

Northparkes Mines
A century of mining together

2021 Annual Review

Pine Donkey Orchid (*Diuris tricolor*),
record highest numbers totaling
1,832 in 2021.

CMOC




Document Details	
Name of Operation	CMOC-Northparkes Mines
Name of Operator	CMOC Mining Pty Ltd operating as CMOC Mining Services Pty Ltd
Development Consent/Project Approval Number	DC11_0060, as modified
Name of holder of development consent/Project Approval	CMOC Mining Pty Ltd
Mining Leases	ML1247, ML1367, ML1641, ML1743
Name of holder of mining lease	CMOC Mining Pty Ltd
Water Licence #	Refer to Table 4 Summary of Licences
Name of holder of water licence	CMOC Mining Pty Ltd
MOP Commencement Date	1 st January 2020
MOP Completion Date	30 th June 2022
Annual Review Commencement Date	1 st January 2021
Annual Review Completion Date	31 st December 2021
I, Jianjun Tian, certify that this audit report is a true and accurate record of the compliance status of CMOC-Northparkes Mines for the period 1 st January 2021 to 31 st December 2021 and that I am authorised to make this statement on behalf of CMOC Mining Pty Ltd.	
Name of authorised reporting officer	Jianjun Tian
Title of authorised reporting officer	Managing Director
Signature of authorised reporting officer	
Date	29 March 2022

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1. STATEMENT OF COMPLIANCE

In accordance with the *Post-approval requirements for State significant mining developments – Annual Review Guideline* (NSW Government, 2015) a statement of compliance has been prepared to document the status of compliance with Development Consent 11_0060 (as modified), mining leases and other relevant approvals at the end of the 2021 reporting period. Table 1 shows each statutory approval and where a non-compliance was identified during the reporting period.

Table 1 Statement of Compliance

Were all conditions of the relevant approvals complied with?	
PA 11_0060	Yes*
ML 1247	Yes
ML 1367	Yes
ML 1641	Yes
ML 1743	Yes
EPL 4784	Yes*
EPBC 2013/6788	Yes
WAL9995, WAL8241, WAL7866, WAL34955, WAL32138, WAL32120, WAL32004, WAL31969, WAL31963, WAL31930, WAL31863, WAL31850, WAL21471, WAL21466, WAL1698, WAL13108, WAL10082	Yes

*Non-compliances were identified during the period as part of the Independent Environmental Audit (IEA), commissioned in April 2021. Details of these non-compliances are in Section 10 of this report. Zero non-compliances occurred outside of the IEA.

2. INTRODUCTION

2.1 Mine Contacts

Table 2 CMOC-Northparkes Mines Contacts

Position	Contact Name	Contact Number
Northparkes Hotline	Gabe Albert	02 6861 3000
Mill Control (24 Hrs)	-	02 6861 3167
Access Control	-	02 6861 3211
Environment and Farm Superintendent	Chris Higgins	02 6861 3265
People, Safety and Environment Manager	Stacey Kelly	02 6861 3495

2.2 Mine Operation Introduction and History

2.2.1 Location, History and Process Overview

CMOC-Northparkes Mines (Northparkes) is a copper-gold mine located 27 kilometres north-west of the town of Parkes in central west New South Wales, Australia (Figure 1). The Northparkes business continues to run under a joint venture arrangement with 80% interest with China Molybdenum Pty Ltd and the remaining 20 percent share owned by the Sumitomo Group.

The majority of Northparkes employees reside in the Parkes Shire, which has a population of approximately 15,000 residents. Parkes Shire is a diverse municipality centred in the town of Parkes. The largest industry is the retail industry, closely followed by the agricultural industry.

North Mining Limited originally received development consent for Northparkes operations in 1992, 15 years after the first onsite resource discovery. This approval was based on open cut mining of E22 and E27 and underground mining of E26 within the 'Mining Reserve' of 64.1 million tonnes (Mt).

Underground block cave mining commenced at Northparkes in October 1993 with the construction of the E26 underground block cave mine through the granting of development consent DA504/90. Northparkes commissioned its second block cave mine, E26 Lift 2 in 2004. In 2008, North Mining Limited commissioned an extension to the second block cave mine, E26 Lift 2 North (E26 Lift 2N). Mining operations at Northparkes focus on the extraction of a range of ore bodies based on a set of target mineral concentration limits.

Open cut mining commenced with the E27 pit in December 1993 and the E22 pit in January 1994. The gold-enriched oxide ore was processed through a separate carbon-in-pulp (CIP) gold circuit, including the use of cyanide for gold extraction, prior to the construction of the copper-gold sulphide processing circuits in 1995. Ore was then stockpiled for blending with E26 underground material. Open cut mining at Northparkes operated on a campaign basis determined by economic and environmental viability. Open cut mining ceased in October 2010 with the completion of the E22 open cut campaign. The CIP processing plant has been decommissioned from site, with cyanide no longer used in process circuits on site.

In February 2007, the NSW Minister for Planning granted PA06_0026 under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act). This approval provided for the ongoing operation of the previously approved mining operations and facilities and the extension of underground block cave mining into the E48 ore body. This project was known as the E48 Project. After approval in 2007, North Mining Limited commenced construction of E48 Lift 1, its third major block cave mine. Initial production of E48 Lift 1 began in 2010 and forms part of the approved underground mining operations in conjunction with E26 Lift 2 and E26 Lift 2N.

In October 2009, approval was granted for two modifications to PA06_0026 under Section 75W of the EP&A Act. Section 75W modification 1 (Mod 1) provided for the construction of the Estcourt Tailings Storage Facility (TSF), a mine and mill upgrade to increase processing up to 8.5Mtpa and extension of mine life until 2025. Section 75W modification two (Mod 2) provided for the development of a 1200m² warehouse within the approved mine infrastructure area.

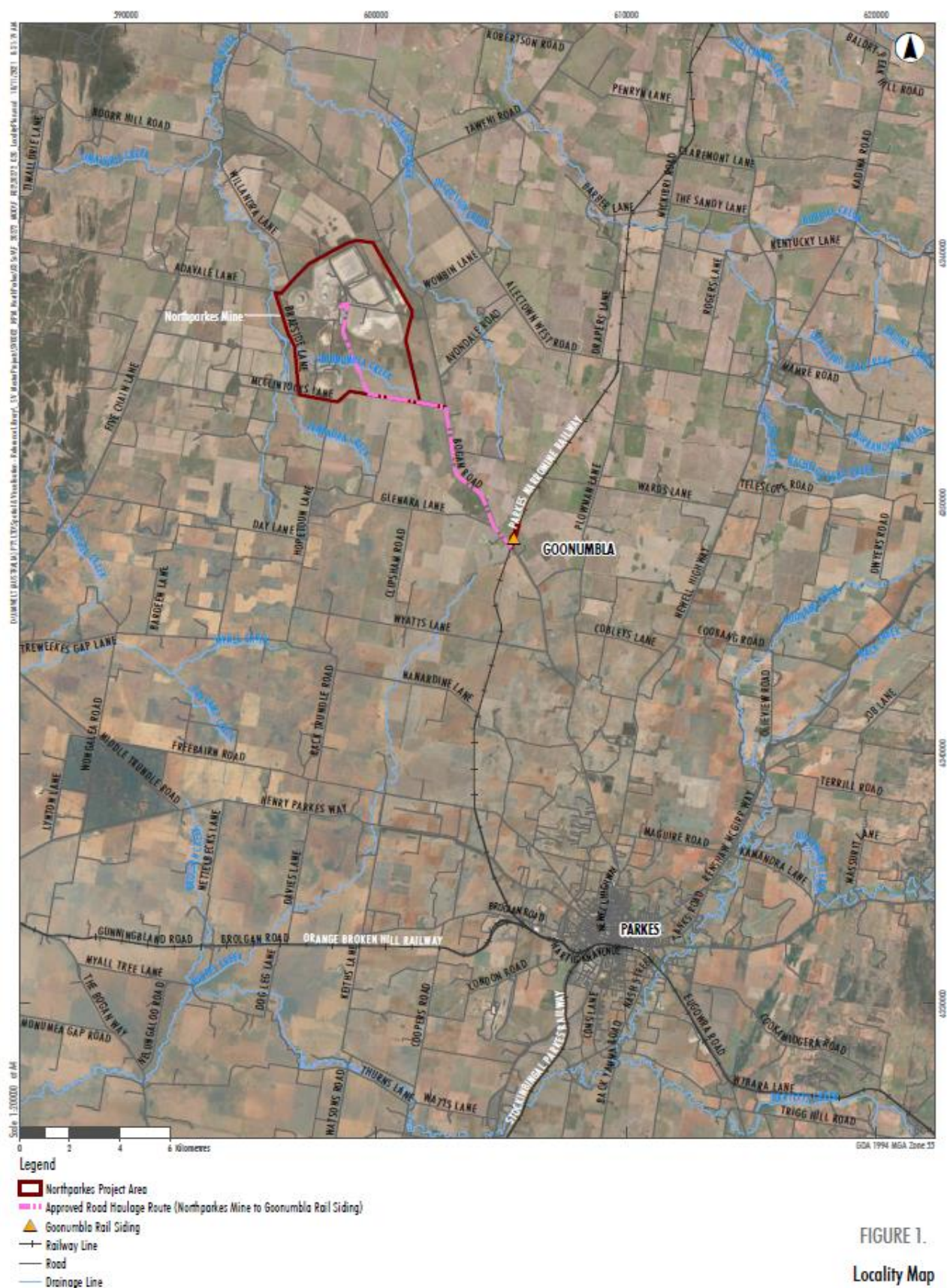
In 2012 North Mining Limited was granted approval for development of a block cave knowledge centre under Part 4 of the EP&A Act (DA 11092) from Parkes Shire Council (PSC).

In 2013, CMOC Mining Pty Ltd acquired Northparkes.

In July 2014, Project Approval was granted for PA11_0600 under section 75J of the EP&A Act for the Northparkes Extension Project (the Project). This approval PA11_0060 surrendered the Project Approval PA06_0026 and DA11092 in accordance with section 104A of the EP&A Act.

In 2019, Project Approval 11_0060 was gazetted as a State Significant Development (SSD) under section 4 of the EP&A Act and is now referred to as Development Consent 11_0060.

A copy of the 2020 Northparkes Value Chain is provided as Figure 2. The value chain is a high-level model used to describe the process by which Northparkes receive raw materials, add value to the raw materials through various processes to create a finished product, and then sell that end product to customers. Northparkes conducts annual value-chain analysis by looking at every production step required to create a product and identifying ways to increase the efficiency of the chain. The overall goal is to deliver maximum value for the least possible total cost and impact, while creating a competitive advantage.



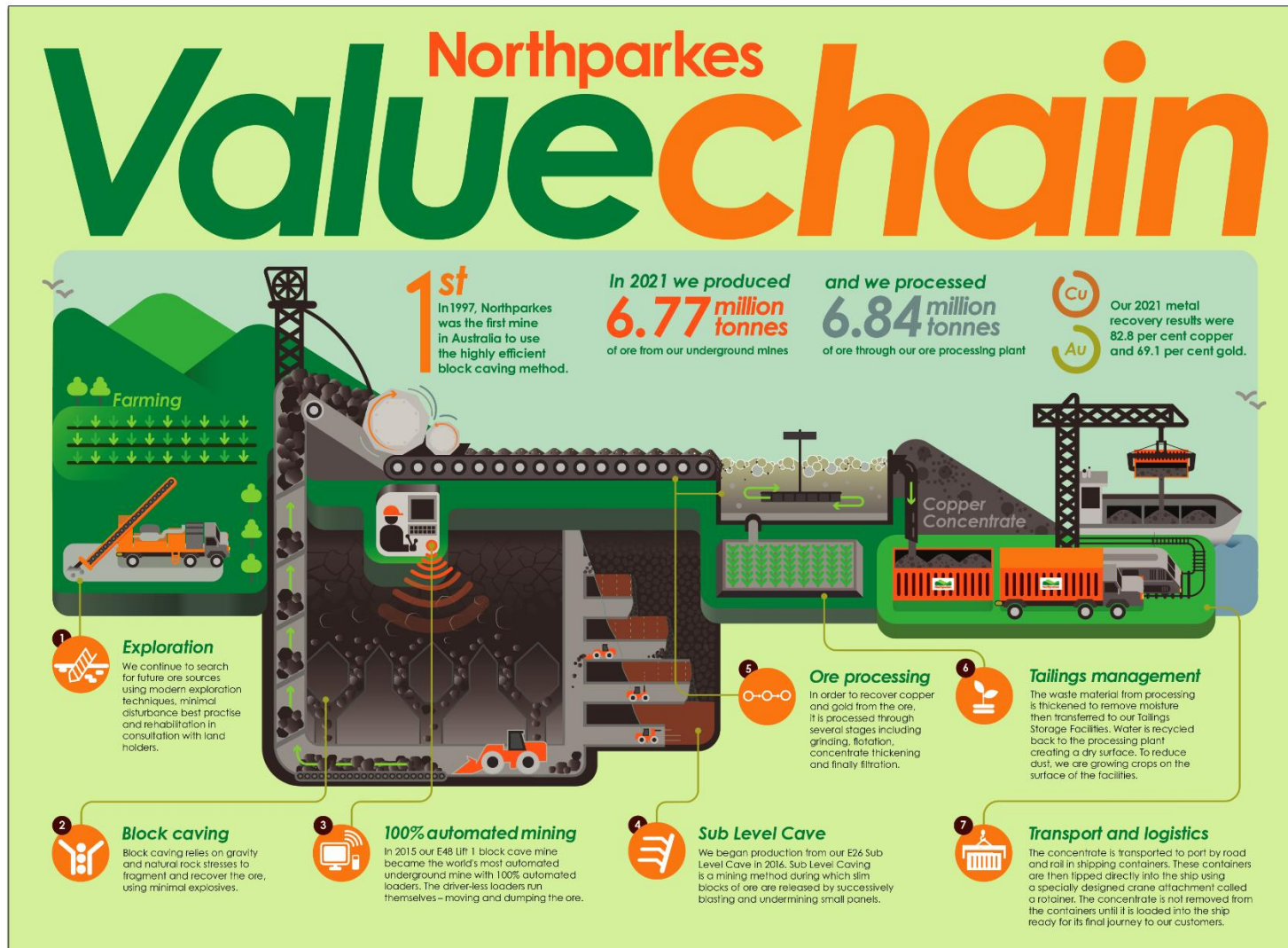


Figure 2 Northparkes 2021 Value Chain

2.2.2 Site Layout and Infrastructure

Surface infrastructure and operation layout is shown in Figure 3.

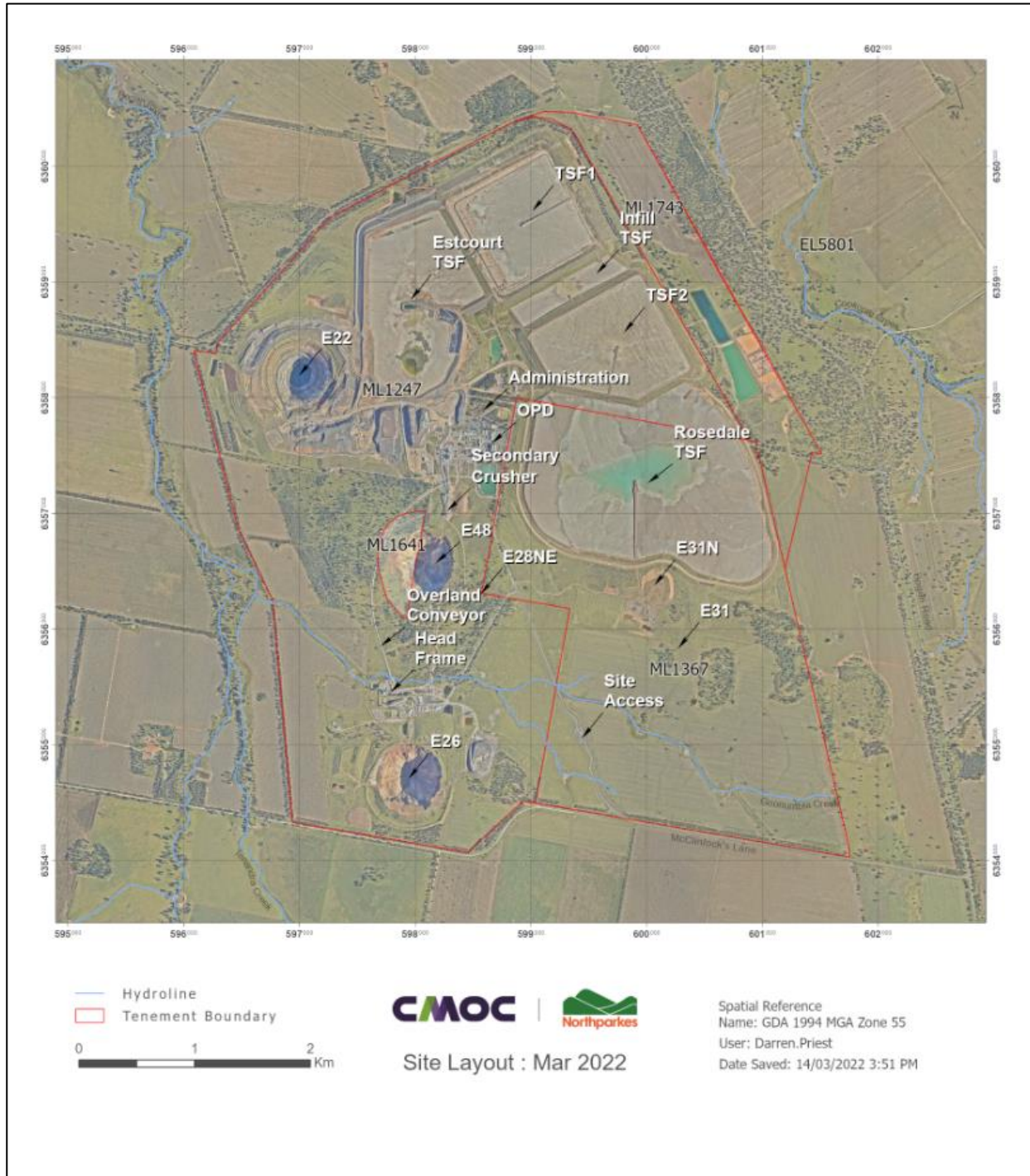


Figure 3 Surface Infrastructure and Operational Layout

The major components of the Northparkes onsite infrastructure and approved future operations includes:

- Continuation of approved underground block cave mining in the E48 and E26 ore bodies, and associated underground infrastructure
- Development of underground block caving in the E22 resource beneath the E22 open cut void
- Campaign open cut mining through development of five open cut resources including:
 - development of four small open cut pits E31, E31N, E28, E28NE
 - E26 open cut which is located in an area of previous underground block cave subsidence (existing vertical extent of subsidence void is approximately 200 metres)
- Ongoing TSF disposal and raises including:
 - continuation of tailings disposal to TSF1, TSF2, Infill TSF and Estcourt TSF to an approved height of 28 metres
 - provision for additional raises on Rosedale TSF to provide for an increased height up to approximately 28 metres above ground surface
 - the extension of the Infill TSF west to adjoin the Estcourt TSF
- Development of new waste dumps (overburden emplacement areas) for the management of open cut waste rock. Waste rock from open cut mining areas can be utilised in the development of TSF raises such as Rosedale TSF
- Continuation of approved ore processing infrastructure up to 8.5 Mtpa capacity, and road haulage of copper concentrate to local rail sidings
- Continued use of existing site infrastructure including administration buildings, workshop, internal access roads and service infrastructure
- Continued use of surface mining infrastructure including ventilation shafts, hoisting shaft and ore conveyors
- Continuation of existing approved water supply and management processes
- Continuation of approved mining operations until end of 2032 and
- Rehabilitation and closure of the mine site will be carried out after the end of the operational life of the Project in accordance with relevant approvals.

2.3 Scope

This Annual Review provides a summary of actual operational and environmental management activities undertaken at Northparkes during the reporting period and provides a review against planned works, as described in the Mining Operations Plan (MOP), and predicted impacts documented in the Northparkes Mines Step Change Project Environmental Assessment (EA) (Umwelt, 2013). The Annual Review also covers community relations and addresses mine development and rehabilitation undertaken during the reporting period.

The report has been prepared to satisfy the conditions of the Development Consent 11_0060 (DC11_0060) (in particular Schedule 6, Condition 4) and Mining Leases (ML) 1247, 1367, 1641, 1743. Key requirements of these approvals are described in Table 3.

The report has been prepared generally in accordance with the NSW Governments "Annual Review Guideline" October 2015 where practicable, as well as the relevant Northparkes reporting framework.

Northparkes recognises and respects the importance of stakeholders and considers positive relationships important to aid in continual improvement of its environmental management practice. This report is therefore provided to the following stakeholders:

- Department of Planning, Industry and Environment
- Resource Regulator, Department of Regional NSW
- Forestry Corporation of NSW
- NSW Environment Protection Agency (EPA)
- Biodiversity Conservation Trust (BCT)
- Peak Hill Local Aboriginal Land Council (PHLALC)
- Wiradjuri Council of Elders (WCE)
- Parkes Shire Council (PSC)

- Forbes Shire Council (FSC)
- Northparkes Community Consultative Committee and
- General public (available at <http://www.northparkes.com/>).

2.4 Annual Review Requirements

Table 3 Annual Review Requirements

Licence Approval or Guideline	Section Reference	Requirement	Reference in this Report
Development Consent 11_0060	Schedule 6, Condition 4	By the end of March each year, or as otherwise agreed by the Secretary, the Proponent shall review the Environmental performance of the project to the satisfaction of the Secretary. This review must:	Whole document
		(a) describe the development that was carried out in the previous calendar year, and the development that is proposed to be carried out over the next year	
		(b) include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, which includes a comparison of these results against the <ul style="list-style-type: none"> the relevant statutory requirements, limits or performance measures/criteria the monitoring results of previous years and the relevant predictions in the EA 	Section 4, Section 6, Section 7, Section 8.
		(c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance	Section 1, Section 11
		(d) identify any trends in the monitoring data over the life of the project	Section 4, Section 6, Section 7, Section 8.
		(e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies and	Section 4, Section 6, Section 7, Section 8.
		(f) describe what measures will be implemented over the next year to improve the environmental performance of the project.	Section 12
	Schedule 3, Condition 38	The Proponent shall: <ul style="list-style-type: none"> (a) implement all reasonable and feasible measures to minimise the waste (including waste rock) generated by the project) (b) ensure that the waste generated by the project is appropriately stored, handled and disposed of and (c) monitor and report on effectiveness of the waste minimisation and management measures in the Annual Review 	Section 4
ML 1247 ML 1367 ML 1641 ML1742	Condition 3 (f)	The lease holder must prepare a Rehabilitation Report to the satisfaction of the Minister. The report must: <ul style="list-style-type: none"> i. provide a detailed review of the progress of rehabilitation against the performance measures and criteria established in the approved MOP ii. be submitted annually on the grant anniversary date (or at such times as agreed by the Minister) and iii. be prepared in accordance with any relevant annual reporting guidelines published on the Department's website. 	Whole document

3. APPROVALS

3.1 Approvals, Leases and Licences

Table 4 summarises the key mining leases and approvals currently held by Northparkes which are relevant to the operations.

Table 4 Summary of Licences

Approval	Description	Issue Date
Project Approvals		
DC11_0060	Project Approval – Step Change Project (Mine Extension)	16/07/2014
DC11_0060 Mod 1	Modification to include Sub Level Cave Mining	16/5/2015
DC11_0060 Mod 2	Correct error in project boundary	31/3/2016
DC11_0060 Mod 3	Development and operation of E26 Lift 1 North	22/8/2017
DC11_0060 Mod 4	Changes to Ore Processing Infrastructure	06/09/2018
DC11_0060 Mod 5	Alternate road haulage route and new secondary crusher	30/09/2019
DC11_0060 Mod 6	E22 Portal, TSF2 Buttrressing and E31 Precinct	In progress
Commonwealth Approvals		
EPBC 2013/6788	EPBC Approval	13/02/2014
Council Approvals		
	PSC Approval for Road Train Access on Bogan Road	19/11/1999
Mining Leases		
ML 1247	Mining Lease (1629.6 Ha)	27/11/1991
ML 1367	Mining Lease (826.2 Ha)	21/03/1995
ML 1641	Mining Lease (24.4 Ha)	25/03/2010
ML 1743	Mining Lease (193.3 Ha)	01/09/2016
Exploration Leases		
EL 5800	Exploration Lease (12,130Ha)	08/01/2001
EL 5801	Exploration Lease (49,550 Ha)	08/01/2001
EL 5323	Exploration Lease (21,840 Ha)	18/07/1997
EL 8377	Exploration Lease (25,950 Ha)	12/06/2015
Environmental Protection Licences		
EPL 4784	Environmental Protection Licence	30/05/2001
Current variation	s.58 Licence variation to update existing conditions and add special condition to permit the controlled burn of Tailings Storage Facility 2 (TSF2) embankment	09/11/2021
Dangerous Good and Explosives		
NDG029083	Acknowledgement of Notification of Hazardous Chemicals on Premises	19/08/2019
XSTR200036	Licence to Store Explosives	24/09/2019
XMNF200011	Licence to Manufacture Explosives	28/07/2019
5060895	Radiation Management Licence	10/11/2020
Heavy Vehicle Authorisation		
133827V6	Road Train Operation Permit	12/09/2020

Water Licences		
WAL43208	Water Access Licence - High Security	01/07/2020
WAL43207	Water Access Licence - General Security	01/07/2020
WAL34955	Water Access Entitlement	04/10/2012
WAL32138	Water Access Entitlement	14/09/2012
WAL32120	Water Access Entitlement	14/09/2012
WAL32004	Water Access Entitlement	14/09/2012
WAL31969	Water Access Entitlement	14/09/2012
WAL31963	Water Access Entitlement	14/09/2012
WAL31930	Water Access Entitlement	14/09/2012
WAL31863	Water Access Entitlement	14/09/2012
WAL31850	Water Access Entitlement	14/09/2012
Forestry Occupation Permits		
847	Limestone State Forest Occupation Permit	14/01/2022
Mining Operations Plan		
MOP	01/01/2020 – 01/01/2022 MOP Period	09/12/2019
MOP Amendment B	15/12/2020 – 30/06/2022 MOP Period	07/07/2021

3.2 Amendments during the Reporting Period

3.2.1 Development Consent

Development Consent 11_0060 (the Consent) was granted on 16 July 2014. Five modifications to the Consent have been granted since 2014 (dated 16/5/2015, 31/3/2016, 22/9/2017, 6/9/18 and 30/8/2019 respectively). The latest modification (Mod 5) was lodged for assessment under the Environmental Planning and Assessment Act 1979 (EP&A Act) in June 2019 and approval granted in August 2019. Mod 5 proposed the use of an alternative road haulage route between the Northparkes Mine and the Parkes National Logistics Terminal until August 2020 and the construction of a new secondary crushing building in a different location to the previous approval.

During the reporting period, Northparkes requested a modification to the Consent under section 4.55(2) of the NSW Environmental Planning and Assessment Act 1979. The modification is known as Mod 6 and includes the following:

- construction and use of a new underground portal access (including associated drive, conveyor and other ancillary infrastructure) for E22 underground mining operations
- TSF2 embankment buttressing (including associated amendments to the approved disturbance area)
- changes to TSF construction within the approved disturbance footprint associated with increased safety requirements for TSFs since first approved
- minor changes to the E31 and E31N open cut pits to reflect updated geological data and improved resource recovery, including:
 - minor adjustments to disturbance areas for the approved pits and associated infrastructure (roads, safety bunds, water management etc)
 - minor increases to maximum approved mining depths
- establishment of temporary waste rock stockpile areas for the E31 and E31N pits to avoid unnecessary material re-handling in the future due to the proposed Rocklands TSF
- additional detail regarding the approved methods and locations of rehabilitation material (soils and vegetation)

- establishment of additional clay and filter material borrow pits for TSF construction and lifts
- relocation of the Contractor area facilities (eg site offices, crib huts and a workshop) which would also service the E31 and E31N mining operations
- relocation of the main water supply pipeline and Rosedale (TSF3) tailings pipeline
- clarification regarding approved disturbance boundaries and the location of ancillary infrastructure within the E31 Precinct.

Vegetation disturbance associated with the proposed modification would be undertaken in stages, comprising:

- Stage 1: E31 Precinct and TSF2 embankment buttressing works
- Stage 2: E22 Portal direct disturbance required for the establishment of the portal
- Stage 3: E22 Portal additional disturbance that may be required subject to detailed design.

Within the reporting period Northparkes also submitted the Scoping Report for a new SSD covering the proposed Northparkes E44 Rocklands Project. The major components of the project are:

- Proposed satellite open cut E44 ore body, which is 13km southwest of the current operations. Ore is proposed to be hauled back to Northparkes via public roads.
- Proposed Rocklands TSF which is within the current mining leases, to the south of the current Rosedale TSF

3.2.2 Environmental Protection Licence

An Annual Return for the reporting period was submitted to the EPA on 28 July 2021 in accordance with requirements under Environment Protection Licence (EPL) 4784 Condition R1.5.

On 8 October 2021, Northparkes requested that Environment Protection Licence 4784 conditions of approval be varied to permit the burning of TSF2 western embankment. The EPA were notified that above average rainfall at the premises had increased the potential for movement in the western wall of TSF2, and vegetation removal was necessary to ensure the effectiveness of monitoring equipment. Aerial spraying and prescribed burning were assessed as the activities of most effectiveness and lowest risk to personnel safety. No burning activity was undertaken in the reporting period.

4. OPERATIONS SUMMARY

4.1 Production Statistics

A summary of production figures for the 2020 and 2021 calendar years is provided in Table 5 below. Also shown are the predicted production figures for the 2022 reporting period.

Table 5 Production and waste rock summary

Material	Approved Limit	2020 Reporting Period	This Reporting Period	2022 Reporting Period (forecast)
Underground Ore Mined to ROM (Mt)	>2.0	6.00	5.37	6.00
Stockpiled Opencut Ore to ROM (Mt)	N/A	0.49	1.40	1.68
Ore Processed (Mt)	8.5	6.49	6.84	7.60
Waste Rock/Overburden (t)	N/A	196,450	10,374	500
Fine Reject (tailings) (Mt)	N/A	6.39	6.74	7.49
Saleable Product (t)	N/A	107,541	107,789	108,437

Mining operations within the 2021 reporting period remained below the limits specified in the Consent. Other conditions relevant to operating conditions are addressed throughout the report.

4.2 Mining and Processing

4.2.1 Open cut

Active open cut mining ceased in 2010. There were no open cut mining activities in the current reporting period.

4.2.2 Underground Operations

Underground mining activities are currently undertaken in ore body E48 using block caving methods and the new block cave E26 L1N. Block Caving is an underground hard rock mining method that involves undermining an ore body, allowing it to progressively collapse under its own weight (see Figure 4 Block Cave Mining Method).

The operations at E26 SLC orebody ceased in 2021 due to achieving planned production. The E26 SLC project commenced construction in April 2015 and went into production in 2016. The mine design aimed to extract a remnant wedge of high-grade material adjacent to the E26 Lift 2 Block Cave. The SLC mining method involved construction of the sub level horizon followed by retreat drill and blast of that horizon. The broken material from blasting was recovered as the main source of production. The second sub level horizon is then constructed, as the top-down process continued. The E26 SLC Mine consisted of three sublevels approximately 20m apart.

The construction of E48 block cave mine was completed in 2010, with the first ore extracted from E48 Lift 1 block cave mine and is currently in production. Automation (remote operation of underground load, haul and dump machinery) continued in the reporting period to maintain full automation of underground mine loaders. In mid-October 2015, Northparkes confirmed its position as the most automated underground mine in the world and achieved 100 percent automation of underground mine loaders.

In 2021 Northparkes continued with the development of the new Block Cave (E26 Lift 1 North). Construction started in January 2019 and by February of 2022 the production of the new block cave will commence. This new block cave is scheduled to start full production in 2023.

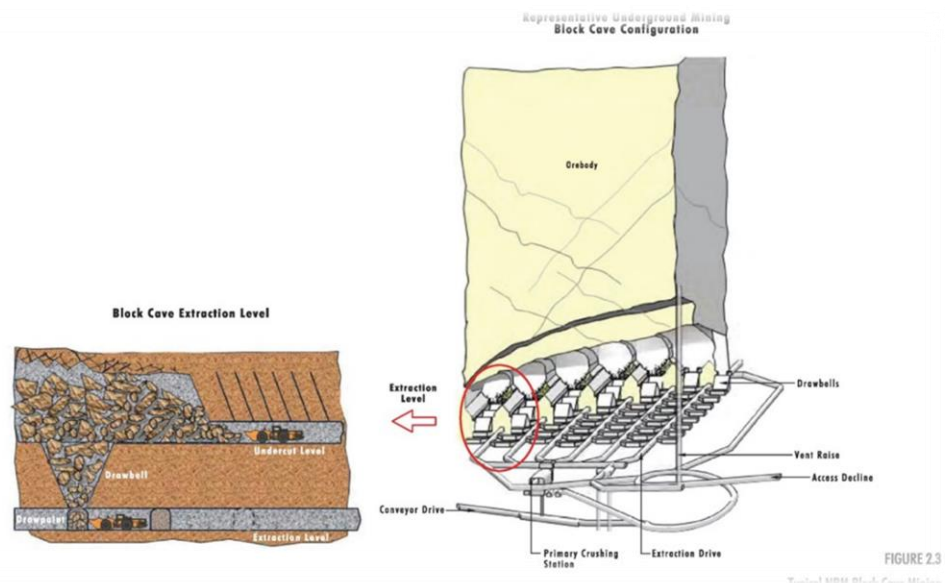


Figure 4 Block Cave Mining Method

4.2.3 Waste Rock

A total of 10,374 tonnes of waste rock from underground development was placed on E26 waste rock emplacement during the reporting period.

The underground waste was primarily from the E26 L1N Block Cave Development Project and consisted mostly of rock contaminated by ground support (steel mesh and shotcrete) and concrete that could not be effectively separated out. All of this waste material was trucked to the surface and separated to extract contaminating material.

4.3 Exploration and Resource Utilisation

Exploration and evaluation programs continued across ML1247 and ML1641 in the 2021 reporting period shown in Figure 5 Exploration and Evaluation Drilling Activities – NPM Mining Leases 2021.

No exploration activities were undertaken on ML1367 or ML1743 during the year. No non-compliances have been noted within the mining leases related to exploration or evaluation activities.

A total of 29 drill holes for 9,959.2m were completed for exploration and evaluation purposes during the reporting period. The drilling program comprised 27 underground diamond holes for a total of 7,302.2m, and 2 surface diamond drill holes totalling 1378.8m of core. Northparkes Mines is committed to identifying and evaluating new ore bodies with the intention of extending mine life.

Mining lease evaluation in 2021 involved the following works:

- A targeted surface diamond drill program of two HQ/NQ core holes to generate samples for metallurgical test work and confirm the metallurgical performance of the upper zones of the E22 Block Cave resource in the area beneath the current E22 open-pit void;
- Underground drilling to define the margins of the E26MJH mineralisation (>0.4% Cu shell), particularly on the eastern and southern margins, which were not well defined by existing drilling; and,
- Infilling poorly drilled and data-poor areas of the existing E26L2NN mineral resource to confirm the tenor of mineralisation.

In addition to new drilling, final assay results were received from two holes drilled in the previous reporting period, which were either part of an ongoing project, or had assays pending. These holes were two holes from the previously completed surface drilling at GRP314.

Non-drilling activities during 2021 included: the creation of two revised Block Models which were created for the E26 and GRP314 deposit areas, and re-assay of 2780 historic diamond and RC pulps from the E48 deposit located on ML1247. Results from this re-assay program are expected in the next reporting period.

Exploration and evaluation activities will continue in the next reporting period (1/1/2022 to 31/12/2022 inclusive). The major focus of these activities will be reverse circulation drilling to evaluate the prospectivity of the Rocklands area, as part of a program evaluating tailings storage facility upgrades, along with further underground diamond drill testing of the E26MJH mineralisation.

The proposed exploration comprises 11,500m of drilling (8,000m diamond drilling and 3,500m reverse circulation drilling) and will be focussed in five programs testing known and postulated mineralisation, being:

- Testing of the White Rock Quarry area, ML1247 (undrilled) and the E51 Prospect area, ML1367 (sparsely drilled) with a program of RC drillholes;
- Testing of the Major Tom area, ML1247/1367 (undrilled) and the Logjam Prospect area, ML1367 (sparsely drilled) plus the sterilisation drilling required for other areas of the Rocklands Tailings Storage facility, ML1367 with a program of RC drillholes;

- Drill testing to define the eastern limits of the GRP314 deposit (Lift 2 position), ML1367 for confirmation of subsidence zone interactions with the proposed Rocklands TSF;
- Additional underground infill drill testing and definition of the boundaries and extents of mineralisation at E26MJH (E26L2 East), ML1247 plus initial drilling to test the E26 CLJ Zone at the Lift 2 level;
- Initial drilling to test the E48 Bodkin Zone at the E48 Lift 1 level.

In addition, a trial Deep Ground Penetrating Radar Geophysical Survey (DGPR) covering two sites on the mine leases is scheduled to occur early in the next reporting period.

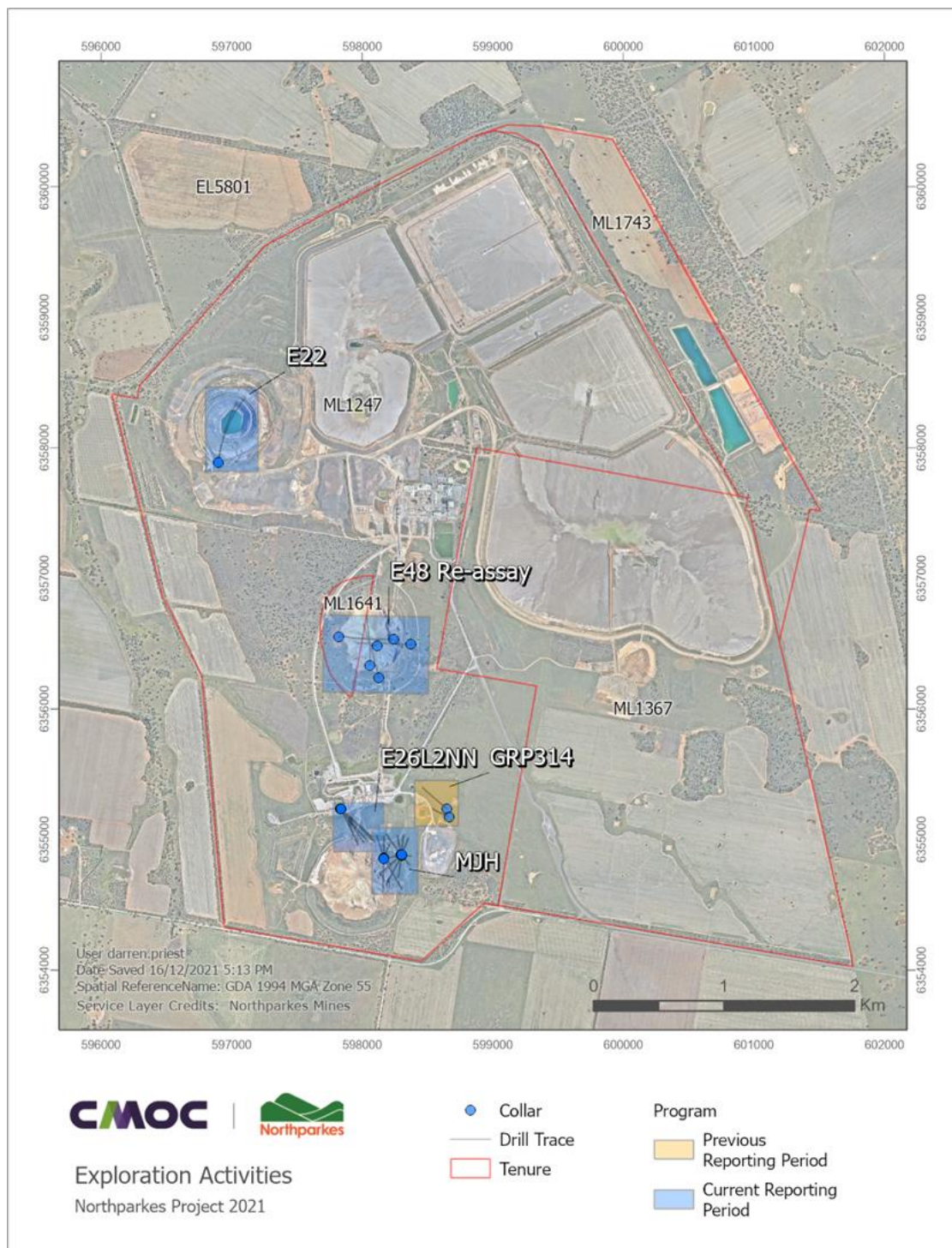


Figure 5 Exploration and Evaluation Drilling Activities - NPM Mining Leases - 2020

4.4 Ore processing

In 2021, a total of 6.84 Mt of sulphide ore was processed from the underground ore bodies and existing surface stockpiles (5.365 Mt underground and 1.402 Mt stockpiled ore). Copper-gold concentrate production totalled 107,798 tonnes (dry) and this product was predominantly sold to customers in China and Japan. Production for the past five years is presented in Table 6.

Ore processing includes several defined stages that include crushing, grinding, flotation and thickening. Ore is sourced from either underground mines or surface stockpiles, where it is first primary crushed, followed by passing through a secondary & tertiary crushing circuit before being stockpiled into two separate stockpiles. From the stockpiles, material is fed to the grinding circuit, comprising of two parallel modules (Mod 1 and Mod 2), each incorporating a Semi Autogenous Grinding (SAG) mill, oversize pebble crushing, two stages of ball milling and froth flotation.

By introducing air and a suite of reagents, minerals are captured and recovered in the flotation process to produce a sulphide-rich concentrate containing Copper and Gold bearing minerals. After flotation, the concentrate is first thickened through thickeners and filtered through ceramic disc filters to produce a low moisture concentrate ready for loading and transportation to the port.

The tailings component is pumped from the flotation stage to a tails thickener for dewatering followed by additional pumping to the tailing's storage facilities.

Commissioning of the new secondary and tertiary crushing facility was completed in 2021 allowing the concentrator to achieve a nominal throughput rate of 7.6Mtpa.

Table 6 Ore Processing Production

Year	Ore Milled (Mt)	Production Copper Concentrate (t)
2017	6.51	132,063
2018	6.48	125,438
2019	6.42	120,832
2020	6.49	107,541
2021	6.84	107,798

4.5 Tailings

In the reporting period, 6.74 million tonnes of tailings were deposited into Rosedale Stage 2 TSF. A summary of the tailings distribution and TSF capacity consumed during the reporting period is provided in Table 7 below.

Table 7 Distribution and Capacity Consumed of Tailings Storage Facilities

Tailings Storage Facility	Distribution (%)	Capacity Consumed (Mt)
TSF1	0.00	0.00
TSF2	0.00	0.00
TSF Infill	0.00	0.00
Estcourt Stage 3	0.00	0.00
Rosedale Stage 2	100	6.74

A total of 126 Mt of tailings has been deposited at Northparkes operations to date. All tailings have been deposited within TSF1, TSF2, Estcourt, Rosedale TSF and the Infill TSF located approximately 2km from the processing plant. The tailings are sub-aerially deposited into the active TSF from the external embankments (excluding TSF1 central discharge) and tailings and supernatant water runoff are contained and directed to the internal central decant towers.

All TSFs at Northparkes have been designed by an Engineer of Record to provide:

- Safe and permanent containment of all tailing's solids
- The recovery of free water for reuse within the processing plant
- Containment of all water under extreme rainfall conditions
- Maximised structural strength through the deposited tailings and
- Containment of all chemical residues.

Northparkes control measures for the management of tailings during construction and operation are implemented as per the Tailings Storage Facility Operation, Maintenance and Surveillance (OMS) Manual and the Emergency Management Tailings Storage Facility Procedure.

The site tailings strategy is regularly reviewed, with the most optimal disposal strategy utilised. The future tailings deposition strategy involves alternating deposition between the Estcourt TSF, Rosedale TSF, Infill TSF and TSF1.

Due to the above average rainfall experienced in 2020 and 2021, phreatic water level rises were observed in the Tailings facilities. A stability review was completed on TSF2 (constructed in 2006), which indicated the embankment stability was below the latest 2019 ANCOLD Guideline levels. From July to November buttressing design, scope and resourcing took place with buttressing work, using remote control dozers, to commence early 2022.

Dust mitigation strategies will continue to be investigated and implemented across the business, with possibilities such as vegetation covers on TSF2 and chisel ploughing any dust susceptible areas of TSFs considered.

4.6 Construction Activities during 2021

A summary of construction activities undertaken during the reporting period and their completion status is provided in Table 8.

Table 8 Summary of construction activities during the reporting period

Infrastructure	Commencement Date	Completion Date
Mine Infrastructure Area (MIA)		
E26L1N Block Cave	January 2019	March 2022
Expansion Project	May 2019	January 2021
Tailings Storage Facilities (TSF)		
Estcourt Stage 3	January 2021	Ongoing

4.6.1 E26L1N

2021 was a significant year that saw the completion of the materials handling system (MHS) including crusher chamber & conveyors as well as completion of the concrete roadways and final development and drawpoint firing.

Construction activities and commissioning of infrastructure was completed with the following activities completed during the period:

- installation of the crusher station COB and concrete pours in the crusher station workshop,
- conveyor head and tail plus SUB and SCA civil works,
- CV08 installation & start of commissioning,
- electrical installation in SCAs and Crusher overhead Crane commissioning,
- most of the MHS civil works completed and most of the erection of over 350t of MHS structural steel including CV16/17 transfer and crane install & commissioning
- crusher chamber main civil works were completed and installation of the structural steel floors & crusher motor. Final MHS steelwork and drives were also completed.
- crusher shells transport and installation were undertaken as well as completion of the MHS structural steel including CV16 feeder station and commissioning of CV17.
- CV16 was completed ready for 2022 commissioning complete with feeder and magnets, and
- completion of over 4500m of roadways towards the end of this quarter with 184 steel sets and brow beams.

This set the project up for final commissioning of the complete MHS and the start of production from the level in 2022.

4.6.2 Expansion Project

The project scope considers a range of modifications and upgrades to each of the operating facilities to achieve a throughput rate of nominal 7.6Mtpa.

Generally, primary crushed product is delivered from underground via a hoist to the surface and conveyed to an existing secondary crushing & screening building. The secondary crushing circuit is to be fed onto existing overland conveyor 123-CV006, which delivers ore to a new product feed conveyor to the new Secondary Crushing and Screening Circuit. The outcome of implementation of secondary crushing and screening facility is to present a P80 of 22mm to the OPD Stockpiles via 123-CV008, (previously P80 of 40mm).

Remaining construction activities and commissioning of infrastructure was complete in H1 with the following activities completed during the period:

- Stage 2 and 3 Commissioning,
- Conveyor CV025 Construction and Commissioning,
- Sheeting of Screen and Crusher Building,
- Air and Water Piping,
- Crusher Dust Scrubber Design Works, and
- Design and installation of chute 36 which is from the new screen onto conveyor CV08.

4.6.3 Estcourt Stage 3

Construction of Estcourt Stage 3 commenced in January 2021, consisting of a downstream raise to the western embankment and upstream raise to the northern embankment. The existing decant was relocated to the northwest corner of the old E27 pit. Between 11.9 to 12.4 Mt of tailings will be deposited in the facility, including residual capacity from the Stage 2 raise. The north and west embankments comprise an upstream portion and a downstream buttress due to foundation conditions.

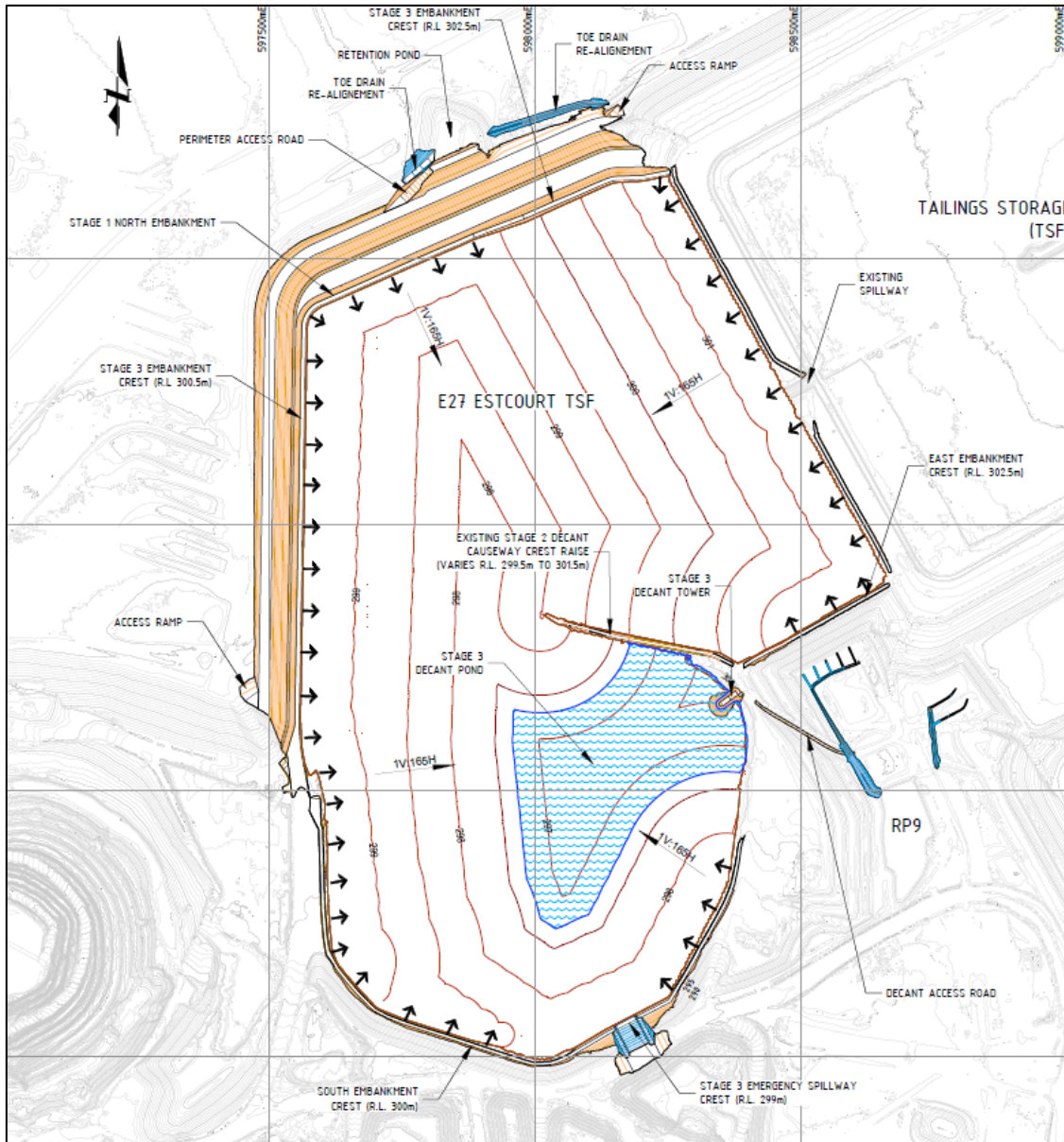


Figure 6 Estcourt TSF stage 3 final tailings profile

4.6.4 Next Reporting Period

Construction activities for the forthcoming reporting period include; construction of Rosedale TSF Stage 3; TSF2 Stabilisation; TSF1 Phase 2 Deposition earthworks; pipeline infrastructure upgrades and feasibility work for Infill Extension.

Physical works for Rosedale Stage 3 is expected to commence from Q2 2022 and concluding in Q2 2023. Completion of Rosedale Stage 3 is expected to add 20 months of storage capacity, which is expected to be consumed over a 24–30-month period, in conjunction with a secondary facility.

Concurrent to the works on Rosedale, TSF2 Stabilisation works (Part 1) is expected to be completed in Q2 2022, before Part 2 stabilisation is completed in Q3 & Q4 2022. These works will bring the facility, which has been dormant for the past 10 years and designed to historic design guidelines, in line with the most current ANCOLD Guidelines.

Works on TSF1 commenced in Q1 2022, and will be completed in Q2, ready for Phase 2 of central deposition. The scope includes the remediation of erosion sustained in the last reporting period due to heavy rainfall. Remediation activities build on the repairs completed in 2020, which have performed to expectations.

Design work for Infill Extension will continue. The project is expected to commence construction in Q1 2023, concurrent with the completion of Rosedale Stage 3.

Lastly, a review will be undertaken on Estcourt TSF, in line with Dam Safety Regulations and required timetable for compliance.

5. ACTIONS REQUIRED FROM 2020 ANNUAL REVIEW

Each year, Northparkes aims to host an Annual Review meeting for the relevant stakeholders, where the Annual Review for the previous reporting period is discussed. The purpose of this meeting is to document any actions required as an outcome of the previous Annual Review, including any actions that have been undertaken and when those actions were complete.

In 2021 Northparkes were not able to hold an onsite meeting, although stakeholder groups and agencies were encouraged to provide comment to the submission. No feedback requiring action was received.

6. ENVIRONMENTAL MANAGEMENT AND PERFORMANCE

6.1 Environmental Management System

Northparkes has developed and implemented a Health, Safety and Environment Management System (HSEMS). The environmental related system components are compliant with ISO14001.

The Environment Management System (EMS) at Northparkes provides the strategic framework for environmental management. The EMS:

- Outlines all relevant statutory leases, licences and approvals that apply to the Northparkes operations
- Details key plans, procedures, management plans and other documents that will be implemented to ensure compliance with all relevant leases, licences and approvals
- Describes the key processes that will be implemented to:
 - Communicate with community and government stakeholders
 - Manage community complaints
 - Resolve disputes and
 - Respond to non-compliance incidents and emergencies.
- Outlines Northparkes monitoring, reporting and auditing requirements
- Outlines relevant roles, responsibilities and accountabilities relevant to environment management for all Northparkes employees and contractors.



During the reporting period, Northparkes maintained the EMS to the ISO14001:2015 standard. Northparkes also maintained its A1 risk rating under the EPA's risk based licencing scheme, the highest possible standard.

Northparkes has developed a suite of environmental management plans to guide environmental management at Northparkes. The plans have been developed in accordance with the EMS, the Consent and other statutory requirements. The revision status of approved key environmental management plans, as required by Schedule 6, Condition 3 of the Consent, is summarised in Table 9.

Table 9 Key Environmental Management Plans

Management Plan	Status
Biodiversity Offset Management Plan	Revision 7.0 - Revised June 2021
Water Management Plan	Revision 13.0 – Revised July 2021
Surface Water Management Plan	Revision 7.0 – Revised July 2021
Groundwater Management Plan	Revision 7.0 – Revised July 2021
Pollution Incident Response Management Plan (PIRMP)	Revision 11.02 - Revised March 2022
Air Quality Management Plan	Revision 19.0 – Revised July 2021
Noise Management Plan	Revision 17.01 - Revised July 2021
Environmental Management Strategy	Revision 15.01 - Revised July 2021
Blast Management Plan	Revision 8.0 - Revised July 2021
Cultural Heritage Management Plan	Revision 9.03 - Revised August 2021
Rehabilitation Management Plan	Revision 14.0 - Revised July 2021
Traffic Management Plan	Revision 1.02 – Revised November 2021

The PIRMP listed in Table 9 applies to all activities that have the potential to generate pollution incidents. These include, but are not limited to, water discharge events, and hazardous spills resulting in land or water contamination and fire hazards.

The PIRMP was not implemented throughout the reporting period, however it was tested in November 2021, and revised accordingly.

6.2 Meteorology

The Consent (Schedule 3, Condition 18) requires a permanent meteorological station to be installed and maintained for the life of the Project. As such, a meteorological monitoring station (MET) has been established to continuously measure and record wind speed, wind direction, temperature, solar radiation and rainfall at Northparkes.

The MET station provides real-time data to Northparkes employees and contractors. Meteorological data is used for assessing compliance, dust and noise management, and for investigative and reporting requirements. The parameters recorded by the MET monitoring station and the method are outlined in Table 10.

Table 10 MET Monitoring Parameters

Parameter	Units	Frequency	Averaging period
Temperature at 2m	°C	Continuous	15 minute
Temperature at 10m	°C	Continuous	15 minute
Wind direction at 10m	°	Continuous	15 minute
Relative Humidity	%	Continuous	15 minute
Rainfall	mm/hr.	Continuous	1 hour
Solar radiation	W/m ²	Continuous	15 minute

6.2.1 Temperature

Maximum, minimum and average temperatures are calculated daily from the 15 min intervals. Figure 7 shows average monthly temperature records for the reporting period (10m MET recordings). Compared to the long-term historical data, average maximum and minimum temperatures were largely lower during the period, averaging -1.4°C across all months. The average minimum for April and average maximum for November were significantly lower than the long-term average, -4.6°C and -3.8°C respectively. Notably, the only average maximum temperature higher than the long-term average was during the month of December (+0.4°C).

Table 11 Temperature averages for 2021 reporting period

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Maximum Temp	31.5	30.4	26.9	23.5	18.6	14.6	13.2	16	18.7	21.7	23.8	31.1
Variance from long-term data	-0.9	-1.2	-1.6	-0.1	0.0	-0.3	-0.8	0.2	-0.7	-2.0	-3.8	0.4
Average Minimum Temp	15.3	15.7	12.9	6.0	4.6	4.5	3.7	2.9	4.1	6.7	12.5	13.4
Variance from long-term data	-2.4	-1.8	-1.9	-4.6	-2.5	-0.4	0.0	-1.5	-2.6	-3.1	-0.6	-2.5

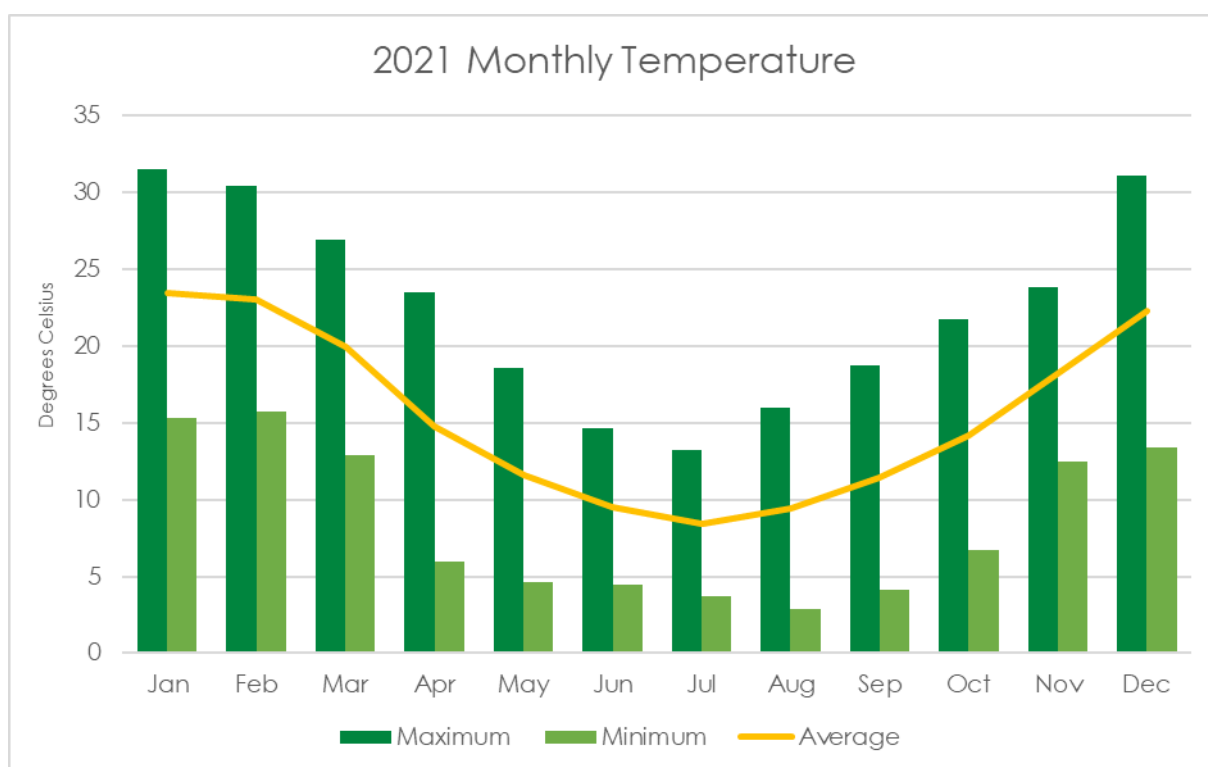


Figure 7 Monthly temperature averages for period

6.2.2 Rainfall

The total onsite rainfall recorded at the MET monitoring station for the period was 719.8mm and represents a 76.8mm (10%) decrease from the previous reporting period. The rainfall received during the reporting period was 132.6mm above the long-term average for the region (587.2mm). A comparison of 2021 rainfall to long-term averages for Parkes is shown in Figure 8 below.

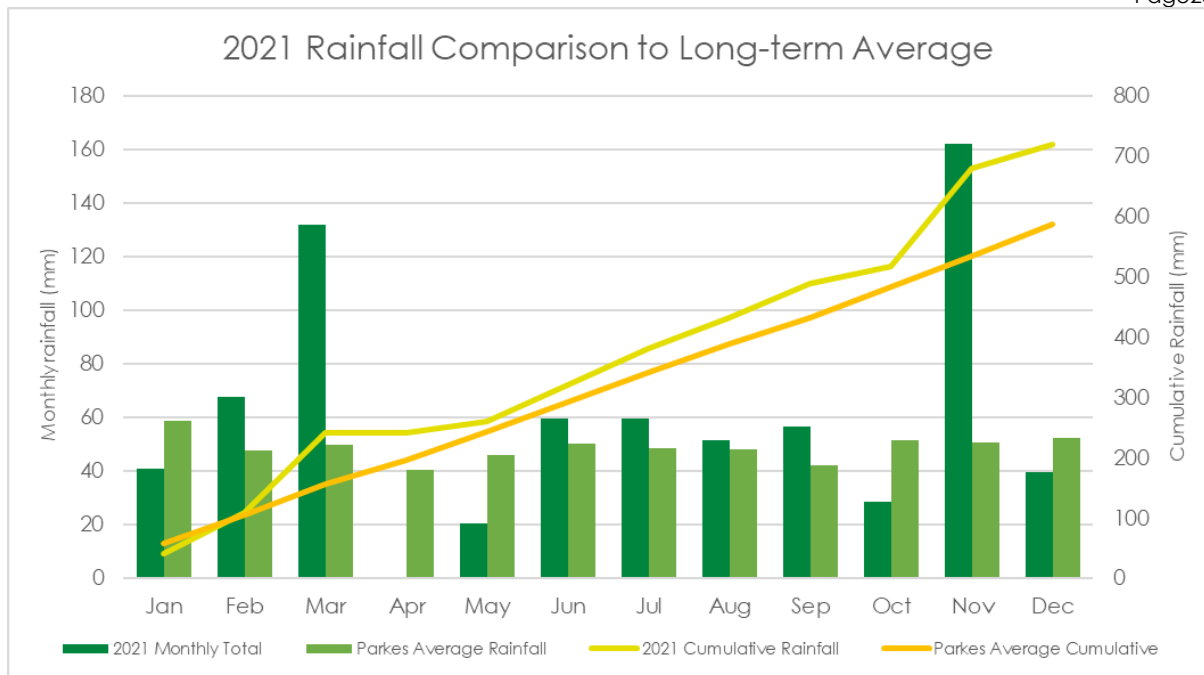


Figure 8 Comparison of 2021 rainfall to long term average for Parkes.

6.2.3 Wind

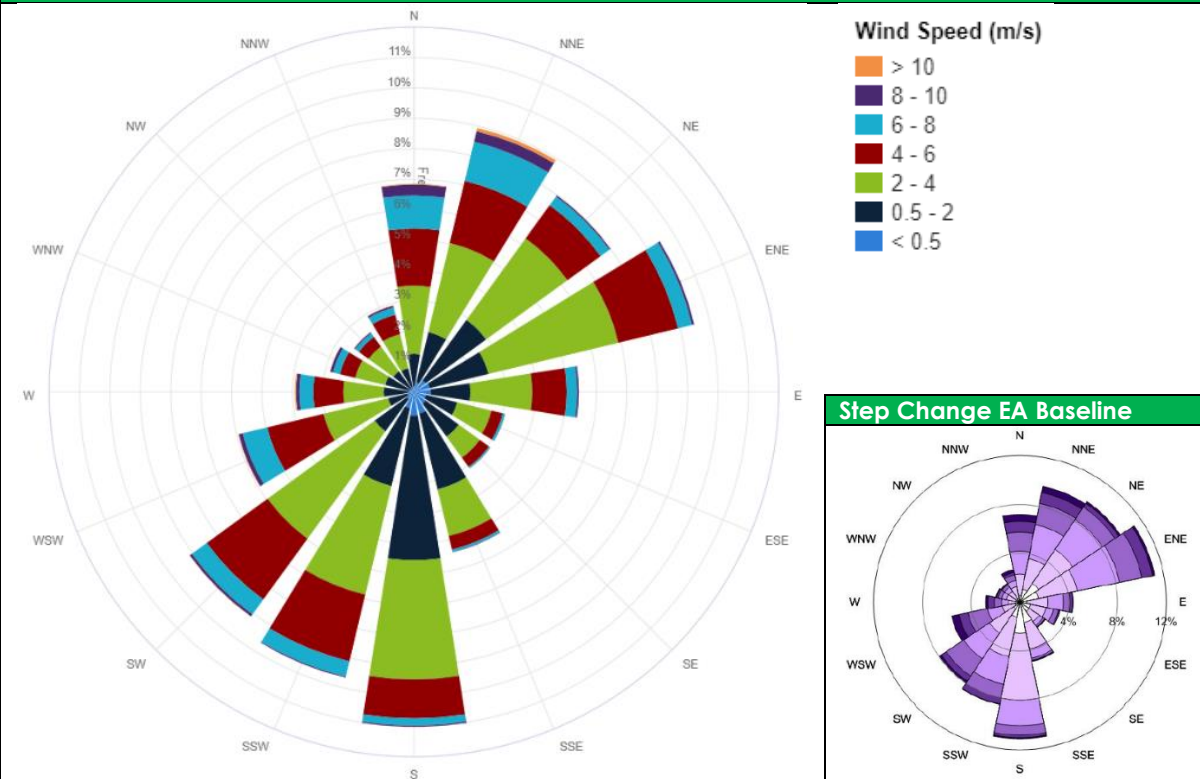
Wind speed and direction are important parameters for the preparation of blasting activities, investigating noise and dust events, and assessing cumulative impacts as a result of other operations in the region. Wind data for the 2021 reporting period are presented in Table 12 and the wind roses provided in Figure 9. Wind speed values are displayed as metres per second.

Table 12 Monthly wind direction percentages for 2021

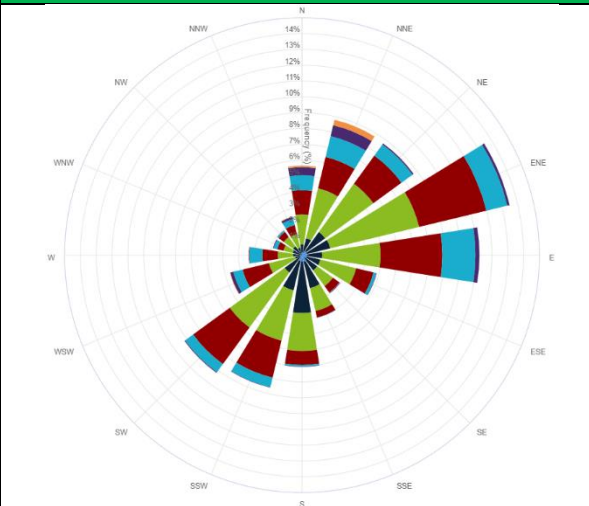
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	%
N (337.6° - 22.5°)	15	12	11	11	9	21	26	18	20	12	15	12	15
NE (22.6° - 67.5°)	21	23	12	12	9	17	19	14	18	14	23	20	17
E (67.6° - 112.5°)	20	21	15	8	6	9	8	6	7	10	14	17	12
SE (112.6° - 157.5°)	7	9	9	6	5	5	3	5	3	10	10	9	7
S (157.6° - 202.5°)	12	12	23	29	34	18	12	22	23	18	14	18	20
SW (202.6° - 247.5°)	15	16	18	24	24	15	14	21	19	17	8	14	17
W (247.6° - 292.5°)	6	4	9	6	9	8	11	11	6	13	9	5	8
NW (292.6° - 337.5°)	5	3	4	4	3	7	8	4	4	6	8	4	5

Analysis of data reveals that prevailing winds during the 2021 reporting period were largely inline with that recorded for the Step Change Environmental Assessment (EA), Umwelt 2013. Prevailing winds for the period were typically received from the northeast or south south west. Average wind speeds were generally consistent through the year recording 3.02m/s in H1 and 3.12m/s in H2.

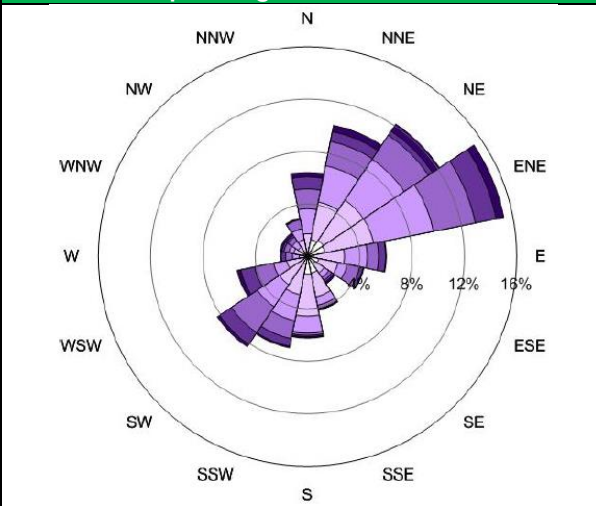
Annual - 2020



Summer - 2021



Summer - Step Change EA Baseline



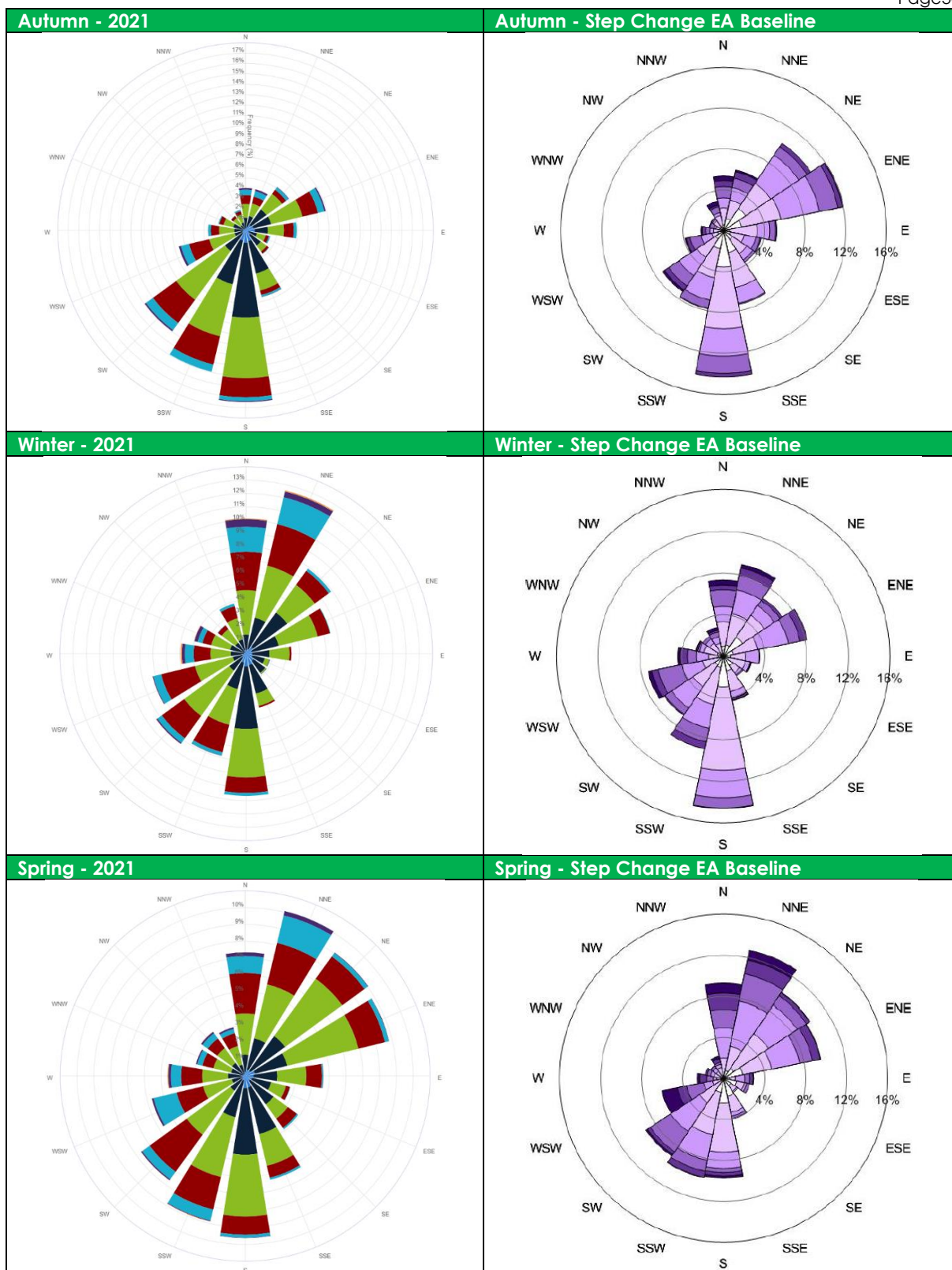


Figure 9 2021 seasonal wind rose comparison against Step Change EA baseline

6.2.4 Meteorology Improvements and Initiatives

Building on the work completed during the 2019 reporting period, CMOC continued to implement and refine the environmental database at Northparkes. This included ongoing utilisation of real-time meteorological data and weather forecasting to guide the implementation of reactive and proactive mitigation measures. A weekly weather assessment is undertaken to evaluate the potential risk for fugitive dust generation, with mitigative measures implemented where required.

6.3 Air Quality

6.3.1 Air Quality Management

Air quality management is undertaken in accordance with the approved Air Quality Management Plan (AQMP). The AQMP outlines mitigation measures, required monitoring and provides clear definitions of the roles and responsibilities related to air quality and greenhouse gas management.

Through implementation of the AQMP, Northparkes executes a range of mitigation measures for air quality that have proven to be effective at managing dust impacts, demonstrated by maintaining compliance. These mitigation measures will continue to be implemented throughout 2022. During the 2021 reporting period, mitigation measures included, but were not limited to, the following:

- Major works scheduled to undergo a risk assessment prior to commencing work
- Environmental inductions and training to ensure workforce awareness
- Purchase of equipment that meets relevant air emission standards
- Maintaining plant and machinery in good working order
- Maintaining haul roads in good condition
- Regular contact with local residents
- Weekly internal weather assessment and forecast predicting risk and controls
- Sealing high traffic roads, where possible
- Ripping of exposed areas, including TSF's
- Use of water carts on construction haul roads
- Scheduling of work with attention paid to adverse weather conditions and modifications made to the work program where necessary
- Implementation of best management practice to minimise the construction, operational and road air quality impacts of the operations
- A program of permanent air quality monitoring, including real-time, of site operations to determine whether the operations are complying with the criteria set out in the Consent.

Northparkes implements a dust monitoring program to measure concentrations of depositional dust, Total Suspended Particulates (TSP) and Particulate Matter (PM10) in the vicinity of the Northparkes operations. Depositional dust monitoring provides an indication of levels of dust in the atmosphere measured in g/m²/month of insoluble matter. TSP monitoring measures the total of all particles suspended in air, utilising a High-Volume Air Sampler (HVAS). PM10 measures the concentration of particulate matter less than 10 microns in diameter, utilising real-time Beta-Attenuation Monitoring (BAM). Results from monitoring are discussed in Section 6.3.2.

The current dust monitoring program includes 11 depositional dust gauges, three HVAS's and three BAM's, details of which are provided in Table 13. A figure showing the location of each air quality monitoring site is provided in Appendix 1.

Table 13 Air Quality Monitoring Sites

Site ID	Type	Units	Frequency
Milpose	PM10 (BAM) and TSP (HVAS)	µg/m ³	Continuously and Every 6 days
Hubberstone	PM10 (BAM) and TSP (HVAS)	µg/m ³	Continuously and Every 6 days
Hillview	PM10 (BAM) and TSP (HVAS)	µg/m ³	Continuously and Every 6 days
ND19 (Hubberstone)	Deposited dust gauge	g/m ² /month	Monthly
ND20	Deposited dust gauge	g/m ² /month	Monthly
ND21 (Lone Pine)	Deposited dust gauge	g/m ² /month	Monthly
ND22 (Milpose)	Deposited dust gauge	g/m ² /month	Monthly
TDE	Deposited dust gauge	g/m ² /month	Monthly
TDE5	Deposited dust gauge	g/m ² /month	Monthly
TDN5	Deposited dust gauge	g/m ² /month	Monthly
TDNE	Deposited dust gauge	g/m ² /month	Monthly
TDS5	Deposited dust gauge	g/m ² /month	Monthly
TDSW	Deposited dust gauge	g/m ² /month	Monthly
TDW	Deposited dust gauge	g/m ² /month	Monthly

6.3.2 Air Quality Performance

All dust samples are collected by trained staff and analysed by NATA certified laboratories. This work is carried out in accordance with relevant statutory and industry code standards. Monitoring equipment is maintained in accordance with manufacturer's specifications.

During the reporting period dust lift-off from the TSFs was managed through the implementation of a variety of different strategies. These strategies included the:

- deposition of wet tailings on Estcourt and Rosedale TSFs,
- strategic ripping of TSF1 surface

The barley stubble on TSF2 from the 2020 sowing has remained providing dust mitigation during the reporting period.

Native saltbush groundcover species have started to colonise across the TSF2 beach. These species are from planted tubestock, broadcasted seeds and natural germination, with succession occurring over the past few years, slowly working towards a functioning dust preventing cover.

PM₁₀

PM10 monitoring results for the 'Hubberstone' (Figure 10 and Figure 11), 'Milpose' (Figure 12 and Figure 13) and 'Hillview' (Figure 14 and Figure 15) monitoring locations, for the reporting period are displayed below. The criteria for exceedances (as nominated in the Consent) is >30 µg/m³ for the annual average and >50 µg/m³ for a 24-hour monitoring period.

Monitoring results for the three locations were under the air quality criteria stated in the Consent, with all outliers removed. During the reporting period, there were a total of one 24hr period at Milpose, two 24hr periods at Hubberstone and five 24hr periods at Hillview that recorded elevated particulate matter above the criteria stated in the Consent. Each of these readings triggered an internal investigation which determined that all elevated results were the due to non-mining influences, namely localised agricultural activities (sowing, harvesting and livestock management) and instrumentation error.

A dust event was observed on 15 May as a result of strong winds generating particulates from the surface of TSF1. The combination of TSF1 being inactive, no recent rainfall and strong winds generated particulates from the facility which were then observed. Nearby receiver "Hubberstone" recorded a 24 hour reading of 47.4 µg/m³, slightly below the 50 µg/m³ limit detailed in the Consent. Following observed dust being generated from the facility, Northparkes mobilized water carts to target the source. Ripping of TSF1 occurred prior to the next high-risk day which proved successful.

All other missing data is due to power supply issues and instrumentation error.

The annual average PM₁₀ levels recorded at all monitoring locations are well below the predicted concentrations of the Step Change EA (~20 µg/m³) and the Consent criteria, shown in Table 14 below.

Table 14 Annual average PM₁₀ results compared to predicted concentrations and the Consent criteria.

Site ID	Annual Average – 2021 (Outliers Omitted)	Predicted Air Quality (Step Change EA)	Development Consent 11_0060 Criteria
Milpose	10.0 µg/m ³	23 µg/m ³	30 µg/m ³
Hubberstone	9.9 µg/m ³	21 µg/m ³	30 µg/m ³
Hillview	8.4 µg/m ³	Not modelled	30 µg/m ³

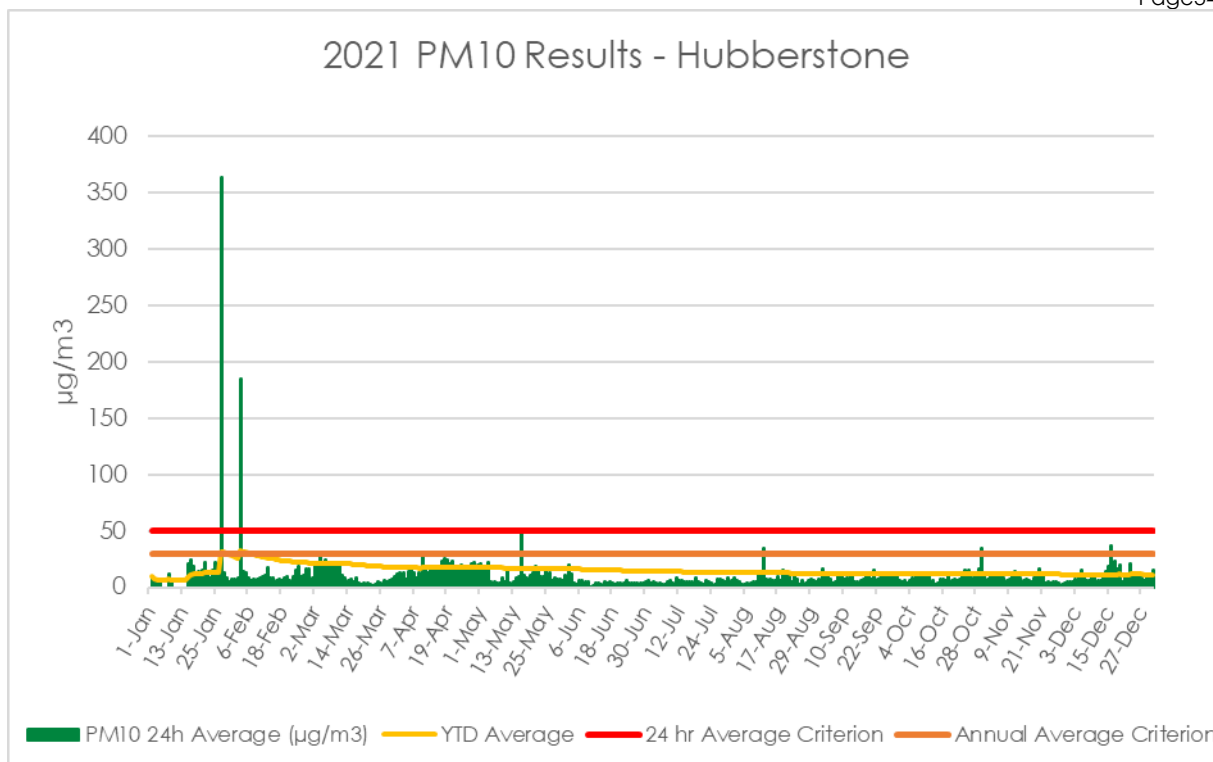


Figure 10 PM10 Monitoring results - Hubberstone

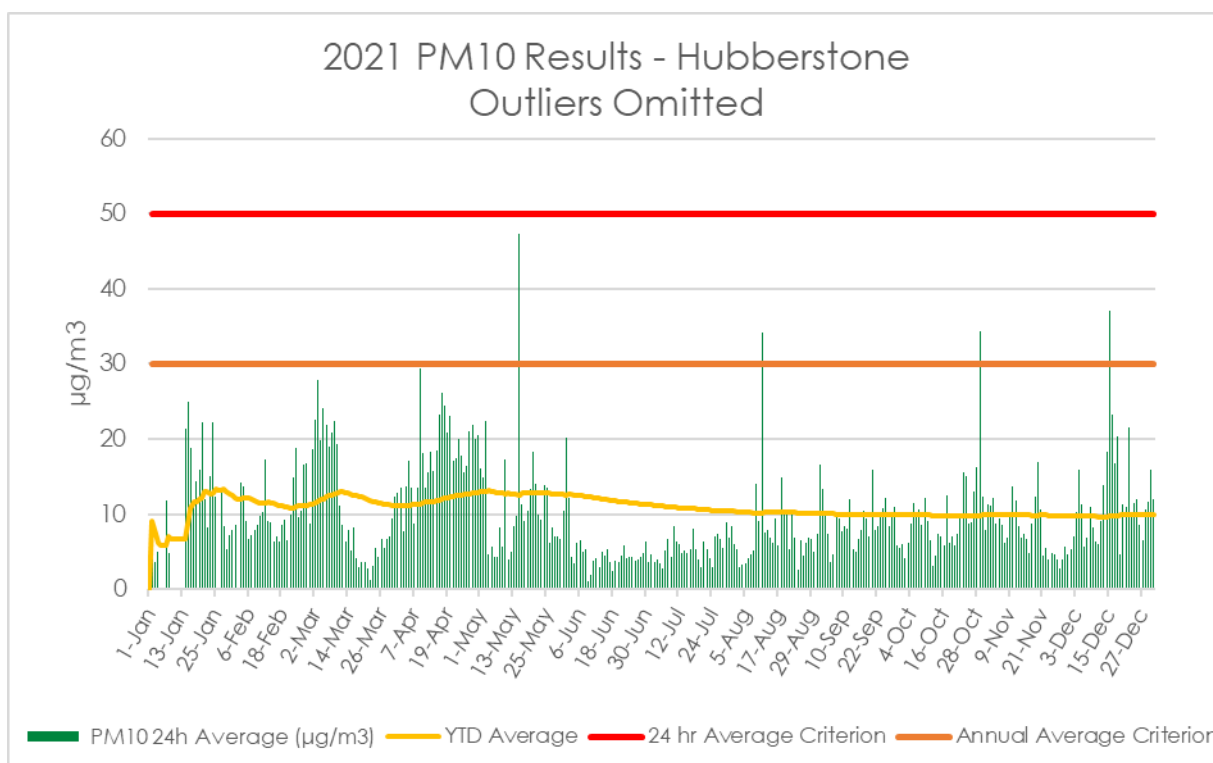


Figure 11 PM10 Monitoring results with outliers omitted - Hubberstone

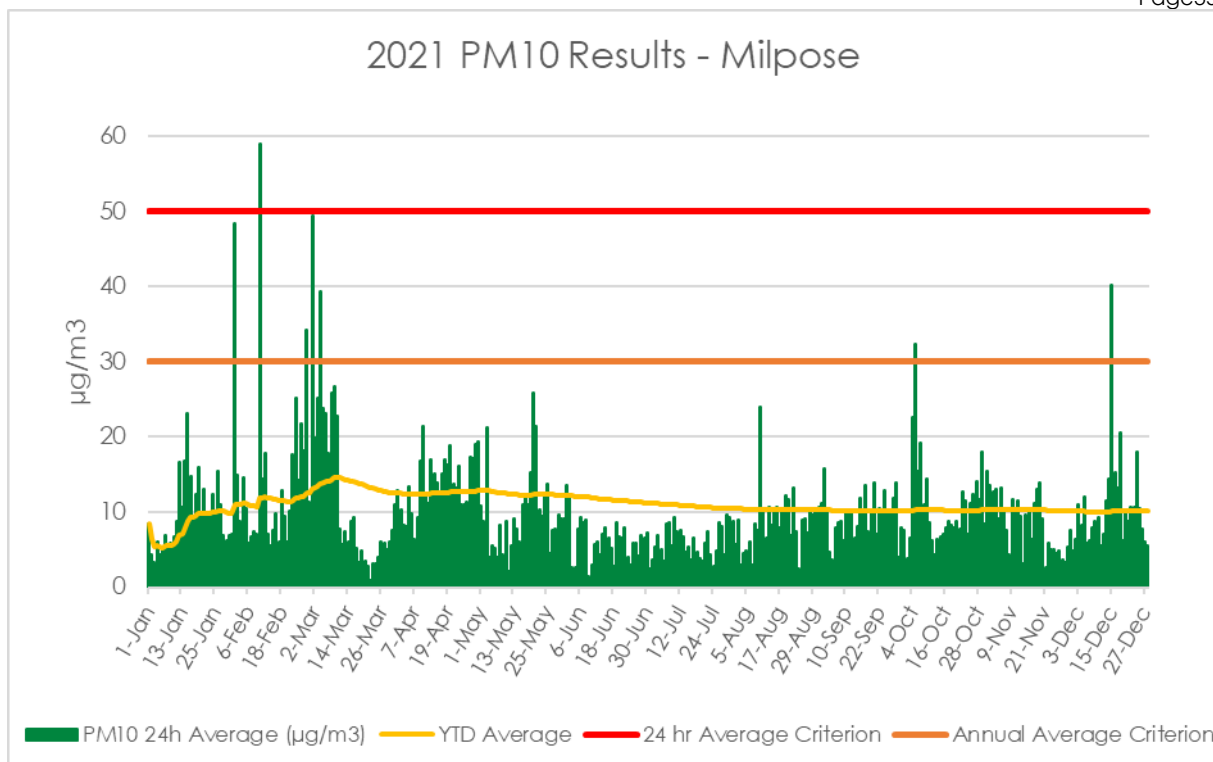


Figure 12 PM10 Monitoring Results – Milpose

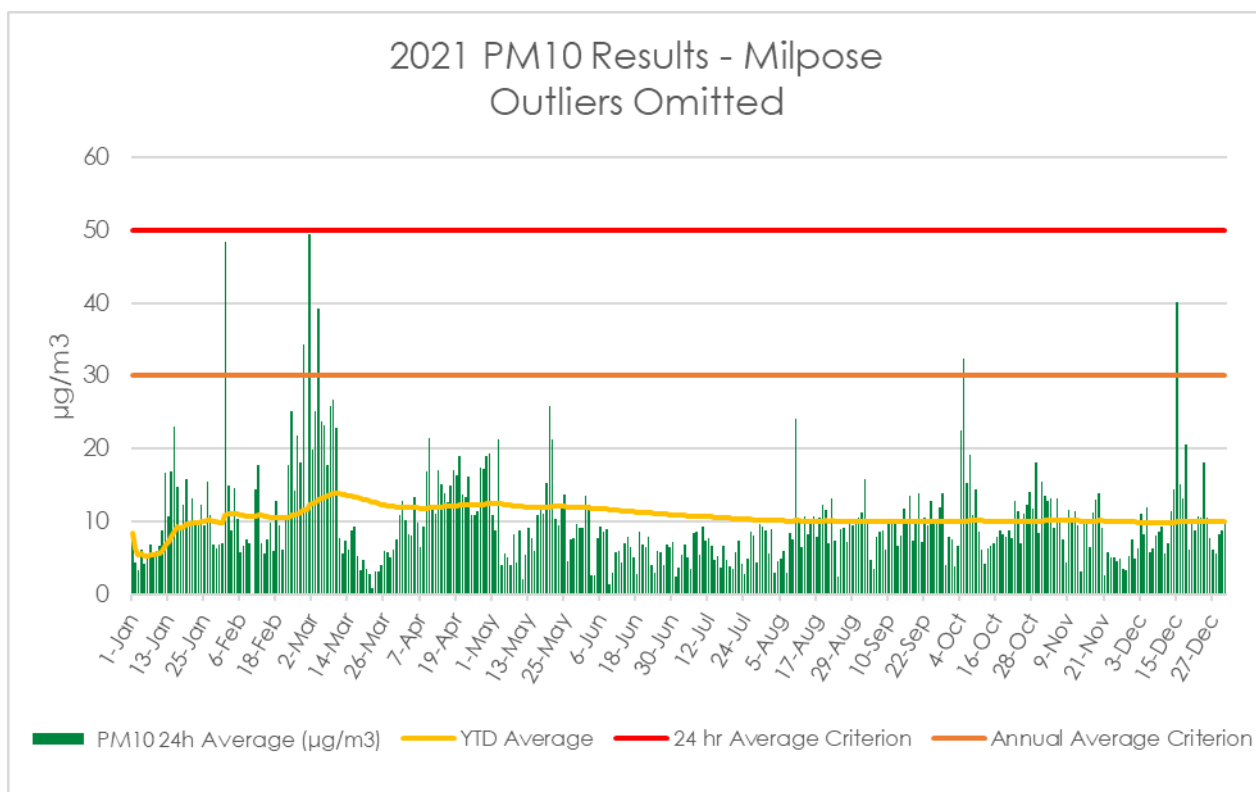


Figure 13 PM10 Monitoring results with outliers omitted – Milpose

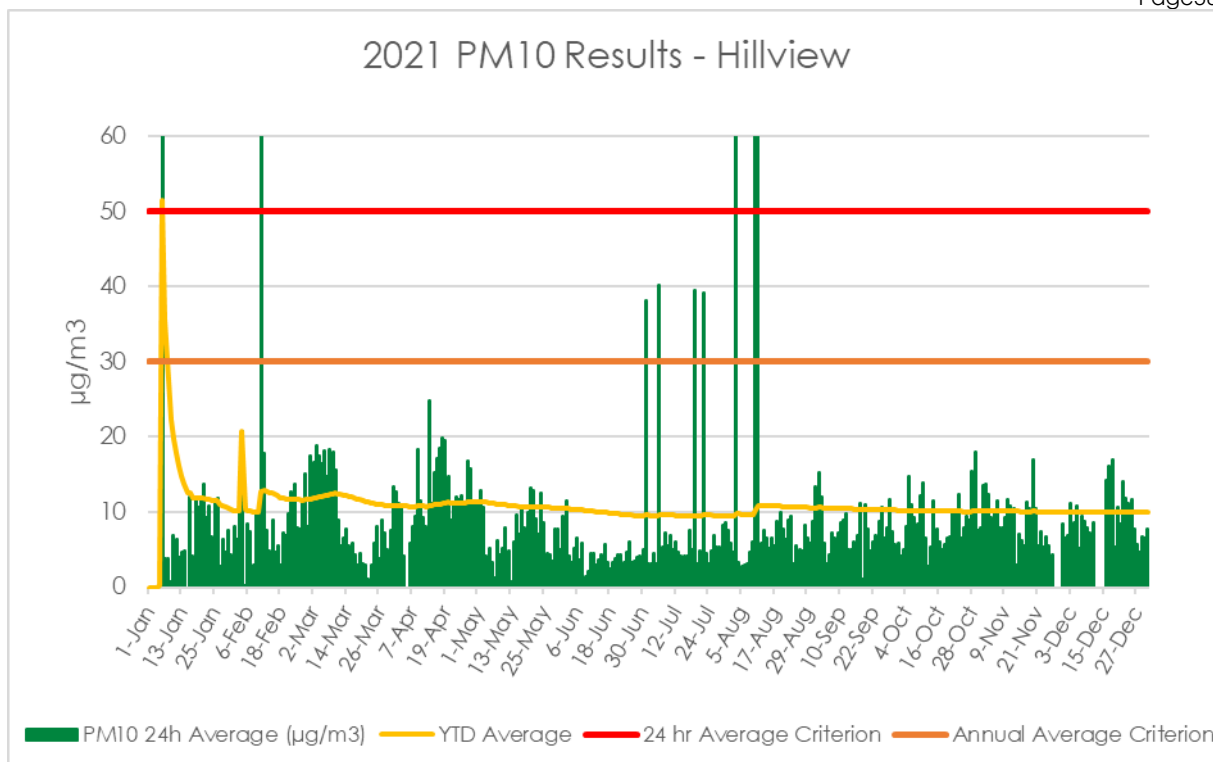


Figure 14 PM10 Monitoring Results – Hillview

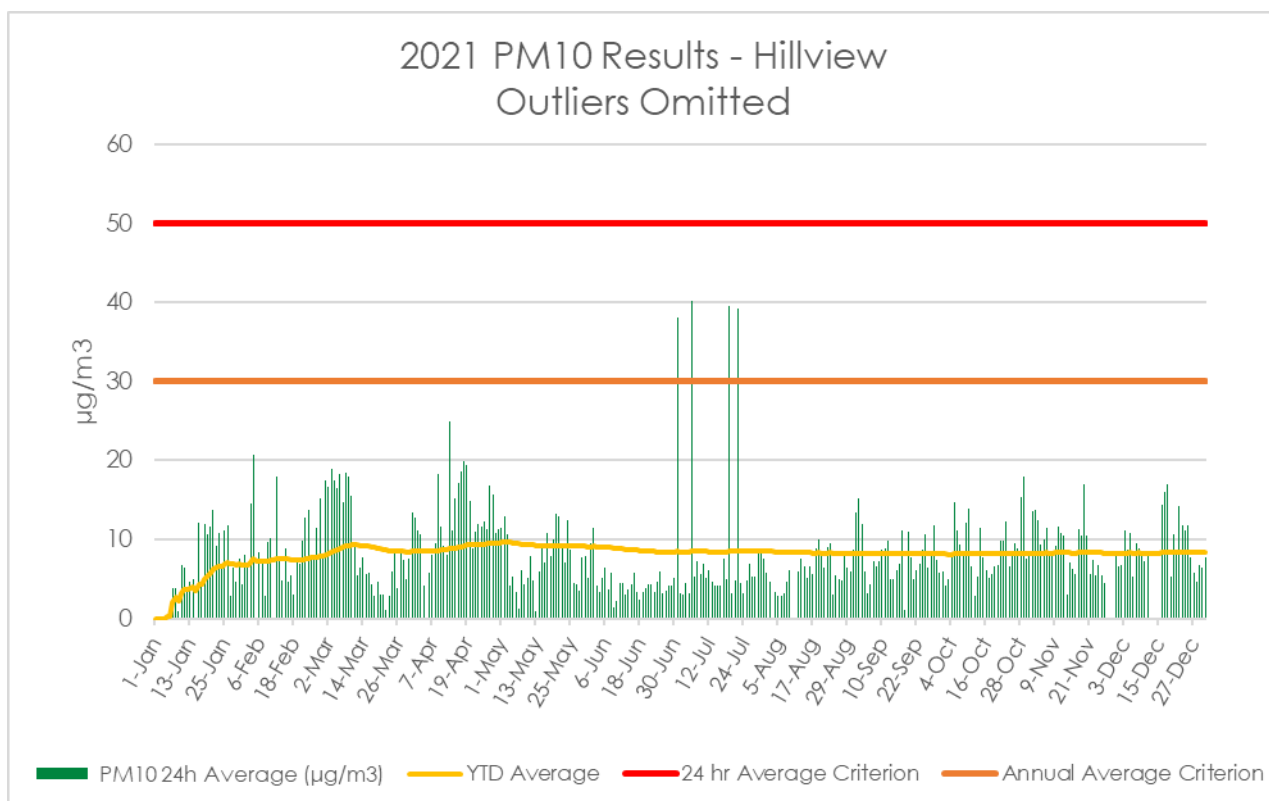


Figure 15 PM10 Monitoring results with outliers omitted – Hillview

Total Suspended Particulates (TSP)

TSP monitoring results for the 'Hubberstone' (Figure 16), 'Milpose' (Figure 17) and 'Hillview' (Figure) monitoring locations for the reporting period are displayed below. Only one elevated result was recorded during the period, recording 163 $\mu\text{g}/\text{m}^3$ at Milpose monitoring location. The result was internally investigated and deemed that the majority of particulate matter was likely to be generated from a source within close proximity to the monitoring location. It cannot be confidently determined that the source of the particulates was solely mining related or from an extraneous source, and has been left within the reporting dataset. The annual average TSP dust levels recorded at all monitoring locations are well below the Consent criteria (90 $\mu\text{g}/\text{m}^3$) and predicted concentrations within the Step Change EA (~50 $\mu\text{g}/\text{m}^3$), shown in Table 15 below.

The missing data for Hubberstone, Milpose and Hillview in Figure 16, Figure 17 and Figure 18, respectively, were the result of power supply issues to the monitoring unit.

Table 15 Annual average TSP results compared against predicted concentrations and development consent criteria.

Site ID	Annual Average – 2021 (Outliers Omitted)	Predicted Air Quality (Step Change EA)	Development Consent 11_0060 Criteria
Milpose	24 $\mu\text{g}/\text{m}^3$	53 $\mu\text{g}/\text{m}^3$	90 $\mu\text{g}/\text{m}^3$
Hubberstone	19 $\mu\text{g}/\text{m}^3$	52 $\mu\text{g}/\text{m}^3$	90 $\mu\text{g}/\text{m}^3$
Hillview	19 $\mu\text{g}/\text{m}^3$	Not modelled	90 $\mu\text{g}/\text{m}^3$

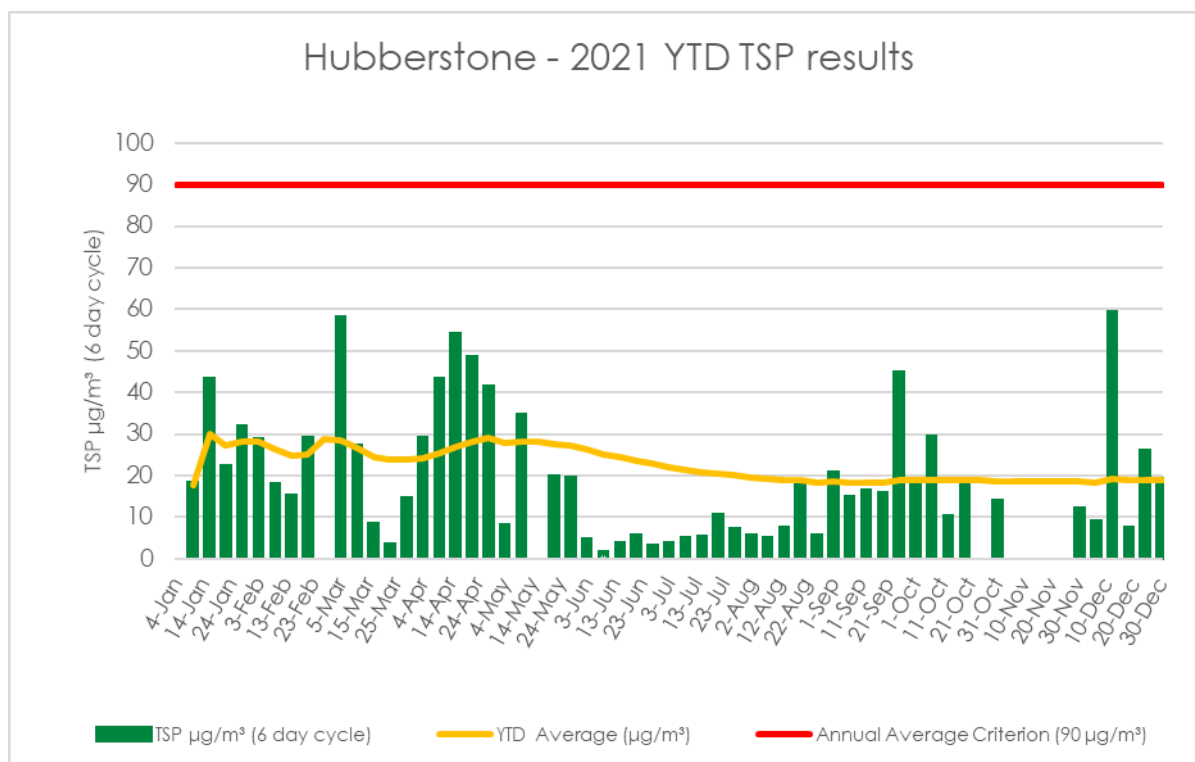


Figure 16 TSP Results for Hubberstone

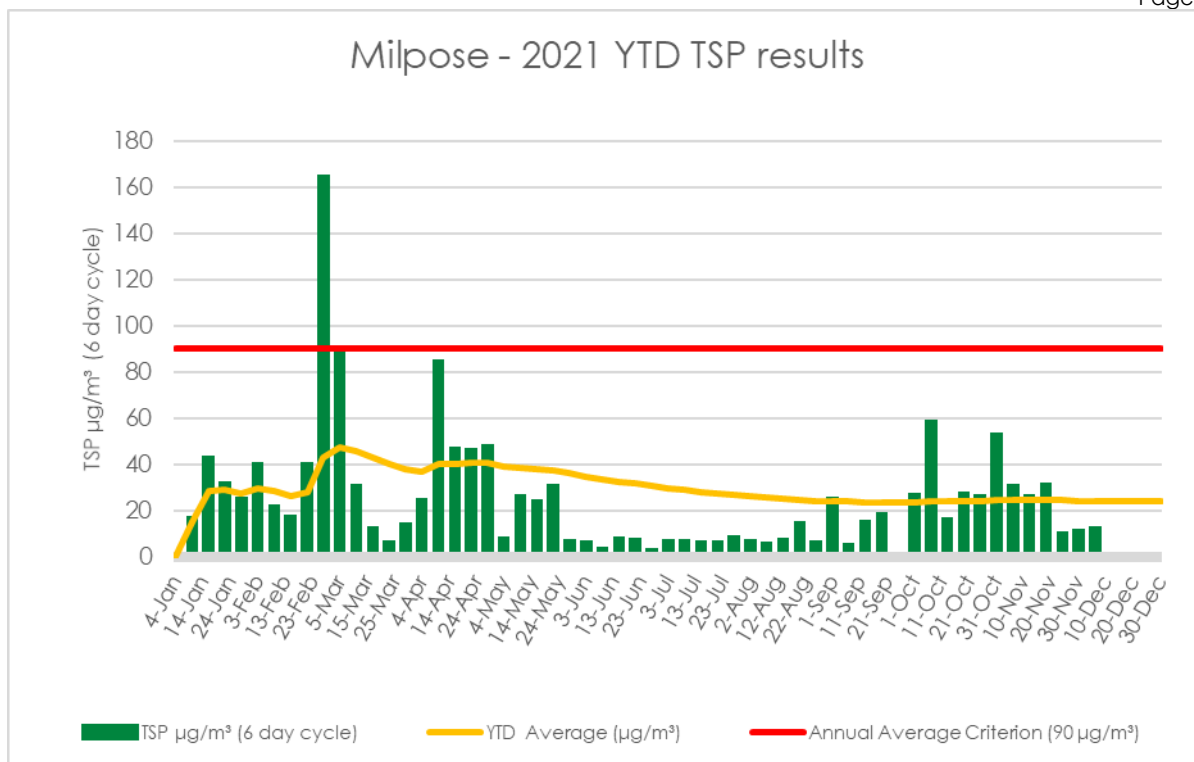


Figure 17 TSP Results for Milpose

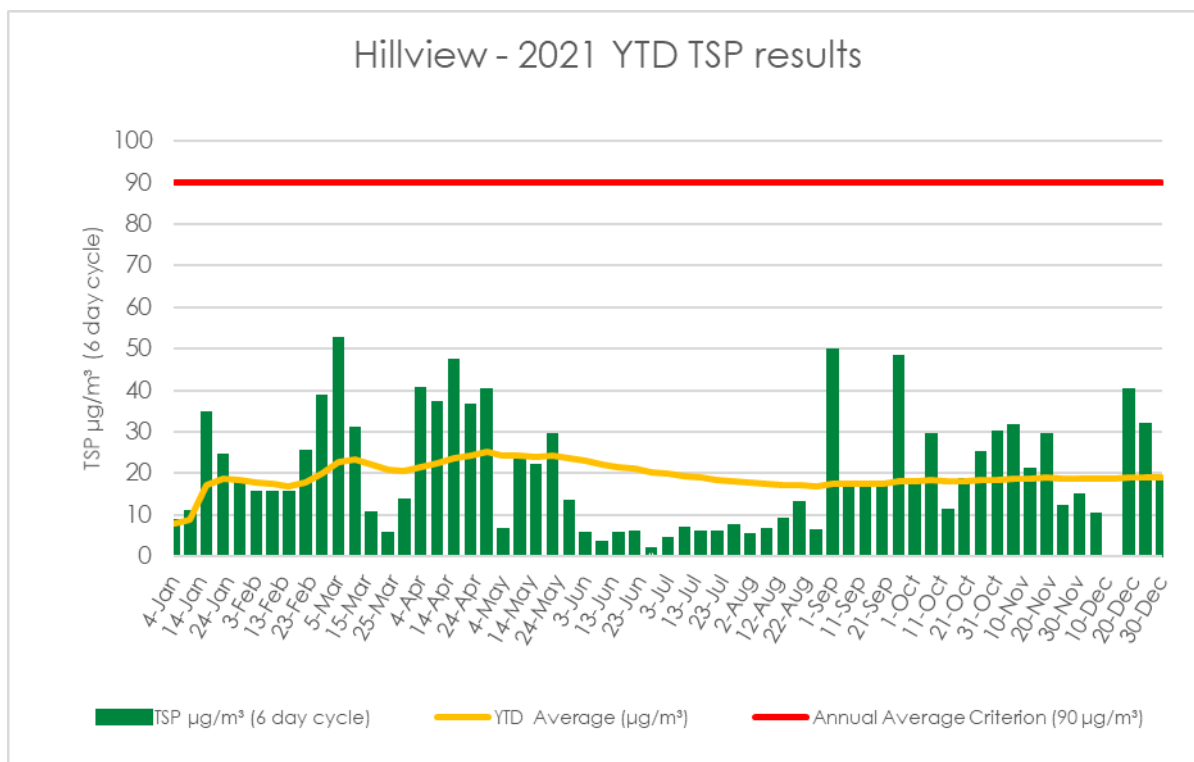


Figure 18 TSP Results for Hillview

Depositional Dust

Depositional dust samples were analysed by a NATA accredited laboratory to determine sample contamination by naturally occurring impurities. Figure 19 presents the annual average results following laboratory analysis of all eleven dust gauges. The results indicate that all reportable depositional dust gauges remained below the annual average criterion of 4.0 g/m²/month for the 2021 period.

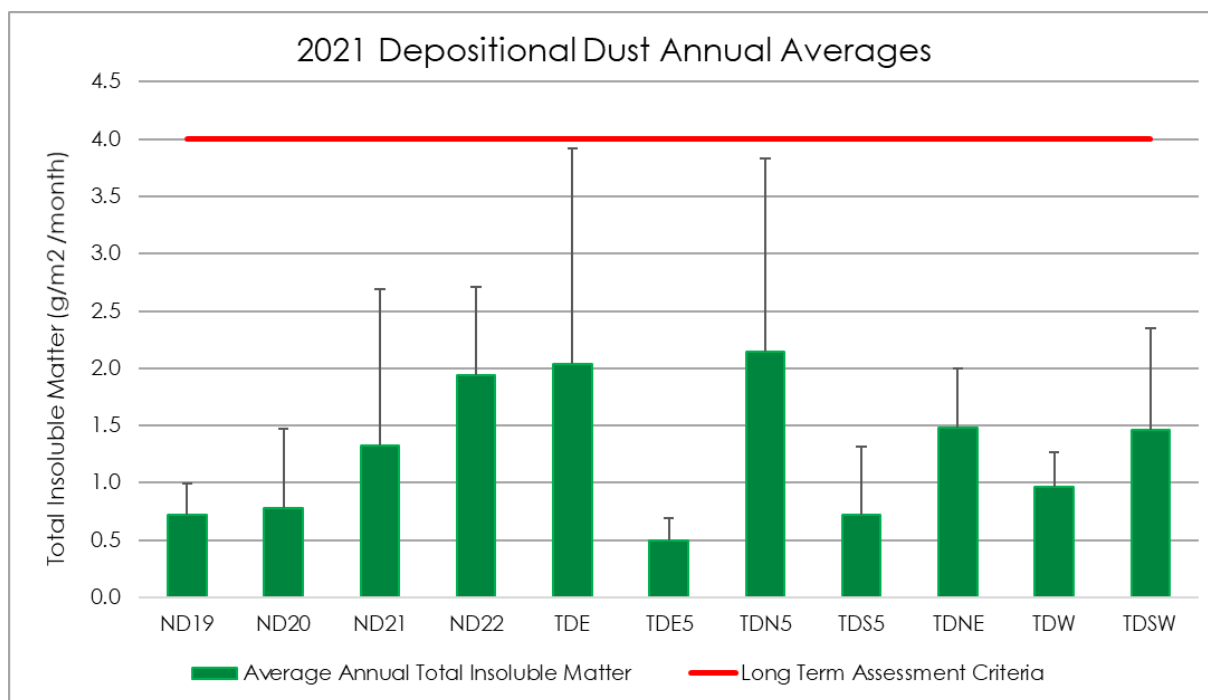


Figure 19 Depositional Dust Annual Averages

Table 16 Annual average depositional dust results compared against predicted concentrations and development consent criteria.

Site ID	Annual Average – 2021 (Outliers Omitted)	Predicted Air Quality (Step Change EA)	Development Consent 11_0060 Criteria
ND19 (Hubberstone)	0.7 g/m ² /month	2.8 g/m ² /month	4.0 g/m ² /month
ND20 (Avondale)	0.8 g/m ² /month	2.9 g/m ² /month	4.0 g/m ² /month
ND21 (Lone Pine)	1.3 g/m ² /month	2.8 g/m ² /month	4.0 g/m ² /month
ND22 (Milpose)	1.9 g/m ² /month	2.9 g/m ² /month	4.0 g/m ² /month
TDE	2.0 g/m ² /month	n/a	n/a
TDE5	0.5 g/m ² /month	n/a	n/a
TDN5	2.1 g/m ² /month	n/a	n/a
TDS5	0.7 g/m ² /month	n/a	n/a
TDNE	1.5 g/m ² /month	n/a	n/a
TDW	1.0 g/m ² /month	n/a	n/a
TDSW	1.5 g/m ² /month	n/a	n/a

Depositional dust systems are often subject to contamination by naturally occurring impurities such as bird droppings, insects and vegetation or regularly impacted by local extraneous sources (such as farming activities, local dirt roads or large dust storms following lengthy drought periods). On fourteen separate occasions over the reporting period, samples were deemed contaminated and removed from the data as outliers. Each reportable elevated result exceeding internal trigger levels is subject to an investigation. These investigations determined that all high readings were the result of localised agricultural activities (sowing, harvesting and livestock management)

All dust gauge results, with outliers removed, remain well below the predicted concentrations in the Step Change EA and criteria of the Consent, shown in Table 16 above. Between 2013 and 2015, the rolling annual average of all gauges was on an upward trend. During 2015, the trend stabilised and then began trending downwards during 2016. Depositional dust levels during the 2018 and 2019 periods reported upward trends as a result of increasing drought conditions. During January and February of 2020, drought conditions were still heavily impacting recorded dust levels before widespread rainfall prompted results to return to that in line of long-term historical data. Results in 2021 continued to trend downward as above average rainfall maintained significant quantities of groundcover and soil moisture.

6.3.3 Air Quality Improvements and Initiatives

During the period, Northparkes undertook an internal review of the depositional dust monitoring program to investigate possible improvement opportunities. Several efficiencies were identified at several monitoring locations to improve the long-term effectiveness of the program. Locations that are consistently impacted by extraneous sources nearby are proposed to be removed or relocated. The review was provided to the EPA for comment and is awaiting comment prior to submission to the Department.

Northparkes will look to employ several additional strategies for managing potential air quality impacts, these include:

- Investigating alternate sowing opportunities on inactive tailings facilities to provide ground cover and to reduce risk of dust lift off,
- Rip the tailings surface areas where there is actual or predicted dust risk due to wind, and
- Alternate tailings material deposition between the active TSFs, reducing dust risk.

6.4 Noise

6.4.1 Noise Management

Operational noise is managed by Northparkes in accordance with the approved Noise Management Plan (NMP). The NMP covers all operational activities with the potential to generate noise at Northparkes. It details specific noise management and mitigation measures, outlines monitoring and reporting requirements and provides clear definition of the roles and responsibilities for noise management.

Control measures for the management of noise during construction, operation and decommissioning are essential in minimising noise impacts. The three main strategies used to identify reasonable and feasible noise control/mitigation strategies are:

- Controlling noise at the source
- Controlling the transmission of noise and
- Controlling noise at the receiver.

Noise control measures at Northparkes are designed to comply with the Consent and the requirements of the *NSW Noise Policy for Industry (2017)*.

Operational control measures include:

- Major scheduled works undergo a risk assessment prior to commencing work
- Environmental inductions and training to ensure workforce awareness
- Purchase of equipment that meets relevant noise emission standards
- Maintaining plant and machinery in good working order

- Maintaining haul roads in good condition
- Operating equipment in a manner that will minimise noise emissions
- Regular contact with local residents
- Modifications to surface ventilation fans
- Scheduling of work with attention paid to adverse weather conditions, particularly at night, and modifications made to the work program where necessary
- Implementation of best management practice to minimise the construction, operational and road noise of the operations
- A program of regular noise monitoring of site operations to determine whether the operations are complying with the criteria set out in the Consent. This monitoring will be undertaken as attended and real-time noise monitoring at surrounding receivers over the life of the mine
- Additional targeted noise monitoring during construction activities, and whilst open cut mining operations occur during winter night-time operations if required. This targeted monitoring program will include the use of real time monitoring and be undertaken to identify situations when meteorological conditions have the potential to exacerbate noise impact on neighbouring receivers. Appropriate noise mitigation measures will be implemented as required, and
- Northparkes has a private agreement in place with the owners of "Avondale" for the property to not be included in the monitoring program while it remains unoccupied.

6.4.2 Noise Performance

Northparkes undertakes a noise monitoring program at five locations on privately owned properties outside the mining leases. The program consists of both operator-attended and unattended surveys at four of the nearest occupied residences, 'Hubberstone', 'Milpose', 'Lone Pine' and 'Hillview' (see Appendix 1). Attended monitoring is also undertaken at 'Adavale' which was added to the quarterly monitoring program in December 2020.

Noise measurements are undertaken in accordance with the requirements of the Consent, AS 1055, and the *NSW Noise Policy for Industry, 2017*. Northparkes engaged acoustic specialists to undertake attended noise monitoring on a quarterly basis at locations defined in the NMP to adequately assess the noise impacts related to Northparkes operations. All acoustic instrumentation is designed to comply with the requirements of AS 1259.2 and carries current NATA or manufacturer calibration certificates.

Temperature inversions, when they occur, have the ability to increase noise levels by focusing sound waves. Temperature inversions occur predominantly at night during the winter months but can also occur as a result of low cloud cover. They are generally determined based on the occurrence of atmospheric stability classes, with moderate and strong inversions corresponding to atmospheric stability categories F and G respectively.

A total of 188 fifteen-minute LAeq attended noise surveys were undertaken during the reporting period. Of which, 137 (73%) were during favourable meteorological conditions, as stipulated in the Consent. The surveys undertaken during unfavourable meteorological conditions were excluded from assessment. The reason for this being that the assessment was undertaken during stability class of F or G. These are shown in Table 20 below.

Unattended noise monitoring was conducted continuously over the year at each monitoring location. This data was used to assess background ambient noise levels and do not have an applicable exceedance criterion.

Targeted noise assessments were also undertaken during the commissioning of the secondary crushing circuit to ensure noise levels are in line with the Consent conditions and those predicted in the EA. An independent assessment was undertaken to gain an understanding of the impact at nearby privately-owned residences from the crushing circuit. Noise results obtained were in line with the previous operation noise impact, noting no additional increase from specific equipment or accumulative effect from existing plant.

A summary of the attended noise monitoring results is provided in Table 17. This includes all quarterly monitoring conducted in 2021.

Table 17 Summary of Attended Noise Monitoring Results

Location		Day	Evening	Night	
		L _{Aeq} (15min)	L _{Aeq} (15min)	L _{Aeq} (15min)	L _{A1} (1min)
	Criteria dB (A)	35	35	35	45
Hubberstone	23-24 Feb	Λ	*Λ	Λ	<40
	1-2 Jun	Λ	Λ	*~25	<35
	31 Aug – 1 Sep	Λ	*~<30	*~<30	<40
	8-9 Dec	~<30	~<30	30	<45
Predicted Noise Impact (EA)		19	32		n/a
Lone Pine	23-24 Feb	Λ	Λ	Λ	<40
	1-2 Jun	Λ	Λ	*Λ	<25
	31 Aug – 1 Sep	Λ	*33	*~<25	<40
	8-9 Dec	Λ	Λ	Λ	<45
Predicted Noise Impact (EA)		17	31		n/a
Milpose	23-24 Feb	<20	Λ	Λ	<40
	1-2 Jun	Λ	*~<30	*~<25	<40
	31 Aug – 1 Sep	Λ	*~<25	*~<25	<40
	8-9 Dec	Λ	Λ	Λ	<45
Predicted Noise Impact (EA)		19	19		n/a
Hillview	23-24 Feb	Λ	Λ	*Λ	<40
	1-2 Jun	Λ	Λ	*~<30	<40
	31 Aug – 1 Sep	Λ	*Λ	*~<25	<40
	8-9 Dec	Λ	Λ	~<30	<40
Predicted Noise Impact (EA)		20	16		n/a
Adavale	23-24 Feb	24	Λ	27	<40
	1-2 Jun	~<30	Λ	Λ	<35
	31 Aug – 1 Sep	Λ	*Λ	*21	<40
	8-9 Dec	Λ	Λ	Λ	<40
Predicted Noise Impact (EA)		21	34		n/a

Note: Measurements represent total mine contribution by excluding impact noise from extraneous sources such as wind noise and fauna. As LA₁ results are not adjustable, this measurement is not representative of noise produced by the mine and should be disregarded. Results indicating a * have been recorded during a stability class of F or G and are not a true representation of the mine noise contribution.

Λ Northparkes Inaudible.

~ Northparkes Slightly Audible

≠ Not measurable

Predicted evening / night impact levels selected based on most significant impact of the two scenarios in the MOD 4 noise assessment.

Noise levels assessed as part of the monitoring program were within all operational noise criteria. They were also within the noise levels predicted in the Modification 4 Expansion Noise Assessment (Umwelt, 2018), and did not exceed the sleep disturbance limit at night despite the frequency and impact of temperature inversion conditions. During most attended monitoring surveys at all locations, operators noted that Northparkes operations were inaudible or only slightly audible.

Northparkes was successful in achieving the long-term intrusive noise goals during the 2021 reporting period.

All attended monitoring reports for the reporting period are available on the Northparkes webpage at: <http://www.northparkes.com/news/#publications>

6.4.3 Noise Improvements and Initiatives

Northparkes will continue to implement the operational controls in the approved NMP including its quarterly attended noise monitoring program to remain compliant with the approved limits.

During the previous reporting period, Northparkes identified increased noise impacts from the commissioned E48 vent fan. Several mitigative options were investigated, concluding that the installation of an acoustic barrier was to be most effective and feasible. The installation of the barrier was completed in January 2022 and has provided effective noise mitigation to the residences west of site. Figure 20 below shows the configuration of the constructed noise barrier in relation to the E48 vent fan.



Figure 20 Photos of the constructed acoustic barrier at the E48 vent fan.

6.5 Blasting

6.5.1 Blasting Management

Northparkes does not currently undertake surface blasting activities. Therefore, all associated management activities are not currently applicable. During the period, in anticipation of surface blasting activities resuming in 2022, four overpressure monitors were installed at nearby neighbouring receivers. The vibration monitors have also assisted to demonstrate that underground draw bell blasting of the E26L1N cave is within the Consent criteria. During the reporting period neighbours to the south of the operations contacted Northparkes stating that blasts could be heard from their residence. It was determined that these were from the larger draw bell blasts and although vibration was well below criteria, they were able to be heard.

6.5.2 Blasting Performance

No surface blasting activities occurred in 2021. All underground blasting activities remain well within the impact limits detailed in the Consent.

6.5.3 Blasting Improvements and Initiatives

The Blast Management Plan (BMP) will be reviewed and submitted for approval prior to undertaking surface blasting. Photos of the installed monitors are shown below in **Figure 21**.



Figure 21 Installed blast monitor at a nearby residence.

6.6 Biodiversity and Ecology

6.6.1 Biodiversity and Ecology Management

Biodiversity impacts at Northparkes are managed in accordance with the approved Biodiversity Offset Management Plan (BOMP) and Vegetation Management Plan (VMP), collectively known as the Offset Management Documents (OMD). The OMD provides a framework for managing biodiversity values within the project boundary, Biodiversity Offset Areas (BOAs), and wider locality.

The OMD guides the implementation of offsetting commitments and manages potential risks to biodiversity as a result of operations at Northparkes. Specifically, the OMD aims to:

- Describe the measures (short, medium and long-term) to be implemented to manage remnant vegetation and habitat within the Project boundary and BOAs, including detailed performance and completion criteria
- Describes enhancement practices and procedures to be undertaken in accordance with commitments stipulated in the Voluntary Conservation Agreements (VCA) and BOMP
- Describe the practical management strategies to be implemented to:
 - manage impacts on flora and fauna
 - maximising salvage and beneficial use of resources in areas to be impacted for habitat enhancement
 - rehabilitate creeks, drainage lines and disturbed areas and
 - control weeds and pests.
- Ensure compliance with all legislative requirements, statutory approvals/licences and corporate responsibilities of Northparkes
- Describe biodiversity monitoring and reporting requirements and
- Provide details of the parties responsible for monitoring, reviewing, and implementing the OMD.

No impacts outside those predicted in the EA have occurred during the reporting period indicating the management strategies specified by the OMD implemented across the site are adequate to address potential impacts.

Northparkes has implemented a range of biodiversity monitoring activities since the commencement of operations, in addition to those studies completed for the EA.

Implementation of Kokoda VCA

During the reporting period, Northparkes continued to implement the active regeneration planting which was initiated in the 2020. The total planting program consists of 18,000 tubestock, installed across 37 hectares to restore farmland to a Grey Box Grassy Woodland (GBGW) ecosystem. In May of 2021, 8,655 remaining tubestock were planted with a combination of mycorrhiza, water crystals, tree tonic and native fertiliser. To prevent grazing and vegetation competition, 400mm core flute guards and weed matting was placed around the installed plants. The 8,500 individuals were a combination of tree and shrub species, the majority, approximately 75%, were targeted at providing diversity within the midstorey of the community.



Figure 22 Plant installed in April trial planting and Spring planting lines

Widespread rain was experienced throughout the region promoting quick establishment and further aided through the abundance of native vegetation, reducing the grazing pressure by macropods. Maintenance of the tubestock will be undertaken as required to ensure success of the planting program.

Table 18 List of tubestock and quantities installed as per of active revegetation program

Species	Common Name	Total Planted	Autumn Trial Planting 2020	Spring 2020	Autumn 2021
<i>Acacia decora</i>	Western Golden Wattle	860	260		600
<i>Acacia doratoxylon</i>	Spearwood	600			600
<i>Acacia hakeoides</i>	Hakea Wattle	600			600
<i>Acacia implexa</i>	Hickory Wattle	820	220	150	450
<i>Acacia lanigera</i>	Woolly Wattle	600			600
<i>Acacia paradoxa</i>	Kangaroo Thorn	600		200	400
<i>Acacia spectabilis</i>	Mudgee Wattle	770	170		600
<i>Cassinia arcuata</i>	Biddy Bush	400		400	
<i>Chrysocephalum apiculatum</i>	Yellow Buttons	400		400	
<i>Dodonaea spp</i>		2000		1550	450
<i>Edina Hastate</i>		150			150
<i>Einadia nutans</i>	Nodding saltbush	1700		1100	600
<i>Bursaria Spinosa</i>	Sweet Bursaria	1250			1250
<i>Enchylaena tomentose</i>	Ruby Saltbush	950		550	400
			650	4350	6700
<i>Eucalyptus albens</i>	White Box	150		150	
<i>Eucalyptus conica</i>	Fuzzy Box	150			150
<i>Eucalyptus dealbata</i>	Tumbledown Gum	150			150
<i>Eucalyptus dwyeri</i>	Dwyers Red Gum	150			150
<i>Eucalyptus melliodora</i>	Yellow Box	150		150	
<i>Eucalyptus microcarpa</i>	Grey Box	2100	600	145	1355
<i>Eucalyptus populnea</i>	Poplar Box	150			150
<i>Eucalyptus sideroxylon</i>	Mugga Ironbark	700	550	150	
<i>Allocasuarina luehmannii</i>	Buloke	150		150	
<i>Allocasuarina verticillata</i>	Drooping Sheoak	150		150	
<i>Brachychiton populneus</i>	Kurrajong	350	200	150	
			1350	1045	1955
<i>Lomandra spp</i>	Mat-rushes	500		500	
<i>Dianella spp</i>	Flax-lilies	500		500	
<i>Austrodanthonia spp</i>	Wallaby grasses	950		950	
			0	1950	0
Total		18000	2000	7345	8655

6.6.2 Biodiversity and Ecology Performance Monitoring

During the reporting period Northparkes engaged external consultants to undertake rehabilitation monitoring at Kokoda Biodiversity Offset. This program is guided by clearly defined, repeatable and consistent methodologies for monitoring changes in various aspects of ecosystem function, succession and long-term sustainability. The adopted monitoring methodology is a standard and simple procedure that can be easily replicated over any vegetation community or revegetation area. It includes a combination of Landscape Function Analysis (LFA) and flora diversity. For more details on rehabilitation monitoring undertaken in 2021, refer to the 2021 Kokoda Offset Monitoring Report, available via the Northparkes website at <http://www.northparkes.com/news/#publications>

Kokoda Ecological Monitoring

A range of ecological field surveys were undertaken across Kokoda in 2021. These included:

- Floristic data using plot-based surveys
- Landscape Function Analysis (LFA) monitoring
- Targeted bird surveys in winter and spring
- Monitoring of kangaroo numbers
- Biometric vegetation surveys and
- Qualitative biannual inspections for weeds, pests and maintenance.

Floristic Data Using Plot-Based Surveys

A total of seventeen 20 x 20 metre permanent flora sampling sites (plots) were assessed at Kokoda in 2021. The location of survey sites was selected to represent the different vegetation communities mapped by Umwelt in 2013 and were marked for ease of relocating for subsequent monitoring surveys (using a handheld global positioning system (GPS) and star pickets). Photographs were also taken at each site to help monitor changes over time.

During surveys, total floristic diversity was recorded in systematic increments within the monitoring plots, beginning at the start of the LFA vegetation transect in the 1 x 1 m sub-plot. Total shrub counts were made within the shaded 10 x 20 m subplots and mature tree counts and condition variables were made within the entire 20 x 20 m quadrat.

Floristic plot-based survey at Kokoda in 2021 recorded 192 plant species, comprised of 56 non-native (exotic) species and 136 native species. No threatened flora species were detected in the flora plots during field surveys. Refer to the 2021 Kokoda Offset Monitoring Report for full information and data.

A range of Key Performance Indicators (KPI's) were quantified by data obtained from replicated reference sites which were representative of the Grey Box Woodland CEEC and Dwyer's Red Gum woodland. All ecological performance indicators are quantified by range values measured from these reference sites which form both *upper* and *lower* KPI targets. The same ecological performance indicators are also measured in the revegetation/rehabilitation sites and these should equal or exceed these values, or at least demonstrate an increasing trend.

Table 19 below indicates the performance of the woodland revegetation monitoring sites against the proposed Primary Completion Performance Indicators. The selection of criteria has been presented in order of rehabilitation phases according to the ESG3 MOP guidelines. The range values of the ecological performance targets are amended annually. Revegetation sites meeting or exceeding the range values of their representative community type have been identified with a coloured box and have therefore been deemed to meet these primary completion performance targets this year. Hashed coloured boxes indicate they may be outside of the reference target ranges, but within acceptable agricultural limits.

The reference sites at Kokoda are typically degraded and of low quality which subsequently have provided low performance targets. In the Grey Box woodlands, there was limited abundance and diversity of the grassy understorey and there were limited shrubs. Subsequently the revegetation activities proposed should include a range of species known to occur within these communities and not just restricted to those occurring within the existing reference sites.

Landscape Function Analysis Monitoring

Landscape Function Analysis (LFA) monitoring was also undertaken at the seventeen permanent plots. LFA is a methodology used to assess key indicators of ecosystem function including landscape organisation and soil surface condition as measure of how well the landscape retains and uses vital resources. The indicators used quantify the utilisation of the vital landscape resources of water, topsoil, organic matter and perennial vegetation in space and time. Soil sampling was also undertaken at the plots.

Table 19 Performance of the Grey Box, Ironbark and Dwyers Red Gum woodland revegetation sites against primary completion performance indicators in 2021.

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measurement (*desirable)	DReveg 1	DReveg 2	DReveg 3	DWoodLQ	GBReveg 1	GBReveg 2	GBReveg 3	GBReveg 4	GBReveg 5	WBWood 1	IronWood 1
<i>Performance indicators are quantified by the range of values obtained from replicated reference sites</i>					2021										
Phase 2: Landform establishment and stability	Landform slope, gradient	Landform suitable for final land use and generally compatible with surrounding topography	Slope	< Degrees (18°)	4	3	4	3	5	4	3	4	3	3	4
	Active erosion	Areas of active erosion are limited	No. Rills/Gullies	No.	0	0	0	0	0	0	0	0	0	0	0
Phase 3: Growth medium development	Soil chemical, physical properties and amelioration	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH (*5.6 - 7.3)	5.9	5.4	6.0	5.5	6.6	5.7	6.2	6.1	6.3	6.4	5.2
			Organic Matter	% (*>4.5)	3.1	3.1	3.1	4.2	3.1	3.3	3.0	2.0	2.4	2.7	5.2
			Phosphorous	ppm (*50)	12.5	11.8	7.2	8.5	3.9	7.2	4.9	1.3	3.6	3.3	4.9
Phase 4: Ecosystem & Land use Establishment	Landscape Function Analysis (LFA): Landform stability and organisation	Landform is stable and performing as it was designed to do	LFA Stability	%	74.5	75.1	77.5	71.3	77.0	73.0	77.8	77.1	77.5	71.3	70.5
			LFA Landscape organisation	%	100	94	100	100	100	100	100	98	100	100	100
	Vegetation diversity		Diversity of shrubs and juvenile trees	species/area	2	7	1	3	1	0	6	5	1	8	6

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measurement (*desirable)	DReveg 1	DReveg 2	DReveg 3	DWoodLQ	GBReveg 1	GBReveg 2	GBReveg 3	GBReveg 4	GBReveg 5	WBWood 1	IronWood 1
		Vegetation contains a diversity of species comparable to that of the local remnant vegetation		% endemic	100	100	100	100	100	0	100	100	100	100	100
			Exotic species richness	<No./area	16	12	22	19	21	13	25	21	26	19	4
	Vegetation density	Vegetation contains a density of species comparable to that of the local remnant vegetation	Density of shrubs and juvenile trees	No./area	9	9	1	18	1	0	14	6	3	21	74
	Ecosystem composition	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Trees	No./area	1	1	1	2	1	0	2	3	1	4	5
			Shrubs	No./area	1	7	0	2	0	0	4	2	0	4	3
			Herbs	No./area	22	30	29	37	25	27	31	34	40	45	28
Phase 5: Ecosystem & Land use Sustainability	Landscape Function Analysis (LFA): Landform function and ecological performance	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	%	43.3	33.4	49.7	56.3	48.3	40	48.9	45.4	47.5	53.3	46.3
			LFA Nutrient recycling	%	44.6	35.6	49.7	56.7	48.3	41.8	44.8	45.0	49.2	53.8	47.8
	Protective ground cover	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Perennial plant cover (< 0.5m)	%	45.5	39	42	14.5	49.5	67	73.5	54	52	52	17.5
			Total Ground Cover	%	87	79.5	100	97.5	100	94.5	96	96.5	100	100	87.5

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measurement (*desirable)	DReveg 1	DReveg 2	DReveg 3	DWoodLQ	GBReveg 1	GBReveg 2	GBReveg 3	GBReveg 4	GBReveg 5	WBWood 1	IronWood 1
	Native ground cover abundance	Native ground cover abundance is comparable to that of the local remnant vegetation	Percent ground cover provided by native vegetation <0.5m tall	%	49.5	70.9	36.3	64.8	31.7	65.7	52	42.3	55	73.6	90
	Ecosystem growth and natural recruitment	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local remnant vegetation	shrubs and juvenile trees 0 - 0.5m in height	No./area	3	5	1	13	0	0	9	4	3	15	42
			shrubs and juvenile trees 1.5 - 2m in height	No./area	0	0	0	0	0	0	0	0	0	0	0
	Ecosystem structure	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	% cover	2	0	0	0	0	0	0	0	0	0	0
			Foliage cover >6m	% cover	0	0	0	24.5	0	0	0	0	0	39	14
	Tree diversity	Vegetation contains a diversity of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree diversity	%	100	0	0	100	0	0	0	0	0	100	100
	Tree density	Vegetation contains a density of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree density	No./area	6	0	0	9	0	0	0	0	0	8	35
	Ecosystem health	The vegetation is in a condition comparable to that of the local remnant vegetation.	Live trees	% population	100	0	0	100	0	0	0	0	0	87.5	74
			Healthy trees	% population	100	0	0	0	0	0	0	0	0	12.5	6
			Flowers/fruit: Trees	% population	0	0	0	89	0	0	0	0	0	50	9

Targeted Bird Surveys

Targeted bird surveys were carried out at Kokoda in winter and spring 2021. Bird surveys were conducted at six sites across two days in winter and eleven sites across two days in spring. Surveys consisted of a two-hectare area search for 20 minutes in suitable habitat within Kokoda on each day.

All bird surveys undertaken at Kokoda in 2021 were undertaken by a suitably qualified ecologist. Winter bird surveys targeted the Regent Honeyeater and Swift Parrot, and spring bird surveys targeted the Superb Parrot and eastern subspecies of the Grey-crowned Babbler. During targeted bird surveys, all birds seen (using binoculars) or heard (using diagnostic calls) were recorded. Targeted bird surveys were undertaken twice at each survey site each time in the early morning when birds are most active and vocal to maximise detectability. Any opportunistic bird species identified during surveys were also recorded.

During targeted bird surveys at Kokoda in 2021, a total of 48 bird species were recorded during winter and a total of 68 bird species during spring. Five of those species were identified as threatened and/or migratory under the *Biodiversity Conservation Act 2016* and *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). These include:

- Superb parrot (*Polytelis swainsonii*) (EPBC: V/ BC: V) - observed during spring survey;
- Grey-crowned babbler (eastern sub-species) (*Pomatostomus temporalis*) (BC-V) - observed during winter and spring surveys;
- Brown Treecreeper (*Climacteris picumnus victoriae*) (BC-V) observed during winter survey;
- Speckled Warbler (*Chthonicola sagittata*) (BC-V) observed during winter and spring surveys; and
- Diamond Firetail (*Stagonopleura guttata*) (BC-V) observed during winter survey.

Threatened species records appear consistent with previous years records. Overall, species diversity appears stable over the past few years. A slight decrease in species abundance recently, in comparison to drought years could likely be attributed to higher rainfall during 2020 and 2021 than recent years, which has resulted in more widely available foraging habitat outside of the Kokoda site, and subsequently, less concentration of species within the site itself during the survey period. Additionally, rainfall, occurred overnight during the winter survey period, and may have impacted survey results. Birds are often inactive during times of rainfall and are more difficult to detect if present.

The grey-crowned babbler (centre) is a sedentary species therefore, these records are likely to indicate that populations of this species occur within Kokoda. However, the superb parrot (left) is a nomadic species and likely to only use the site for foraging during eucalypt flowering.



Figure 23 Superb Parrot, Grey-crowned babbler (eastern sub-species) & Speckled Warbler

Biometric Vegetation Surveys

Biometric vegetation surveys were undertaken at the Kokoda Biodiversity Offset Site in 2021 between the 11th and 15th of October to support Northparkes Voluntary Conservation Agreement (VCA). Results were found to be generally consistent with previous monitoring years. An increase in annual weeds was observed as a result of widespread rain during the reporting period. The VCA for Kokoda was submitted in 2017, as per the Northparkes project approvals and was signed by Northparkes and the Office of Environment and Heritage (OEH) Executives in February 2018.

Qualitative Biannual Inspections

Biannual inspections of the Kokoda Biodiversity Offset Site were undertaken July and December of 2021 and recorded the presence and locations of pests and weeds as well as outlined any maintenance activities that may require action.

During the July inspection, access was limited as a result of above average rainfall. No weeds of concern were identified although there was evidence of feral pigs traversing through the property. Several diggings along the creek line with no sightings of resident pigs suggests that the animals were passing through the property. Fencing at the creek crossings to be evaluated and remedied, where required in 2022.

During the December inspection, access had substantially improved and the revegetation area was able to be traversed. Above average rainfall continuing throughout the later half of the year prompted natural regeneration across the offset area. No signs or observations of any weeds or concern. There was no evidence of pigs although some rabbits were spotted near the residence. Monitoring of the rabbit population continues with baiting programs to be implemented if required.

Opportunistic Flora and Fauna Monitoring

In 2019 prior to the erection of exclusion fence, a number of trail cameras were set up across Kokoda to opportunistically observe the range of potential feral animal species. The cameras were then again set up after the completion of the fencing to assess what species required ongoing management. Table 20 details the current presence of feral animal species from the trail cameras. Although the presence of cats have not been captured post fencing, it is possible they exist within offset area, but are yet to be photographed. Programs for the management of these feral pest species, mainly pigs and rabbits, will continue to be investigated during 2022.

Table 20 Presence of feral pest species

Feral Animal Species	2019 (Prior to Fencing)	2020 (Post Fencing)	2021
Rabbits	Yes	Yes	Yes
Cats	Yes	No	No
Dogs	No	No	No
Foxes	Yes	Yes	No
Pigs	Yes	No	Yes
Goats	Yes	No	No

Pine Donkey Orchid Population Monitoring

Field inspections of the two populations of the Pine Donkey Orchid (*Diuris tricolour*) (PDO) found within the Northparkes mining lease were carried out during September and October, which targeted emerging and effloresced plants to coincide with the species flowering period. The density of PDO individuals recorded at the two populations have varied significantly over the years, with the seasonal conditions, ground cover abundance, ease of identification and survey timing having a significant impact on the orchid populations. In 2017, exceptionally dry conditions resulted in individuals being stunted with most being 10-15cm in height. Some individuals had finished flowering, while others were in bud. In 2018, very dry conditions persisted throughout the year, however 31 mm and 29 mm of rain falling during August and September promoted the emergence of the orchids. It is believed that the dry conditions during the 2019 flowering period led to zero individuals observed across both sites. During 2020, consistent rainfall throughout the year significantly aided in the emergence of plants in late September. The exclusion fence around the Limestone orchid site has also assisted in reducing the macropod grazing pressure. With above average rainfall again received in 2021, record numbers of individuals was recorded at both Adavale and Limestone sites.

Table 21 Number of Pine Donkey Orchids observed during surveys.

Population	2013	2014	2015	2016	2017	2018	2019	2020	2021
Limestone Forest	N/A	69	143	485	37	494	0	770	973
Adavale Lane	N/A	130	38	603	37	52	0	180	859
Total	947	199	181	1,088	74	546	0	950	1,832



Figure 24 Pine Donkey Orchid (*Diuris tricolour*)

6.6.3 Land Category Mapping

In September 2021 Umwelt mapped out the Category 1 and Category 2 land within the Consent area in accordance with the *Local Lands Services Act 2013*. The mapping relied on aerial images to determine those areas that qualified as Category 1 due to being disturbed prior to 1990.

The assessment also clarified that those areas that were disturbed prior to 1990, however had since been planted with mid and overstorey vegetation by Northparkes, were still considered Category 1 as the plantings were not done so under any regulatory requirement.

The mapping of Category 1 and Category 2 will inform current and ongoing biodiversity assessments however ground truthing will occur to confirm the status.

6.6.4 Biodiversity and Ecology Improvements and Initiatives

Northparkes has implemented a comprehensive biodiversity management and monitoring program, which will continue through the next reporting period to consistently track and inform Northparkes' performance in meeting biodiversity objectives.

Monitoring and maintenance of the active revegetation will be undertaken in 2022. Additional fencing maintenance will also be undertaken to reduce pest and feral species accessing the property.

6.7 Waste

6.7.1 Waste Management

The Consent, specifically Schedule 3 Condition 38, requires the following in regards to waste:

- Implement all reasonable and feasible measures to minimise waste generated by the Project
- Ensure waste generated by the Project is appropriately stored, handled and disposed of and
- Monitor and report on the effectiveness of waste minimisation and management measures in the Annual Review.

Northparkes Waste Management Plan covers aspects of waste management peripheral to mining activities, i.e. does not include production waste, such as coarse or fine reject. The Waste Management Plan was prepared in accordance with the objectives of the *Waste Avoidance and Resource Recovery Act 2007* and is based on the waste management hierarchy of avoid, reduce, reuse, recycle and dispose.

Waste management measures employed on site include:

- General waste from operations is disposed of at an appropriate licensed waste management facility
- Recyclable wastes are collected for recycling at an appropriate facility
- Contaminated soil is collected and transported to the on-site bioremediation area for treatment and eventual on-site disposal
- Scrap metal materials are separated onsite and collected by a recycling contractor for off-site recycling
- All waste oils and greases are segregated and stored appropriately until collection by a licensed waste contractor for appropriate offsite recycling/disposal
- Waste chemicals (including solvents) are segregated, stored appropriately and transported offsite by a licensed waste contractor for appropriate disposal
- Contaminated areas are bunded and water is reused within the process water circuit and
- Clean water surface water/runoff is diverted around mine facilities (where feasible).

6.7.2 Waste Performance

Northparkes tracks operational waste disposal for all key waste streams. All waste streams are stored in appropriate containers prior to disposal at licenced facilities.

This reporting period has seen an increase of waste compared to the 2020 reporting period. This can be attributed to the increased amount of consumables required for various construction projects being undertaken by Northparkes. There was also a heavy focus on recycling of scrap metal waste during the period. Amounts of hazardous material recycled and disposed decreased during the period.

Operational waste collection statistics for the 2021 reporting period is summarised in Table 22.

Table 22 Summary of Waste Disposal

Waste Stream	Tonnes
Hazardous recycled: empty drums oil filters oily water waste grease waste oil dust suppressant/resin/glue and fluorescent tubes.	136.6
Hazardous disposal: hydraulic hose medical/sanitary waste oily rags and used absorbent	14.3
Non-Hazardous recycled: empty drums	51.0
Non-Hazardous disposal: mixed solid waste	469.8
Recycled metal	2,933.4
TOTAL	3,605.1

Northparkes and its contractors have continued to implement the waste management hierarchy. Wherever possible, waste materials are re-used on site in preference to direct disposal. Recycling of materials is also undertaken where possible to minimise waste. An example of reuse is the integration of an oil water separator at the wash bay, which minimises waste water and returns water to the water management system for re-use.

Northparkes contracts a third-party waste service to manage its waste from the premises. This has successful as specialised waste streams can be more thoroughly investigated for opportunities and improvements.

Site induction packages include waste awareness and Northparkes has included waste best practice in employee and contractor HSE sessions. Environmental inspections were undertaken by Northparkes throughout the reporting period with observations and non-conformances communicated as necessary to relevant contractors.

6.7.3 Bioremediation Area

The bioremediation area was maintained and monitored during the reporting period, as listed in Table 23. Successful management of this bioremediation area has allowed for onsite treatment of contaminated material and subsequently reduced the need to transfer contaminated waste material offsite. The bioremediation area was active during the 2021 reporting period (refer to Table 23).

The materials retained in the bioremediation area were aerated as the bioremediation agent was applied. The material was tested in the 2021 reporting period for any residual hydrocarbons. The results of the 2021 sampling demonstrated that the material has been remediated and is suitable for onsite disposal. Once the bioremediation area is empty, the fresh material from the western surge dam cell will be transported to the bay and treated during the next reporting period.

Table 23 Summary of Bioremediation Activities

Initiated	Origin of Material	Description	Completion
2016	-	Construction of bioremediation area	2016
2016	Surge Dam 2	The treatment of approximately 15,000m ³ of material from the western surge dam with Micro-Blaze formulation	2017
2019	Surge Dam 1	The treatment of approximately 21,000m ³ of material from the eastern surge dam with Micro-Blaze formulation	Ongoing

6.7.4 Waste Audit

During the reporting period an audit was carried out of the waste contractor that services Northparkes. The audit tracked a number of waste streams from Northparkes to the waste contractors system and then onto the next treatment location.

The audit found that the waste supplier was disposing of waste streams as per regulations and identified that some improvements in tracking Northparkes volumes could be made.

6.7.5 Waste Improvements and Initiatives

Consistent with the implementation of the waste management hierarchy, Northparkes and its waste contractor continue to look for ways to re-use waste materials onsite in preference to direct disposal.

Overall waste disposal volumes are predicted to reduce in 2022 due to a decrease in civil construction activities.

6.8 Cultural Heritage

6.8.1 Cultural Heritage Management

The management, including identification, assessment and monitoring, of cultural heritage at Northparkes is undertaken in accordance with the Cultural Heritage Management Plan (CHMP).

The CHMP prescribes:

- The policies and practices for the preservation of sites during construction and operations
- Other facets of cultural heritage practices and conservation measures including salvage of sites as required and the practice of due diligence inspections
- Management of unanticipated Aboriginal objects and
- Other relevant cultural heritage considerations including consultation with the Aboriginal community.

Northparkes utilises a Site Disturbance Permit (SDP) approval system to manage the protection of heritage sites on the mining lease. This approval process applies to activities planned in undisturbed areas or previously rehabilitated areas. The area to be disturbed is compared to the Aboriginal cultural heritage sensitivity zones to determine the need for additional survey work or salvage work prior to starting the project.

6.8.2 Cultural Heritage Performance

In accordance with the CHMP, the Wiradjuri Executive Committee (WEC) met on a regular basis throughout the reporting period, with meetings held in March and November. The WEC is a consultation forum to enable appropriate review of the aboriginal heritage management practices at Northparkes and identify potential improvement opportunities from the community.

Works and initiatives undertaken by the WEC in the reporting period included:

- Feedback on selection of Northparkes Indigenous Scholarship recipients and encouragement of Indigenous employment.
- Engagement with Skillset Landworks to promote indigenous employment as part of the Kokoda revegetation project.
- Maintained the Indigenous workforce participation rates at 6% as part of the School2Work program which actively engages the community.
- Commitments outlined in the 2020 work plans included: education, community engagement, business development and employment and training.

In the reporting period, three due diligence assessments were conducted on the mining lease with no Aboriginal objects being discovered. The assessed areas were the RP27 drain realignment for Estcourt TSF construction, the E22 portal area within Limestone State Forest (Mod 6) and the area between Rosedale TSF and OPD (Mod 6).

Whilst carrying out the assessment of the E22 portal area, further investigation into a previously determined potential scar tree was undertaken by Wiradjuri elders and an Archaeologist. As a result of the closer analysis, the tree was deemed not to be Aboriginal modified. This recorded site will be removed from the Northparkes and AHIMS database within the next reporting period.

Within the reporting period a significant amount of cultural heritage assessment was carried out for the E44 Rocklands SSD project. The potential project area and haul road for the E44 satellite pit was surveyed and then a number of sieve transects were completed. A number of Aboriginal objects were identified during the survey, however none were identified as part of the sieving program. Those found will be added to the AHIMS database, however the most significant scatter was determined to have been placed there in the past 20 years. This fieldwork was carried out on exploration licences and is not part of the current mining leases.



Figure 25 Limestone State Forest Tree and E44 Sieving Pits

6.8.3 Cultural Heritage Improvements and Initiatives

Work and initiatives planned for the WEC in the next reporting period include:

- Develop and complete 2021 work plans in the three identified areas: education, employment, and community engagement
- Support school to work programs including training and apprenticeships
- Develop initiatives to increase the percentage of Indigenous employees within the workforce
- Raise employee awareness and knowledge of Cultural Heritage through induction programs and sessions with employees.
- Improve community engagement through volunteer opportunities and
- Undertake a review of the working Agreement between Northparkes and the WEC.

7. WATER MANAGEMENT

Water management at Northparkes is undertaken in accordance with approved management plans, prepared generally in accordance with the Consent. The Water Management Plan (WMP) acts as the overarching document to govern water management at Northparkes. Approved subordinate plans supporting the WMP include:

- Surface Water Management Plan (SWMP)
- Groundwater Management Plan (GWMP) and
- Site Water Balance (SWB) report.

7.1 Surface Water

7.1.1 Surface Water Management

Surface water is managed in accordance with the SWMP and associated water management plans which conform to the Consent, licenses and other regulatory requirements of Northparkes.

The primary objectives of water management at Northparkes is to manage dirty and contaminated catchment runoff, divert clean water around operational areas of the mine and to collect and store water for use on site to minimise the dependence on external water supplies. A critical component of the water management system is to maintain zero discharge of contaminated water into the surrounding environment.

The water management strategy includes the separation of clean, dirty and contaminated water, categorised as follows:

- **Clean water** includes surface runoff from areas not affected by mining operations and includes runoff from undisturbed areas and rehabilitated areas and water supplied by external sources. The clean water system includes diversion drains and farm dams (FD) surrounding the active mining areas in order to capture and divert clean water away from areas disturbed by mining operations.
- **Dirty water** includes sediment-laden runoff from disturbed areas, including rehabilitated waste rock stockpile areas, TSF embankments and surface infrastructure areas that are not associated with mineralized ore. Runoff from these areas is collected in sediment ponds (SP) to allow sediment to fall out of suspension.
- **Contaminated water** includes water associated with mining, ore processing and tailings storage. Any potentially contaminated water is managed within retention ponds (RP), the Caloola Dams, E22 pit, surge dams and the process water dam to avoid discharge into surrounding watercourses and to maximise water reuse.

In accordance with the Consent, Northparkes maintains a Surface Water Balance (SWB) for effective management of water resources. The SWB details water use, water demand and water management, as well as the sources and security of water supply, including contingency for future reporting periods.

The following subsections describe surface water monitoring and environmental performance.

Surface Water Monitoring Program

Water quality monitoring is undertaken at Northparkes specifically within the three defined water management systems mentioned above.

Table 24 lists each monitoring location and their corresponding water management system.

Table 24 Surface Water Quality Monitoring Location Catchments

Clean water management system	Dirty water management system	Contaminated water management system
Upstream WC4, WC6, WC7, WC13, W14 Downstream WC1, WC2, WC3, WC5, WC11 WC12, WC15, WC16 Farm Dams FD04, FD05, FD06, FD07, FD11, FD12, FD16, FD18, FD25, FD26, FD27	SP03, SP10, SP15, SP33	RP01, RP02, RP03, RP04, RP05, RP06, RP07, RP08, RP09, RP12 RP13, RP15, RP16, RP19, RP20, RP21, RP22, RP23, RP24, RP25, RP26, RP27, RP28, RP32 Grease Trap 2, Process Water Dam, Surge Dam 1 and 2, Caloola South

The monitoring locations of watercourses and surface water storages are provided in Appendix 2. Table 25 identifies the specific analytical suites undertaken for each of the different water management systems.

The monitoring of watercourse stability is required to manage the potential impact on the watercourse as a result to changes in the watercourses hydraulic operation. As part of the water quality monitoring of watercourses, visual assessments are conducted to determine any visible instabilities. Records are made, including comments regarding bed and bank condition. Photographs may also be taken to provide a record on the status of the watercourse.

Table 26 provides information on the watercourse stability monitoring program.

Table 25 Surface water monitoring program

Monitoring Locations	Frequency	Analytical Suite
Watercourses (clean water systems)	Quarterly	pH, EC, TSS, TDS, Cu, Na, K, Ca, Mg, Cl, SO ₄ , HCO ₃ , CO ₃
Farm Dams (clean water systems)	Quarterly	pH, EC, TSS, TDS, Cu, NA, K, Ca, Mg, Cl, SO ₄ , HCO ₃ , CO ₃
Sediment Ponds (dirty water management system)	Quarterly	pH, EC, TSS, TDS, Cu, NA, K, Ca, Mg, Cl, SO ₄ , HCO ₃ , CO ₃
Retention Ponds and Process water system (contaminated water management system)	Quarterly	pH, EC, Cu
	Annual	pH, EC, TSS, TDS, Na, K, Ca, Mg, Cl, SO ₄ , HCO ₃ , CO ₃ , Al, As, Ba, Be, Cd, Co, Cu, Cr, Mo, Mn, Ni, Pb, Se, Th, U, Zn

Table 26 Watercourse stability monitoring program

Location	Frequency	Assessment Requirements
WC01, WC02, WC03, WC04, WC05, WC06, WC07, WC11, WC12, WC13, WC14, WC15, WC16	Quarterly, additional sampling following heavy rainfall events.	Visual assessment of channel form, presence of instabilities in watercourse banks or in crossing structure (bridge/culvert).

Northparkes uses a handheld multi-parameter water quality probe (pH, EC, temperature). All water quality samples requiring lab analysis are collected by a suitably qualified employee and sent to a NATA accredited laboratory for processing.

The existing monitoring program is subject to periodic review and as such will evolve with the continual development of Northparkes water management system.

Surface Water Quality Criteria

Surface water quality criteria use a two-stage water quality trigger system based on the statistical analysis of the existing available water quality data. Current water management plan Stage 1 and Stage 2 trigger values as well as livestock water quality guidelines were taken into consideration when developing and updating the site water quality trigger levels. The current trigger levels for surface water quality sites are detailed in Appendix C of the approved WMP.

7.1.2 Surface Water Performance

There were no non-compliances related to surface water management recorded during the reporting period. All storages show trends that are generally within historical ranges of all parameters. All quarterly monitoring events were carried out successfully and within the scheduled period.

Surface Water Quality

Samples were able to be taken at all locations during the monitoring period. Widespread rain through the remainder of the year enabled routine sampling to be undertaken. Due to the nature of the ephemeral streams, many water courses were dry at time of sampling throughout the monitoring period. WC12 (Bogan River) was able to be sampled consistently throughout the year with all other monitoring locations only able to be sampled in Q3 and Q4 of 2021.

Watercourses

Watercourses recorded results in line with long-term data. Electrical conductivity and dissolved copper did not fluctuate although pH decreased slightly across all locations. All results were below internal trigger values.

Farm Dams

Farm dam results for all parameters remained in line with historical data with the exception of FD18 recording elevated electrical conductivity. Three of the four sampling events recorded values that exceeded the internal trigger values. This location will be monitored closely for change during the next reporting period.

Retention Ponds

Process water monitoring locations (retention ponds) fluctuated throughout the year although still remain within long-term historical data across pH, electrical conductivity and dissolved copper. Several elevated readings were recorded during the period; pH of RP12 and RP26; electrical conductivity of RP15 and SD1, and; dissolved copper in RP04. All results have returned to levels below the internal trigger values.

Sediment Ponds

Sediment pond locations recorded pH, electrical conductivity and dissolved copper results in line with long-term historical data and well below the internal trigger values.

Northparkes will continue to monitor and assess local water courses to ensure there are no detrimental mine related impacts to the local environment.

The monitoring results were predominantly in line with or below historical data and representative of the regional freshwater quality characteristics. The monitoring results are available in Appendix 2.

7.1.3 Surface Water Improvements and Initiatives

During the period, Northparkes commissioned a third-party audit of Table 6, Condition 22 of DC11_0060. The audit found Northparkes to be largely compliant against the water management performance measures. Some documentation regarding TSF design was not able to be provided and could not be verified as fully compliant.

Within the next reporting period there will be several initiatives regarding water management. Northparkes will work to streamline monitoring requirements and refine the site water model to reflect current and future operations.

7.2 Groundwater

7.2.1 Groundwater Management

Groundwater is managed in accordance with the approved GWMP. The GWMP provides a framework defining how Northparkes will assess, manage and mitigate impacts to the groundwater system. This particularly focuses on impacts to the shallow alluvial aquifer as a result of mining activities such as dewatering the open pit void and underground operations. The GWMP specifies impact assessment criteria and trigger levels to identify groundwater level and quality changes, and outlines Northparkes monitoring and reporting requirements for groundwater management.

Groundwater Monitoring Program

Northparkes groundwater monitoring program aims to identify any changes to the natural groundwater system as a result of mining operations and ensure compliance with the Consent. It focuses on potential impacts to environmental assets and groundwater users in the area surrounding Northparkes.

The monitoring program undertaken during the reporting period included:

- Quarterly monitoring of groundwater levels and
- Quarterly laboratory groundwater quality analysis.

During the reporting period the active groundwater monitoring network comprised 42 monitoring bores screened across different geographical areas, including 12 surrounding the tailing storage facilities, 14 surrounding the open cut voids, 11 associated with the underground operations and five regional bores on neighbouring properties. Monitoring details for these bores are listed in Table 27 and Table 28 and their respective locations are shown in Appendix 2.

Table 27 Groundwater Monitoring networks

TSF Bores	Opencut Bores	Underground Bores	Regional
MB01, MB02, MB03, MB05, MB06B, W26, W27, W28, W29, W30, W31, W32	MB10, MB11, MB12, MB13, MB14, MB16, W14, W19, W20, W21, W22, W23, W24, W25	MB17, MB18, MB19, MB20, P101, P102, P103, P104, P139, P145, P149	Far Hilliers, Moss, Wright, Long Paddock, South Hilliers

Table 28 Groundwater monitoring program

Monitoring Locations	Frequency	Analytical Suite
TSF Bores, Open cut Bores, Underground Bores, Regional Bores	Quarterly	Water level, pH, EC, total dissolved solids, hydroxide alkalinity, carbonate alkalinity, bicarbonate alkalinity, total alkalinity, sulphate, chloride, calcium, magnesium, sodium, potassium, aluminium, antimony, arsenic, beryllium, barium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, zinc, nitrate, strontium, thallium, thorium, uranium, iron and mercury.

Groundwater Quality Criteria

Northparkes engaged an independent consultant to conduct a review of trigger levels for groundwater levels and quality. The review was conducted to assist in providing more relevant trigger levels for the groundwater monitoring network. The trigger levels were developed to assist in identifying and appropriately managing potential groundwater impacts based on historical monitoring data available from the groundwater monitoring network. Northparkes has developed groundwater levels and quality criteria for each bore where there is sufficient data available.

Each bore has been set with Stage 1 and 2 trigger levels which correspond to Appendix D of the WMP. Applying individual trigger levels to bores provides Northparkes with a more accurate and representative range of the groundwater levels and quality of the bores. This enables more accurate interpretation of the monitoring data with respects to the Northparkes operation. The trigger values were independently reviewed in 2020 with no changes made. No further changes were made in 2021. The trigger values for water level and quality for the groundwater monitoring sites are detailed in Appendix D of the WMP.

7.2.2 Groundwater Performance

There were no non-compliances related to groundwater management recorded during the reporting period. All bores show trends that are generally within historical ranges of all parameters. Quarterly monitoring events were carried out successfully and within the scheduled period with the exception of bores located within the TSF2 regulatory imposed exclusion area, following concerns with the facility. The EPA have been regularly consulted on the issue, including the restricted access to the monitoring locations, and have been advised that monitoring will recommence following the removal of the exclusion area.

Groundwater Quality

TSF Bores

The groundwater monitoring results were predominantly in-line with historical long-term data. The electrical conductivity of all bores had stabilised during 2021 following a decrease in the previous period. MB03 recorded elevated dissolved copper results during the period before returning to existing levels. Electrical conductivity levels were also elevated and will be monitored during next period. Likewise, there was a significant change to the pH of W29 in quarter 4 and will continue to be monitored closely during the next period.

Open Cut Bores

Open cut monitoring bore MB11 was not sampled during the reporting period and hasn't been sampled since Q2 2016 due to it being dry. Likewise, foreign material at water level is preventing MB12 from being sampled (last sampled Q1 2018). MB16, W14, W22 and W23 were not able to be monitored in H2 of 2021 as they are located within the TSF2 regulatory imposed exclusion area. Electrical conductivity is slowly trending down across all TSF bores and pH has slightly increased. MB13 and W21 exceeded the internal trigger values during the period and will be monitored closely during the next period. Dissolved copper was generally in line with historical results although W25 recorded multiple quarterly results slightly above the internal trigger value. MB22 and MB23 also recorded results above the internal trigger values. These bores will be closely monitored during the next reporting period for stabilisation.

Underground Bores

All underground bores are generally in line with historical data and below internal trigger values. MB18's pH had significantly increased during the previous period and has now returned to existing levels. MB17 had one elevated electrical conductivity result that was above the internal trigger values and has since decreased to existing levels. Electrical conductivity has stabilised across many of the bores, P102, P139, P149 and MB20, and will continue to be monitored closely through the next reporting period.

Regional Bores

Regional ground water quality remained similar to the previous reporting period and in-line with the long-term averages. Groundwater pH, copper concentration and electrical conductivity at each regional bore were generally consistent with previous monitoring periods.

The groundwater monitoring results were predominantly in-line with historical long-term average data, and consistent with the EA predictions. The monitoring results are presented in Appendix 2.

Groundwater Levels

Quarterly monitoring of groundwater levels are undertaken by suitably qualified Northparkes personnel in accordance with the approved GWMP. Throughout 2021, and over the last 10 years, groundwater levels have displayed a consistent upward trend at all monitoring bores, the cause of which is continuing to be investigated. Changes in rainfall over the past decade may also have effects on local water quality variability. Groundwater levels remained below internal trigger values set in the WMP.

7.2.3 Improvements and Initiatives

During the period, Northparkes initiated a low flow sampling method for groundwater monitoring. The submersible pump is placed in the bore to the screen depth and sample retrieved using compressed air. The low flow method will continue to be implemented as part of the Northparkes groundwater monitoring program.

As part of the in progress State Significant Development assessment, a review is planned of the groundwater quality monitoring requirements as long-term trends continue to show no significant change since the inception of the project. Northparkes is proposing to revise the frequency of groundwater quality monitoring as quarterly monitoring is not showing any significant trends. Once reviewed, the WMP will be submitted to the Department for approval.

7.3 Water Balance

Northparkes has implemented a water model to capture water inputs, outputs and throughputs. The GoldSim model is used to incorporate the latest production data and future demands.

Results of the model are incorporated in internal management decisions and are communicated internally to the leadership team on an annual basis.

In reviewing the mine water balance for the reporting period, the following is of note:

- A total rainfall of 719.8mm was recorded at the onsite weather station during the reporting period. The rainfall received during the reporting period was 132.6mm above the long-term average for the region (587.2mm),
- The volume of freshwater imported to site was less than previous reporting periods (3,009 in 2019 and 2,998 in 2020) as a result of increased rainfall. All water imported to site was from groundwater and surface water licence allocations owned by Northparkes or through a commercial arrangement with Parkes Shire Council, as shown in Table 31,
- There was an increase in total water usage being directly linked to increased production rates though the processing plant and tailings management. A 25% increase was seen from the previous reporting period,
- Recycled water use increased significantly during this reporting period from 2,392 ML in 2020 to 4,004 in 2021.

Details of Northparkes water balance for the reporting period are outlined in Table 29.

Table 29 Reporting period water balance

Water Balance	Total (ML)
Total Water Input from external sources	2,684
Recycled onsite water	4,004
Water Use	6,688

7.3.1 Surface Water Storage

Water is essential in the processing of ore through the concentrator to produce copper concentrate. Effective water management is therefore crucial to the long-term success of Northparkes operations. A summary of the major water storage volumes at the beginning of the four most recent reporting periods are provided in Table 30.

Table 30 Major Water Storages

Major Storage Volumes (ML)	01/01/2019	01/01/2020	01/01/2021	01/01/2022
Caloola North	118	0	326	425
Caloola South	124	0	427	504
E22 Void	1,464	533	575	917
Process Water Dam (PWD)	172	132	180	190
RP09	50	10	60	60
Other Infrastructure	-	-	-	200
TOTAL	1,928	675	1,538	2,296

Water storage levels of all active sediment ponds, retention ponds and process water dams are monitored and recorded periodically. This allows for effective management of stored supplies in terms of consumption, avoidance of potential discharges and infrastructure planning.

Onsite water storages are heavily dictated by surface water inflows. Annual rainfall over the past decade has been following a decreasing trend (Figure 26) which puts further emphasis on the need to conserve, protect and recycle water resources. Northparkes continually look to optimise water use and investigate opportunities to operate more efficiently to manage water impact responsibly.

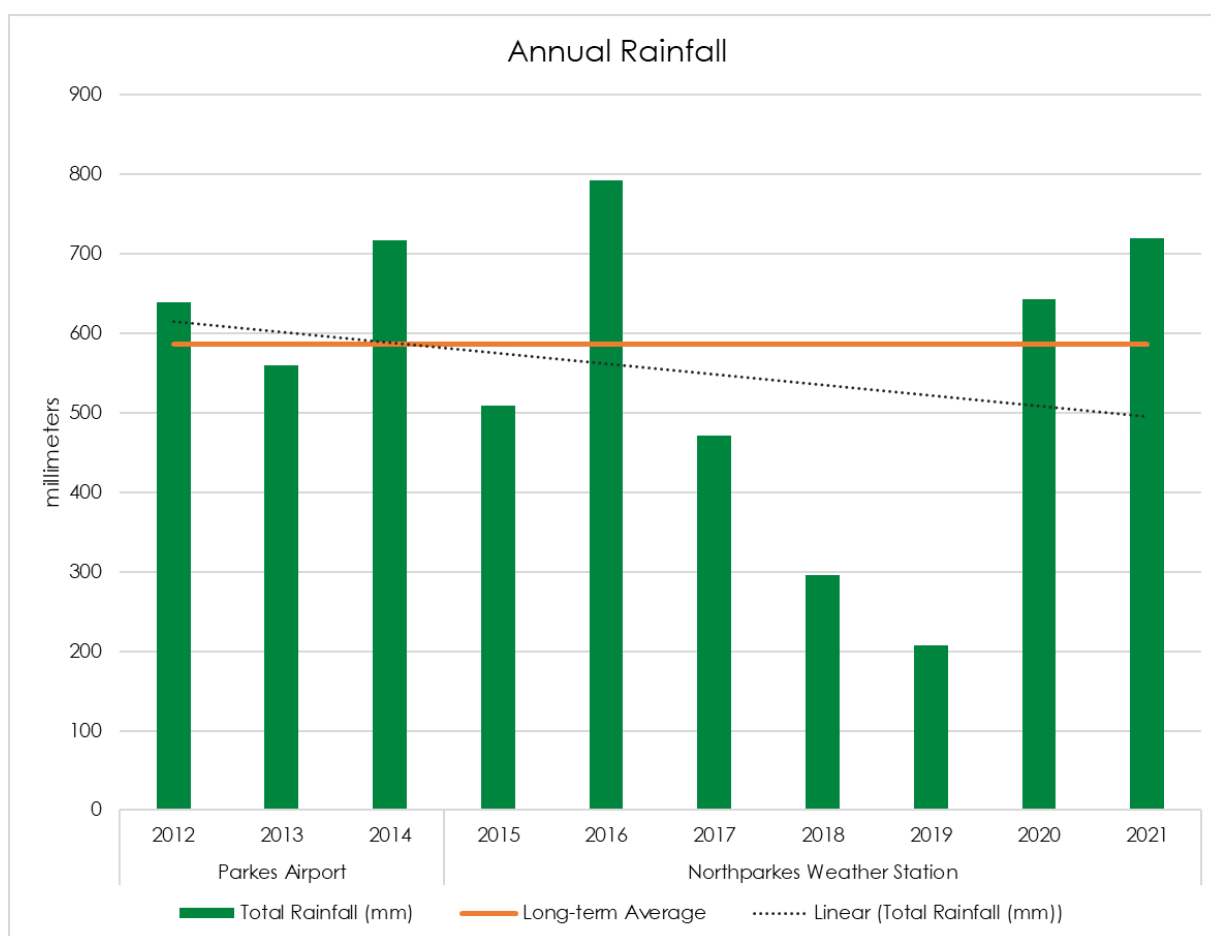


Figure 26 Annual rainfall at Northparkes mines (Note: Parkes airport rainfall data 2012 - 2014)

7.4 Water Supply

Northparkes sources water from numerous locations including imported water from various licences (see Table 4 Summary of Licences

). Water recycled from the on-site ore processing facility and tailings dam reclamation system is collected through existing on-site infrastructure.

Effective water management is crucial to the long-term success of Northparkes operations as it is essential in the processing of ore through the concentrator to produce copper concentrate. The water management system aims to efficiently and economically collect, store and re-use water onsite to minimise external water supply inputs and supplement supply during periods of high consumption.

In accordance with its licences and the Consent, Northparkes:

- accesses groundwater from the Lachlan Alluvial Water Sources
- holds water entitlements for surface water extraction from the Lachlan River.
- can trade additional water to make up shortfalls or sell any excess water in a reporting period.
- uses existing water entitlements to supplement demand.

The water supplied by Northparkes licenses for mining activities during the 2020/2021 water reporting period is detailed in Table 31.

Table 31 Northparkes 2020/2021 Mine Water Entitlements and Use

Water Licence	Water sharing plan, source and management zone	Licensed Volume (ML)	Passive take/ inflows	Active Pumping	Total
WAL43208	Lachlan River Water Sharing Plan Lachlan River Regulated River Water Source (High Security)	1305	0	No	972.95
WAL43207	Lachlan River Water Sharing Plan Lachlan River Regulated River Water Source (General Security)	3463	0	No	0
WAL34955	Lachlan River, Water Sharing Plan NSW Murray Darling Basin Fractured Rock Groundwater Sources	232	<10	No	<10
WAL32138	Lachlan River, Water Sharing Plan Lachlan Unregulated and Alluvial Water Sources	1110	0	No	0
WAL32120		1050	0	Yes	264.44
WAL32004		1600	0	Yes	216.27
WAL31969		1728	0	No	0
WAL31963		700	0	No	0
WAL31930		600	0	No	0
WAL31863		534	0	No	0
WAL31850		500	0	No	0

Core water demand during the 2021 reporting period was for ore processing. Small quantities of water were also required for dust suppression, vehicle wash down and potable water uses. Table 32 outlines future estimated water volumes as described in the EA (Umwelt, 2013). Water demand predictions were initially provided in the EA and have remained unchanged through subsequent project modifications.

Table 32 Predicted Water Demand

Water Source	Current Approved Operations (ML)
External	4,350
Recycled	2,091
Surface Water Runoff	523
Groundwater	290
Total	7,254

8. REHABILITATION

Northparkes owns and manages approximately 10,500 ha of land within and surrounding the mine leases. This area supports a range of land uses including mining, exploration, crop production and habitat re-establishment.

Rehabilitation activities incorporate the entire landholding in order to enhance the regional landscape and native habitat values. The Rehabilitation Strategy is described in Sections 2.0 and 3.0 of Appendix 4 of the EA. The State and Federal approvals require rehabilitation to be consistent with the Rehabilitation Strategy (i.e. Schedule 3, Condition 39 of DC11_0060). The MOP summarises the key elements of the Rehabilitation Strategy as well as providing a description of activities and mine landform. As discussed within the 2020 to 2022 MOP, there are limited opportunities for progressive rehabilitation, however activities were carried out in accordance with the MOP.

The Rehabilitation Management Plan (RMP) was prepared to guide the ongoing management of the sites progressive rehabilitation as to ensure that it is integrated with the surrounding Northparkes owned land and is managed with a view to enhancing the regional landscape and native habitats.

8.1 Post Mining Land Use

Northparkes is committed to developing a stable landform that is capable of supporting sustainable ecosystems and enables sustainable land use after the completion of mining operations at Northparkes.

The agreed final land use as stated in the Consent includes the following:

- Agricultural land use
- Native vegetation re-establishment and conservation
- Restricted land use and
- Limestone State Forest.

8.2 Northparkes Farms and Adjacent Vegetation

Agricultural land around the mine site is used primarily for cropping in combination with native vegetation communities. Since acquiring the agricultural holdings, Northparkes has placed considerable emphasis upon sustainable agricultural practices to minimise off-site impacts including:

- Removal of stock to minimise impacts to soil and vegetation
- Conservation tillage practices and
- Soil conservation works (including stubble retention).

Wherever possible, Northparkes has maintained remnant vegetation within its landholdings. An important component of the rehabilitation strategy is the development and implementation of revegetation plans that link the significant areas of remnant vegetation with wildlife corridors and enhance ecological value.

Land management aspects are monitored on a continuous basis across the mining lease and farms through inspections conducted by the Environment and Farms team. These aspects include vegetation clearing activities, topsoil management, invasive weed and animal pest mitigation.

Scheduled inspections (known as Zero Harm Operations Walks (ZHOWs)) of areas within and surrounding the Northparkes mining lease, including the farms, are undertaken either on a quarterly or biannual basis. ZHOWs assess aspects of land management, soils, water and dust.

8.3 TSF1 Final Landform

During 2019, discharge of tailings using the central discharge method was undertaken to assist the final formation of TSF1. This method creates a self-draining final landform that assists with closure of the facility. The central discharge requires the discharged of tailings in thin layers to enable drying. As such, the tailings discharge will continue to occur over several years. There was no deposition of tailings on TSF1 during the reporting period, however it is planned for 2022.

Rehabilitation related works were carried out on the TSF1 North and East embankment buttresses during the period, to repair patches of erosion from increased rainfall. The repair works were completed, however further work to create the final growth medium cover will be required in the next reporting period.

8.4 E22 Waste Rock Batter

A small area on the western batter of the rehabilitated E22 waste rock emplacement had erosion repairs carried out in 2021. The area was reshaped, with erosion gutters and benches removed to create a consistent gradient (Figure 27). Growth medium was sourced immediately below the area from a rehabilitation stockpile that was against the Sediment Pond #3 embankment.

Heavy rainfall immediately after the growth medium was applied, but before seed had germinated, has resulted in minor erosion rills forming. This area will be monitored in the next reporting period to determine if further works are required.



Figure 27 E22 waste rock batter rehabilitation repairs

8.5 Estcourt TSF North and Western Embankment

The final planned lift of Estcourt TSF occurred during the reporting period, creating the final landform for the northern and western embankments. No growth medium has been added to the waste rock constructed embankments during the reporting period.

8.6 Research and Rehabilitation Trials

8.6.1 TSF1 Trial Plots

Since 2008, the Centre for Mined Land Rehabilitation (CMLR) has carried out a range of rehabilitation studies in association with the TSFs. The field trial component is focused on four trial plots of 20m x 20m within the southwest corner of TSF1, separated from active deposition. Each plot has different levels and layers of cover over the tailings.

Table 33 TSF1 capping trial design specifications

Design	Plot A	Plot B	Plot C	Plot D
	No specific cover	Shallow cover	Shallow cover with capillary break	Standard cover
Topsoil [m]	0.1	0.1	0.1	0.1
Waste rock [m]	--	0.4	0.4	0.9
Capillary break [m]	--	--	0.3	--
Total trial depth [m]	0.1	0.5	0.8	1

The plots have demonstrated that the tailings generally contain low concentrations of sulphide bearing minerals and some residual metals such as copper. Physically, they are characterised by relatively low hydraulic conductivity and small percentage of continuous macro-pores, which has limited free drainage but shows crack development close to the surface.

The following criteria for an optimal cover design informed the decision for the field trial plots:

- Avoidance of deep drainage
- Sufficient depth of soil for plant growth
- Storage of precipitation and
- Prevention of upward salt movement.

Modelling of the water balance for various cover design scenarios showed that for the climatic conditions of Northparkes, the contribution of vegetation to extract moisture from the cover could greatly improve the performance (i.e. reduces the risk of deep drainage). The maximum depth from which upward water flow caused by evaporation has been derived from modelling is approximately 1.8 to 2m. This depth would ensure avoidance of surface salt accumulation. In case of shortcomings of topsoil or other fine textured material, upward flow from a saline subsurface layer can be interrupted by a capillary break layer, consisting of coarse competent rock, which would allow a reduction of the cover thickness.

Drone photos have been taken of the trial plots from 2019 onwards. These records assist to monitor the differences between groundcover percentage and indicate species diversity between each plot across the reporting years (Figure 28). Plot A continued to maintain the highest percentage of groundcover and higher species diversity. Plots C and D increased in both groundcover percentage and species diversity between 2019 and 2021.

With increased rainfall over 2020 and 2021, which is significantly more than the preceding drought years, the increased groundcover across the plots is expected. The assessments will continue into the next reporting period.

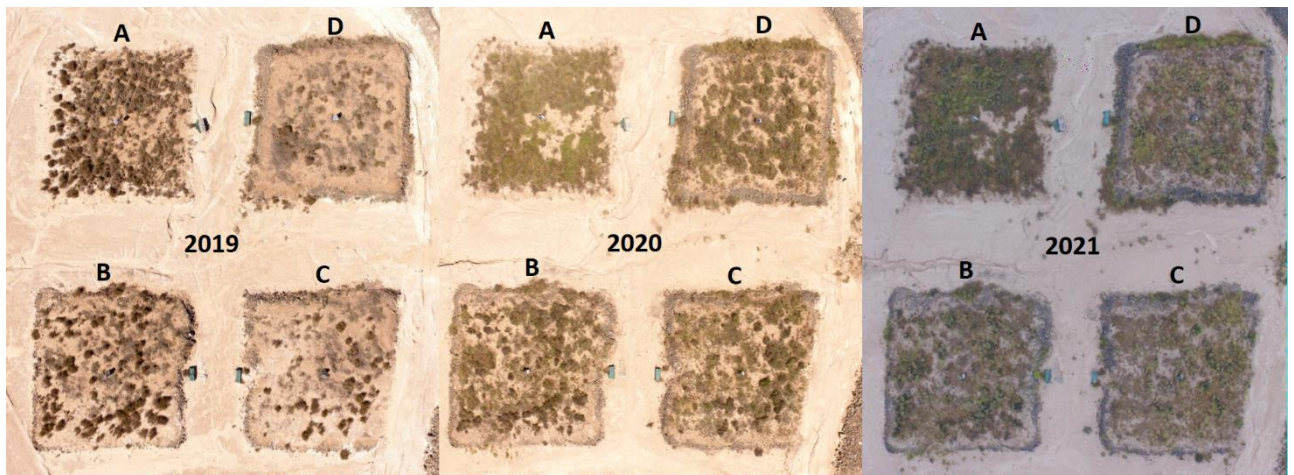


Figure 28 TSF1 trial plot groundcover comparison from 2019 to 2021

8.6.2 TSF2 Direct Revegetation

Since 2015, a range of projects on the existing TSFs to reduce potential dust lift off have been undertaken. The establishment of vegetation directly onto tailings has not only proven to be an effective dust control strategy but has demonstrated vegetation establishment directly within the saline tailings surface is possible.

During May 2020, the majority of the TSF2 tailings beach was sown to barley. With a wetter than average year the germination rates and plant establishment was successful in reducing dust. A visual assessment of cover across TSF2 was carried out in 2021 and it was determined that a barley crop was not required.

Over the past five years, local native salt bush and blue bush species have colonised TSF2 and continue to provide ongoing dust management. The ongoing success of native vegetation species to establish directly in the TSF2 tailings has initiated a multi-year study into the potential for the tailings material to be used as a growth medium for long term rehabilitation. Due to the limited access to TSF2 during the reporting period from the enforced exclusion zone, limited studies were carried out in 2021.

To build on the study carried out in December 2020 by Landloch, a strip of chicken manure fertiliser was added across the TSF2 beach in 2021. As can be seen in Figure 29, the manure was added to a section of the TSF with minimal native species established. When access to the TSF2 beach is accepted, an assessment of the vegetative response will be assessed.



Figure 29 Chicken manure spread across TSF2 in 2021

During 2020, a mix of native salt bush and blue bush species were sown in strips across TSF2, which has accelerated the native vegetation cover across the tailings. Figure 30 shows the established native species in the northeast corner of TSF2 from the tailings beach (Feb 2021) and via a drone (May 2021). Further assessment of species diversity and contribution to groundcover percentage will be carried out in 2022, once access to TSF2 is allowed.



Figure 30 Bluebush and saltbush established directly within the TSF2 tailings (2021)

8.6.3 Tailings Cover Research Application

Within the reporting period the University of Queensland put in a funding application under the Australian Research Council linkage projects seeking funding for detailed research into tailings rehabilitation at Northparkes.

The study aims to develop indicators of early soil formation processes in Northparkes tailings, driven by bio-geochemical and physical weathering processes and their feedback mechanisms for the purpose of sustainable rehabilitation outcomes. The study includes field monitoring and laboratory methods.

The research builds on the above-mentioned tailings outcomes on TSF1 and TSF2, with the funding expected to be determined in 2022.

8.6.4 Material Resource Assessment

As detailed in the MOP, Northparkes initiated a materials resource assessment to better understand the quantity and quality of stockpiled material required for closure. The report was completed in June 2021 and assessed topsoil, subsoil and waste rock stockpiles for both volume and suitability as a growth medium.

The review of topsoil and subsoil stockpiles indicated that the volumes within the previous register were below the actual amounts. The stockpile volumes were calculated in 2021 using LiDAR data, where as it is believed that the previous topsoil volumes were based on a mixture of methods, such as number of truck loads. The 2021 Landloch study showed an increase of 11% for topsoil and 57% for subsoil over previous recorded totals. The stockpiled material is adequate to meet the required volumes used in the most recent Rehabilitation Cost Estimate.

Topsoil material was considered adequate quality for use as the primary growth medium. The limiting factors for subsoil for use in rehabilitation is sodicity, salinity and high acidity. Specific amendments were suggested for both topsoil and subsoil to address any potential limitations to plant growth.

Landloch have separated the subsoil stockpiles into two categories, non-saline and saline. Those subsoil stockpiles with high salinity values were considered to be limiting to plant growth for all but salt tolerate species. Therefore, those subsoil stockpiles identified as saline, will not be able to be used for any domains other than the already saline tailings facilities.

8.7 Rehabilitation Status

The areas rehabilitated to date include the E26 Oxide Dump, E26 Lift 1 Mullock Dump and waste rock dumps surrounding the E22 pit. None of these rehabilitated areas have been signed-off as final by regulators.

In 2009, DnA Environmental established a total of 19 monitoring sites which included four mixed woodland and three native grassland reference sites. These monitoring sites are assessed on a three-year basis, with the latest monitoring being carried out in the 2020 reporting period. The monitoring results from 2017 were included in previous Annual Reviews.

All reference sites have been subjected to some prior form of disturbance, in particular clearing, logging and grazing and some sites were likely to be older regrowth. Exotic annual grasses and a range of other agricultural weeds such were also common.

The 12 rehabilitation monitoring sites were a combination of mixed native woodland and grasslands communities which occurred on various waste emplacements (E22, E26, E27) and on the sides of TSF1 and TSF2. Some sites were also established in revegetation areas located around the farming properties (Kundibah, Beechmore and Altona) as well in the Limestone Forest Offset (LFO) area. Separate monitoring reports have been prepared to record ecological changes occurring in the Estcourt and Kokoda Offset Areas. The monitoring sites were chosen based on their final land use/vegetation community type and year of establishment and were considered to be representative of the rehabilitation area as a whole.

The mine sites rehabilitation status at the end of the 2020 reporting period are in line with the 2020-2022 MOP schedule. The detail within Table 34 aligns with the details within the 2020-2022 MOP.

The TSF1 external batters and tailings beach landform represent the 102ha of land being prepared for rehabilitation within Table 34. Erosion of the TSF1 external batter was identified during the reporting period. Initial works to fix the erosion were completed in the 2020 and 2021 reporting periods.

During the 2021 reporting period the Estcourt TSF final planned embankment raise occurred creating the final landform for the north and western embankments. A portion of the E22 waste rock emplacement was used to source construction material for Estcourt TSF construction. These two activities resulted in the changed rehabilitation status areas in the 2021 reporting period. These were also detailed within MOP Amendment A.

Within the 2022 reporting period, not major changes in rehabilitation status is planned. Further works will be done on the TSF1 batter, TSF1 beach and E22 waste rock emplacement, however they will not alter the 2021 status.

There are no current or foreseeable issues that may affect the ability to successfully rehabilitate the site. Table 34 and Figure 31 provides the status of disturbance and rehabilitation as per 'Table 8' of the guidelines.

Table 34 Rehabilitation Status

Mine Area Type	2020 Reporting Period (Actual)	2021 Reporting Period (Actual)	2022 Reporting Period (forecast)
Total Mine Footprint	1,145	1,160	1,160
Total active disturbance	876	873	873
Land being prepared for rehabilitation	102	131	131
Land under active rehabilitation	163	156	156
Completed Rehabilitation	0	0	0

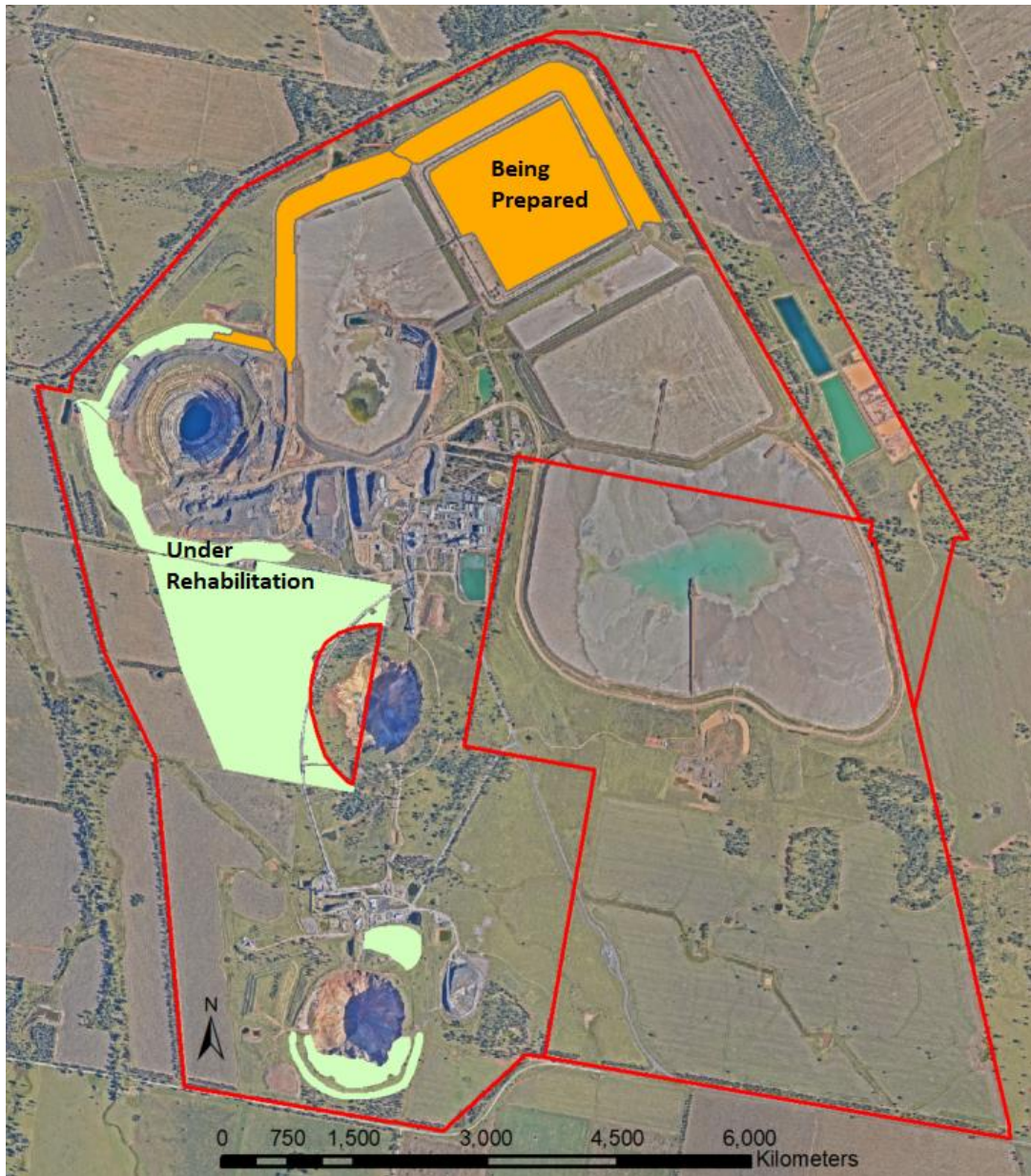


Figure 31 Rehabilitation status at the end of the reporting period

8.8 Rehabilitation Actions for the next Reporting Period

As per the commitments within the current MOP period, the following rehabilitation activities will be carried out:

- The ongoing monitoring of the established tailings cover trial plots on TSF1 will continue, which is detailed within Section 8.6.1
- Continued research into the vegetation established directly into the tailings, which is detailed within Section 8.6.2 and
- Erosion repairs for the outside batter of TSF1 will continue into the next reporting period.
- Creation of the final landform for the Estcourt TSF embankments
- The rehabilitation phase will change for the portion of the E22 waste rock emplacement where material is being sourced for Estcourt TSF construction.

9. COMMUNITY RELATIONS

9.1 Reporting Period Summary

The Northparkes Stakeholder Communications Management Plan (the Plan) guides Northparkes relationship with the community in which it is licensed to operate. The Plan aims to address the various and, at times, diverse needs of Northparkes stakeholders: employees, community and government. During 2021, despite the challenges of COVID-19, Northparkes:

- Expanded stakeholder relationships
- Worked closely with the community and proactively participated in community initiatives
- Invested in the future of the community through community contributions, strategic partnerships, and scholarship programs
- Recognises the importance of positive relations with its community and takes this into account in the operation of its business and the decisions made.

9.2 Community Engagement

Northparkes engages directly and regularly with the local community to both understand community issues and to keep the community updated about activities relating to the operations at Northparkes.

The Northparkes Community Consultative Committee (CCC) was established in 2006. The CCC provides an open forum to discuss any issues relating to Northparkes and its impact on the local community. The CCC comprises an independent chairperson, several local council and community members and Northparkes personnel. Three meetings were held in the reporting period in March, July and November 2021. The primary topics covered within the period related to the Modification 6 and E44 Rocklands SSD approvals works. A range of considerations were raised, however no significant issues were raised during the meetings held with the CCC during the reporting period.

Northparkes hosts formal meetings open to neighbours twice a year and meets with many neighbours individually throughout the year. During 2021, we held a meeting in March to provide an operational update, we then met again in July to provide an update on the E44 Rocklands SSD Project. For the July meeting, there were two sessions held, one at the Adavale Community Hall and the other at the Parkes Services Club.

Northparkes held a community walking day at the Kokoda Biodiversity Offset in December of 2021 inviting the Lachlan Landcare Group, National Parks Association Lachlan Valley Branch, Parkes Rotary and general community, to view the completed revegetation works that had occurred over the past 18 months. Discussions were held regarding follow up events and use of the offset property for additional community events.

The Northparkes Facebook and LinkedIn page were used actively as a two-way communication channel by both Northparkes and the community in 2021. The Northparkes Facebook Page has over 4,000 followers and LinkedIn has over 9,000 followers.

9.3 Social Impact Assessment

In August 2021 Umwelt finalised a Social Impact Scoping Report for the Northparkes E44 Rocklands Project. The report was submitted as an attachment to the Scoping Report submitted on the Major Mines portal in September 2021. The full Social Impact Study will be completed in future years as the project developments.

The completed social assessment included the compilation of a social base profile and a range of targeted engagement. The targeted engagement included:

- 1:1 meetings at nearby residences
- Public meetings
- Targeted meetings with stakeholder groups such as the Wiradjuri Executive Committee, Community Consultative Committee, Business Chambers and Water User groups.
- Website, social and paper media advertising
- Regulators presentations

9.4 Contributions and Achievements

In line with its commitment to support a sustainable community, Northparkes has an investment program to manage financial support for local community events, committees and schools. This program encompasses a small number of carefully considered donations, the Northparkes Community Investment Program and the partnership programs. An independent sub-committee helps Northparkes make decisions regarding sponsorship requests from the local community, as part of the Northparkes Community Investment Program.

In 2021, Northparkes continued to provide financial assistance to local organisations that deliver benefits to the community investing in various sporting, educational, cultural, industry, environmental and agricultural programs.

The major initiatives in the reporting period included:

- Funding a Grants Officer Program in conjunction with Parkes Shire Council
- Funding for an Aboriginal project officer in conjunction with Parkes Shire Council
- A Sports Grant Program with the Parkes Shire Council
- Supporting education through the Parkes Life Education Program
- A community equipment scheme which provides community groups access to equipment such as marquees, a blow-up TV screen, a PA system, eskies etc. for use free of charge.



Figure 32 Members from community and sporting groups at the Community Investment Presentation.

Kokoda Revegetation Project

During the period, Northparkes were the recipient of the Land Works award from Skillset for the revegetation work carried out over the past two years at the Kokoda Biodiversity Offset. The Land Works award recognises a partnership that helps Skillset realise its aim of creating life changing opportunities for people in regional areas, specifically through career development in the environmental sector.

The revegetation project was also recognised for excellence in environmental improvement in the local community during the 2021 period, subsequently being nominated and awarded the Environmental Award at the Parkes Shire Council Australia Day ceremony in January 2022.



Figure 33 Northparkes Mines receiving the Skillset Land Works award for 2021

9.5 Complaints

9.5.1 Management of Complaints

Northparkes has a process for receiving, investigating, responding and reporting complaints received from community members. 24-hour external telephone lines are in place to allow the public to raise community concerns. These contact numbers are advertised on the website (www.northparkes.com).

Registered neighbours received via post an updated magnetised contact list including all relevant contact numbers of Northparkes personnel.

The website provides information about all aspects operations and has the capacity for the community to submit enquiries, concerns or complaints via e-mail direct to the Community and External Relations Advisor.

All complaints received across site are referred to the Community and External Relations Advisor, and are then responded to in a professional and timely manner. All complaints are recorded, with the outcomes of investigation findings and corrective actions communicated to the relevant personnel and reported in the Annual Review and the annual Northparkes Report.

Northparkes maintained its dust risk notification communication strategy in 2021. The Northparkes Environment Team distributes a weekly weather report, internally. If there is a high-risk dust day, the Community and External Relations Advisor sends an advance text message to any neighbour who may be affected. The message includes information about the expected high-risk day and any mitigating actions Northparkes plans to take, as well as the invitation to call the Community and External Relations Advisor if people have concerns or questions.

9.5.2 Registered Community Complaints

During the reporting period, zero complaints from the community were received. Northparkes was not advised of any complaints to a regulator during the reporting period.

Monthly summaries of complaints are made publicly available on the website at: <http://www.northparkes.com/news/#community-reports>

A number of concerns were raised by Northparkes neighbours to employees which were addressed adequately, preventing the neighbours making formal complaints. The concerns have been discussed in:

- Section 6.4.3: noise from the E48 vent fan
- Section 6.5.3: blasts heard from E26L1N draw bells

9.6 Workforce Profile

Wherever possible, local personnel are employed by Northparkes and its contractors. The team consists of 431 staff, with majority locally based. A breakdown of the local government areas where employees reside is presented in Table 35.

Table 35 Residential Locality of Northparkes Employees

Locality	Northparkes Employee Residency (%)
Parkes	68%
Forbes	13%
Dubbo	2%
Orange	2%
Peak Hill	3%
Other	12%

10. INDEPENDENT ENVIRONMENTAL AUDIT

As required by Schedule 6, Condition 9 and 10 of DC11_0060, Northparkes conducted an independent environmental audit in 2021 to the satisfaction of the Secretary. Northparkes commissioned a suitably qualified person to undertake the audit with all findings detailed in the audit report, available on the Northparkes website. A summary of the findings has been provided in Table 36 below:

In total, 256 conditions across the Consent, Environmental Protection Licence and Mining Leases were audited. The auditor found:

- 190 'compliant' findings (74%);
- 19 'non-compliant' findings (17 'administrative' and 2 'medium' risk) (7%);
- 20 'not triggered' findings (8%);
- and 27 'noted' (11%).

Table 36 Summary of findings and action plan from 2021 IEA

Risk Category of Finding (Administrative, Low, Medium, High)	Description of finding (Requirement, Description, Evidence)	Recommendation	Action	Due Date	Status	Incident Management Number
Development Consent 11_0060						
Administrative Non-compliance Schedule 2 Condition 8	Non-compliance: Consent PA06_0026 and DA DA11092 were surrendered on 20 June 2018. It is noted that the surrender of the consents occurred after the 12-month period specified in this Condition.	Northparkes request that this condition be removed during from the consent during the next Modification of Development Consent	Agree. Northparkes will seek to remove condition during MOD 6 assessment	31 Dec 21	In progress	9430
Administrative Non-compliance Schedule 3 Condition 5	Non-compliance: Section 8 of the Noise Management Plan details the noise monitoring program. No information relating to calibration or validation of noise monitoring results is contained in the plan. Section 6.5 defines what constitutes a noise incident and the reporting requirements.	Revise the Noise Management Plan to include the description of the operation of the unattended Noise Monitoring Program as a source of validation data.	Agreed. Northparkes will review the Noise Management Plan and include relevant information to comply with this condition.	30 Sep 21	In progress	9431
Medium Non-compliance Schedule 3 Condition 21	Non-compliance: On 15 April 2019 slurry from the Secondary Crusher discharged into Goonumbra Creek. The creek was dry at the time of the incident and the slurry was successfully removed. No water pollution occurred as a result of this incident. Note however, that the EPA issued an official caution as a result of the incident. The incident investigation undertaken by Northparkes identified operator error as the cause and implemented further training in materials management.	The incident has been investigated and appropriate action taken. No further action required.	Noted. No further action required.	-	-	-
Administrative Non-compliance Schedule 3 Condition 21(c)(i)	Non-compliance: Section 5.1 of the Water Management Plan provides an overview of the Site Water Balance. Section 5.1 does not contain detail regarding contingency planning or reporting procedures.	Review and revise Section 5.2 of the Water Management Plan to include all requirements of Schedule 3 Condition 23(c)(i).	Agreed. Northparkes will review the Water Management Plan and include relevant information to comply with this condition.	30 Sept 21	Complete	9432

Administrative Non-compliance Schedule 3 Condition 21(c)(ii)	<p>Non-compliance: The SWMP/WMP does not include:</p> <ul style="list-style-type: none"> • detailed baseline data on water flows and quality in the waterbodies that could be affected by the project (section 6 of the SWMP contains some baseline data on water quality (pH, electrical conductivity, total suspended solids and copper), but there is no data on water flows); • detailed plans, including design objectives and performance criteria, for the: <ul style="list-style-type: none"> - tailings storage facilities; - final voids; • detailed performance criteria, other than trigger levels, for: <ul style="list-style-type: none"> - the water management systems (clean dirty and contaminated); - downstream surface water quality; - downstream flooding impacts; and - stream and riparian vegetation health for Bogan River, Tenandra Creek, Goonumbra Creek and Cookpie Creek; • a program to monitor and report on downstream flooding impacts. 	Review and revise Surface Water Management Plan to include all requirements of Schedule 3 Condition 23(c) (ii).	Agreed. Northparkes will review the Water/Surface Water Management Plans and include relevant information to comply with this condition.	30 Sept 21	Complete	9433
Administrative Non-compliance Schedule 3 Condition 21(c)(iii)	<p>Non-compliance: The GWMP/WMP does not include:</p> <ul style="list-style-type: none"> - detailed baseline data on groundwater levels, yield and quality in the region and privately-owned groundwater bores that could be affected by the project (section 6 of the GWMP provides some baseline data regarding pH, TDS, and spatial and temporal variations in water quality across the Northparkes site near the ore bodies); - a program to monitor and report on groundwater inflows to the sub-level cave mining operations; - a program to monitor and report on background changes in groundwater yield/quality against mine-induced changes; - a program to validate the groundwater model for the project, and comparison of monitoring results with modelled predictions. 	Review and revise Section 5.2 of the Groundwater Management Plan to include all requirements of Schedule 3 Condition 23(c) (iii).	Agreed. Northparkes will review the Water/Groundwater Management Plans and include relevant information to comply with this condition.	30 Sept 21	Complete	9434

Administrative Non-compliance Schedule 3 Condition 41(a)	Non-compliance: No evidence was available to confirm that Council, BCD or the CCC were given the opportunity to review Rehabilitation Management Plan.	Ensure that during the preparation of the combined MOP / Rehabilitation Management Plan that the relevant stakeholders are consulted.	Develop the integrated MOP / Rehabilitation Management Plan in accordance with approved guideline and licence condition requirements.	31 Dec 21	Not yet commenced. In transition with Rehab reform.	9437
Administrative Non-compliance Schedule 3 Condition 41(b)	Non-compliance: No evidence was available to confirm that NSW Trade & Investment approved the Rehabilitation Management Plan.	Ensure that the revised Rehabilitation Management Plan / Mining Operations Plan is approved by relevant government agency.				
Administrative Non-compliance Schedule 3 Condition 41(c)	Non-compliance: DPIE considered that the plan did not appear to meet the requirements of the relevant NSW Trade and Investment Guidelines.	Ensure that the combined Rehabilitation Management Plan / Mining Operations Plan meets the requirements of the relevant guidelines.				
Administrative Non-compliance Schedule 3 Condition 41(d)	Non-compliance: The current version of the Rehabilitation Management Plan does not describe how the rehabilitation of the site would be integrated with the implementation of the biodiversity offset strategies.	Ensure that the integrated MOP / Rehabilitation Management Plan describes how the rehabilitation of the site would be integrated with the implementation of the biodiversity offset strategies.				
Administrative Non-compliance Schedule 3 Condition 41(g)	Non-compliance: While Table 5 of the Rehabilitation Management Plan notes the requirement, where possible, to implement interim rehabilitation, no details / strategy for interim rehabilitation is described.	Ensure that the integrated MOP / Rehabilitation Management Plan describes the interim rehabilitation strategy being or proposed to be implemented.				
Administrative Non-compliance Schedule 6 Condition 1(e)	Non-compliance: The EMS provides a high-level overview of stakeholder communications and references to the Stakeholder Communications Management Plan.	Review the Environmental Management Strategy / Stakeholder Communications Management Plan to include details of the stakeholder dispute resolution process.	Agreed. Northparkes will review the Stakeholder Communications Management Plan and include relevant information to comply with this condition.	30 Oct 21	Complete	9438

	<p>The Stakeholder Communications Management Plan contains a description of the Complaint Management process and processes for communications with regulators.</p> <p>Details of the dispute resolution process were not found in either the Stakeholder Communications Plan or the Environmental Management Strategy.</p> <p>The EMS contains a description of the Incident Management System. It is noted that reference to the RMSS (the system under which incidents are managed) is not described.</p>	<p>Revise the Incident Management Section of the EMS to include relevant details regarding the use of the RMSS.</p>	<p>Agreed. Northparkes will review the Environmental Management Strategy and include relevant information to comply with this condition.</p>	30 Oct 21	Complete	9439 9440
Administrative Non-compliance Schedule 6 Condition 3(a)	<p>Non-compliance: All plans contain relevant detailed baseline data except for the Noise Management Plan and Air Quality Management Plan.</p>	<p>Revise the Air Quality and Noise Management Plans to include detailed baseline data.</p>	<p>Agreed. Northparkes will review the Air Quality and Noise Management Plans and include relevant information to comply with this condition</p>	30 Oct 21	Complete	9441
Administrative Non-compliance Schedule 6 Condition 3(g)	<p>Non-compliance: Three of the plans (Environmental Management Strategy, Heritage Management Plan and Blast Management Plan) contained appropriate references to the Incident Management Process to be implemented.</p> <p>Two of the Plans (Traffic Management Plan and Heritage Management Plan) contained details of the complaint management procedure.</p> <p>Two of the plans (Environmental Management Strategy and Blast Management Plan) described the non-compliance management procedure.</p>	<p>Review and revise all plans to ensure that they contain consistent descriptions of the:</p> <ul style="list-style-type: none"> • Complaint Management • Incident Management; and • Non-compliance Management. 	<p>Agreed. Northparkes will review all management plans and update with current procedures to ensure consistency.</p>	30 Oct 21	Complete	9442
Administrative Non-compliance Schedule 6 Condition 4(b)	<p>Non-compliance: Section 6 of the Annual Reviews present the environmental monitoring summaries (and interpretations) for the reporting period. The assessment of performance against the individual environmental parameters includes a discussion of trends in the monitoring data and performance against trigger values (including statutory compliance criteria), however these sections do not specifically provide a comparison of actual against predicted impacts.</p>	<p>In future Annual Reviews ensure that for each category of impact presented in the EA, that an assessment of actual impacts against predicted impacts are reported.</p>	<p>Agreed. Northparkes will ensure that reporting period data is analysed against predicted impacts and reported in the Annual Review.</p>	30 Oct 21	In progress	9443

Administrative Non-compliance Schedule 6 Condition 4(e)	Non-compliance: The Annual Reviews do not specifically provide a comparison of actual against predicted impacts					
Administrative Non-compliance Schedule 6 Condition 11(a)	Non-compliance: Copies of all approved plans and strategies are provided on the website (under Environmental Management Plans, Programs and Reports) with the exception of the Rehabilitation Management Plan.	Upload a copy of the current Rehabilitation Management Plan onto the Northparkes website.	Agreed.	30 Oct 21	In progress	9445

Environmental Protection Licence 4784

Medium Non-compliance Condition L1.1	Non-compliance: On 15 April 2019 slurry from the Secondary Crusher discharged into Goonumbra Creek. The creek was dry at the time of the incident and the slurry was successfully removed. No water pollution occurred as a result of this incident. Note however, that the EPA issued an official caution as a result of the incident. The incident investigation undertaken by Northparkes identified operator error as the cause and implemented further training in materials management.	The incident has been investigated and appropriate action taken. No further action required.	Noted. No further action required.	-	-	-
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Mining Lease 1247

Administrative Non-compliance Condition 5	Non-compliance: A written incident report was provided to the EPA on 17 April (two days after the initial notification), however a report was not provided to the Resource Regulator.	Ensure that the Resources Regulator is notified of any reportable environmental incident in accordance with Mining Lease Condition 5.	Noted.	-	-	-
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The next independent environmental audit is scheduled for 2024.

11. INCIDENTS AND NON-COMPLIANCES

11.1 Non-compliances during the reporting period

As stated within Section 1 and 10, there were no non-compliances outside of the Independent Environmental Audit during the period. The auditor identified 17 administrative and 2 medium risk non compliances during the period which have been actioned accordingly. For more detail see Section 10 for a summary of the audit findings.

11.2 Summary Environmental Incidents

During 2021 there were 19 internal incidents with an environmental component reported across different event types and event outcomes. The details of incidents, likely causes, actions to date and additional proposed measures were uploaded into the risk management system (known as RMSS) in accordance with reporting procedures. The separation between near misses and incidents is detailed within Table 37.

Table 37 Environmental Hazards and Incidents in 2020

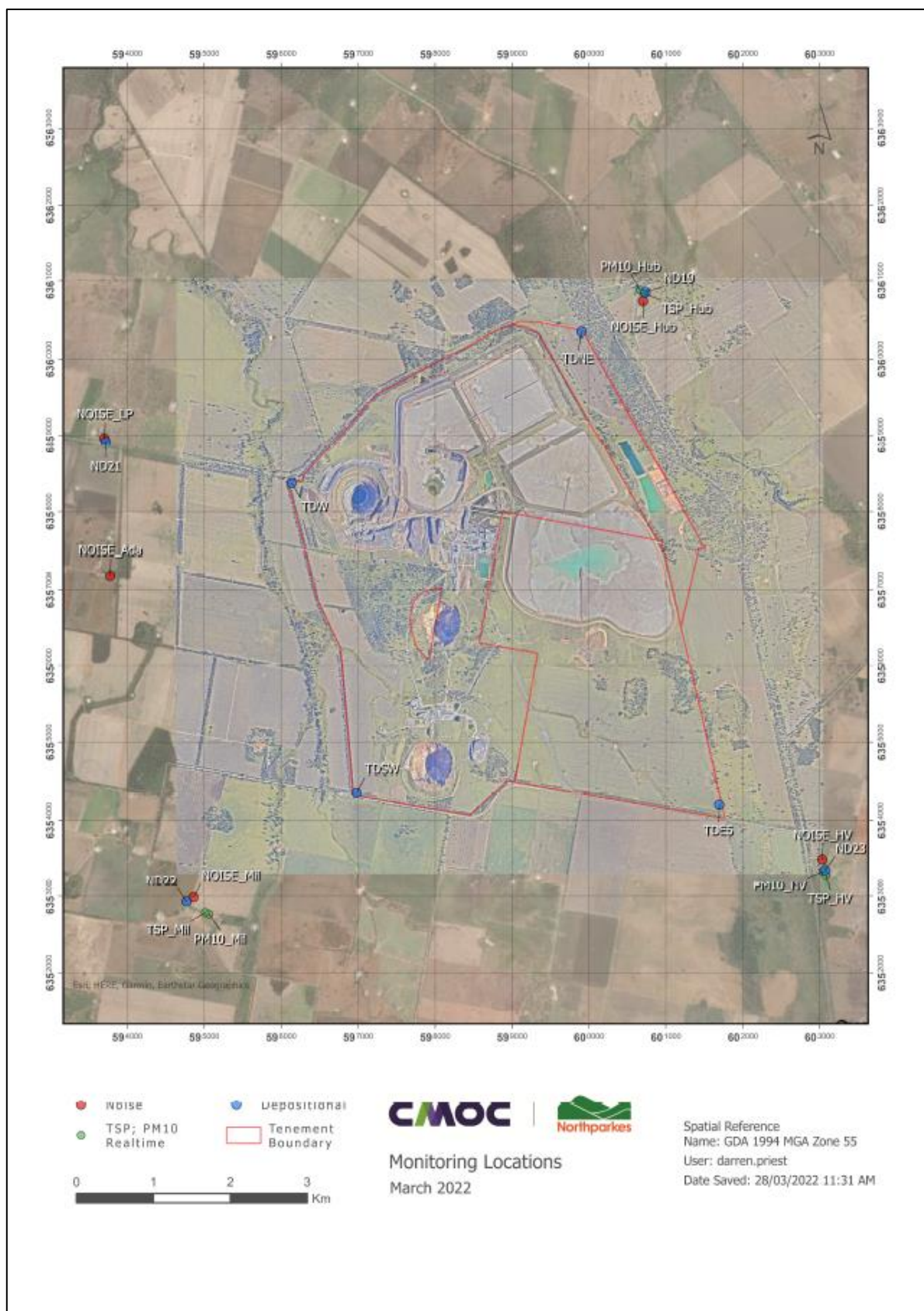
Event Type	Number
Damage/Report Only	1
Hazards	8
Incident Near Miss	3
Incident Actual	7
Total	19

12. ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Activities proposed for the next reporting period include:

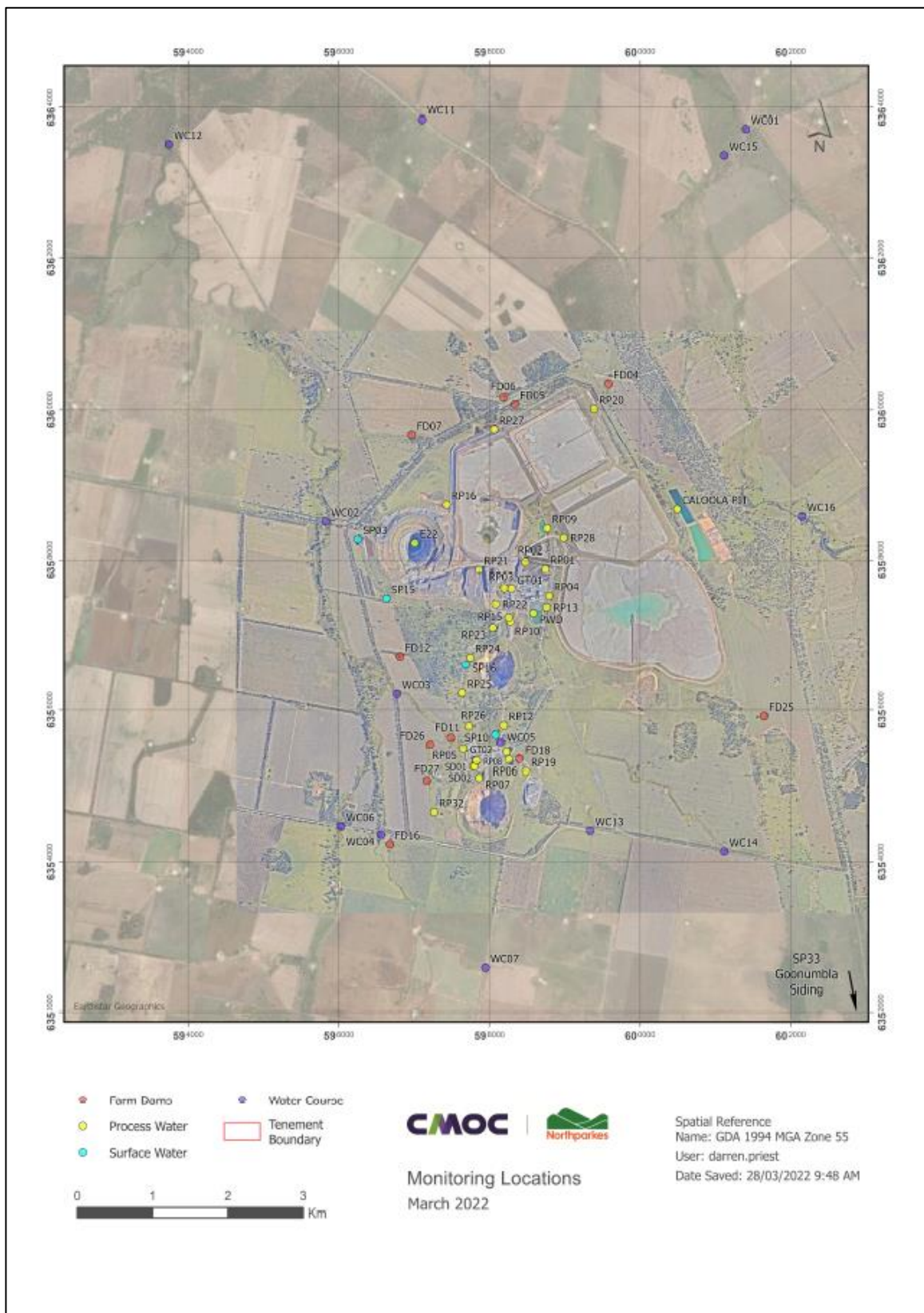
- The approvals for future works will continue to be progressed through both the Mod 6 and E44 Rocklands works. Mod 6 is planned to be a focus in the first half of the reporting period with the E44 Rocklands SSD being a multiple year process.
- An audit of compliance against the EPBC conditions will be completed within the next reporting period.
- In the first half of the next reporting period Northparkes will transition from the MOP process to the Rehabilitation Management Plan under the NSW Rehabilitation Reforms.
- An audit of the copper concentrate shipping loading facilities at Port Kembla will be carried out in the next reporting period. The focus will be to ensure contamination risks are continued to be managed after the concentrate has left Northparkes operations.
- The agreement between Northparkes and local Traditional Owners is ten years old. Within the next reporting period, the review of the Wiradjuri Executive Committee Agreement will begin.
- Review and revision of various Environmental Management Plans with a focus on outcomes from the outcomes from Mod 6.
- Continue the research aimed at improved long-term effectiveness of tailings closure covers

APPENDIX 1 DUST AND NOISE MONITORING LOCATIONS

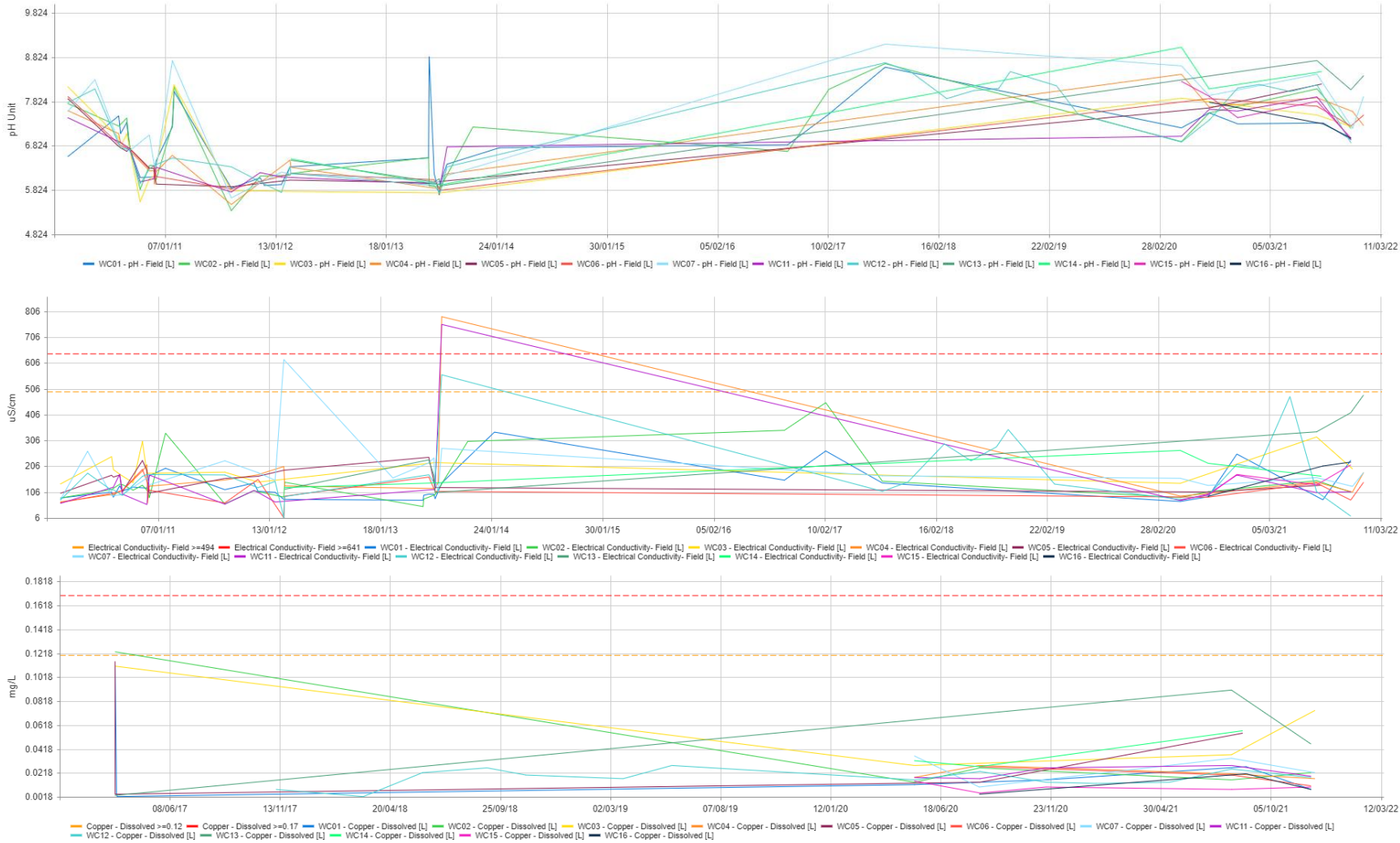


APPENDIX 2 WATER MONITORING

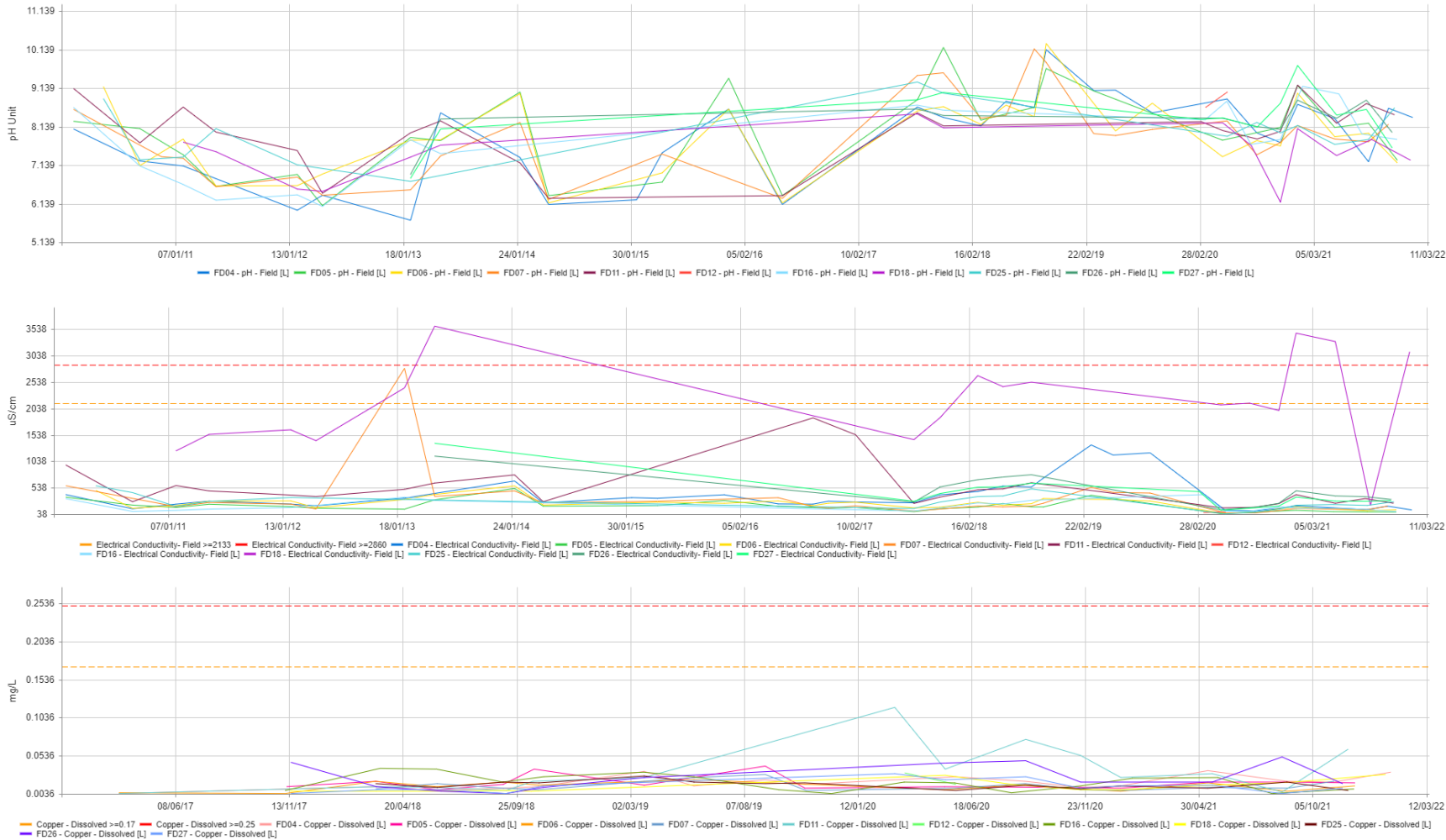
Surface water monitoring locations



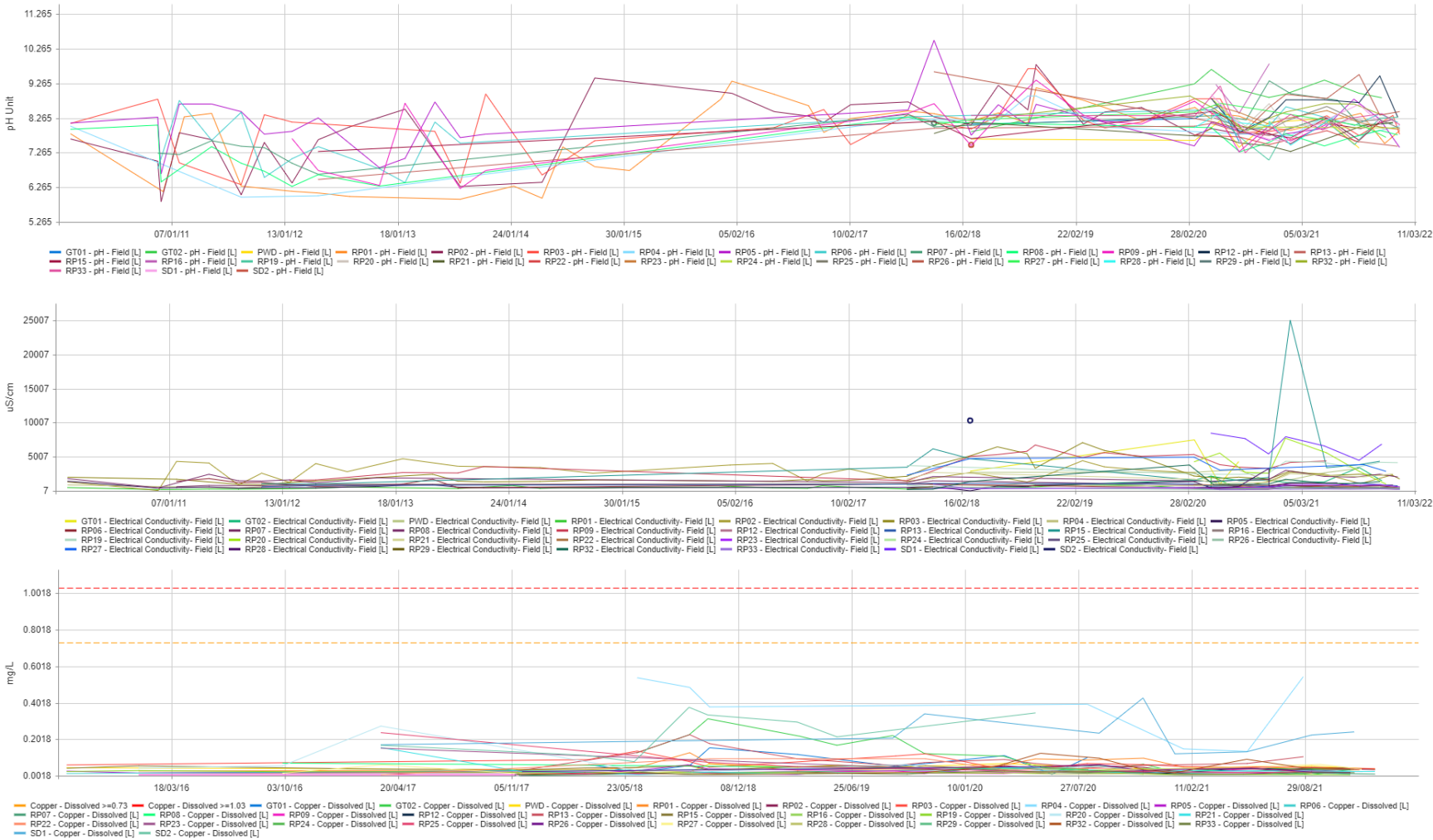
Surface water monitoring results – Water Course pH, electrical conductivity and copper



Surface water monitoring results – Farm dams pH, electrical conductivity and copper



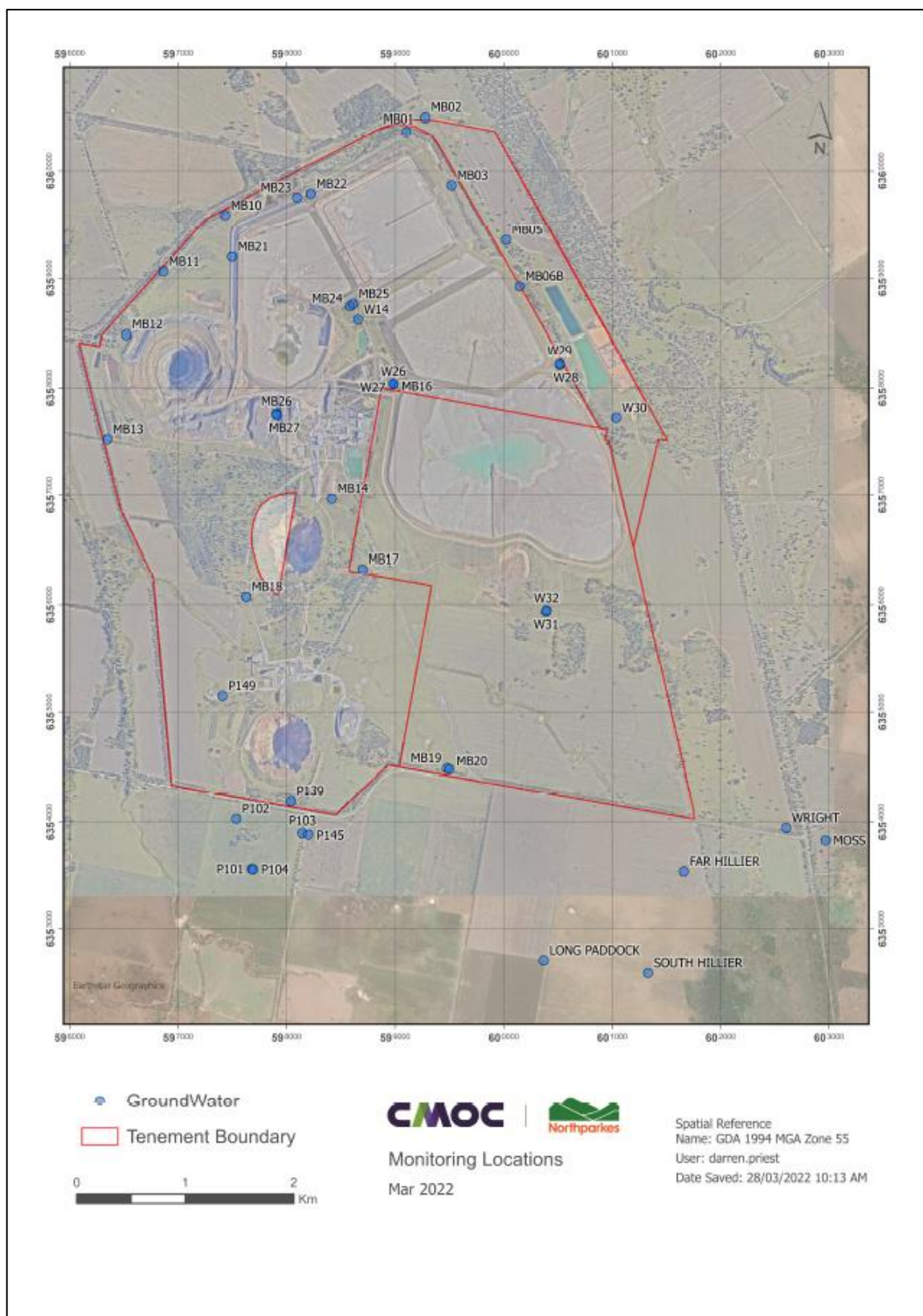
Surface water monitoring results – Retention ponds pH, electrical conductivity and copper



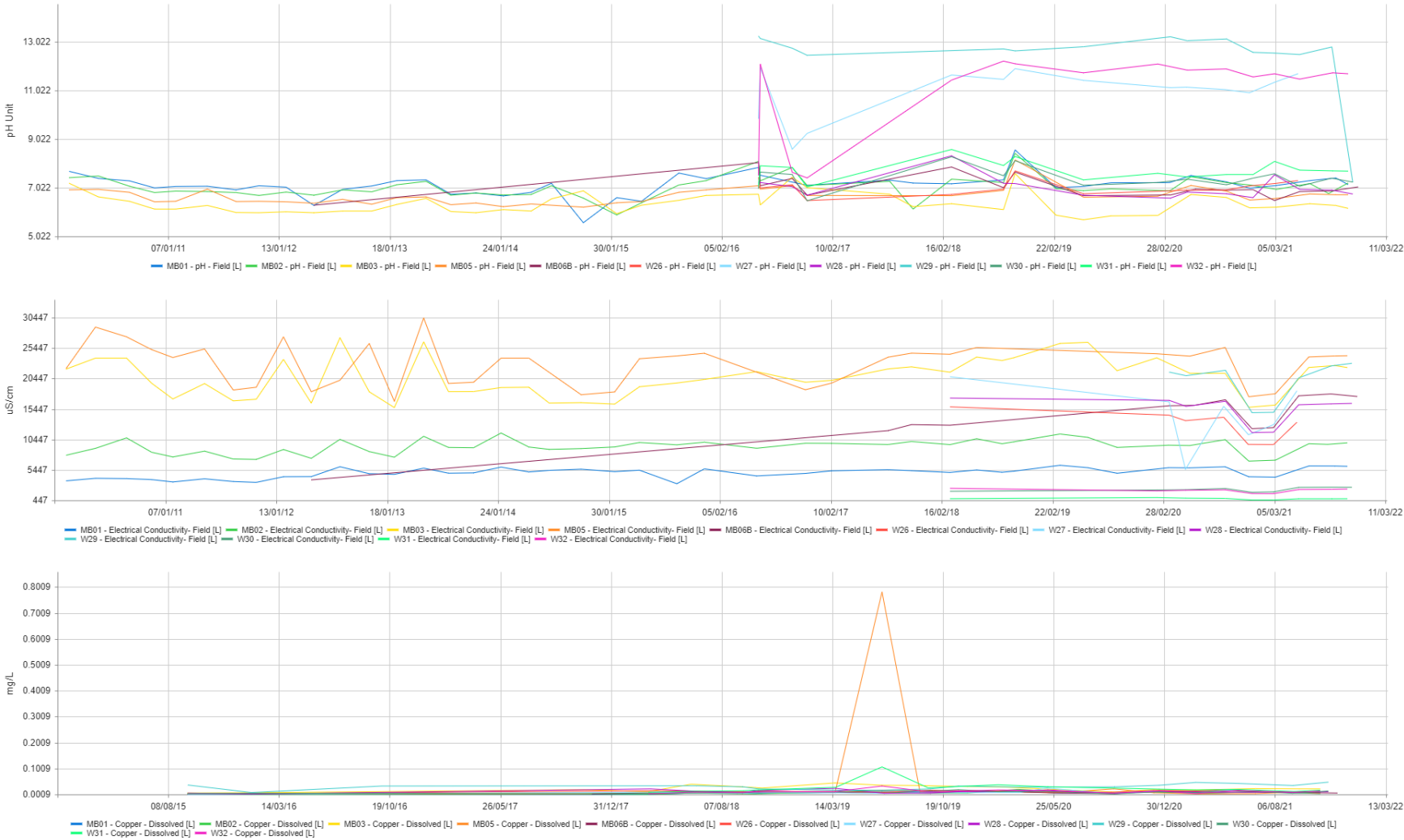
Surface water monitoring results – Sediment ponds pH, electrical conductivity and copper



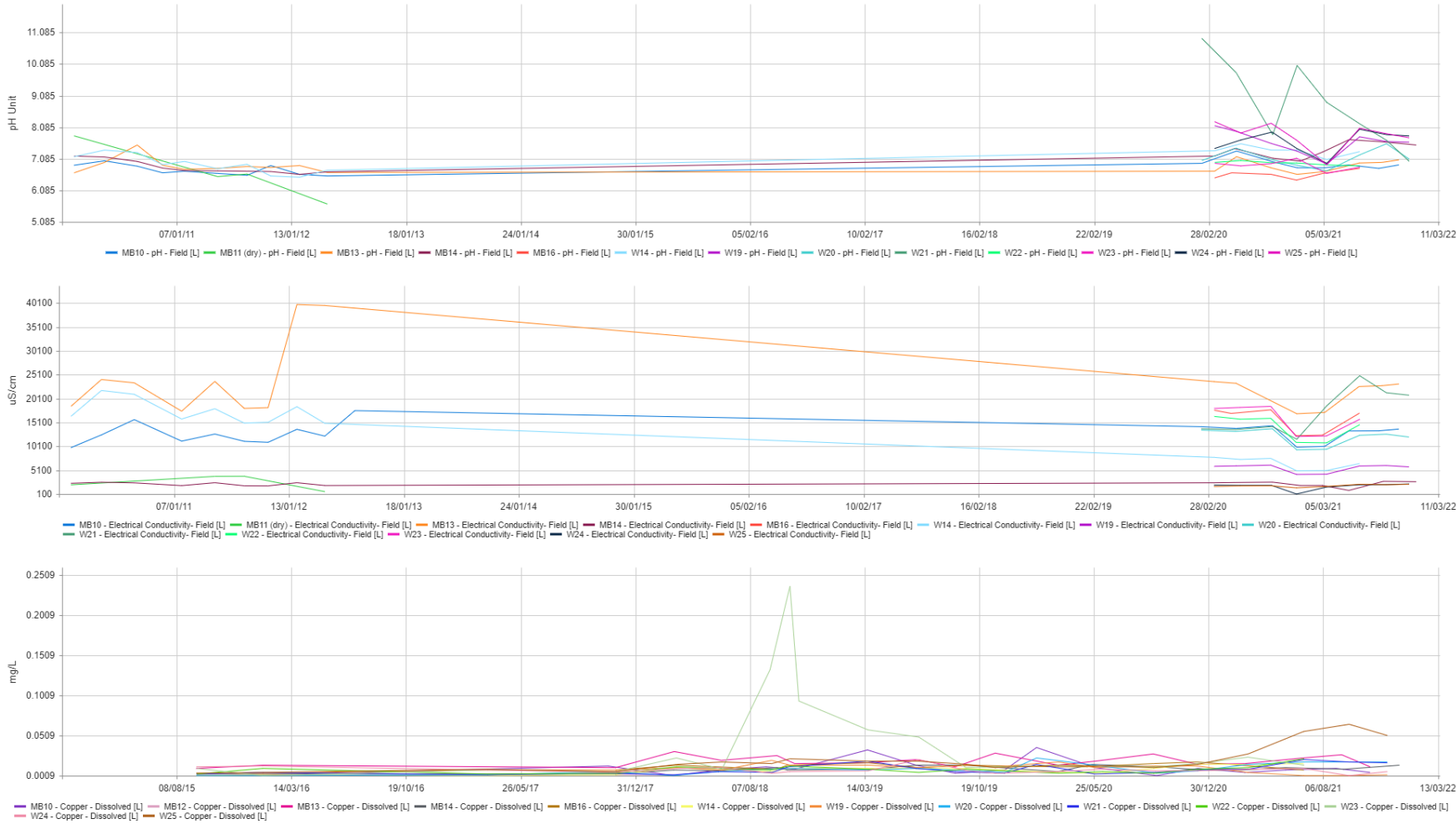
Ground water monitoring locations



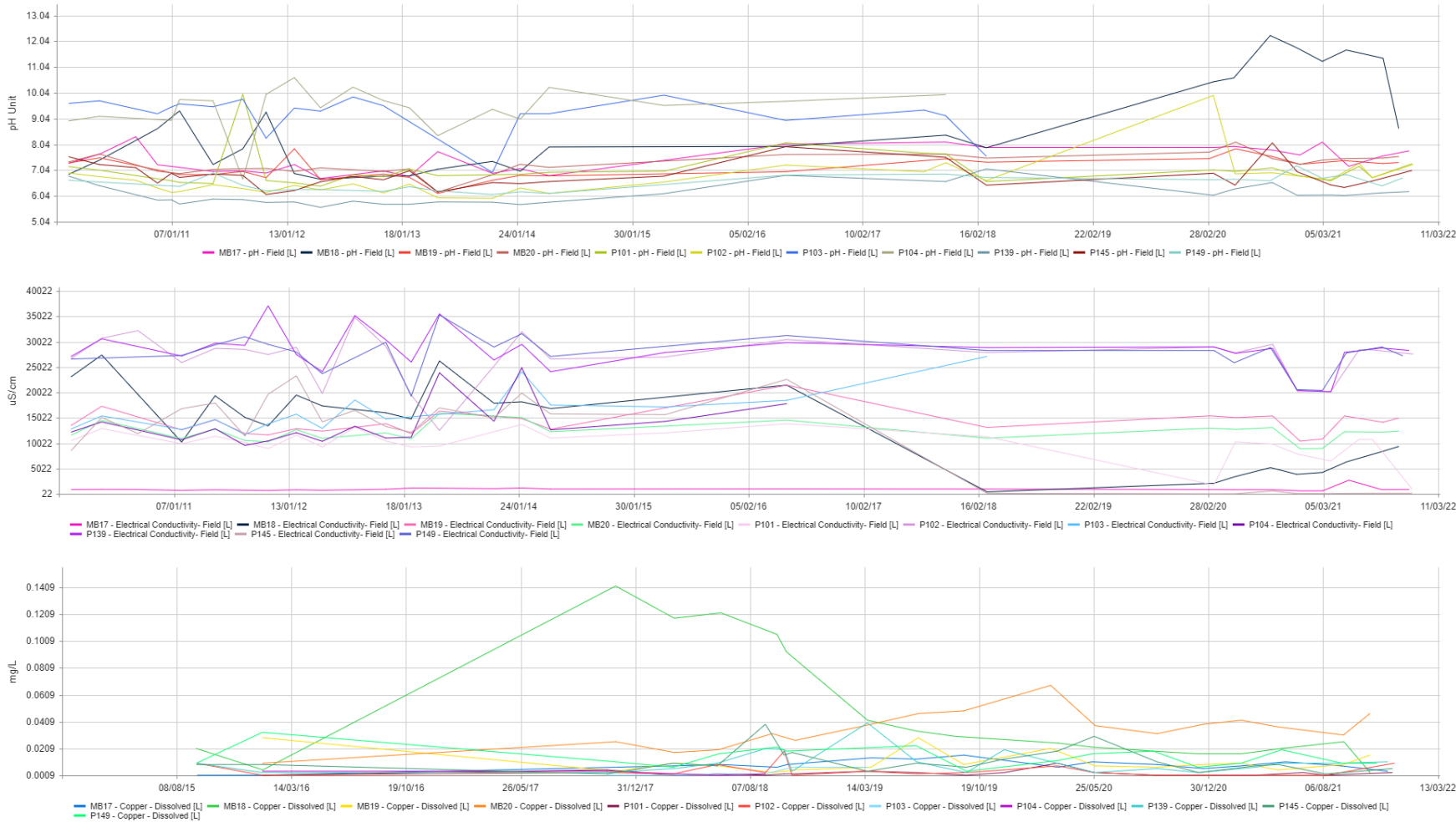
Ground water monitoring results – TSF bores pH, electrical conductivity and copper



Ground water monitoring results – Opencut bores pH, electrical conductivity and copper



Ground water monitoring results – Underground bores pH, electrical conductivity and copper



Ground water monitoring results – Regional bores pH, electrical conductivity and copper

