW19_SS4* (Figure 1 and Figure 4). A baseline photo is included for a pre-mining comparison (Photo 138). The rockfall and fragments were estimated due to safety concerns. The rockfall has an estimated volume of less than 0.1m³, with fragments scattered below (Photo 139 to Photo 141). No follow up inspection was undertaken as the impact was identified following the completion of Longwall 19.

DA3A_LW19_042 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Rockfall from a cliff (step) which is left mostly intact (<10% length), resulting in insignificant ground disturbance.



Photo 138: LW19_SS4 during its baseline inspection. Taken 17/06/2022.



Photo 139: LW19_SS4 during its most recent inspection. Taken 12/04/2023.



Photo 140: DA3A_LW19_042 looking at rockfall and associated fragments. Taken 12/04/2023.



Photo 141: DA3A_LW19_042 looking at rockfall and associated fragments. Taken 12/04/2023.

DA3A_LW19_044 (E 291000, N 6192679)

DA3A_LW19_044 is located approximately 15m east of *Wongawilli Creek* (Figure 4). The impact consists of iron staining which appears beneath a rock (Photo 142) and flows westward from DA3A mining area. The iron staining's extent is approximately 20m in length and does not flow into *Wongawilli Creek* (Photo 143). No follow up inspection was undertaken as the impact was identified following the completion of Longwall 19.

DA3A_LW19_044 is a Level 1 trigger as per the DA3A Watercourse Impact, Monitoring Management and Contingency Plan (Table 7), specifically:

- Observable increase in iron staining within the mining area



Photo 142: *DA3A_LW19_044*, looking at origin of iron staining beneath a rock. Taken 19/04/2023.



Photo 143: *DA3A_LW19_044*, looking at extent of iron staining. Taken 19/04/2023.

DA3A_LW19_046 (E 291636, N 6192624)

DA3A_LW19_046 is located approximately 390m west of *Fire Road 6F* (Figure 4). The impact consists of a rockfall on a steep slope/step. Several boulders have become dislodged from the steep slope/step face with an approximate debris area of 7m² (Photo 144 to Photo 146). The boulders that detached have a total combined rockfall volume of approximately 10m³. The impact site has minimal impact to vegetation or ground disturbance. No follow up inspection was required as the impact was identified following the completion of Longwall 19.

DA3A_LW19_046 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Rockfall from a cliff (step) which is left mostly intact (<10% length), resulting in insignificant ground disturbance.



Photo 144: DA3A_LW19_046, showing steep slope/ step face where rocks detached. Taken on 27/04/2023.



Photo 145: DA3A_LW19_046, showing steep slope/ step face where rocks detached. Taken on 27/04/2023.



Photo 146: DA3A_LW19_046, showing debris area. Taken on 27/04/2023.

DA3A_LW19_047 (E 291302, N 6192673)

DA3A_LW19_047 is located approximately 460m to the north of WC14, a tributary to *Wongawilli Creek* (Figure 4). The impact consists of a rockfall on a steep slope/step. The largest rock segment that has detached from the slope face has an approximate rockfall volume of less than 0.1m³ (Photo 147) and a debris area of 0.7m² (Photo 148). The impact site has very minimal impact to vegetation or ground disturbance. No follow up inspection was required as the impact was identified following the completion of Longwall 19.

DA3A_LW19_047 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length;
- Rockfall from a cliff (step) which is left mostly intact (<10% length), resulting in insignificant ground disturbance.



Photo 147: DA3A_LW19_047, showing steep slope/ step where rock has detached from rock face. Taken on 27/04/2023.



Photo 148: DA3A_LW19_047, showing debris area. Taken on 27/04/2023.

DA3A_LW19_052 (E 291521, N 6192382)

DA3A_LW19_052 is located approximately 40m to the north of WC14, a tributary to Wongawilli Creek (Figure 4). The impact consists of rock fracturing along a steep slope with a small associated rockfall. The fracturing has a maximum continuous length of 3m, and a maximum width of 0.01m (Photo 150). The associated rockfall has a volume of less than 0.1m³ (Photo 149).

DA3A_LW19_052 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length;
- Rockfall from a cliff (step) which is left mostly intact (<10% length), resulting in insignificant ground disturbance.



Photo 149: DA3A_LW19_052, showing area of rockfall. Taken on 4/5/2023.



Photo 150: DA3A_LW19_052, showing area of rock fracturing. Taken on 4/5/2023.

DA3A_LW19_053 (E 291508, N 6192499)

DA3A_LW19_053 is located approximately 155m to the north of tributary WC14 (Figure 4). The impact consists of rock fracturing and associated rockfall along the base of a step. The rock fracturing has a maximum continuous length of 0.35m and a maximum width of 0.001m wide (Photo 152). The rockfall has an approximate volume of 0.3m³ (Photo 151). No follow up inspection was undertaken as the impact was identified following the completion of Longwall 19.

DA3A_LW19_053 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length;
- Rockfall from a cliff (step) which is left mostly intact (<10% length), resulting in insignificant ground disturbance.



Photo 151: DA3A_LW19_053, showing area of rockfall. Taken on 4/5/2023.



Photo 152: DA3A_LW19_053, showing rock fracturing. Taken on 4/5/2023

DA3A_LW19_054 (E 291671, N 6192546)

DA3A_LW19_054 is located 365m to the west of Fire Road 6F (Figure 4). The impact consists of rock fracturing and associated fragmentation. The rock fracturing has a maximum continuous length of 3.4m and a maximum width of 0.01m (Photo 153 and Photo 154). The largest rock fragment has a volume of less than 0.1m³ (Photo 154). No follow up inspection was required as the impact was identified following the completion of Longwall 19.

DA3A_LW19_054 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 153: DA3A_LW19_054, showing rock fracturing and fragmentation. Taken on 4/5/2023.



Photo 154: DA3A_LW19_054, showing rock fracturing and fragmentation. Taken on 4/5/2023.

DA3A_LW19_055 (E 291494, N 6192483)

DA3A_LW19_055 is located approximately 150m to the north of tributary WC14 (Figure 4). The impact consists of rock fracturing and a small rockfall beneath an overhang of a steep slope. Rock fracturing beneath the overhang has a maximum continuous length of 1.2m, a maximum width of 0.003m and a maximum measurable depth of 0.58m (Photo 156). The rockfall has an approximate volume of less than 0.01m³ (Photo 155). No follow up inspection was undertaken as the impact was identified following the completion of Longwall 19.

DA3A_LW19_055 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length;
- Rockfall from a cliff (step) which is left mostly intact (<10% length), resulting in insignificant ground disturbance.



Photo 155: DA3A_LW19_055, showing area of rockfall. Taken on 4/5/2023.



Photo 156: DA3A_LW19_055, showing rock fracturing. Taken on 4/5/2023.

DA3A_LW19_056 (E 291611, N 6192519)

DA3A_LW19_056 is located 160m to the north of tributary WC14 (Figure 4). The impact consists of rock fracturing and rockfall/ block movement on a step/ overhang. The rock fracture has a maximum continuous length of 17.5m. The large section of rock that has detached from the adjacent ground has an estimated volume of 110m³ (Photo 157). There are multiple fractures under the overhang estimated to be up to 1.5m in length with widths up to 0.05m. There are also three rock fractures on the outcrop above the overhang, up to 0.15m in length and a width up to 0.04m (Photo 158). The impact site has minimal downslope vegetation disturbance. The immediate area around the impact was flagged with marking tape as a safety precaution. No follow up inspection was undertaken as the impact was identified following the completion of Longwall 19.

DA3A_LW19_056 is a Level 2 trigger as per the Dendrobium Area 3A Landscape TARP (Table 7), specifically:

- Rock fall or overhang collapse at a cliff (step) site, where characteristics of the cliff (step) have changed.
- Crack or fracture between 10 and 50m length.



Photo 157: DA3A_LW19_056, showing step/overhang that detached. Taken on 5/05/2023.



Photo 158: DA3A_LW19_056, showing top view of block that have moved away from the adjacent ground. Taken on 5/05/2023.

DA3A_LW19_057 (E 291553, N 6192524)

DA3A_LW19_057 is located 180m to the north of WC14, a tributary to Wongawilli Creek (Figure 4). The impact consists of a rockfall from a step. The rockfall has a combined total volume of approximately 0.5m³ (Photo 159 and Photo 160). The impact site has minimal ground disturbance or impact to vegetation. No follow up inspection was undertaken as the impact was identified following the completion of Longwall 19.

DA3A_LW19_057 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Rockfall from a cliff (step) which is left mostly intact (<10% length), resulting in insignificant ground disturbance.



Photo 159: DA3A_LW19_057, showing step where rocks detached. Taken on 5/05/2023.



Photo 160: DA3A_LW19_057, showing step where rocks detached and debris area. Taken on 5/05/2023.

DA3A_LW19_058 (E 291541, N 6192528)

DA3A_LW19_058 is located 190m to the north of tributary WC14 (Figure 4). The impact consists of a series of small fractures to a rock outcrop (Photo 161). The maximum continuous length of the fractures is 0.26m while the maximum width is 0.015m (Photo 162). The impact also contained a small rockfall which with total volume less than 0.01m³ (Photo 162). No follow up inspection was required as the impact was identified following the completion of Longwall 19.

DA3A_LW19_058 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length;
- Rockfall from a cliff (step) which is left mostly intact (<10% length), resulting in insignificant ground disturbance.



Photo 161: DA3A_LW19_058, showing step where rock has detached from rock face. Taken on 5/05/2023. Note: Tape measure is set to 0.5m in length.



Photo 162: DA3A_LW19_058, showing step where rock has detached from rock face. Taken on 5/05/2023. Note: Tape measure is set to 0.5m in length.

DA3A_LW19_059 (E 291458, N 6192561)

DA3A_LW19_059 is located 225m to the north of tributary *WC14* (Figure 4). The impact consists of two rock fractures beneath a small overhang. The largest fracture has a maximum continuous length of 2.34m, a maximum width of 0.03m and a maximum measurable depth of 0.15m (Photo 163). The fractures resulted in a small rockfall less than 0.01m³ in volume (Photo 164). No follow up inspection was undertaken as the impact was identified following the completion of Longwall 19.

DA3A_LW19_059 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length;
- Rockfall from a cliff (step) which is left mostly intact (<10% length), resulting in insignificant ground disturbance.



Photo 163: *DA3A_LW19_059*, showing rock fracturing. Taken on 5/05/2023.



Photo 164: *DA3A_LW19_059*, showing fallen debris. Taken on 5/05/2023.

DA3A_LW19_060 (E 291426, N 6192566)

DA3A_LW19_060 is located 235m to the north of tributary *WC14* (Figure 4). The impact consists of a rock fracture, displacement and rockfall on a step/outcrop (Photo 165 to Photo 167). The rock fracture has a maximum continuous length of 3.26m and a maximum width of 0.04m. The displacement along the outcrop measured 3.43m in length (Photo 166). The total volume of the rockfall is approximately 0.7m³ (Photo 167). No follow up inspection was undertaken as the impact was identified following the completion of Longwall 19.

DA3A_LW19_060 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Crack or fracture up to 100mm width;
- Crack or fracture up to 10m length;
- Rockfall from a cliff (step) which is left mostly intact (<10% length), resulting in insignificant ground disturbance.



Photo 165: DA3A_LW19_060, showing extent of rock fracture and rockfall. Taken on 5/05/2023.



Photo 166: DA3A_LW19_060, showing extent of displacement. Taken on 5/05/2023.



Photo 167: DA3A_LW19_060, showing rockfall. Taken on 5/05/2023

DA3A_LW19_061 (E 291404, N 6192596)

DA3A_LW19_061 is located 265m to the north of tributary WC14 (Figure 4). The impact consists of a rock fracture on a step/outcrop and associated soil cracking. The rock fracture has a total continuous length of 5.6m, a maximum width of 0.14m and a maximum measurable depth of 1.16m (Photo 168). The soil cracking has a total continuous length of 9.5m, a maximum width of 0.13m and a maximum measurable depth of 0.5m (Photo 169). No follow up inspection was undertaken as the impact was identified following the completion of Longwall 19.

DA3A_LW19_061 is a Level 2 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 168: DA3A_LW19_061, showing extent of rock fracture. Taken on 05/05/2023.



Photo 169: DA3A_LW19_061, showing extent of soil crack. Taken on 05/05/2023.

DA3A_LW19_062 (E 291527, N 6192539)

DA3A_LW19_062 is located 200m to the north of WC14, a tributary to Wongawilli Creek (Figure 4). The impact consists of multiple rock fractures on the face of a rock outcrop. The largest continuous length of the fractures is 0.60m while the largest width is 0.01m (Photo 170 and Photo 171). No follow up inspection was undertaken as the impact was identified following the completion of Longwall 19.

DA3A_LW19_062 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 170: DA3A_LW19_062, showing extent of rock fracture. Taken on 05/05/2023.



Photo 171: DA3A_LW19_062, showing extent of rock fracture. Taken on 05/05/2023.

DA3A_LW19_063 (E 292280, N 6192283)

DA3A_LW19_063 is located 150m to the east of Fire Road 6F (Figure 3). The impact consists of rock movement from a steep slope where a boulder has shifted downslope, with associated fragmentation (Photo 172 and Photo

173). The total volume of rock movement was estimated to be 2.5m³. No follow up inspection was undertaken as the impact was identified following the completion of Longwall 19.

DA3A_LW19_063 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

- Surface movement or rock displacement with negligible soil surface exposed



Photo 172: DA3A_LW19_063, showing rock movement site. Taken on 10/05/2023.



Photo 173: DA3A_LW19_063, showing associated rock fragmentation. Taken on 10/05/2023.

8 TARP TRIGGERS

8.1 Water Quality

There were no water quality triggers recorded during the extraction of Longwall 19.

8.2 Shallow Groundwater

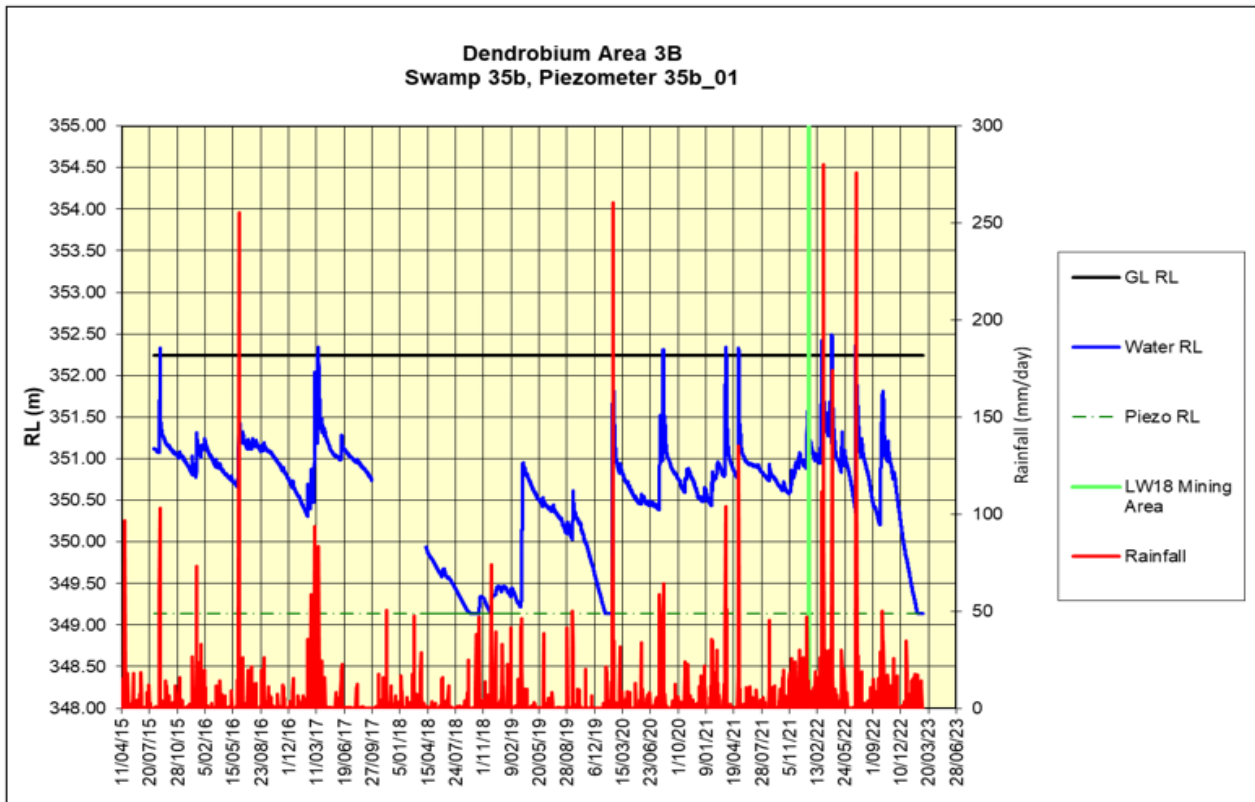
Swamp 35b (S35b_01)

A near-surface groundwater trigger was recorded in Swamp 35b (borehole 35b_01) during analysis of piezometer data for the swamp. Borehole 35b_01 is located 116m to the south of Longwall 18 (Figure 4). It entered the Longwall 18 400m buffer (mining area) on 16 January 2022, was passed by Longwall 18 on 3 March 2022 and remained in the mining area until the end of the longwall. The post mining rate of water level recession (17.94 mm/day calculated between 20/12/22 05:00 and 17/01/23 02:00) exceeded the rate recorded at the same depth interval before mining (11.48 mm/day calculated between 1/11/19 18:00 and 15/12/19 08:00) (Graph 1). This will be addressed in more detail in the specialist Surface Water and Shallow Groundwater Assessment of the final EoP Report.

These results contribute to a Level 3 trigger according to the Longwall 19 Swamp Impact, Monitoring, Management and Contingency Plan (Table 6), specifically:

- 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. (It should be noted that there is only one shallow borehole/piezometer in Swamp 35b, therefore only a Level 3 trigger applies).



Graph 1: Near-surface groundwater levels at 35b_01, logged hourly, date range: 06/08/2015 to 28/02/2023

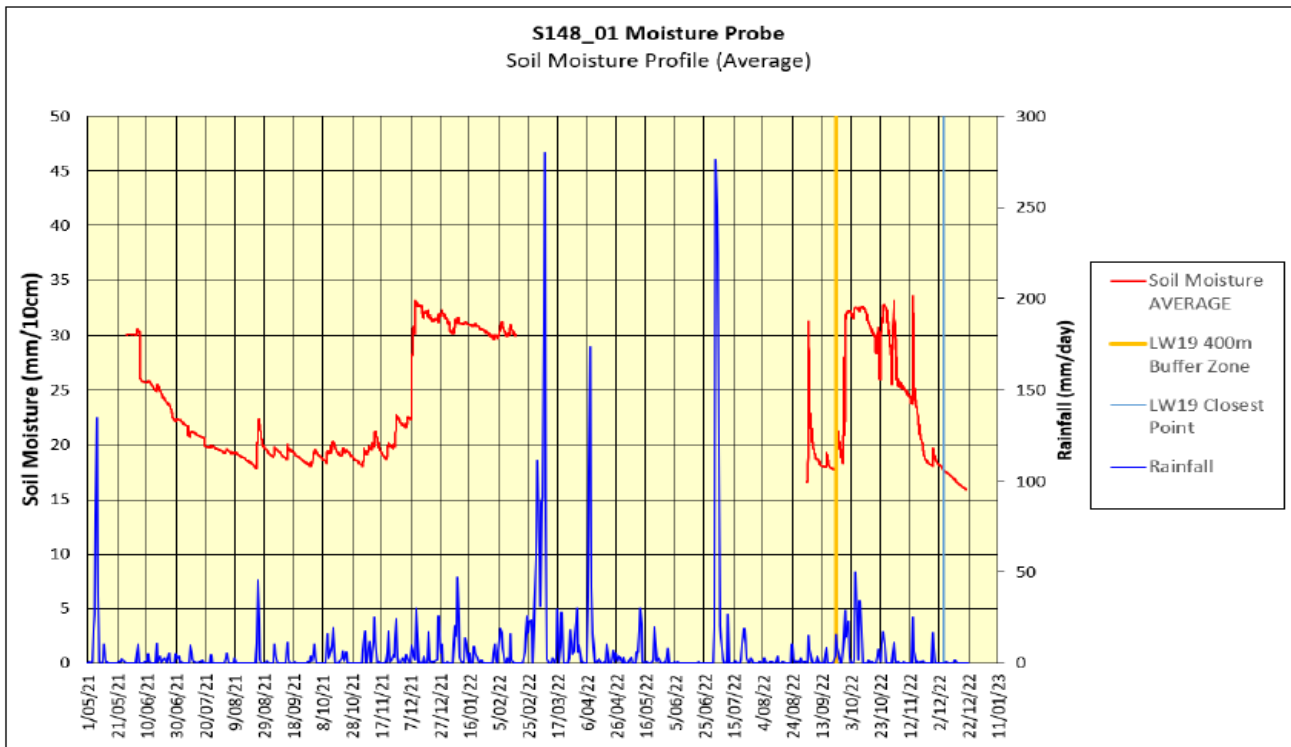
8.3 Soil Moisture

Swamp 148 (S148_01)

A soil moisture probe and datalogger were installed at site *S148_01* in May 2021. This site is situated, at its closest point, approximately 47m south of Longwall 19 (Figure 4). Site *S148_01* entered the 400m buffer zone (mining area) of Longwall 19 on 23 September 2022 and was passed by Longwall 19 on 5 December 2022. Analysis of records at *S148_01* show the average soil moisture data being lower than the lowest data recorded during the baseline period (Graph 2). This will be addressed in more detail in the specialist Surface Water and Shallow Groundwater Assessment of the final EoP Report.

Soil moisture results at *S148_01* contribute to a Level 3 trigger according to the Longwall 19 Swamp Impact, Monitoring, Management and Contingency Plan (Table 6), specifically:

- Soil moisture level lower than baseline level at >80% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps). Note- there is only one probe installed in the swamp.



Graph 2: Average soil moisture records at S148_01, logged hourly. Date range: 27/05/2021 to 20/12/2022

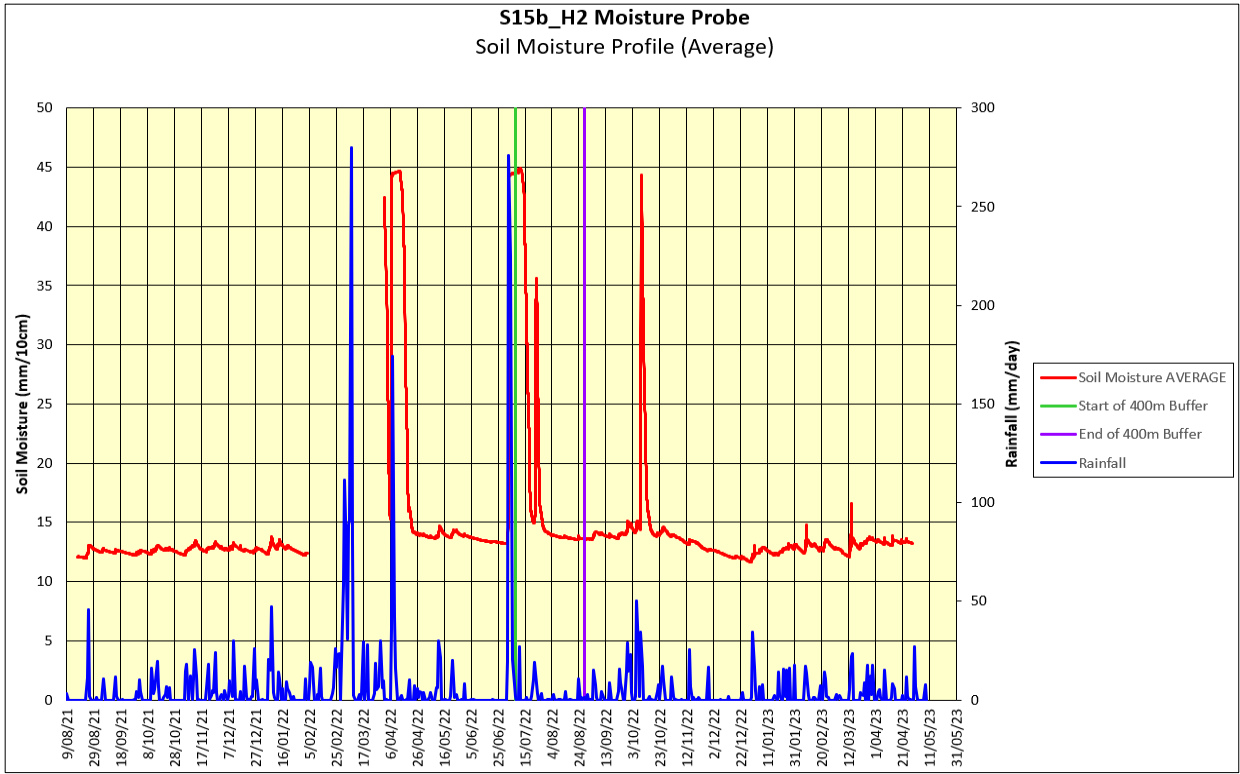
Swamp 15b

Four soil moisture probes and dataloggers were installed in *Swamp 15b* at sites *S15b_H1*, *S15b_H2*, *S15b_H3* and *S15b_39* in August 2021. Analysis of records show the average soil moisture data after the completion of extraction being lower than the lowest data recorded during the baseline period at three of four sites i.e. at *S15b_H2*, *S15b_H3* and *S15b_39* (Graph 3 to Graph 5). These trigger sites are situated to the north and north-east of Longwall 19 (Figure 3).

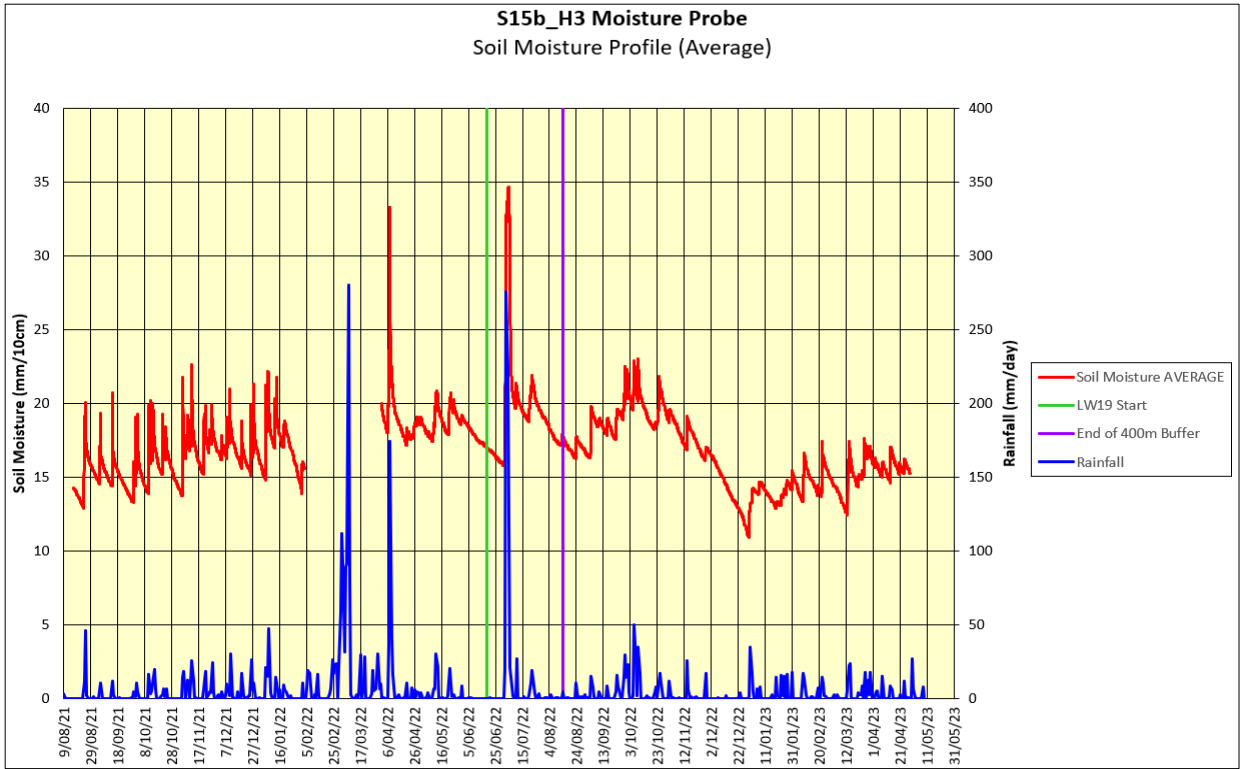
Soil moisture results at *Swamp 15b* contribute to a Level 2 trigger according to the Longwall 19 Swamp Impact, Monitoring, Management and Contingency Plan (Table 6), specifically:

- 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#).

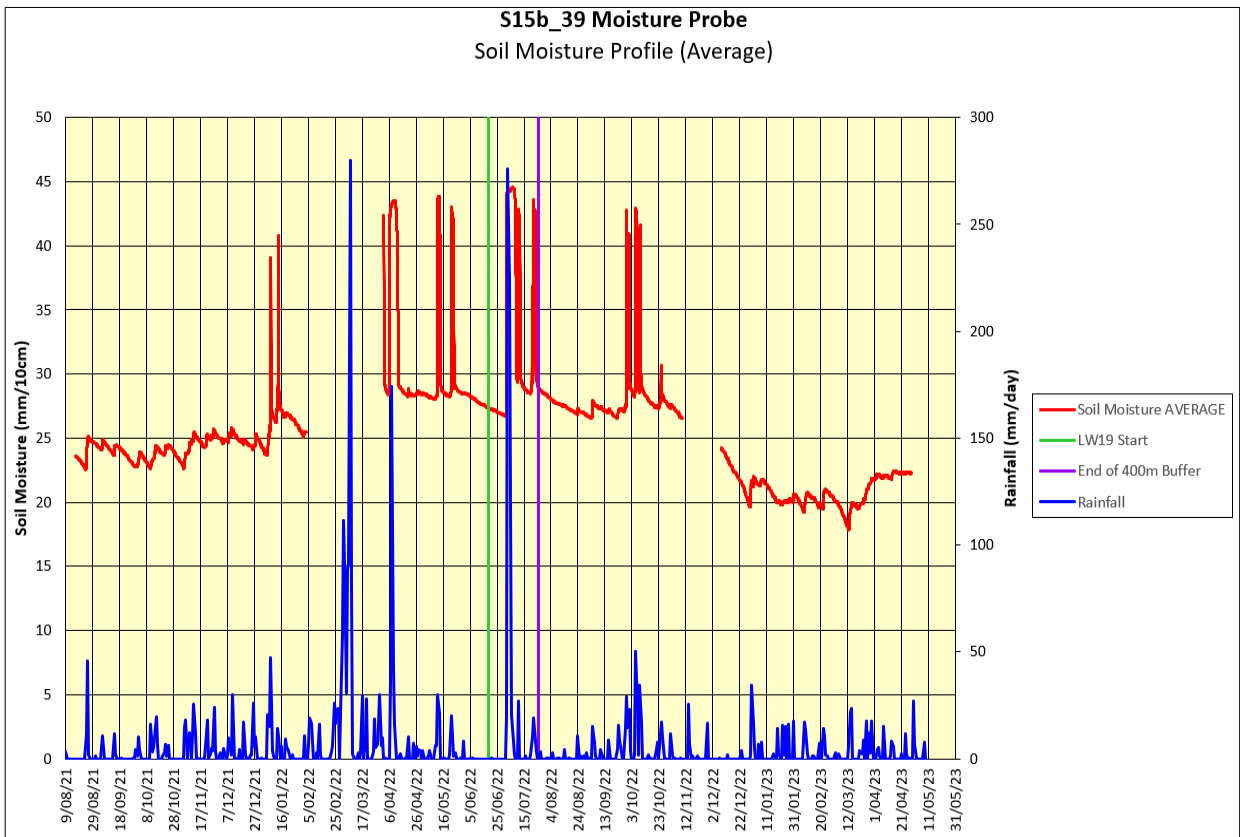
#Comparison with reference swamps is undertaken as part of the End of Panel report.



Graph 3: Average soil moisture records at S15b_H2, logged hourly. Date range: 16/08/2021 to 28/04/2023.



Graph 4: Average soil moisture records at S15b_H3, logged hourly. Date range: 16/08/2021 to 28/04/2023.



Graph 5: Average soil moisture records at S15b_39, logged hourly. Date range: 16/08/2021 to 28/04/2023.

9 IMPACTS TO BUILT FEATURES

DA3A_LW19_026 (E 292083, N 6192457)

DA3A_LW19_026 is located on Fire Road 6F and consists of soil cracking (Figure 4). The soil cracking has an approximate discontinuous length of 12m, a maximum continuous length of 6m, a maximum width of 0.05m and maximum measurable depth of approximately 0.2m (Photo 174 and Photo 175). A follow up inspection was undertaken on 11 May 2023 and no changes were observed.

DA3A_LW19_026 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 174: DA3A_LW19_026, section of soil cracking. Taken on 21/12/2022.



Photo 175: DA3A_LW19_026, section of soil cracking. Taken on 21/12/2022.

DA3A_LW19_035 (E 291863, N 6192548)

DA3A_LW19_035 consists of soil cracking and rock displacement to a closed vehicle access track and surrounding bushland west of Fire Road 6F (Figure 4). The site is situated near Landscape monitoring site LW19_AT1 (Figure 1). The soil cracking extends across a closed vehicle access track where it continues into the bushland causing rock displacement. The impact has a discontinuous length of 18m, a maximum continuous length of 15 m, a maximum width of 0.10m and a maximum measurable depth of 2.29m (Photo 176 to Photo 179). Caution tape barricading is in place at the site

as a safety precaution. A follow up inspection was undertaken on 11 May 2023 and no changes were observed.

DA3A_LW19_035 is a Level 2 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 176: DA3A_LW19_035, depth of the soil cracking. Taken on 16/03/2023.



Photo 177: DA3A_LW19_035, width of the soil cracking/rock displacement. Taken on 16/03/2023.



Photo 178: DA3A_LW19_035, overview of the impact. Taken on 16/03/2023.



Photo 179: DA3A_LW19_035, section of soil cracking. Taken on 16/03/2023.

DA3A_LW19_036 (E 291530, N 6193145)

DA3A_LW19_036 is located 480m north of Longwall 19 and consists of soil cracking on closed access track adjacent to watercourse WC17 (Figure 4). Due to the nature and location of the soil crack it is likely historic and occurred during extraction of Longwall 7. The soil crack has a maximum length of 0.65m, a maximum width of 0.07m, and a maximum measurable depth of 0.79m (Photo 180 and Photo 181). A follow up inspection was undertaken on 11 May 2023 and no changes were observed.

DA3A_LW19_036 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 180: DA3A_LW19_036, soil cracking. Taken on 21/03/2023.



Photo 181: DA3A_LW19_036, soil cracking. Taken on 21/03/2023.

DA3A_LW19_048 (E 291780, N 6192521)

DA3A_LW19_048 is located approximately 280m west of Fire Road 6F (Figure 4). The impact consists of rock fracturing and rock movement along a closed access track. The rock fracture has a maximum continuous length of 3.1m, a maximum width of 0.045m and a maximum measurable depth of 0.265m (Photo 182 to Photo 183). The rock movement presents a gap between soil and rock that's approximately 0.035m wide (Photo 184). The rock fracture has no impact to the access track. No follow up inspection was required as the impact was identified following the completion of Longwall 19.

DA3A_LW19_048 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 182: DA3A_LW19_048, showing rock fracturing. Taken on 27/04/2023.



Photo 183: DA3A_LW19_048, showing width of rock fracture. Taken on 27/04/2023.



Photo 184: DA3A_LW19_048, showing rock movement. Taken on 27/04/2023.

DA3A_LW19_049 (E 291793, N 6192541)

DA3A_LW19_049 is located approximately 260m west of *Fire Road 6F* (Figure 4). The impact consists of soil cracking along a closed access track. The soil crack has a total discontinuous length of 9.9m, a maximum continuous length of 3.1m, a maximum width of 0.08m and a maximum measurable depth of 0.9m (Photo 185 and Photo 186). Flagging tape was put along the access track as a safety precaution. No follow up inspection was undertaken as the impact was identified following the completion of Longwall 19.

DA3A_LW19_049 is a Level 1 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 185: DA3A_LW19_049, showing extent of soil crack.
Taken on 27/04/2023.



Photo 186: DA3A_LW19_049, showing width of soil crack.
Taken on 27/04/2023.

DA3A_LW19_050 (E 291820, N 6192550)

DA3A_LW19_050 is located approximately 230m west of *Fire Road 6F* (Figure 4). The impact consists of soil cracking along a closed access track. The soil crack has a total discontinuous length of 6.3m, a maximum continuous length of 2.9m, a maximum width of 0.15m and a maximum measurable depth of 0.63m (Photo 187 and Photo 188). Flagging tape was put along the access track as a safety precaution. No follow up inspection was required as the impact was identified following the completion of Longwall 19.

DA3A_LW19_050 is a Level 2 trigger as per the Dendrobium Area 3A Landscape TARP (Table 8), specifically:

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



Photo 187: DA3A_LW19_050, showing extent of soil crack.
Taken on 27/04/2023.



Photo 188: DA3A_LW19_050, showing width of soil crack.
Taken on 27/04/2023.

10 CURRENT AND FUTURE MONITORING

Monitoring undertaken during Longwall 19 and recommendations for future monitoring in Dendrobium Area 3C, particularly concerning Longwall 21, are outlined in Table 4 **Error! Reference source not found.** These recommendations are based on monitoring commitments in the Dendrobium Area 3A/3C SMP, WIMMCP and SIMMCP and the proximity of sites to future longwalls.

The monthly post mining period of two years has lapsed for Swamp 23 and tributary LA3. These will be monitored at a reduced frequency, or as otherwise recommended in specialist assessments of the Longwall 19 End of Panel Report.

Table 4: Monitoring sites associated with Longwall 19 and monitoring proposed for Longwall 21.

Aspect	Monitoring Sites Associated with Longwall 19	Monitoring Frequency	Longwall 21 Recommended Future Monitoring
Watercourses	Observational, photo point and water monitoring		
	Longwall 19 Monitoring <ul style="list-style-type: none"> • Wongawilli Creek • Sandy Creek • SC10 • SC10B • SC10C • WC13 • WC13A • WC14 • WC15 • WC17 • WC17B 	Monthly 2 years pre and post mining, weekly when longwall is within 400m of monitoring site. Reference sites 6 monthly. Landscape Sites: pre and post mining, monthly when longwall is within 400m of monitoring site.	Longwall 21 Monitoring <ul style="list-style-type: none"> • Wongawilli Creek • WC20 • WC21 • WC24 • WC24A • LC5 DA3A Monitoring (post-mining) <ul style="list-style-type: none"> • Wongawilli Creek • Sandy Creek • SC10 • SC10B • SC10C • SC7 • WC13 • WC13A • WC14 • WC15 • WC17 • WC17B Dendrobium Area 3B (post-mining for 2 years) <ul style="list-style-type: none"> • LA2 • ND1 • ND1A • ND1B • ND1C • ND2 • WC12

Aspect	Monitoring Sites Associated with Longwall 19	Monitoring Frequency	Longwall 21 Recommended Future Monitoring
			<ul style="list-style-type: none"> WC15 WC7
	<p>Water Quality</p> <p>Wongawilli Creek and tributaries</p> <ul style="list-style-type: none"> Wongawilli Creek (WC_Channel 14, WC_Pool 53, WC_Pool 55, WC_Pool 69, WC_Pool 72b, WC_Pool 72A) WC13 (WC13_Pool 1, WC13_Pool 3) WC14 (WC14_Pool 3, WC14_Pool 16) WC15 (WC15_Pool 2, WC15_Pool 9) WC17 (WC17_Pool 0, WC17_Pool 4, WC17_Pool 10, WC17_Pool 12) <p>Sandy Creek and tributaries</p> <ul style="list-style-type: none"> Sandy Creek (Sck_Rockbar 5, Sandy Creek Arm) SC10 (SC10_Pool 1, SC10_Rockbar 3, SC10_Pool 4, SC10_Pool 10b, SC10_Pool 11, SC10_Pool14, SC10_Pool 15, SC10_Pool 21, SC10_Pool 23, SC10_Pool 26a, SC10_Pool 29. SC10C (SC10C_Pool 1, SC10C_Pool 3, SC10C_Pool 5, SC10C_Pool 8, SC10C_Pool 11a) <p>Reference Site</p> <ul style="list-style-type: none"> LC5_S1 CR36_S1 NDC1 	<p>Monthly monitoring pre, during and post mining for two years.</p>	<p>Longwall 21 Monitoring</p> <ul style="list-style-type: none"> Wongawilli Creek (WC_Pool 49, WC_Pool 46, WC_Pool 45, WC_Pool 44, WC_Channel 10, WWU1, WWU4, Wongawilli Creek (FR6)) WC20 (WC20_Pool 8, WC20_Rockbar 17) WC24 (WC24_Pool 10, WC24_Pool 22) WC24A (WC24A_Pool 1) LC5 (LC5_Pool 26, LC5_S1) Lake Cordeaux (LC_1) <p>Dendrobium Area 3A (post-mining for 2 years)</p> <p>Wongawilli Creek and tributaries</p> <ul style="list-style-type: none"> Wongawilli Creek (WC_Channel 14, WC_Pool 53, WC_Pool 55, WC_Pool 69, WC_Pool 72b, WC_Pool 72A) WC13 (WC13_Pool 1, WC13_Pool 3) WC14 (WC14_Pool 3, WC14_Pool 16) WC15 (WC15_Pool 2, WC15_Pool 9) WC17 (WC17_Pool 0, WC17_Pool 4, WC17_Pool 10, WC17_Pool 12) <p>Sandy Creek and tributaries</p> <ul style="list-style-type: none"> Sandy Creek (Sck_Rockbar 5, Sandy Creek Arm) SC10 (SC10_Pool 1, SC10_Rockbar 3, SC10_Pool 4, SC10_Pool 10b, SC10_Pool 11, SC10_Pool 21, SC10_Pool14, SC10_Pool 15, SC10_Pool 21, SC10_Pool 23, SC10_Pool 26a, SC10_Pool 29. SC10C (SC10C_Pool 1, SC10C_Pool 3, SC10C_Pool 5, SC10C_Pool 8, SC10C_Pool 11a) <p>Dendrobium Area 3B (post-mining for 2 years)</p> <ul style="list-style-type: none"> Lake Avon (LA_1, LA1) LA2 (LA2_Pool 5, LA2_Pool 24, LA2_Pool 25, LA2_Pool 34) ND1 (ND1_Pool 2, ND1_Pool 23) Native Dog Creek (NDC_Pool 1, NDC_Pool 6, NDC_Pool 7, NDC_Pool 15) ND2 (ND2_Pool 3)

Aspect	Monitoring Sites Associated with Longwall 19	Monitoring Frequency	Longwall 21 Recommended Future Monitoring
			<ul style="list-style-type: none"> WC12 (WC12_Pool 1, WC12_Pool 12, WC12_Rockbar 18) WC15 (WC15_Pool 34) Wongawilli Creek WC7 (WC7_Pool 1, WC7_Pool 9, WC7_Pool 14)
Swamps	Observational, Photo Point and Water Monitoring		
	<ul style="list-style-type: none"> Swamps 12, 15a, 15b, 34, 95, 146, 148 	<p>Pre and post mining for 2 years, monthly when longwall is within 400 m of monitoring site.</p> <p>Weekly inspection and pool water levels when longwall is within 400 m of monitoring site.</p> <p>Reference sites 6-monthly.</p>	<ul style="list-style-type: none"> Swamps 9, 144 and 145
Shallow Groundwater Level			
	<p>Longwall 19 Monitoring</p> <ul style="list-style-type: none"> Swamp 12: 12_01, 12_03, 12_04 Swamp 15A: 15a_03, 15a_04, 15a_07, 15a_12, 15a_15, 15a_18, 15a_19 Swamp 15b: 15b_H1, 15b_H2, 15b_H3, 15b_39 Swamp 34: 34_01 Swamp 95: 95_01 Swamp 146: 146_01 Swamp 148: 148_01 <p>Reference Sites</p> <ul style="list-style-type: none"> Swamp 2: 02_S01 Swamp 7: 07_S05, 07_S06 Swamp 22: 22_01, 22_02 Swamp 25: S25_S01 Swamp 33: S33_S01, S33_S03 Swamp 84: S84_S02 Swamp 85: S85_S01, S85_S02 Swamp 86: S86_S01, S86_S02 Swamp 87: S87_S01, S87_S02 Swamp 88: S88_S01, S88_S02 	<p>For open hole sites:</p> <ul style="list-style-type: none"> Monthly monitoring pre, during and post mining for two years to be reviewed annually Reference sites 6 monthly <p>For instrumented sites:</p> <ul style="list-style-type: none"> Automatic groundwater level monitoring pre, during and post mining (1-hour interval or similar) Monitoring post mining for five years to be reviewed annually 	<p>Longwall 21 Monitoring</p> <ul style="list-style-type: none"> Swamps, 9,144 and 145 <p>Dendrobium Area 3B (post-mining for 2 years)</p> <ul style="list-style-type: none"> Swamp 14: 14_01 Swamp 35a: 35a_01 Swamp 35b: 35b_01 Swamp 150: 150_01 Swamp 151: 151_01 <p>Reference Sites</p> <ul style="list-style-type: none"> Swamp 2: 02_01 Swamp 22: 22_01, 22_02 Swamp 24: 24_01 Swamp 25: 25_01 Swamp 33: 33_01, 33_03 Swamp 84: 84_02 Swamp 85: 85_01, 85_02 Swamp 86: 86_01, 86_02 Swamp 87: 87_01, 87_02 Swamp 88: 88_01, 88_02
Soil Moisture			
	<ul style="list-style-type: none"> Swamp 12: 12_01, 12_03, 12_04 Swamp 15A: 15a_03, 15a_04, 15a_07, 15a_12, 15a_15, 15a_18, 15a_19 Swamp 15b: 15b_H1, 15b_H2, 15b_H3, 15b_39 Swamp 34: 34_01 	<p>For manually measured sites:</p> <ul style="list-style-type: none"> Monthly monitoring for 2 years baseline and post mining and 6-monthly reference sites Weekly monitoring when longwall is within 400 m of monitoring site 	<p>Longwall 21 Monitoring</p> <ul style="list-style-type: none"> Swamps 9, 144 and 145 <p>Dendrobium Area 3B (post-mining 2 years)</p>

Aspect	Monitoring Sites Associated with Longwall 19	Monitoring Frequency	Longwall 21 Recommended Future Monitoring
	<ul style="list-style-type: none"> • Swamp 95: 95_01 • Swamp 146: 146_01 • Swamp 148: 148_01 <p>Reference Sites:</p> <ul style="list-style-type: none"> • Swamp 2: S02_S01 • Swamp 7: S07_S05, S07_S06 • Swamp 22: 22_01, 22_02 • Swamp 24: S24_S01 • Swamp 25: S25_S01 • Swamp 33: S33_S01, S33_S03 • Swamp 84: S84_S02 • Swamp 85: S85_S01, S85_S02 • Swamp 86: S86_S01, S86_S02 • Swamp 87: S87_S01, S87_S02 • Swamp 88: S88_S01, S88_S02 	<p>For instrumented sites:</p> <ul style="list-style-type: none"> • Automatic soil moisture monitoring pre, during and post • Monitoring post mining for five years to be reviewed annually 	<ul style="list-style-type: none"> • Swamp 14: 14_01 • Swamp 35a: 35a_01 • Swamp 35b: 35b_01 • Swamp 149: 149_01 • Swamp 150: 150_01 • Swamp 151: 151_01 <p>Reference Sites:</p> <ul style="list-style-type: none"> • Swamp 2: S02_S01 • Swamp 7: S07_S05, S07_S06 • Swamp 22: 22_01, 22_02 • Swamp 24: S24_S01 • Swamp 25: S25_S01 • Swamp 33: S33_S01, S33_S03 • Swamp 84: S84_S02 • Swamp 85: S85_S01, S85_S02 • Swamp 86: S86_S01, S86_S02 • Swamp 87: S87_S01, S87_S02 • Swamp 88: S88_S01, S88_S02
Landscape	Targeted Sites		
	<p>Cliffs</p> <ul style="list-style-type: none"> • DA3-CF7 • DA3-CF8 • DA3-CF15 • DA3-CF16 • DA3-CF17 • DA3-CF18 <p>Fire Trails</p> <ul style="list-style-type: none"> • Fire Road 6F (across active mining area) • 	<p>Monthly monitoring during any subsidence period. Monitoring to continue 6 monthly for 2 years following the completion of mining.</p>	<p>Cliffs</p> <ul style="list-style-type: none"> • DA3-CF13 <p>Fire Trails</p> <ul style="list-style-type: none"> • Fire Road 6F (across active mining area)
Inspection of Active Mining Area – Landscape Features, Vegetation, Watercourses			
	<p>Continue monitoring of all mapped cliff, steep slope, watercourse, swamp and firetrail sites in subsidence area.</p> <p>Continue general observation of active mining areas.</p>	<p>Weekly monitoring when longwall extraction is within 400m of feature.</p>	<p>Continue monitoring of all mapped cliff, steep slope, watercourse, swamp and fire trail sites in subsidence area.</p> <p>Continue general observation of active mining areas.</p>

11 PREDICTED AND OBSERVED IMPACTS

The below table provides a summary of the predicted and observed impacts for Longwall 19 (Table 5).

Table 5: Dendrobium Area 3A Impacts, TARPs and Performance measures for Longwall 19.

Performance measures	Potential Impacts	Exceeding prediction	TARP Trigger Level	Observed Impacts/Triggers	Additional Comments
WATERCOURSES					
Observational Monitoring					
<p>Wongawilli Creek & Sandy Creek</p> <p><i>Dendrobium Area 3A SMP Approval:</i> Minor environmental consequences including:</p> <ul style="list-style-type: none"> • <i>minor</i> fracturing, gas release and iron staining; and • <i>minor</i> impacts on water flows, water levels and water quality. <p><i>Dendrobium Modified Development Consent:</i></p> <ul style="list-style-type: none"> • The Applicant must ensure that underground mining operations do not cause subsidence impacts at Sandy Creek and Wongawilli Creek other than “minor impacts” (such as minor fracturing, gas release, iron staining and minor impacts on water flows, water levels and water quality) to the 	<p>Minor environmental consequences including minor fracturing, gas release and iron staining; and minor impacts on water flows, water levels and water quality</p>	<p><u>Observational</u> Mining results in more than minor environmental consequences in Wongawilli Creek, including:</p> <ul style="list-style-type: none"> • structural integrity of the bedrock base of any significant permanent pool or controlling rockbar cannot be restored i.e. pool water level within the pool after CMAs continues to be lower than baseline period • fracturing within Wongawilli Creek or Sandy Creek resulting in diversion of flow such that >10% of the pools have water levels lower than baseline period • measured surface water flow reduction, based on Assessment Methods C, D, to be compared against predictions made in 	<p><u>Observational</u> Level 1</p> <ul style="list-style-type: none"> • 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 • Observation that a pool on a subject Creek is dry • Observation that the subject Creek has ceased to flow 	<ul style="list-style-type: none"> • DA3A_LW19_029 - Gas release on WC_Pool 50 (Wongawilli Creek) 	<p>- See impact report dated 09/02/2023</p>

satisfaction of the Secretary.		<p>contemporary groundwater modelling conducted (to the satisfaction of the Secretary) to assess whether effects that cannot be explained by natural variability;</p> <ul style="list-style-type: none"> • gas release results in vegetation dieback that does not revegetate • gas release results in mortality of threatened species or ongoing loss of aquatic habitat; • iron staining and associated increases in dissolved iron resulting from the mining is observed in water at Wongawilli Creek downstream monitoring site Wongawilli Ck (FR6) or observed in water at Sandy Creek downstream monitoring site SCK_Rockbar 5 • mining results in two consecutive exceedances or three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months that cannot be attributed to natural variation 	<p>Level 2</p> <ul style="list-style-type: none"> • Observation that a single pool on a subject Creek is dry in consecutive monitoring events • Observation that two or more pools on a subject Creek are dry in a single monitoring event • Observation that the subject Creek has ceased to flow in consecutive monitoring event • 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. 	<p>No Level 2 impacts observed</p>
			<p>Level 3</p> <ul style="list-style-type: none"> • 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 	<p>No Level 3 impacts observed</p>

			<p>pool which results in observable loss of surface water</p> <ul style="list-style-type: none"> • 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 		
<p>Waterfall SC-WF1</p> <p><i>Dendrobium Modified Development Consent:</i> The Applicant must ensure that, as a result of the development:</p> <ul style="list-style-type: none"> • no rock fall occurs at Sandy Creek Waterfall or from its overhang; • the structural integrity of the waterfall, its overhang and its pool are not impacted; • cracking in Sandy Creek within 30 m of the waterfall is of negligible environmental and hydrological consequence; and • negligible diversion of water occurs from the lip of the waterfall to the satisfaction of the Secretary. 	<p>Negligible environmental consequences including: no rock fall occurs at the waterfall or from its overhang; no impacts on the structural integrity of the waterfall, its overhang and its pool; negligible cracking in Sandy Creek within 30 m of the waterfall; and negligible diversion of water from the lip of the waterfall</p>	<p>Mining results in more than negligible environmental consequences including:</p> <ul style="list-style-type: none"> • rock fall at the waterfall or its overhang • impacts on the structural integrity of the waterfall, its overhang or its pool • cracking in Sandy Creek within 30m of the waterfall which results in observable flow diversion • cracking in Sandy Creek which results in observable flow diversion from the lip of the waterfall 	<p>Level 1</p> <ul style="list-style-type: none"> • Visible fracturing, ecological impact or water diversion on Sandy Creek due to mining Longwall 19 <p>Level 2</p> <ul style="list-style-type: none"> • Visible fracturing, ecological impact or water diversion within 300 m - 150 m of Sandy Creek Waterfall on Sandy Creek <p>Level 3</p> <ul style="list-style-type: none"> • Visible fracturing, ecological impact or water diversion within 150 m of Sandy Creek Waterfall on Sandy Creek 	<p>No impacts observed</p>	

Drainage Lines/ Tributaries			<p>Level 1</p> <ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • DA3A_LW8_003 - Rock fracturing on WC14 • DA3A_LW19_045 - Iron staining on WC15 • DA3A_LW19_051 - Rock fracturing on WC14 	<ul style="list-style-type: none"> - See impact report dated 17/04/2023 - See impact report dated 01/05/2023 - See impact report dated 09/05/2023
			<p>Level 2</p> <ul style="list-style-type: none"> • 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 stabilize 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 	<ul style="list-style-type: none"> • DA3A_LW19_003 - Iron staining present on WC14. 	<ul style="list-style-type: none"> - See impact report dated 17/08/2022

			<p>Level 3</p> <ul style="list-style-type: none"> • 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 	<p>No Level 3 impacts observed</p>	
Water Quality					
Wongawilli Creek	Wongawilli Creek - minor environmental consequences	<ul style="list-style-type: none"> • Mining results in two consecutive exceedances or three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> - pH 4.39 - EC 163.9 uS/cm - DO 49.1% 	<p>Level 1</p> <ul style="list-style-type: none"> • One exceedance of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> - pH 4.39 - EC 163.9 uS/cm - DO 49.1% <p>Level 2</p> <ul style="list-style-type: none"> • Two non-consecutive exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the 	<p>No impacts observed</p>	

			<p>baseline mean within six months:</p> <ul style="list-style-type: none"> - pH 4.39 - EC 163.9 uS/cm - DO 49.1% <p>Level 3</p> <ul style="list-style-type: none"> • Three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: - pH 4.39 - EC 163.9 uS/cm - DO 49.1% 		
Sandy Creek	Sandy Creek - minor environmental consequences	<ul style="list-style-type: none"> • Mining results in two consecutive exceedances or three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> - pH 5.10 - EC 129.9 uS/cm - DO 17.9% 	<p>Level 1</p> <ul style="list-style-type: none"> • One exceedance of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> - pH 5.10 - EC 129.9 uS/cm - DO 17.9% <p>Level 2</p> <ul style="list-style-type: none"> • Two non-consecutive exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> - pH 5.10 - EC 129.9 uS/cm - DO 17.9% <p>Level 3</p> <ul style="list-style-type: none"> • Three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> - pH 5.10 	No impacts observed	

			<ul style="list-style-type: none"> - EC 129.9 uS/cm - DO 17.9% 		
<p>Lake Cordeaux</p> <p><i>Dendrobium Modified Development Consent:</i> Operations will not result in reduction (other than negligible reduction) in the quality or quantity of surface water or groundwater inflows to Lake Cordeaux or Lake Avon or surface water inflow to the Cordeaux River at its confluence with Wongawilli Creek.</p>	<p>Negligible reduction in the quality and quantity of surface water and groundwater inflows to Lake Cordeaux</p>	<p>Mining results in more than negligible reduction in the quality or quantity of surface water or groundwater inflows to Lake Cordeaux, including:</p> <ul style="list-style-type: none"> • measured surface water flow reduction, based on Assessment Methods C, D, to be compared against predictions made in contemporary groundwater modelling conducted (to the satisfaction of the Secretary) to assess whether effects that cannot be explained by natural variability⁴⁵ • mining results in two consecutive exceedances or three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months that cannot be attributed to natural variation 	<p>Level 1 One exceedance of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months:</p> <ul style="list-style-type: none"> - pH 3.96 - EC 137 uS/cm - DO 49.4% <p>Level 2 Two non-consecutive exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months:</p> <ul style="list-style-type: none"> - pH 3.96 - EC 137 uS/cm - DO 49.4% <p>Level 3 Three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months:</p> <ul style="list-style-type: none"> - pH 3.96 - EC 137 uS/cm - DO 49.4% 	<p>No impacts observed</p>	
<p>Cordeaux River</p> <p><i>Dendrobium Modified Development Consent:</i> Operations will not result in reduction (other than negligible reduction) in the quality or quantity of surface water or groundwater inflows</p>	<p>Negligible reduction in the quality and quantity of surface water inflow to the Cordeaux River at its confluence with Wongawilli Creek</p>	<p>Mining results in more than negligible reduction in the quality or quantity of surface water inflows to the Cordeaux River at its confluence with Wongawilli Creek, including:</p>		<p>No impacts observed</p>	

<p>to Lake Cordeaux or Lake Avon or surface water inflow to the Cordeaux River at its confluence with Wongawilli Creek.</p>		<ul style="list-style-type: none"> • measured surface water flow reduction in Wongawilli Creek at its confluence with Cordeaux River is greater than predicted by modelling (to the satisfaction of the Secretary) that cannot be attributed to natural variation⁶ • mining results in two consecutive exceedances or three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months that cannot be attributed to natural variation 			
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Pool Water Level

<p>Wongawilli Creek and Sandy Creek</p>	<p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> • Wongawilli Creek - minor environmental consequences • Sandy Creek - minor environmental consequences 	<ul style="list-style-type: none"> • Fracturing resulting in diversion of flow such that >10% of the pools have water levels lower than baseline period 	<p>Level 1</p> <ul style="list-style-type: none"> • Single pool on a subject Creek is observed as dry <hr/> <p>Level 2</p> <ul style="list-style-type: none"> • Single pool on a subject Creek is observed as dry in consecutive monitoring events • Two or more pools on a subject Creek are observed as dry in a single monitoring event <hr/> <p>Level 3</p> <ul style="list-style-type: none"> • Fracturing resulting in diversion of flow such that <10% of the pools have water levels lower than baseline period 	<p>No impacts observed</p>	
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Performance measures	Potential Impacts	Exceeding prediction	TARP Trigger Level	Observed Impacts/Triggers	Additional Comments
SWAMPS					
<p>Minor changes in the ecosystem functionality of the swamps</p> <p><i>Dendrobium Modified Development Consent:</i></p> <ul style="list-style-type: none"> Operations shall not cause erosion of the surface or changes in ecosystem functionality of Swamp15a and that the structural integrity of its controlling rockbar is maintained or restored, to the satisfaction of the Secretary. 	<p>Falls in surface or near-surface groundwater levels in swamps.</p> <p><i>N.B. not linked specifically to a performance measure and would not be considered a breach if predictions were exceeded.</i></p>		<p>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).</p>	No Level 1 impacts	
			<p>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.</p>	No Level 2 impacts	
			<p>Level 3 Groundwater level lower than baseline level at >80% of monitoring sites (within 400m of mining) within a swamp (in</p>	<p>• Swamp 35b - Groundwater Level 3 trigger at S35b_01</p>	- See impact report dated 14/03/2023

			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.		
Minor changes in the ecosystem functionality of the swamps	Falls in soil moisture levels in swamps. <i>N.B. Not linked specifically to a performance measure and would not be considered a breach if predictions were exceeded.</i>		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).	No Level 1 impacts	
			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).	<ul style="list-style-type: none"> • Swamp 15b - Soil moisture Level 2 trigger at swamp sites S15b_39, S15b_H2 and S15b_H3 	

			<p>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).</p>	<p>• Swamp 148 - Soil moisture Level 3 trigger at S148_01</p>	
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Performance measures	Potential Impacts	Exceeding prediction	TARP Trigger Level	Observed Impacts/Triggers	Additional Comments
LANDSCAPE					
<p>Longwall 19 and 19A Study Area</p> <p>Cliffs All mapped cliff sites in subsidence area</p> <p>Steep Slopes All mapped steep slopes in subsidence area</p>			<p>Level 1</p> <ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • DA3A_LW19_001 - Rock fracturing to a steep slope/ step. • DA3A_LW19_004 - Rock fracturing to a steep slope/ step • DA3A_LW19_005 - Rock fracturing to a steep slope/ step 	<p>- See impact report dated 05/08/2022</p> <p>- See impact report dated 23/08/2022</p> <p>- See impact report dated 23/08/2022</p>

<p>Fire Trails All mapped fire trails in subsidence area</p>			<ul style="list-style-type: none"> • 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 100 mm width • Crack or fracture up to 10 m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> • DA3A_LW19_007 - Soil cracking in bushland • DA3A_LW19_008 - Rock fracturing to an outcrop • DA3A_LW19_009 - Rock fracturing to an outcrop • DA3A_LW19_010 - Rock fracturing to an outcrop • DA3A_LW19_011 - Rock fracturing to an outcrop • DA3A_LW19_012 - Rock fracturing to an outcrop • DA3A_LW19_014 - Dislodgement of a boulder 	<ul style="list-style-type: none"> - See impact report dated 20/10/2022 - See impact report dated 08/11/2022 - See impact report dated 08/11/2022 - See impact report dated 08/11/2022 - See impact report dated 08/11/2022 - See impact report dated 08/11/2022 - See impact report dated 08/11/2022
				<ul style="list-style-type: none"> • DA3A_LW19_017 - Rock fracturing to an outcrop • DA3A_LW19_018 - Rock displacement to a steep slope • DA3A_LW19_019 - Rock displacement to a steep slope • DA3A_LW19_023 - Rock fracturing to an outcrop 	<ul style="list-style-type: none"> - See impact report dated 15/12/2022 - See impact report dated 15/12/2022 - See impact report dated 15/12/2022 - See impact report dated 15/12/2022

			<ul style="list-style-type: none"> • DA3A_LW19_025 - Rock displacement away from soil • DA3A_LW19_026 - Soil cracking • DA3A_LW19_027 - Rock fracturing and two small rockfalls on a step • DA3A_LW19_028 - Rock fracturing to rock outcrop • DA3A_LW19_031 - Rock fracturing to an outcrop • DA3A_LW19_032 - Rock fracturing to an outcrop • DA3A_LW19_033 - Rockfall on a rock outcrop 	<ul style="list-style-type: none"> - See impact report dated 09/02/2023 - See impact report dated 22/12/2022 - See impact report dated 11/01/2023 - See impact report dated 09/02/2023 - See impact report dated 17/02/2023 - See impact report dated 17/02/2023 - See impact report dated 17/02/2023
			<ul style="list-style-type: none"> • DA3A_LW19_034 - Rock fracturing to an outcrop • DA3A_LW19_036 - Soil cracking over closed access track • DA3A_LW19_037 - Rock fracturing and rockfall near cultural heritage site <i>Sandy Creek 21 (52-5-0273)</i> • DA3A_LW19_038 	<ul style="list-style-type: none"> - See impact report dated 17/02/2023 - See impact report dated 30/03/2023 - See impact report dated 29/03/2023 - See impact report dated 29/03/2023

			<ul style="list-style-type: none"> - Rock fracturing and rockfall at cultural heritage site <i>DM15 (52-2-3639)</i> • DA3A_LW19_039 - Rockfall on steep slope • DA3A_LW19_040 - Rockfall and associated fragmentation • DA3A_LW19_042 - Rockfall and fragmentation at landscape monitoring site • DA3A_LW19_046 - Rockfall on steep slope • DA3A_LW19_047 - Small rockfall on edge of steep slope/ step • DA3A_LW19_048 - Rock fracturing and movement on closed access track 	<ul style="list-style-type: none"> - See impact report dated 17/04/2023 - See impact report dated 17/04/2023 - See impact report dated 17/04/2023 - See impact report dated 01/05/2023 - See impact report dated 01/05/2023 - See impact report dated 01/05/2023
			<ul style="list-style-type: none"> • DA3A_LW19_049 - Soil cracking along closed access track • DA3A_LW19_052 - Rock fracturing and rockfall on steep slope • DA3A_LW19_053 - Rock fracturing and rockfall on rock step • DA3A_LW19_054 - Rock fracturing and fragmentation at base of steep slope 	<ul style="list-style-type: none"> - See impact report dated 01/05/2023 - See impact report dated 09/05/2023 - See impact report dated 09/05/2023 - See impact report dated 09/05/2023

			<ul style="list-style-type: none"> • DA3A_LW19_055 - Rock fracturing and rockfall beneath an overhang • DA3A_LW19_057 - Rockfall at a step • DA3A_LW19_058 - Rock fracturing and fragmentation • DA3A_LW19_059 - Rock fracturing and fragmentation beneath overhang • DA3A_LW19_060 - Rock fracturing, displacement and rockfall on steep slope/ outcrop • DA3A_LW19_062 - Rock fracturing on an outcrop • DA3A_LW19_063 - Boulder shifted downslope 	<ul style="list-style-type: none"> - See impact report dated 09/05/2023 - See impact report dated 09/05/2023 - See impact report dated 09/05/2023 - See impact report dated 09/05/2023 - See impact report dated 09/05/2023 - See impact report dated 09/05/2023 - See impact report dated 15/05/2023 	
			<p>Level 2</p> <ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • DA3A_LW19_002 - Rock fracturing to steep slope/ step • DA3A_LW19_006 - Soil cracking to bushland • DA3A_LW19_013 - Rock fracturing and rock movement at steep slope/ step • DA3A_LW19_015 - Rock fracturing to a steep slope/ step 	<ul style="list-style-type: none"> - See impact report dated 05/08/2022 - See impact report dated 05/09/2022 - See impact report dated 08/11/2022 - See impact report dated 08/11/2022

			<ul style="list-style-type: none"> • 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 300 mm width • Crack or fracture between 10 and 50 m 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 	<ul style="list-style-type: none"> • DA3A_LW19_016 - Rock fracturing and small rockfall at steep slope/ step • DA3A_LW19_020 - Soil cracking at the base of an outcrop • DA3A_LW19_021 - Soil cracking and displacement to boulders • DA3A_LW19_022 - Soil cracking, rock fracturing and displacement in bushland • DA3A_LW19_024 - Rock fracturing to a step and soil cracking in bushland • DA3A_LW19_030 - Rock fracturing to an outcrop 	<ul style="list-style-type: none"> - See impact report dated 08/11/2022 - See impact report dated 15/12/2022 - See impact report dated 15/12/2022 - See impact report dated 15/12/2022 - See impact report dated 22/12/022 - See impact report dated 17/02/2023
			<p>Level 3</p> <ul style="list-style-type: none"> • Major cliff collapse where the characteristics of the cliff change significantly and there is significant 	<p>No Level 3 impacts</p>	<ul style="list-style-type: none"> - See impact report dated 17/03/2023 - See impact report dated 17/04/2023

			<p>ground disturbance that is unlikely to naturally stabilise within the monitoring period</p> <ul style="list-style-type: none">• Crack or fracture over 300 mm width• Crack or fracture over 50 m length• Mass movement of a slope causing large areas of exposed soil with potential for further movement		
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12 APPENDIX A – TRIGGER ACTION RESPONSE PLANS

Table 6: Dendrobium Swamp Impacts, Triggers and Response Plan.

<i>Performance Measures</i>	<i>Potential Impacts</i>	<i>Performance Triggers</i>	<i>Management Strategies</i>	<i>Offsets</i>	<i>Other Actions</i>
Negligible erosion of the surface of the swamp	Gully erosion or similar	<p><u>Level 1:</u> The increase in length of erosion within a swamp (compared to its pre-mining length) is 2% of the swamp length or area; and/or</p> <p>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.</p> <p><u>Level 2:</u> The increase in length of erosion within a swamp (compared to its pre-mining length) is 3% of the swamp length or area; and/or</p> <p>Soil surface crack that causes erosion that is likely to stabilise within the monitoring period without intervention; and/or</p> <p>Gully knickpoint forms or an existing gully knickpoint becomes active.</p> <p><u>Level 3:</u> The increase in length of erosion within a swamp (compared to its pre-mining length) is 4% of the swamp length or area; and/or</p> <p>Soil surface crack that causes erosion that is unlikely to stabilise within the monitoring period without intervention.</p> <p><u>Exceeding Prediction</u></p> <p>Mining results in the total length of erosion within a swamp (compared to its pre-mining length) to increase >5% of the length or area of the swamp compared to any increase in total erosion length in a reference swamp (ie increase in length or area of erosion in an impact swamp less any increase in length or area in erosion in a reference swamp is >5%).</p>	<p>a) upfront mine planning</p> <p>b) erosion monitoring (ie ALS, observation)</p> <p>c) coir logs</p> <p>d) knickpoint control</p> <p>e) water spreading</p> <p>f) weeding</p> <p>g) fire management</p> <p>h) reporting</p> <p>i) investigation and review</p> <p>j) update future predictions</p>	<p>Offset required immediately, if no remediation considered practicable.</p> <p>Offset required 2 years following remediation, if it is ineffective.</p> <p>This period can be extended to 5 years, with the agreement of the Secretary.</p>	

<p>Minor changes in the size of the swamps</p> <p>Minor changes in the ecosystem functionality of the swamps</p> <p>No significant change to the composition or distribution of species within the swamps</p>	<p>Swamp vegetation changes:</p> <ul style="list-style-type: none"> - Swamp size - Species richness, distribution, composition and diversity - Vegetation sub-communities 	<p>Swamp Size</p> <p><u>Level 1:</u> A trending decline in the extent of an upland swamp (combined area of groundwater dependent communities) for two consecutive monitoring periods, greater than observed in the Control Group, and exceeding the standard error (SE) of the Control Group.</p> <p><u>Level 2:</u> A trending decline in the extent of an upland swamp (combined area of groundwater dependent communities) for three consecutive monitoring periods, greater than observed in the Control Group, and exceeding the SE of the Control Group.</p> <p><u>Level 3:</u> A trending decline in the extent of an upland swamp (combined area of groundwater dependent communities) for four consecutive monitoring periods, greater than observed in the Control Group, and exceeding the SE of the Control Group.</p> <p><u>Exceeding Prediction:</u> Mining results in a trending decline in the extent of an upland swamp (combined area of groundwater dependent communities) for five consecutive monitoring periods, greater than observed in the Control Group, and exceeding the SE of the Control Group.</p> <p>Ecosystem Functionality</p> <p><u>Level 1:</u> A trending decline in the extent of any individual groundwater dependent community within a swamp for two consecutive monitoring periods, greater than observed in the Control Group, and exceeding the SE of the Control Group.</p> <p><u>Level 2:</u> A trending decline in the extent of any groundwater dependent community within a swamp for three consecutive monitoring periods, greater than observed in the Control Group, and exceeding the SE of the Control Group.</p>	<ul style="list-style-type: none"> a) upfront mine planning b) vegetation monitoring c) water spreading d) seeding/planting e) weeding f) fauna monitoring g) fire management h) grouting of controlling rockbars and bedrock base and/or use of other remediation techniques i) reporting j) investigation and review k) update future predictions 	<p>Offset required immediately, if no remediation considered practicable.</p> <p>Offset required 5 years following remediation, if it is ineffective.</p> <p>This period can be extended to 10 years, with the agreement of the Secretary.</p>	<p>Monitoring period for swamp size is related to capture of Lidar data at the end of each longwall ~ 1 year</p> <p>Triggers for groundwater decline result in increased intensity and frequency of vegetation monitoring</p>
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		<p><u>Level 3:</u> A trending decline in the extent of any groundwater dependent community within a swamp for four consecutive monitoring periods, greater than observed in the Control Group, and exceeding the SE of the Control Group.</p> <p><u>Exceeding Prediction:</u> Mining results in a trending decline in the extent of a groundwater dependent community within a swamp for five consecutive monitoring periods, greater than observed in the Control Group, and exceeding the SE of the Control Group.</p> <p>Species Composition and Distribution</p> <p><u>Level 1:</u> A 2% (or otherwise statistically significant) decline in species richness or diversity during a period of stability or increase in species richness/diversity in reference swamps for two consecutive years; and/or</p> <p><u>Level 2:</u> A 5% (or otherwise statistically significant) decline in species richness or diversity during a period of stability or increase in species richness/diversity in reference swamps for three consecutive years.</p> <p><u>Level 3:</u> An 8% (or otherwise statistically significant) decline in species richness or diversity during a period of stability or increase in species richness/diversity in reference swamps for four consecutive years.</p> <p><u>Exceeding Prediction:</u> Mining results in a >10% (or otherwise statistically significant) decline in species richness or diversity during a period of stability or increase in species richness/diversity in reference swamps for five consecutive years.</p>			
Maintenance or restoration of the structural integrity of the bedrock base of any significant permanent pool	Subsidence impacts (i.e. cracking) on bedrock base or controlling rockbar	<p><u>Level 1:</u> Fracturing observed in the bedrock base of any significant permanent pool which results in observable loss of surface water of 10% compared to baseline for the pool (in addition to any decrease in reference pools).</p> <p><u>Level 2:</u> Fracturing observed in the bedrock base of any significant permanent pool which results in observable loss of surface water of 20% compared to baseline for the pool (in addition to any decrease in reference pools).</p>	<ul style="list-style-type: none"> a) upfront mine planning b) subsidence monitoring c) surface water monitoring d) groundwater monitoring e) grouting of controlling of controlling 	Offset required immediately , if no remediation considered practicable.	

<p>or controlling rockbar within the swamps</p>		<p><u>Level 3:</u> Fracturing observed in the bedrock base of any significant permanent pool which results in observable loss of surface water of 20% compared to baseline for the pool for >20% of the time over a period of 1 year (in addition to any decrease in reference pools).</p> <p><u>Exceeding Prediction</u> Structural integrity of the bedrock base of any significant permanent pool or controlling rockbar cannot be restored, ie pool water level within the swamp after CMAs continues to be >20% lower than baseline for >20% of the time over a period of 1 year.</p>	<p>rockbars and bedrock base and/or use of other remediation techniques</p> <p>f) CMAs g) reporting h) investigation and review i) update future predictions</p>	<p>Offset required 2 years following remediation, if it is ineffective.</p> <p>This period can be extended to 5 years, with the agreement of the Secretary.</p>	
<p>Minor changes in the ecosystem functionality of the swamps</p>	<p>Falls in surface or near-surface groundwater levels in swamps</p> <p><i>NB. Not linked specifically to a PM and would not be considered a breach if predictions were exceeded.</i></p>	<p><u>Level 1:</u> Groundwater level lower than baseline level at any monitoring site within a swamp (in comparison to reference swamps); and/or</p> <p>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).</p> <p><u>Level 2:</u> 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</p> <p>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.</p> <p><u>Level 3:</u> 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</p> <p>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.</p>	<p>a) upfront mine planning b) groundwater monitoring c) implementation of swamp research program d) weeding e) fire management f) reporting g) update future predictions</p>		<p>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</p>

<p>Minor changes in the ecosystem functionality of the swamps</p>	<p>Falls in soil moisture levels in swamps</p> <p><i>NB. Not linked specifically to a PM and would not be considered a breach if predictions were exceeded.</i></p>	<p><u>Level 1:</u> Soil moisture level lower than baseline level at any monitoring sites (within 400 m of mining) within a swamp (in comparison to reference swamps).</p> <p><u>Level 2:</u> Soil moisture level lower than baseline level at 50% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps).</p> <p><u>Level 3:</u> Soil moisture level lower than baseline level at >80% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps).</p>	<p>a) upfront mine planning b) soil moisture monitoring c) water spreading d) weeding e) fire management f) reporting g) update future predictions</p>		<p>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</p>
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Table 7: Dendrobium Watercourse Impacts, Triggers and Response Plan.

OBSERVATIONAL MONITORING		
<p>Sandy Creek and Wongawilli Creek</p> <p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> • Wongawilli Creek - minor environmental consequences • Sandy Creek - minor environmental consequences <p>General observation of streams in active mining areas when longwall is within 400m</p>	<p>Level 1</p> <ul style="list-style-type: none"> • 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 • Observation that a pool on a subject Creek is dry • Observation that the subject Creek has ceased to flow 	<ul style="list-style-type: none"> • Continue monitoring program • Submit an Impact Report to BCD, DPE, DRG, Water NSW • Report in the End of Panel Report • Summarise actions and monitoring in AEMR

	<p>Level 2</p> <ul style="list-style-type: none"> • Observation that a single pool on a subject Creek is dry in consecutive monitoring events <p>Observation that two or more pools on a subject Creek are dry in a single monitoring event</p> <p>Observation that the subject Creek has ceased to flow in consecutive monitoring event</p>	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Carry out Water Flow Assessment Method D • Review monitoring frequency • Submit letter report to DPE, DRG and Water NSW and seek advice on any CMA required • Implement agreed CMAs as approved (subject to agency feedback)
	<p>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</p> <p>Crack or fracture between 10 and 50m length</p> <p>Soil surface crack that causes erosion that is likely to stabilise within the monitoring period without intervention</p> <p>Observable increase in iron staining within the mining area continues to outside the mining area i.e. 400m from the longwall</p>	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency • Submit letter report to DPE, DRG and Water NSW and seek advice on any CMA required • Implement agreed CMAs as approved (subject to agency feedback)
	<p>Level 3</p> <ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Offer site visit with BCD, DPE, DRG, Water NSW • 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, DRG, Water NSW • Completion of works following approvals and at a time agreed between S32, DPE, DRG and Water NSW (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
	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> • Structural integrity of the bedrock base of any significant permanent pool or controlling rockbar cannot be restored i.e. pool water level within the pool after CMAs continues to be lower than baseline period 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 3</i> • Investigate reasons for the exceedance • Update future predictions based on the outcomes of the investigation

	<ul style="list-style-type: none"> • Gas release results in vegetation dieback that does not revegetate • Gas release results in mortality of threatened species or ongoing loss of aquatic habitat • Iron staining and associated increases in dissolved iron resulting from the mining is observed in water at Wongawilli Creek downstream monitoring site Wongawilli Creek (FR6) • Iron staining and associated increases in dissolved iron resulting from the mining is observed in water at the Sandy Creek downstream monitoring site Sandy Creek SCh_Rockbar 5 Cracking in Sandy Creek within 30 m of the waterfall is of greater than negligible environmental and hydrological consequence • Greater than negligible diversion of water occurs from the lip of the waterfall 	<ul style="list-style-type: none"> • Provide residual environmental offset for any mining impact where CMAs are unsuccessful as required by Condition 14 Schedule 3 of the Development Consent
<p>WC13, WC14, WC15, WC16, WC17, WC17A, WC17B, SC7, SC10 and SC10C General observation of streams in active mining areas when longwall is within 400m</p>	<p>Level 1</p> <ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Continue monitoring program • Submit an Impact Report to BCD, DPE, DRG, Water NSW • Report in the End of Panel Report • Summarise actions and monitoring in AEMR
	<p>Level 2</p> <p>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</p> <p>Crack or fracture between 10 and 50m length</p> <p>Soil surface crack that causes erosion that is likely to stabilise within the monitoring period without intervention</p>	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency • Submit letter report to DPE, DRG and Water NSW and seek advice on any CMA required • Implement agreed CMAs as approved (subject to agency feedback)

	<p>Observable increase in iron staining within the mining area continues to outside the mining area i.e. 400m from the longwall</p>	
	<p>Level 3</p> <ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Offer site visit with BCD, DPE, DRG, Water NSW • 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, DRG, Water NSW • Completion of works following approvals and at a time agreed between S32, DPE, DRG and Water NSW (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
WATER QUALITY		
<p>Wongawilli Creek</p> <p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> • Wongawilli Creek - minor environmental consequences <p>Wongawilli Creek (FR6) Baseline means:</p> <ul style="list-style-type: none"> • pH 6.01 • EC 100.4 uS/cm • DO 89.5% 	<p>Level 1</p> <ul style="list-style-type: none"> • One exceedance of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> – pH 4.39 – EC 163.9 uS/cm – DO 49.1% 	<ul style="list-style-type: none"> • Continue monitoring program • Submit an Impact Report to BCD, DPE, DRG, Water NSW • Report in the End of Panel Report • Summarise actions and monitoring in AEMR
	<p>Level 2</p> <ul style="list-style-type: none"> • Two non-consecutive exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency • Submit letter report to DPE, DRG and Water NSW and seek advice on any CMA required

	<ul style="list-style-type: none"> - pH 4.39 - EC 163.9 uS/cm - DO 49.1% 	<ul style="list-style-type: none"> • Implement agreed CMAs as approved (subject to agency feedback)
	<p>Level 3</p> <ul style="list-style-type: none"> • Three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> - pH 4.39 - EC 163.9 uS/cm - DO 49.1% 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Offer site visit with BCD, DPE, DRG, Water NSW • Implement additional monitoring or increase frequency if required • Review relevant TARP and Management Plan in consultation with key agencies • Develop site CMA (subject to agency feedback). This may include: <ul style="list-style-type: none"> - Limestone emplacement to raise pH where it is appropriate to do so • Completion of works following approvals and at a time agreed between S32, DPE, DRG and Water NSW (i.e. may be after mining induced movements and impacts are complete), including monitoring and reporting on success
	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> • Mining results in two consecutive exceedances or three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> - pH 4.39 - EC 163.9 uS/cm - DO 49.1% 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 3</i> • Investigate reasons for the exceedance • Update future predictions based on the outcomes of the investigation • Provide residual environmental offset for any mining impact where CMAs are unsuccessful as required by Condition 14 Schedule 3 of the Development Consent
<p>Sandy Creek</p> <p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> • Sandy Creek - minor environmental consequences <p>SChk_Rockbar 5 Site Baseline means:</p> <ul style="list-style-type: none"> • pH 5.54 • EC 101.1 uS/cm 	<p>Level 1</p> <ul style="list-style-type: none"> • One exceedance of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> - pH 5.10 - EC 129.9 uS/cm - DO 17.9% 	<ul style="list-style-type: none"> • Continue monitoring program • Submit an Impact Report to BCD, DPE, DRG Water NSW • Report in the End of Panel Report • Summarise actions and monitoring in AEMR
	<p>Level 2</p>	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency

<ul style="list-style-type: none"> • DO 74.8% 	<ul style="list-style-type: none"> • Two non-consecutive exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> – pH 5.10 – EC 129.9 uS/cm – DO 17.9% 	<ul style="list-style-type: none"> • Submit letter report to DPE, DRG and Water NSW and seek advice on any CMA required • Implement agreed CMAs as approved (subject to agency feedback)
	<p>Level 3</p> <ul style="list-style-type: none"> • Three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> – pH 5.10 – EC 129.9 uS/cm – DO 17.9% 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Offer site visit with BCD, DPE, DRG, Water NSW • Implement additional monitoring or increase frequency if required • Review relevant TARP and Management Plan in consultation with key agencies • Collect laboratory samples and analyse for: <ul style="list-style-type: none"> – pH, EC, major cations, major anions, Total Fe, Mn & Al – Filterable suite of metals • Develop site CMA (subject to agency feedback). This may include: <ul style="list-style-type: none"> – Limestone emplacement to raise pH where it is appropriate to do so • Completion of works following approvals and at a time agreed between S32, DPE, DRG and Water NSW (i.e. may be after mining induced movements and impacts are complete), including monitoring and reporting on success
	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> • Mining results in two consecutive exceedances or three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> – pH 5.10 – EC 129.9 uS/cm – DO 17.9% 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 3</i> • Investigate reasons for the exceedance • Update future predictions based on the outcomes of the investigation • Provide residual environmental offset for any mining impact where CMAs are unsuccessful as required by Condition 14 Schedule 3 of the Development Consent

<p>Lake Cordeaux</p> <p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> • Lake Cordeaux - negligible reduction in the quality of surface water inflows to Lake Cordeaux <p>Sandy Creek Arm Site</p> <p>Baseline means:</p> <ul style="list-style-type: none"> • pH 6.11 • EC 93 uS/cm • DO 87.6% 	<p>Level 1</p> <ul style="list-style-type: none"> • One exceedance of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> – pH 3.96 – EC 137 uS/cm – DO 49.4% 	<ul style="list-style-type: none"> • Continue monitoring program • Submit an Impact Report to BCD, DPE, DRG, Water NSW • Report in the End of Panel Report • Summarise actions and monitoring in AEMR
	<p>Level 2</p> <ul style="list-style-type: none"> • Two non-consecutive exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> – pH 3.96 – EC 137 uS/cm – DO 49.4% 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency • Submit letter report to DPE, DRG and Water NSW and seek advice on any CMA required • Implement agreed CMAs as approved (subject to agency feedback)
	<p>Level 3</p> <ul style="list-style-type: none"> • Three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> – pH 3.96 – EC 137 uS/cm – DO 49.4% 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Offer site visit with BCD, DPE, DRG, Water NSW • Implement additional monitoring or increase frequency if required • Review relevant TARP and Management Plan in consultation with key agencies • Collect laboratory samples and analyse for: <ul style="list-style-type: none"> – pH, EC, major cations, major anions, Total Fe, Mn & Al – Filterable suite of metals • Develop site CMA (subject to agency feedback). This may include: <ul style="list-style-type: none"> – Limestone emplacement to raise pH where it is appropriate to do so – Grouting of fractures in rockbar and bedrock base of any significant pool where flow diversion results in pool water level lower than baseline period • Completion of works following approvals and at a time agreed between S32, DPE, DRG and Water NSW (i.e. may be after mining induced movements and impacts are complete), including monitoring and reporting on success
	<p>Exceeding Prediction</p>	<ul style="list-style-type: none"> • <i>Actions as stated for Level 3</i>

<ul style="list-style-type: none"> • Mining results in two consecutive exceedances or three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> – pH 3.96 – EC 137 uS/cm – DO 49.4% 	<ul style="list-style-type: none"> • Investigate reasons for the exceedance • Update future predictions based on the outcomes of the investigation • Provide residual environmental offset for any mining impact where CMAs are unsuccessful as required by Condition 14 Schedule 3 of the Development Consent
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Table 8: Dendrobium Landscape Impacts, Triggers and Response Plan.

Landscape Features		
<p>Longwall 19 and 19A Study Area</p> <p>Cliffs All mapped cliff sites in subsidence area <i>(Refer to Figures 3-1 for location of sites)</i></p> <p>Steep Slopes All mapped steep slopes in subsidence area <i>(Refer to Figure 3-1 for location of sites)</i></p> <p>Fire Trails All mapped fire trails in subsidence area <i>(Refer to Figure 3-1 for location of sites)</i></p>	<p>Level 1</p> <ul style="list-style-type: none"> • 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 100 mm width • Crack or fracture up to 10 m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> • Continue monitoring program • Submit an Impact Report to key stakeholders • Summarise impacts and report in the EOP and AR

	<p>Level 2</p> <ul style="list-style-type: none"> • 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 300 mm width • Crack or fracture between 10 and 50 m 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 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • 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 <p><i>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</i></p>
	<p>Level 3</p> <ul style="list-style-type: none"> • 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 • Crack or fracture over 300 mm width • Crack or fracture over 50 m length • Mass movement of a slope causing large areas of exposed • soil with potential for further movement 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Immediately notify stakeholders and technical specialists and seek advice on any CMA required • Offer site visit with stakeholders • Implement additional monitoring or increase frequency if required • Completion of works following approvals and at a time agreed between S32, DPE 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 <p><i>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</i></p>

		<i>not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i>
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* These may be revised in consultation with DPE and RR and other key stakeholders following analysis of natural variability within the pre-mining baseline data. These TARP's relate to Dendrobium Area 3A and impacts resulting from mining.