Northparkes Mines
PO Box 995 Parkes NSW 2870 Australia
T +61 2 6861 3000 F +61 2 6861 3101
www.northparkes.com

Northparkes Mines Annual Environmental Management Report

2016

January 2016 – December 2016

Name of Mine	Northparkes Mines
Name of Leaseholder and	CMOC Mining Pty Limited, Sumitomo Metal Mining Oceania pty ltd, and SC Mineral Resources pty ltd
Mine Operator	CMOC Mining Services pty Ltd operating as Northparkes Mines
Mining Leases	ML 1247, ML 1367 ML1641, ML1743
Environnent Protection Licence	EPL 4784
Development Consent	PA 11_0060 including Mod 1 and 2
MOP Commencement Date	1 Jan 2015
MOP Completion Date	1 Jan 2020
AEMR Commencement Date	1st January 2016
AEMR Completion Date	31st December 2016
Reviewed by	
Title	Stacey Kelly Manager - People, Safety & Environment
Date	
Signature	
Approved by	
Title	Stefanie Loader, Managing Director
Date	
Signature	

Revision Summary

First Issue	Issue Date	Implementation Requirements	Approved By
0	28 Feb 17	Report on environmental monitoring results from 2016	S. Loader

Version No.	Revision Date	Clause No.	Revision Details	Approved By
1				
2				

Approval Position	Automatic Notifications
Managing Director	

Hard Copy Locations	Associated Documents to be reviewed

Contents

List of Tables

List of Figures

1. EXECUTIVE SUMMARY

Northparkes Mines (Northparkes) is a copper and gold mine located 27 kilometres North West of Parkes in central west New South Wales, Australia. Northparkes is a joint venture between China Molybdenum Co., Ltd (CMOC) (80 percent) and the Sumitomo Groups (20 percent).
The Northparkes Step Change Project was approved with conditions by State and Federal regulators in 2014. Included in these approvals was an extension of the mine life to 2032, construction of new tailings storage facility (TSF), two new open cuts and associated infrastructure.

This Annual Environmental Management Report (AEMR) details the mining operations, production, and environmental management and community relations for Northparkes during the 2016 calendar year. Additionally, this AEMR will outline any changes from the current Mine Operations Plan (MOP) which was submitted in June 2016.

Operations during the Reporting Period

Northparkes operates two underground ore bodies, E26 and E48 to access copper sulphide porphyry ore bodies using the block cave mining method. Northparkes was the first Australian mine to use block caving as its mining method at E48 ore body.

A total of 6.17 Mt of ore was mined in 2016 from both E26 & E48 underground ore bodies.

A total of 6.07 MT of ore was processed in 2016 through the Mill.

Mill upgrade projects were carried out with the installation of a new Post Flots project and de bottlenecking.

The Rosedale Tailings Storage Facility Stage was completed and commissioned in 2016. A review of the trigger levels for surface and groundwater quality were conducted by an external consultant in 2016. This was presented through the resubmission of the Surface Water, Groundwater and Water Management Plan to the Department of Planning and Environment.

Environmental Performance

Environmental monitoring is a key component of Northparkes operation. A summary of the environmental monitoring undertaken at Northparkes in 2016 is provided below:

- Air Quality – exceedances were recorded for PM10 and TSP during the reporting period. These exceedances were investigated and attributed to farm activities such as shearing, cropping or stock movement and grazing.
- Surface Water – the overall water quality of surface water were generally consistent within long-term averages. There were fluctuations observed in the surface water quality resulting from the higher than average rainfall in 2016.
- Ground Water – groundwater levels and quality remained constant at all monitoring bores during the reporting period and are in line with long-term averages. Over the last 10 years, the groundwater levels at all bores have increased more than 2m due to higher rainfall and high infiltration rates.
- Noise – compliance monitoring (attended noise) occurred in March, June, September and December. During these monitoring periods, no exceedances in operational noise criteria were recorded. No exceedances were recorded through the real time noise monitors.
- Three cultural heritage survey was conducted in 2016. These were conducted in accordance with the Site Disturbance Permit requirements.

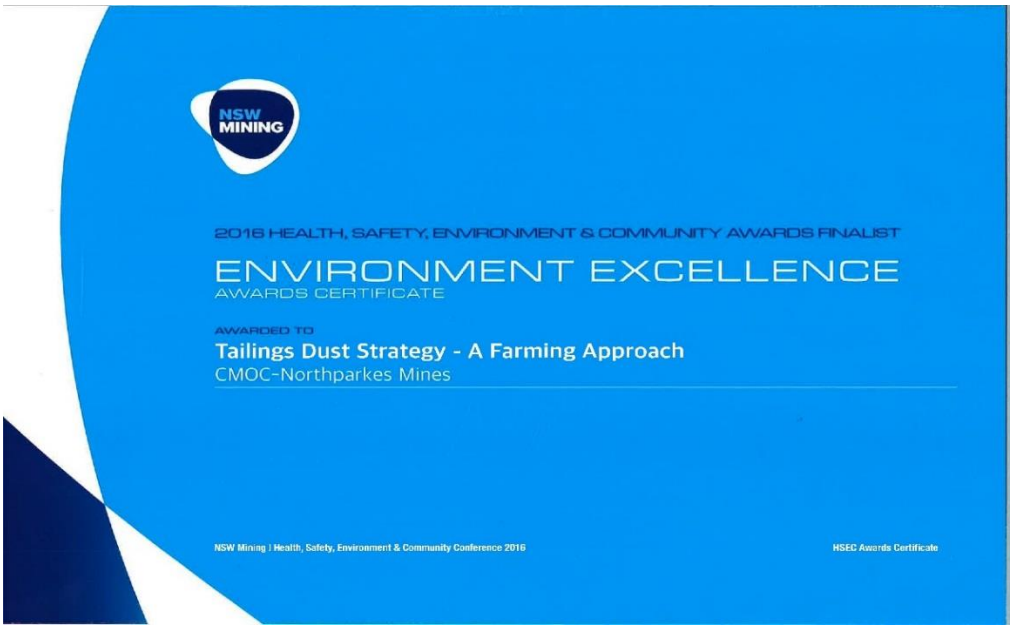
- Blasting – no surface blasting activities were conducted in 2016.
- Meteorological Monitoring - Total annual rainfall for 2016 was 699.8 mm which is 278 mm increase on rainfall received in 2015.
- Flora and Fauna – a range of flora and fauna surveys were undertaken in 2016, including assessments as part of the Rosedale Project as well as surveys at the Kokoda Offset Site. Surveys were conducted for pine donkey orchid populations within the Project Area and close to the Project Disturbance Boundary.
- Baseline ecological surveys were conducted at Kokoda for;
    - Floristic data using plot-based surveys;
    - Landscape Function Analysis (LFA) monitoring;
    - Targeted bird surveys in winter and spring;
    - Biometric vegetation surveys; and
    - Qualitative biannual inspections for weeds, pests and maintenance.

Rehabilitation - The Centre for Mine and Land Rehabilitation (CMLR) is continuing with the project regarding suitable cover materials for the Tailings Storage Facilities. The project assesses moisture levels within the cover profile in and tailings material.

Other Issues and Risks - environmental risks associated with Northparkes 'operations are recorded in the Environmental Aspects and Impacts Register. This was reviewed in 2016. This was conducted as part of the site wide annual risk register review process.

Community and External Relations - Northparkes engages directly and regularly with the local community to understand community concerns or issues, and to keep the community updated on activities relating to Northparkes' operations. In 2016, Northparkes continued to provide assistance to local community organisations in the form of in-kind support via the Northparkes Community Volunteer Leave Program and financial assistance via the Community Investment Program. Northparkes contributed 1220 hours of volunteering to community programs and $353,000 was invested in various sporting, educational, cultural, environmental and agricultural programs in 2016. No community complaints were received in 2016.

Northparkes Mines was a finalist in the 2016 NSW Mining, Health, Safety, Environment and Community Awards (pic below) for the use of farming techniques to assist in the management of dust from the Tailings Storage Facilities.



Northparkes Mines was also awarded the 2016 NSW Mining, Health, Safety, Environment and Community Health Excellence Award for the Heart at Work program.

Year in Review 2016

	2015	*2016*	*2017 (Plan)*
General			
Government fines	0	0	0
Reportable incidents	16	2	0
Legal compliance	✓	✓	✓
ISO 14001 certification	✓	✓	✓
Mining			
Concentrate production (t)	151,518	137,145	124,894
F/T employment level	324	353	317
Total land clearance (ha)	45	5	10
Total land rehabilitation (ha)	0	0	0
Community			
Complaints	2	0	0
Main complaint issue	Dust/Traffic	Nil	NA
CCC meetings	1	2	2
Investments ($)	381,000	353,000	350,000

2. INTRODUCTION

A summary of Northparkes' operations, setting and localised weather conditions experienced during the reporting quarter.

2.1 Scope

The Annual Environmental Management Report (AEMR) details the environmental performance of Northparkes from 1 January 2016 – 31 December of 2016 and outlines proposed actions for the next reporting period. The AEMR applies to Northparkes' activities being undertaken on Mining Leases (ML) 1247, 1367, 1641, ML1743 and Goonumbla Rail Siding.

The AEMR has been prepared in accordance with the NSW Department of Trade & Investment (DTI) "AEMR Guidelines for MOP's prepared to EDG03 requirements", which is the most current guideline available for the preparation of an AEMR. The current MOP has been prepared in accordance with ESG3 Mining Operations Plan MOP Guidelines September 2013. Project Approval 11_0060 Schedule 6, Condition 4 also includes a requirement to complete an AEMR, this states;
"*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*".

Compliance against conditions stated in the Project Approval (11_0060), including Modifica*tion 1 and 2 (Appendix 1) are required to be reported in the AEMR and are therefore included in this document.*

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

- Department of Industry Resources and Energy (DRE);
- Department of Planning and Environment (DPE);
- Department of Primary Industries – Water;
- Parkes Shire Council (PSC);
- Forbes Shire Council (FSC)
- NSW Office of Environment and Heritage (OEH);
- NSW Environment Protection Agency (EPA);
- Peak Hill Local Aboriginal Land Council (PHLALC;)
- Wiradjuri Council of Elders (WCE);
- Northparkes Community Consultative Committee; and
- General public (available at www.Northparkes.com.au).
-

2.1.1 Location, History and Process Overview

Northparkes copper-gold mine is 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 (CMOC) 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.

Northparkes is an open cut and underground operation, however the open cut mines have been economically exhausted and operations of these pits ceased in 2010. The two underground ore bodies, E26 and E48, access copper sulphide porphyry ore bodies using the block cave mining method. . The E26 block cave ceased production in 2010. The E26 orebody continued to be mined using the sub level caving mining method which commenced in 2016.

Ore is transported to surface where it is processed through a semi-autogenous grinding (SAG) circuit and associated floatation process. The copper concentrate slurry is filtered through ceramic discs, loaded into sealed containers and transported to Port Kembla from Goonumbla Rail Siding. By-products from the ore processing facility are stored in the onsite Tailings Storage Facilities.

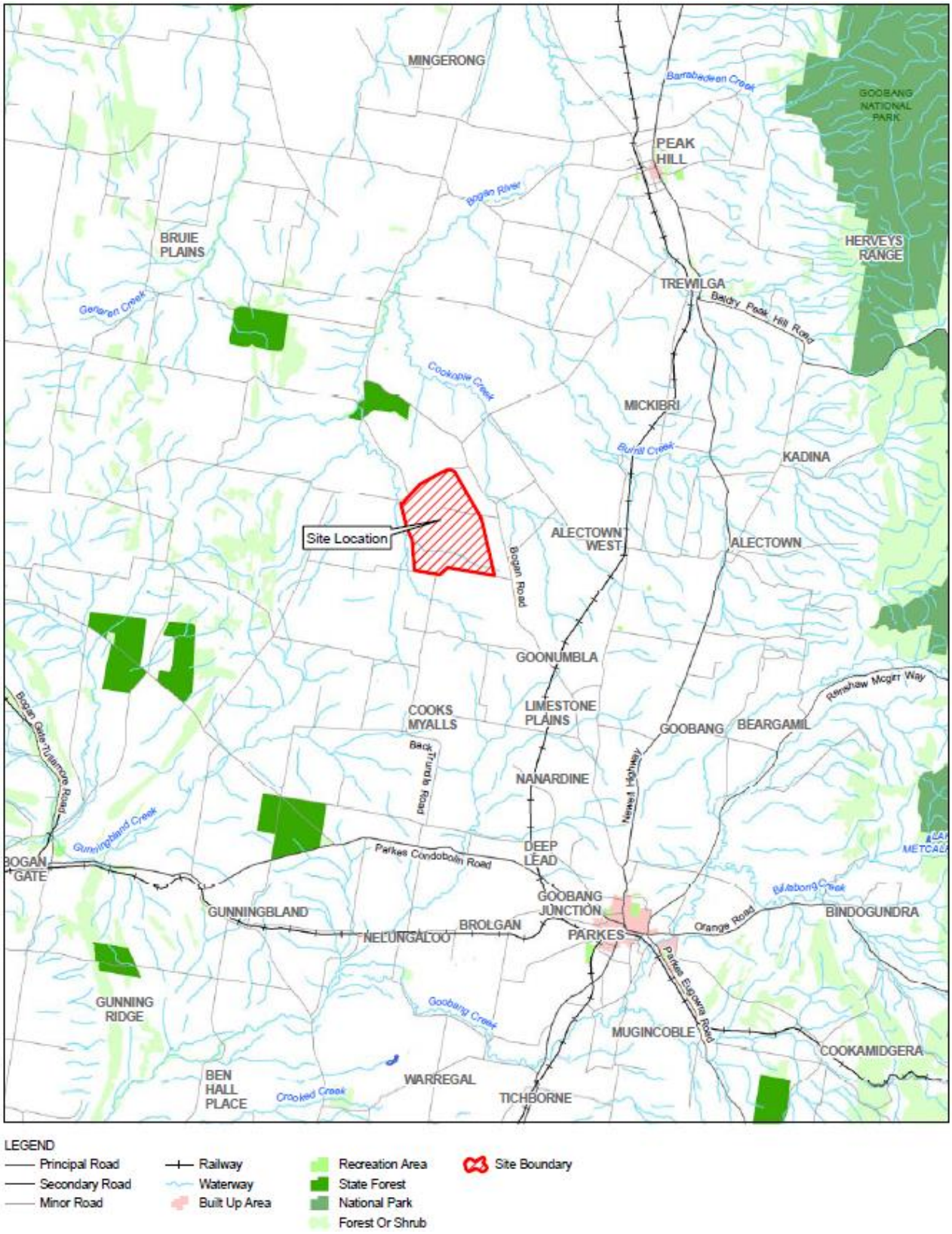


Figure 1 Regional Proximity

2.1.2 Site Layout and Infrastructure

Surface infrastructure and operation layout is shown in Figure 2 Operational Layout.

Onsite infrastructure includes:

- Two former open cut pits E22 and E27, surrounded by ore stockpiles, waste rock dumps and a sound bund;
- Tailings Storage Facilities: TSF1, TSF2, Estcourt, E27 and Rosedale and associated infrastructure;
- The E26 Sub Level Cave (SLC) and E48 underground block cave mine and resultant surface subsidence zone.
- Underground mining fixed plant infrastructure including two crushers, maintenance workshops and materials handling conveyor system;
- Surface mining related infrastructure such as the portal, hoisting shaft, secondary crusher, ventilation fans, transfer and overland conveyor, mining offices and contractor laydown areas;
- Marginal ore stockpiles, waste rock dumps, topsoil stockpiles and stockpiles of clay and oxide material are located around the surface subsidence zone outside the predicted subsidence limits;
- The processing plant including surface crusher, crushed ore stockpiles, active grinding mills, froth flotation area, concentrate filtration and storage bays and tailings storage facilities;
- Service infrastructure including administration buildings and change rooms, core shed, metallurgical laboratory, emergency response shed, warehouse, workshop, electrical infrastructure, surface contractor lay down areas and associated roads;
- Goonumbla rail siding infrastructure including portable amenities; and
- Water management infrastructure.

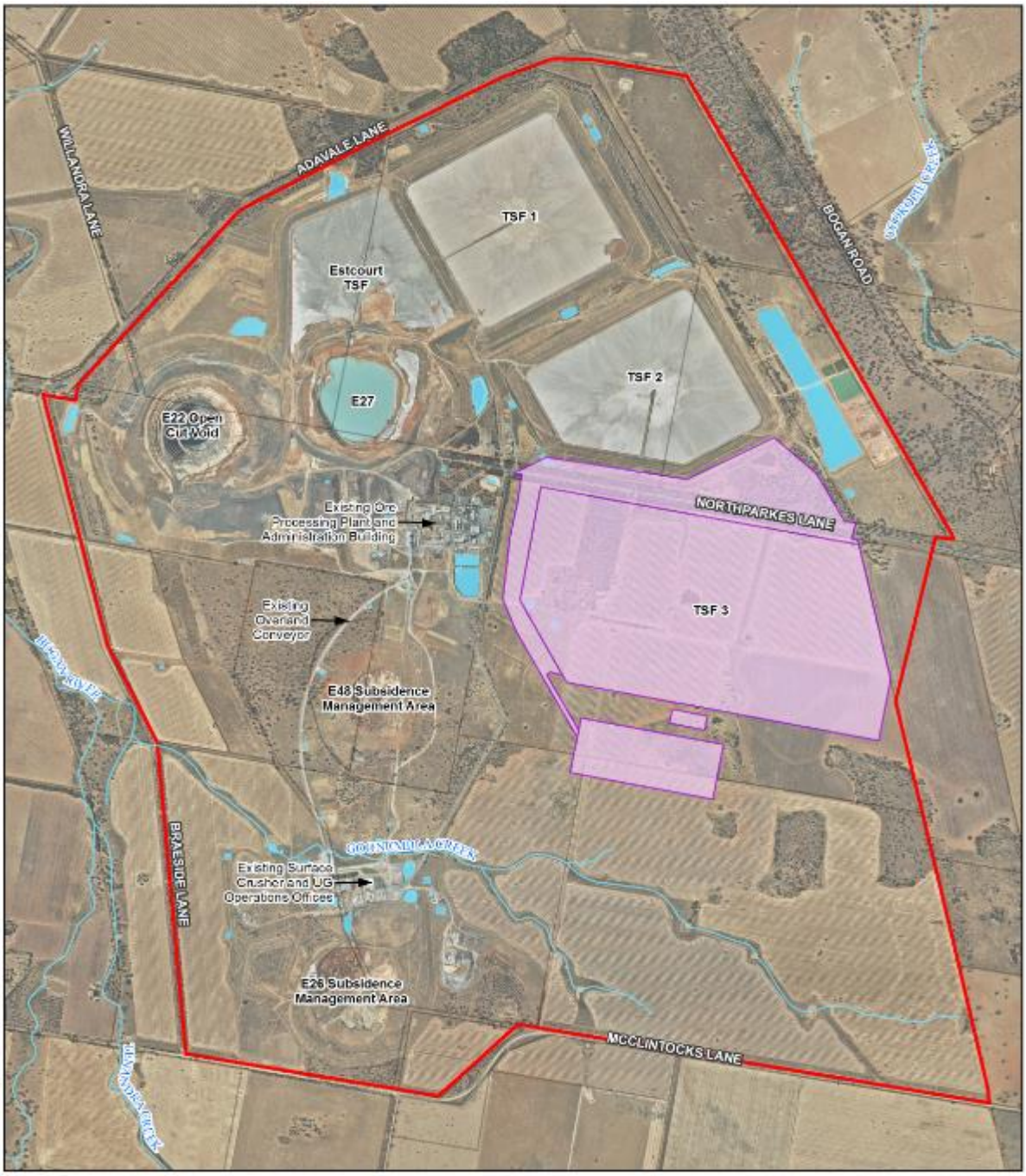


Figure 2 Operational Layout

2.2 Contents, Leases and Licences

Northparkes has a large number of statutory approvals and associated legal obligations that regulate its mining related activities onsite. The status of Northparkes' main statutory approvals are listed in Table 1.

Table 1 Summary of Licences

Approval	Description	Issue Date
ML 1247	Mining Lease (1629.6 ha)	27/11/1991
ML1367	Mining Lease (826.2 ha)	21/03/1995
ML1641	Mining Lease (24.4 ha)	25/03/2010
ML1743	Mining Lease (193.3 ha)	01/09/2016
EL 5800	Exploration Lease (245 km^2)	08/01/2001
EL 5801	Exploration Lease (495 km^2)	08/01/2001
EL 5323	Exploration Lease (218 km^2)	18/07/1997
PA11_0060	Project Approval – Step Change Project (Mine Extension)	16/07/2014
PA11_0060 Mod 1	Modification to include Sub Level Cave Mining	
EPBC 2013/6788	EPBC Approval	13/02/2014
	PSC Approval for Road Train Access on Bogan Road	19/11/1999
EPL 4784	Environmental Protection Licence	30/05/2001
35/02983	Dangerous Goods Notification	-
07-100146-001	Licence to Store (Explosives)	27/07/2009
70WA600026	Joint Water Supply Works	01/07/2004
70AL600028	Water Access Licence 8241	01/07/2004
70AL603187	Water Access Licence 10082	18/10/2005
70BL226550	Bore Licence (Mining, Irrigation, Stock and Domestic)	01/07/2008
70BL230929	Bore Licence (Mining and Irrigation) – Bore 7	10/07/2009
70BL229975	Bore Licence (Domestic and Stock)	26/07/2004
70BL226584	Bore Licence (Mining) – Bore 8	27/05/2008
80BL356559	Bore Licence (Dewatering – Mining) – E26 and E48	18/01/2010
80BL245449	Bore Licence (Dewatering – Mining) – E22	18/01/2010
80BL245450	Bore Licence (Dewatering – Mining) – E27	18/01/2010
DA2009/0057	Development Consent (Forbes Water Pipeline)	19/03/2009
HD 48307	Limestone State Forest Occupation Permit	24/11/2015
N/A	2016-2020 MOP Approval	13/05/2015

2.2.1 Amendments over the Reporting Period

2.2.2 Project Approval

The Project Approval 11_0600 was granted on 16 July 2014. In conjunction with this project approval the Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 approval for Northparkes was also granted on the 13 February 2014.A modification submitted to the existing Project Approval (PA 11_0060) was granted by the NSW Department of Planning and Environment (DPE)in the current reporting period to include sub-level cave mining methods.

No other project approvals were received in the reporting period.

2.2.3 Mining Operations Plan

A revised MOP was submitted in June 2016. The following information was updated;

- Relevant information from PA 11_0060 Mod 2;
- Information on ML1743;

- Information on vent shaft upgrade;
- Final landform and rehabilitation options for tailings storage facilities (TSF);
- Air quality management strategies for the TSF;
- Resubmission of the RCE;
- Entire review of document to ensure consistency with Environmental Assessment (EA) and current Project Approval 11_0060.

The new MOP has been developed under the guidelines "ESG3: Mining Operations Plan (MOP) Guidelines, September 2013". The new MOP is still awaiting approval from the Department.

2.2.4 Environmental Protection Licence

An Annual Return for the reporting period was submitted to the EPA by 25 July 2016 in accordance with requirements under Environment Protection Licence (EPL) 4784 Condition R1.1.

2.2.5 Occupation Permit

There were no applications submitted to, or granted by, Forests NSW to modify the existing Limestone National Forest Occupation Permit in the current reporting period. The occupation permit for Limestone National Forest automatically renews each year.

2.2.6 Management Plans

Northparkes has submitted an updated Surface Water Management Plan, Water Management Plan and Groundwater Management Plan. These plans have been updated to reflect new trigger levels proposed for surface and groundwater quality and groundwater levels. The trigger levels have been recommended through a review of existing water monitoring data to assist in providing more relevant levels to assess potential impacts and the success of current environmental management programs in protecting water quality and levels.

The Heritage Management Plan is currently being reviewed and will be finalised following appropriate consultation in 2017.

The Air Quality Management Plan was reviewed and updated in February and March 2016.

The Noise Management Plan was updated in January and March 2016.

The Biodiversity Offset Management Plan has also been updated and resubmitted in 2016. Several revisions have been completed with the final revision submitted in November 2016 and approval received in December 2016.

2.3 Mining contacts

Current contact details for the Northparkes Managing Director and Environmental Manager:

Stefanie Loader –Managing Director
Phone: 02 6861 3000
Email: stefanie.loader@Northparkes.com

Stacey Kelly – Manager People, Safety & Environment
Phone: 02 6861 3280
Email: stacey.kelly@northparkes.com

2.4 Actions Required From Previous AEMR Review Meeting

Actions raised at the AEMR meeting held on 14 September 2016 are provided in Table 2: Actions from AEMR Meeting.

Table 2: Actions from AEMR Meeting

Action Required	Where dealt with in this AEMR
Ensure that TSF1 closure design and infill are included in the MOP.	Section 1.1.1.2 and Table 1
MOP's to be consistent with EIS and Project Approvals	Section 1.1.1.2 and Table 1

3. OPERATIONS DURING THE REPORTING PERIOD

3.1 Key Production Outcomes

Reporting period summary;

- 6.07 million tonnes of ore milled;
- 137,445 tonnes of copper concentrate produced; and
- 6.17 million tonnes of ore mined.
- Ore mined for 2016 is a new production record.
-

3.2 Mining and development

3.2.1 Open cut

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

3.2.2 Underground Operations

Underground mining activities are currently undertaken in ore body E48 using block caving methods. Block Caving is an underground hard rock mining method that involves undermining an ore body, allowing it to progressively collapse under its own weight. It is the underground version of open pit mining. A schematic of the underground mining section is seen in Figure 3.

The operations at E26 orebody ceased in 2008 due to ingress of clay in the drawpoints. The E26 SLC was commissioned in 2016. 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 achieve full automation of underground mine operations. In mid-October 2015, Northparkes confirmed its position as the most automated underground mine in the world and achieved 100 percent automation.

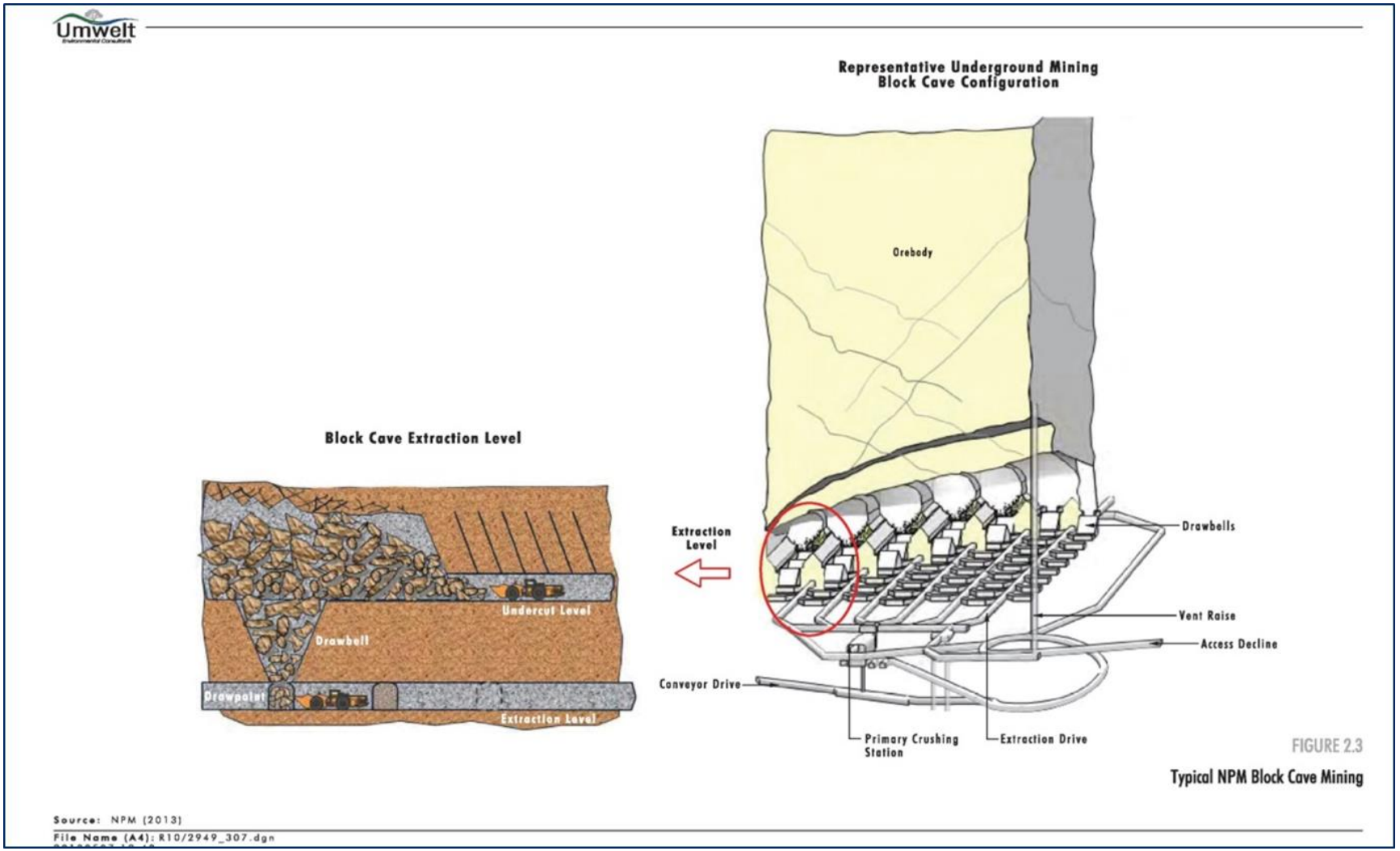


Figure 3 Block Cave Mining Method

3.2.3 Exploration and Resource Utilisation

Exploration and evaluation programs continued in the current reporting period, on both mining and exploration leases. Mining lease evaluation involved the completion of the drilling component to the ongoing E26 Lift 1 North Pre-Feasibility Study. Drilling involved the evaluation of an area immediately adjacent to the historic E26 Lift 1 cave from surface, and also underground drilling to test the lower region of this area. The holes drilled as part of this program will also be used for ongoing metallurgical test work, down hole geotechnical measurements and for cave monitoring for the life of the proposed cave. Exploration activities during the period included reverse circulation (RC) and diamond drilling programs over four prospect areas.

In total, 9529.7m of surface drilling and 4460.5m of underground drilling was completed during the reporting period. In addition, previously un-assayed intervals from the upper portions of 14 historic diamond holes east of the E26 Lift 1 area were cut and assayed. Northparkes Mines is committed to identifying and evaluating new ore bodies with the intention extending mine life.

Exploration and evaluation activities will continue in the next reporting period. Focus is aimed at diamond drilling to evaluate near mine prospects, advancing exploration targets across all exploration leases with both RC and aircore drilling, along with follow-up work in the E44 prospect area on Exploration Licence 5323.

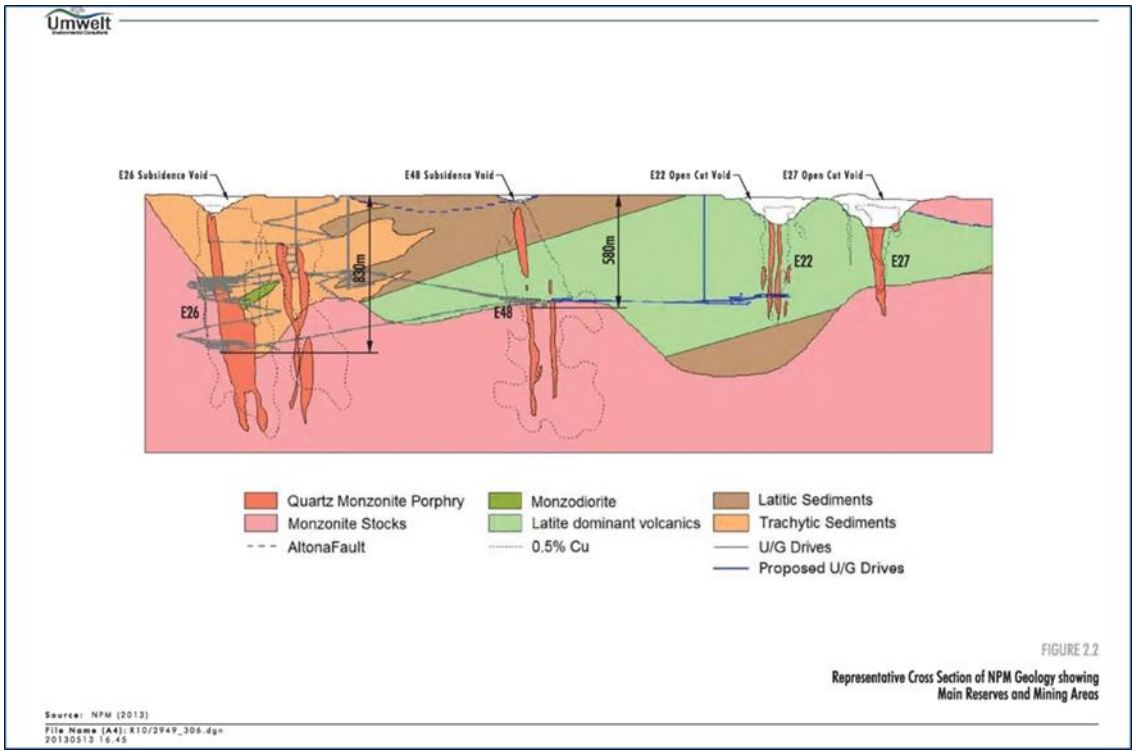


Figure 4 Cross section showing the zones of mineralisation in relation to existing and proposed mine infrastructure

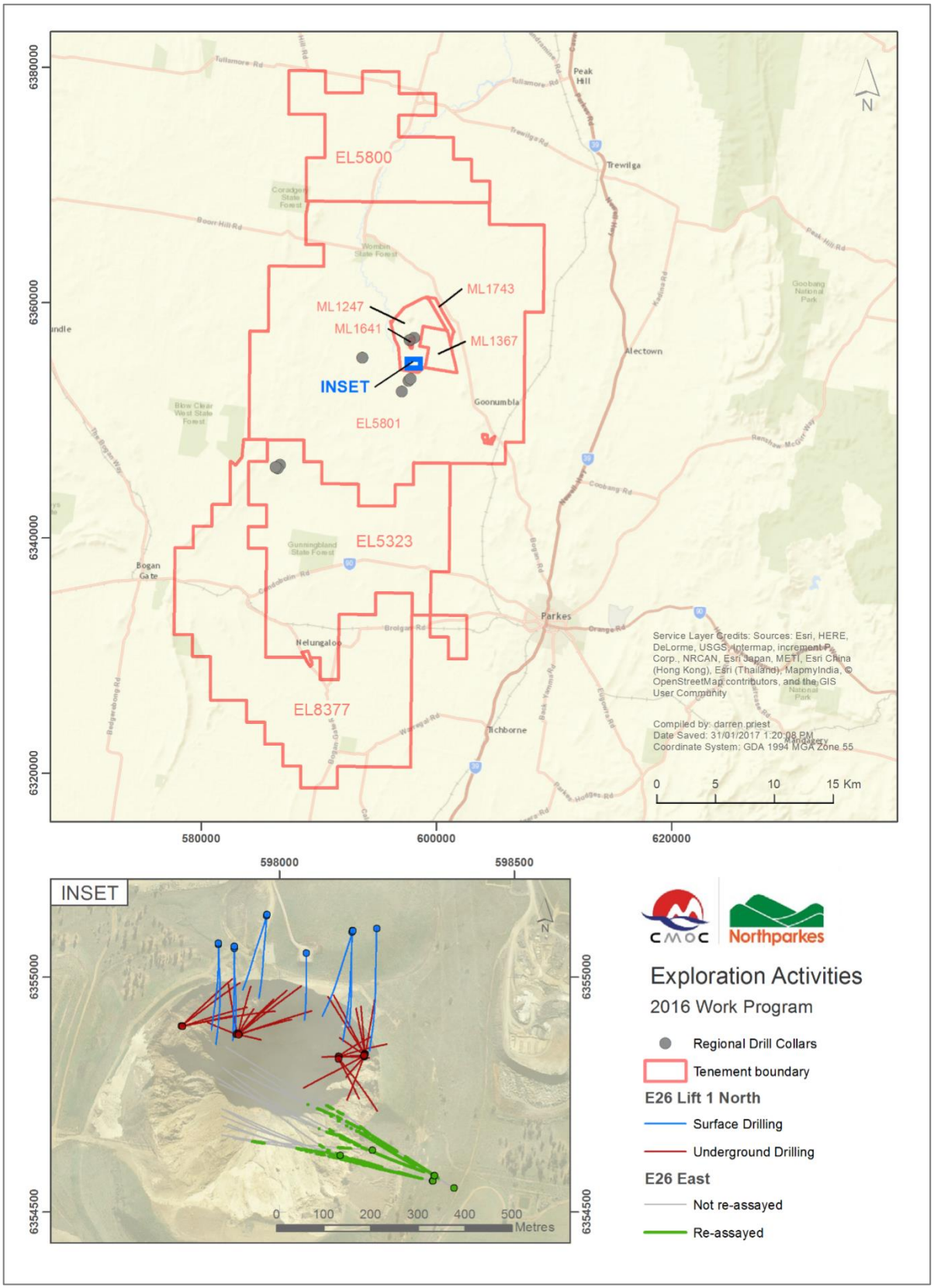


Figure 5 Exploration Activities for 2016

3.2.4 Sub Level Caving (SLC) Mining Method

Northparkes has received an approval to undertake sub-level cave mining technique along with the approved Block Cave Mining method.

The SLC mining method is a well-established mass mining method in the international mining industry for narrow ore bodies. The SLC mining method, like block caving, belongs to a group of unsupported extractive mining techniques classed as caving methods. Caving methods rely on the undercutting of an area of rock, and then gradual failure of the overlying rock due to gravity and stress, to minimise mining risk and supply production.

The E26 Sub Level Cave (SLC) project commenced construction in April 2015. The mine design aims to extract a remnant wedge of high grade material adjacent to the E26 Lift 2 Block Cave. The SLC mining method involves construction of the sub level horizon followed by retreat drill and blast of that horizon. The broken material from blasting is recovered as the main source of production. The second sub level horizon is then constructed, as the top down process continues. The E26 SLC Mine consists of three sublevels approximately 20m apart. The first production ring in the E26 SLC was extracted in July 2016. Throughout 2016, the E26 SLC produced about 130,000 tonnes in total.

Diagrams of the SLC Mining Method at Northparkes are displayed in Figure 3 Block Cave Mining Method, Figure 4 Cross section showing the zones of mineralisation in relation to existing and proposed mine infrastructure, Figure 6 Sub-level cave schematic diagram, Figure 7 Comparison between Block Caving (left) and SLC (right), Figure 8 SLC design plans with E26 cave (Yellow) and Production rings (Purple and Red)Figure 9 SLC wider view.

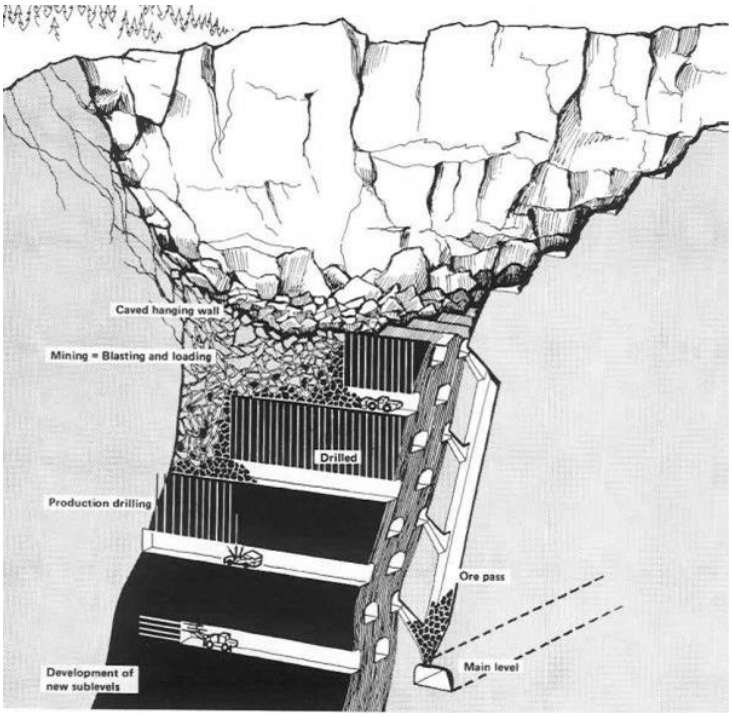


Figure 6 Sub-level cave schematic diagram

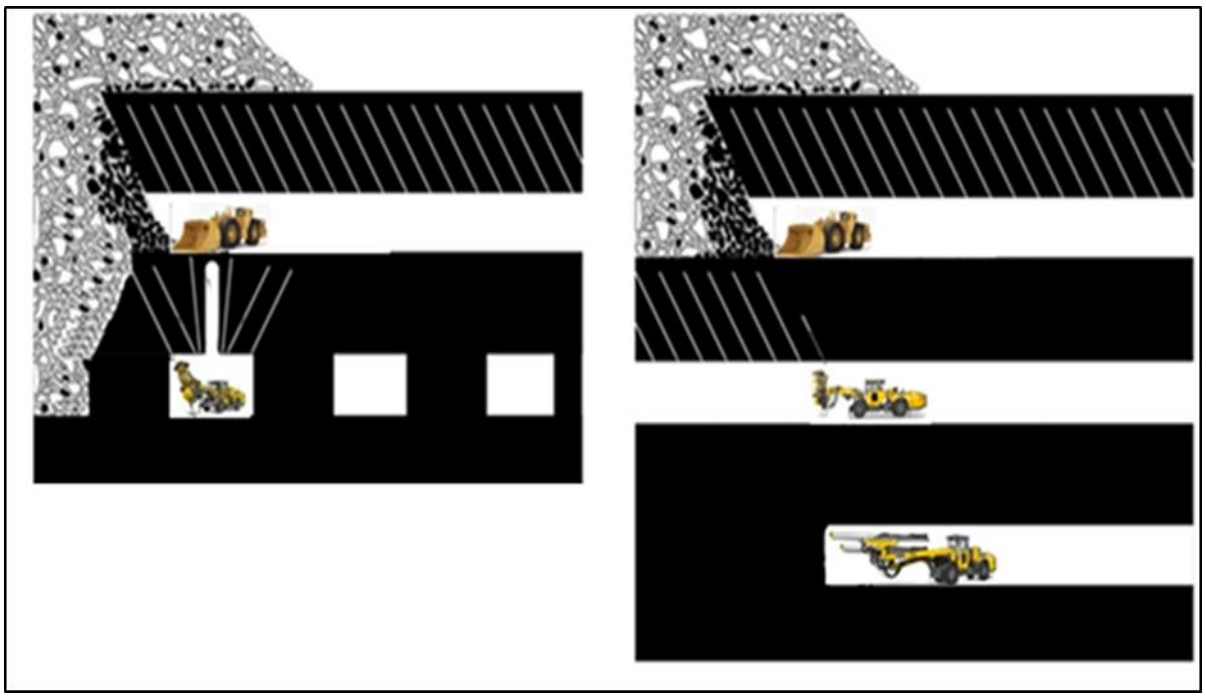


Figure 7 Comparison between Block Caving (left) and SLC (right)

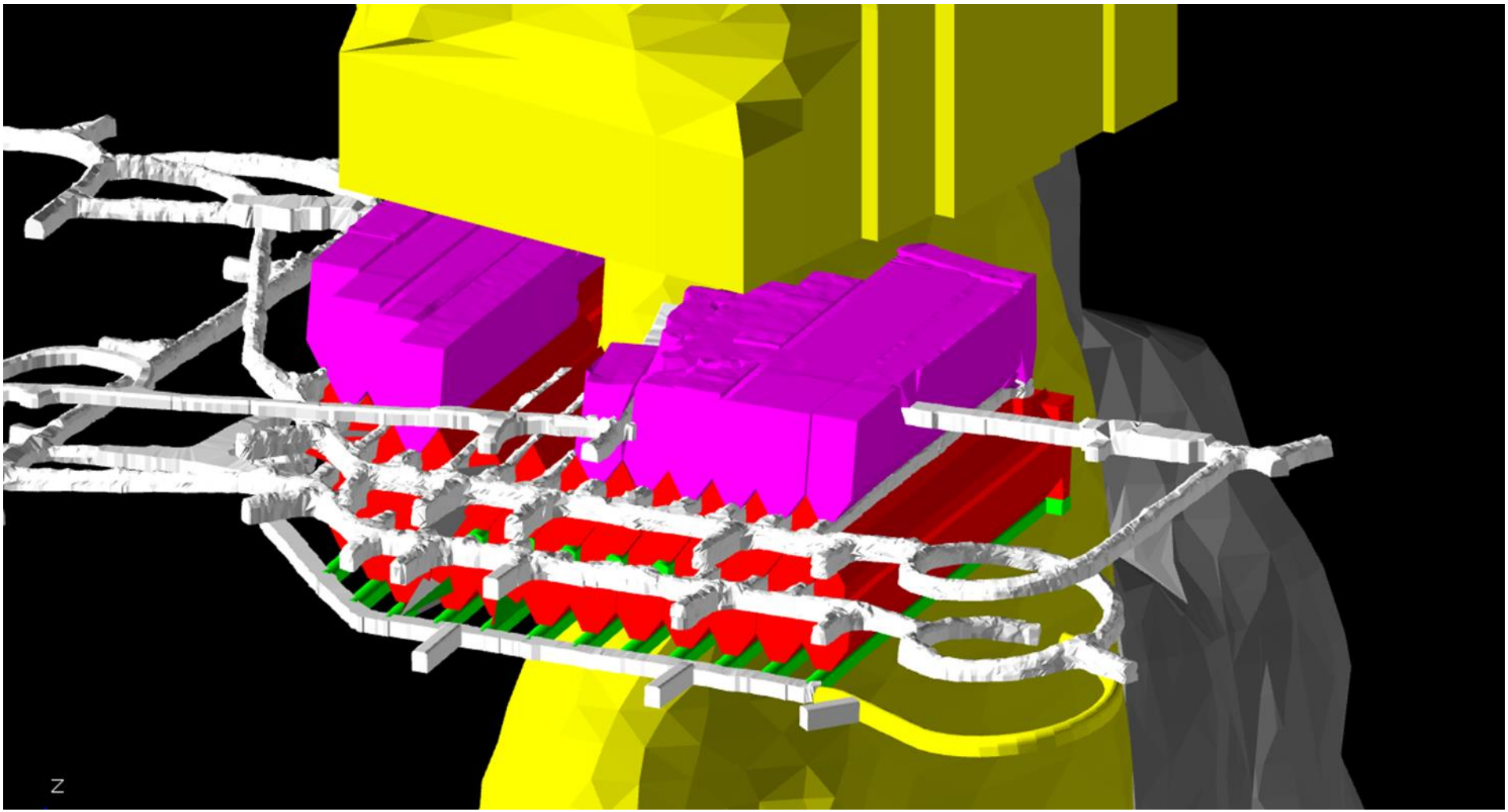


Figure 8 SLC design plans with E26 cave (Yellow) and Production rings (Purple and Red)

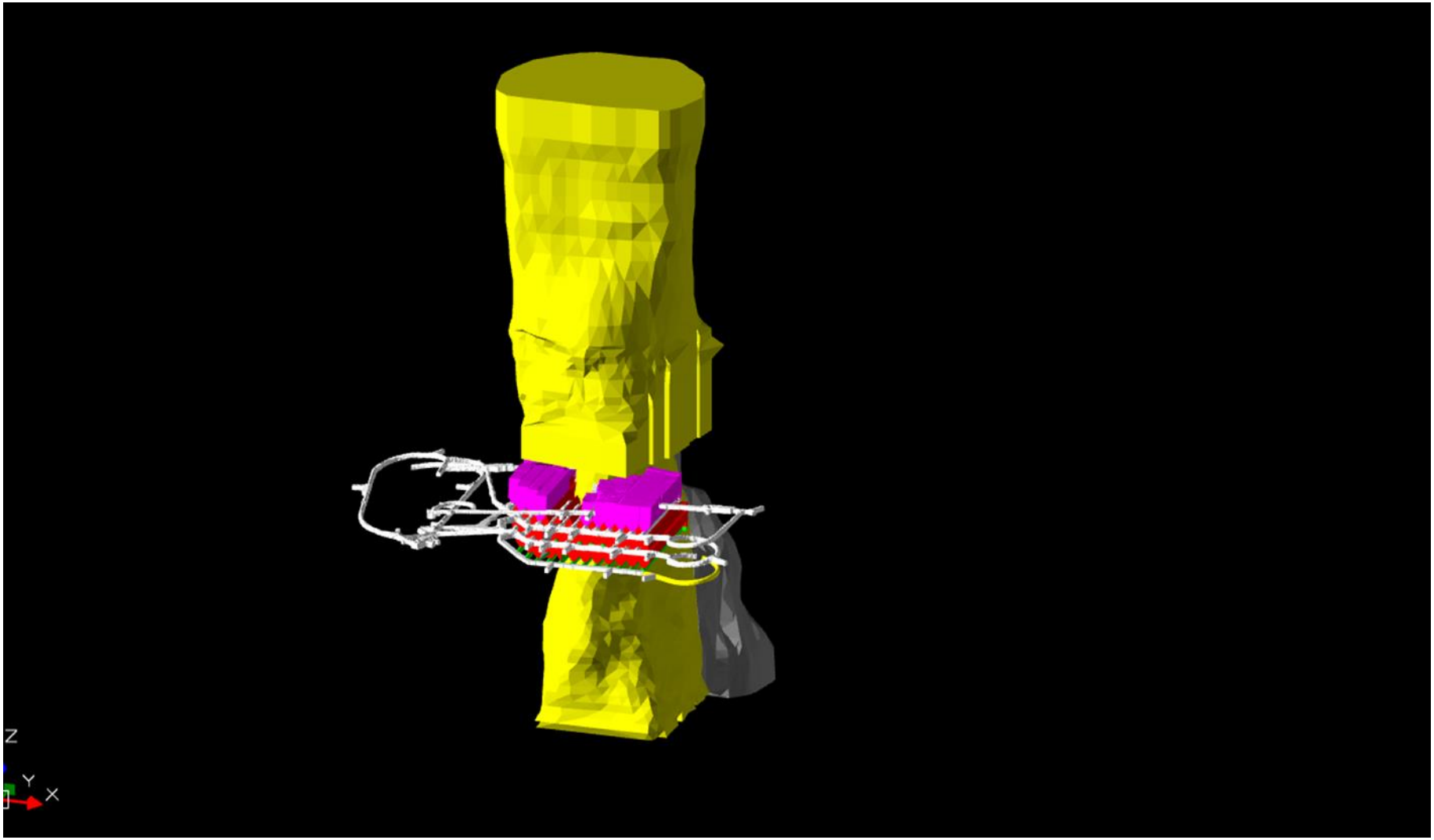


Figure 9 SLC wider view.

3.2.5 Ore processing

In 2016, a total of 6.07 Mt of sulphide ore was processed from the underground ore body. Copper-gold concentrate production totalled 137,445 tonnes. This product was predominantly sold to customers in China and Japan. Production for the past five years is presented in Table 3 Ore Processing Production.

Ore processing as shown in the Figure 10 Process-flow schematic for Northparkes Operations includes a number of defined stages including grinding, floatation and thickening.

The grinding circuit comprises two separate modules (Mod 1 and Mod 2), each incorporating a Semi Autogenous Grinding (SAG) mill, oversize crushing technology, two stages of ball milling and froth floatation.

The floatation process floats a sulphide concentrate to recover copper and gold bearing minerals. From the floatation, the concentrate is processed through the concentrate thickener and transferred to the storage shed.

The tailings component is pumped from the floatation stage to a tails thickener and then to the TSF.

Table 3 Ore Processing Production

Year	Ore Milled (Mt)	Production Copper Concentrate (t)
2012	5.65	155,838
2013	6.01	168,282
2014	6.13	169,376
2015	6.04	151,518
2016	6.07	137,445

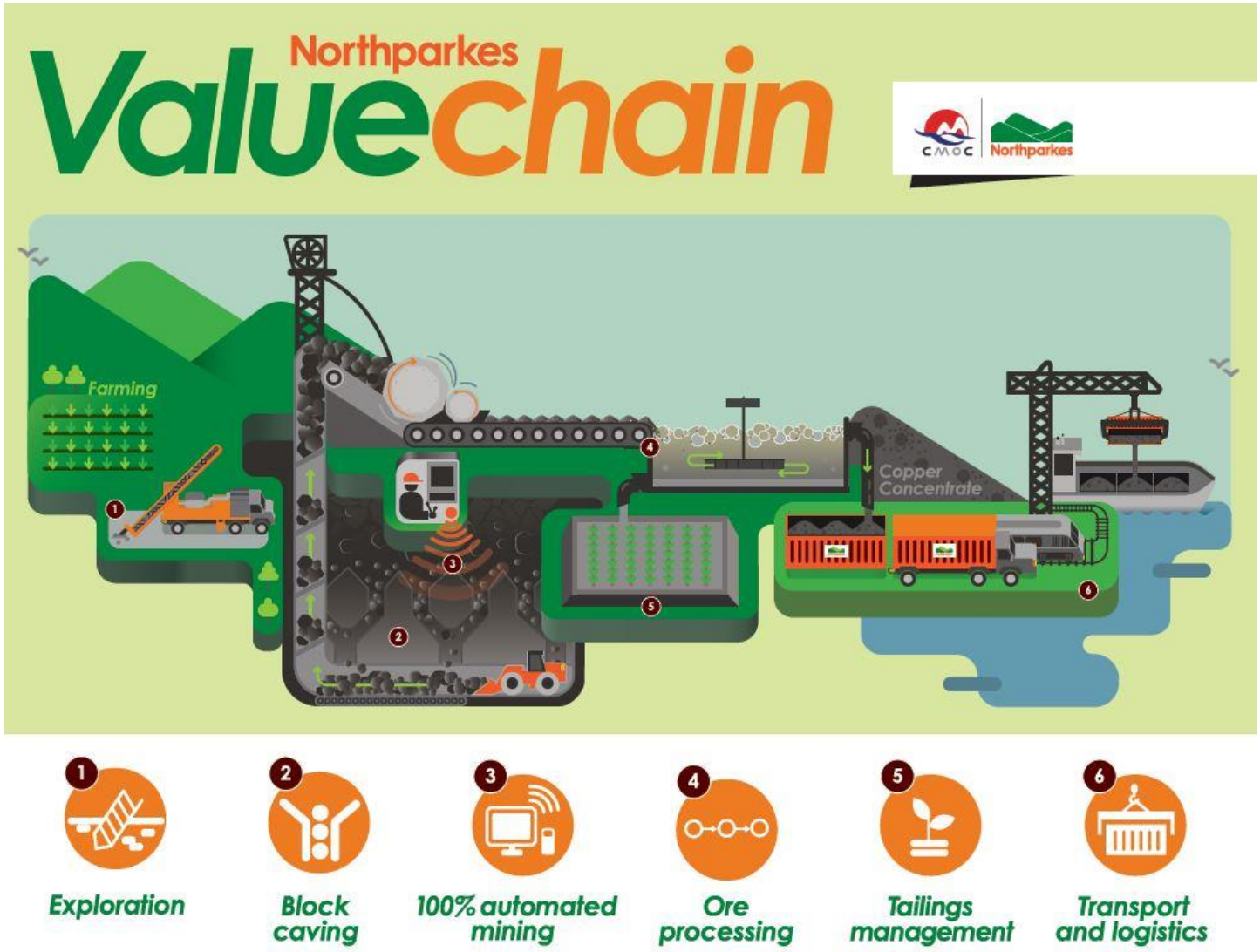


Figure 10 Process-flow schematic for Northparkes Operations

3.2.6 Project Work in 2016

The following projects were completed in 2016;

- TSF 1 Closure Design – Feasibility and Detailed design, for execution in 2017;
- Erosion study – Design options for TSF1 batter slopes;
- Rosedale TSF – construction completed and commissioned in June 2016;
- Ongoing rehabilitation trails on TSF1 by University of Queensland Centre for Land Management Rehabilitation
- Mining vent upgrade in accordance with information in the Mining Operations Plan (MOP);
- Surge dam remediation – treating hydrocarbon laden sediment, excavating the surge dam to allow water management on site and reducing the risk of overflow; and
- Underground and Ore Processing Department waste hydrocarbon storage areas consolidated into one fit for purpose shed.

4. ENVIRONMENT AND FARM TEAMS

Northparkes has an HSE Policy committed to pollution prevention and continual improvement of environmental management activities. To support the intent of this Policy, environmental management is undertaken by the onsite Environmental team, which forms part of the Northparkes People, Safety and Environment (PSE) department.

The HSE policy (Appendix 2) is a part of the developed and implemented Health, Safety, Environment and Quality Management System (HSE MS). This is certified to ISO14001 and audited on an annual basis.

Team members of the Environment team include the following roles;

- Manager – People, Safety and Environment
- Superintendent – Environment & Farms;
- Senior Environment Advisor;
- Environment Advisor (Ecology); and
- Farm Specialist
-

4.1 Environmental Management System

Northparkes developed, implemented and maintains a HSE MS, of which the environmental component of this system maintains certification for ISO14001. The HSE MS encourages a rigorous and consistent approach to managing and improving its environmental performance across all of its mining and related activities.

The HSE MS outlines minimum standards to encourage continual improvement in HSE performance.. A periodic Certification Audit against the ISO 14001 standard was conducted in the reporting period. The purpose of the audit is to assess Northparkes' alignment with the ISO14001 Certification. The audit identified ten minor non-conformances, three observations and one commendation.

4.2 Reportable Environmental Incidents

During the reporting period, Northparkes had – two reportable environmental incidents Table 4 provides information on these incidents.

Formal incident notifications summarising the incident details, likely causes, actions taken to date and additional proposed measures were submitted to the EPA, the Department of Industry, Resources & Energy and other relevant government agencies in accordance with Northparkes reporting procedures.

Table 4 Environmental Incidents 2016

Date	Details
8/07/2016	Hydrocarbon spillage outside bunded area.
30/12/2016	Total Suspended Particles monitor at Hillview was not in operation for the December month due to technical issues.

4.3 Meteorology

Reporting period summary

Annual rainfall was 66 percent more than received in 2015

4.3.1 Monitoring

Northparkes operates a meteorological monitoring station located within ML 1367 that complies with AS 2923. The weather station records 10-minute and 24-hour average wind speed, wind direction, air temperature, relative humidity, solar radiation and rainfall.

4.3.2 Management

A meteorological monitoring station is maintained to provide real time and periodic meteorological data for operational purposes. The interpretation of meteorological data assists in daily operational planning and management and provides a historical record.

Employees access weather data via the Northparkes intranet; this data is used in internal and external environmental reporting.

4.3.3 Results

A total rainfall of 699.8 mm was recorded at the weather station during the reporting period. This represents a 278 mm increase from the previous reporting period. The rainfall received during the reporting period was above the long-term average for the region. Table 5 outlines rainfall figures in comparison with the long-term average.

Temperature and evaporation for the reporting period are shown in Table 5 Rainfall summary for 2016 and Figure 11 Temperature and Evaporation Summary for 2016Table 5. Daily temperature, wind and rainfall data for the reporting period is provided in Appendix 3. Evaporation followed expected seasonal trends observed in previous climatic conditions for the region. The monthly maximum temperatures were significantly warmer, recorded at a mean of +1.26°C above the average. These figures are consistent with the national average which experienced the third warmest year on record.

North-east and south-east winds were the dominant winds throughout the reporting period. This is similar to previous reporting periods and consistent with long-term trends. Annual and quarterly wind roses have been produced to identify the predominant wind directions observed throughout the reporting period. Windroses are presented in Figure 12 Windrose for 2016.

Table 5 Rainfall summary for 2016

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Monthly Total (mm)	70.8	0.4	18.8	25	62.8	165	38.8	45.4	139.2	35.6	41.4	56.6
Long Term Average (mm)	47.5	44	39.3	31	35.7	33.4	36	34	32.8	47.4	39.6	41.6
YTD Actual (mm)	70.8	71.2	90	115	178.8	342.8	381.6	427	566.2	601.8	643.2	699.8
Wet days	10	1	9	3	9	21	12	10	15	8	5	5
Maximum Temp (Deg C)	44.2	42.4	38.7	36.6	26.4	19.6	23.6	21.8	22.2	31.1	37.1	39.9
Minimum Temp (Deg C)	13.7	11.5	8.7	7.2	1.1	-0.7	-1.6	-1.7	1.6	2.4	1.2	6.9

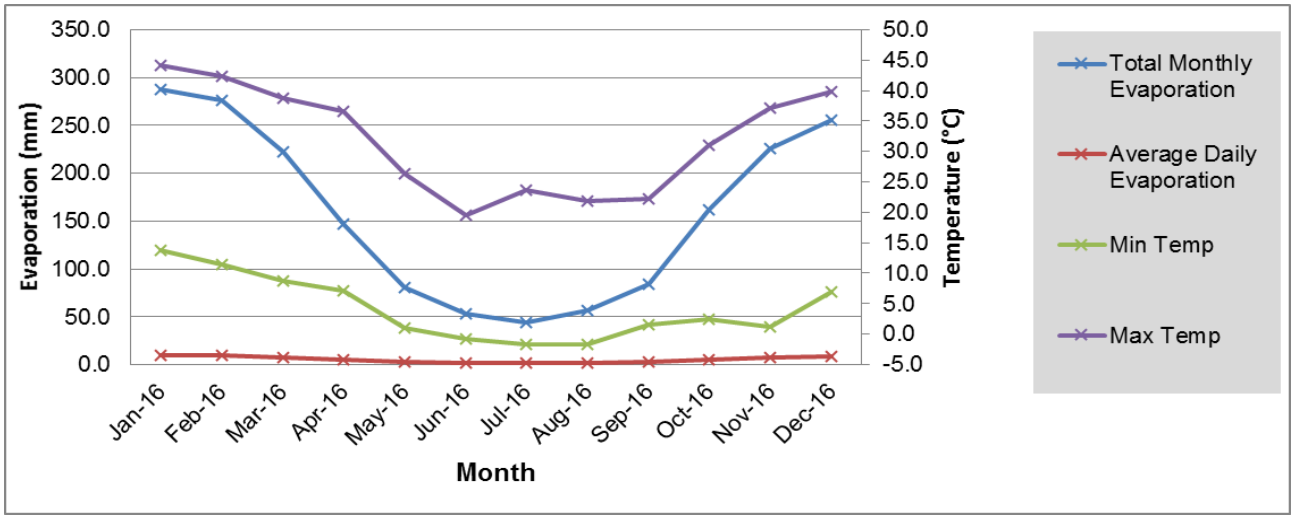
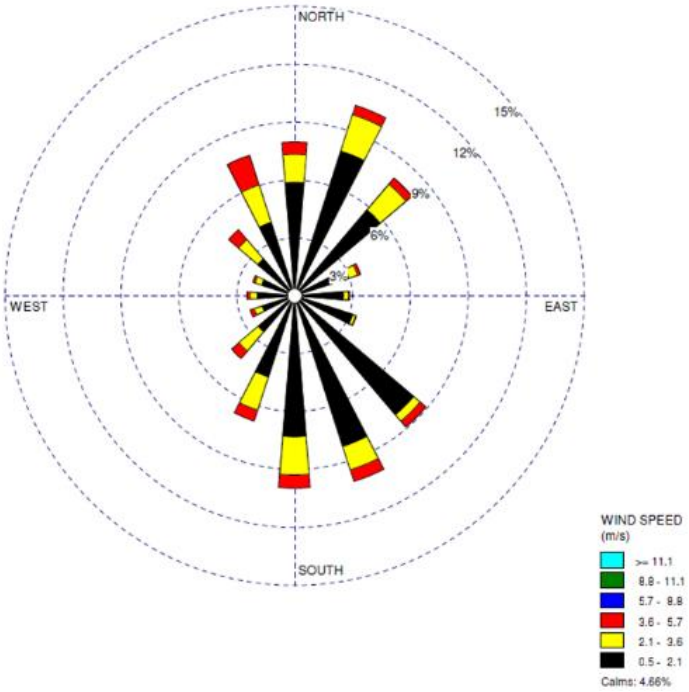
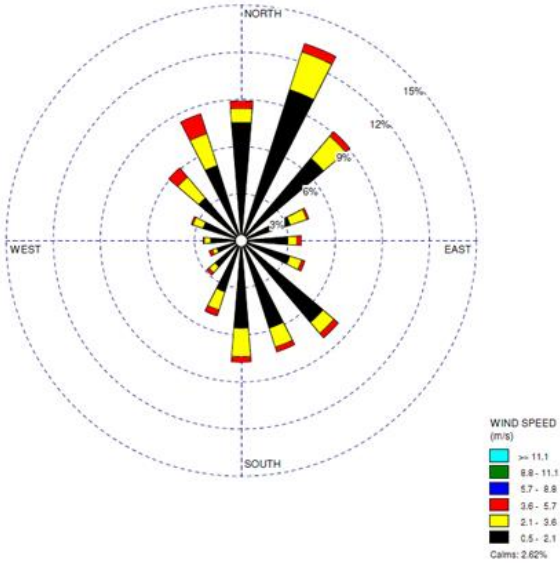


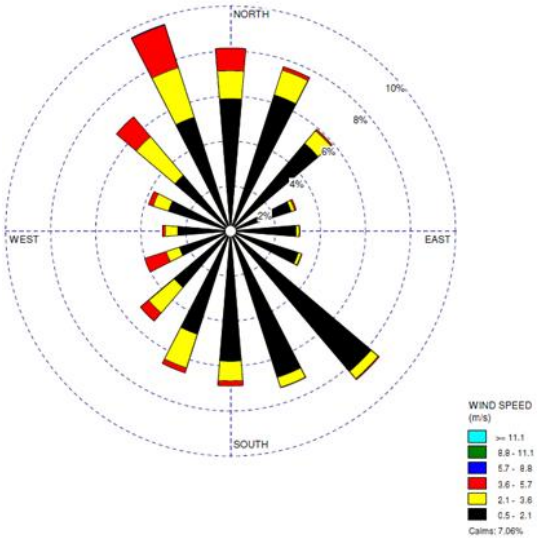
Figure 11 Temperature and Evaporation Summary for 2016



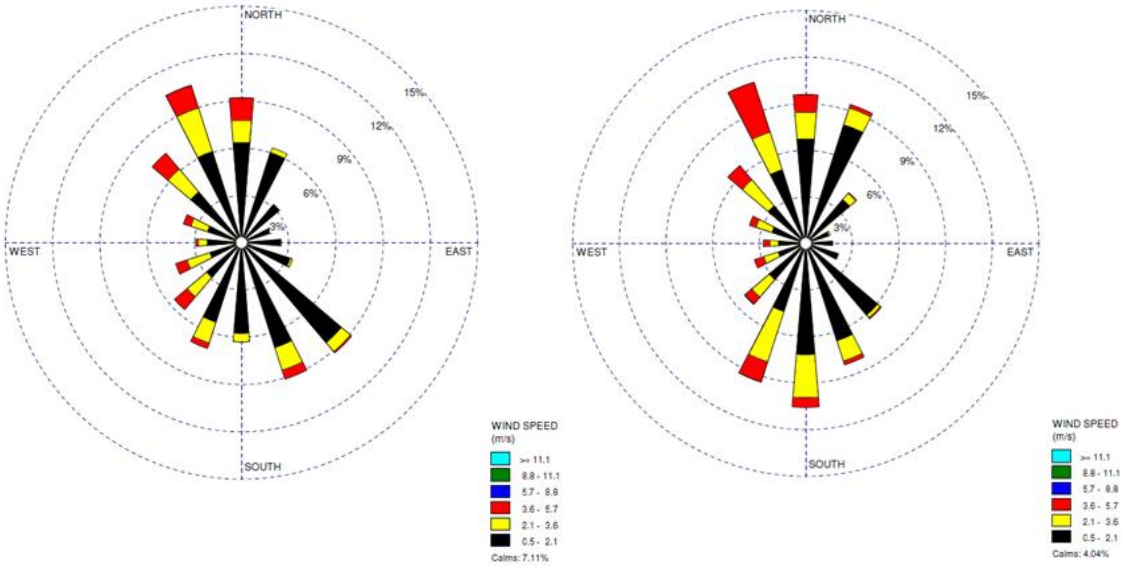
2015 Summary



Q1 2016 Summary



Q2 2016 Summary



Q3 2016 Summary **Q4 2016 Summary**

Figure 12 Windrose for 2016

4.3.4 Actions Proposed for 2017

Continued calibration of the weather station.

4.4 Air Quality

4.4.1 Reporting Period Summary

- All required monitoring was completed during the reporting period.
- Straw bales on the surface of TSF1 continued to operate as an effective breakdown of wind activity and reduce dust exceedances / complaints.

- Barley planting on TSF 1.

- No community complaints were received during 2016.
- Three real time PM10 monitors continue to monitor real time dust at three neighbouring properties.

4.4.2 Monitoring

Northparkes has implemented an air quality monitoring program to periodically sample at key locations on and adjacent to the Mine Lease. The program is designed to assess the effectiveness of dust control measures and ensure compliance with PA11_0060 and EPL 4784 conditions as well as internal standards and procedures.

The monitoring program consists of PM10 (real time continuous monitoring using beta-attenuation monitors (BAMs)) and depositional dust gauges. These 11 monitoring points are strategically located around the mine lease and neighbouring properties (Figure 13 Northparkes Air Quality Monitoring Locations).

Fine dust particles measured as PM10 are monitored using Beta Attenuation Monitors (BAMs). Each station is fitted with a size selective inlet that operates 24 hours per day in accordance with AS 3580.9.6. These samplers monitor dust particles that, similar to dust deposition, can also be sourced from a range of mining and non-mining activities. PM10 monitoring is undertaken at the local residences of 'Hubberstone', 'Hillview' and 'Milpose'.

Total suspended particulate matter (TSP), is measured using a high volume sampler (Hi-Vol), which samples for 24 hours every six days. Monitoring is conducted in accordance with AS/NZS 3580.9.3:2003 – Methods for sampling and analysis of ambient air Method 9.3: Determination of suspended particulate matter—Total suspended particulate matter (TSP) — High volume sampler gravimetric method. TSP monitoring is undertaken at 'Hubberstone', 'Hillview' and 'Milpose'.

Depositional dust gauges record the total of deposited dust for a month-long period. Depositional dust gauges are a useful measure of broad scale changes to the local air quality but may be influenced by a number of sources including mining, agriculture, ambient dust, fires and vehicle emissions. Sample collection may also be affected by non-mining organic contamination (e.g. bird droppings, sticks and insects). For this reason, depositional dust gauges are a less accurate sampling method than TSP and PM10 monitoring methods.

Depositional dust samples are analysed for insoluble solids, ash residue and combustible matter so that the impact of sample contamination can be assessed.

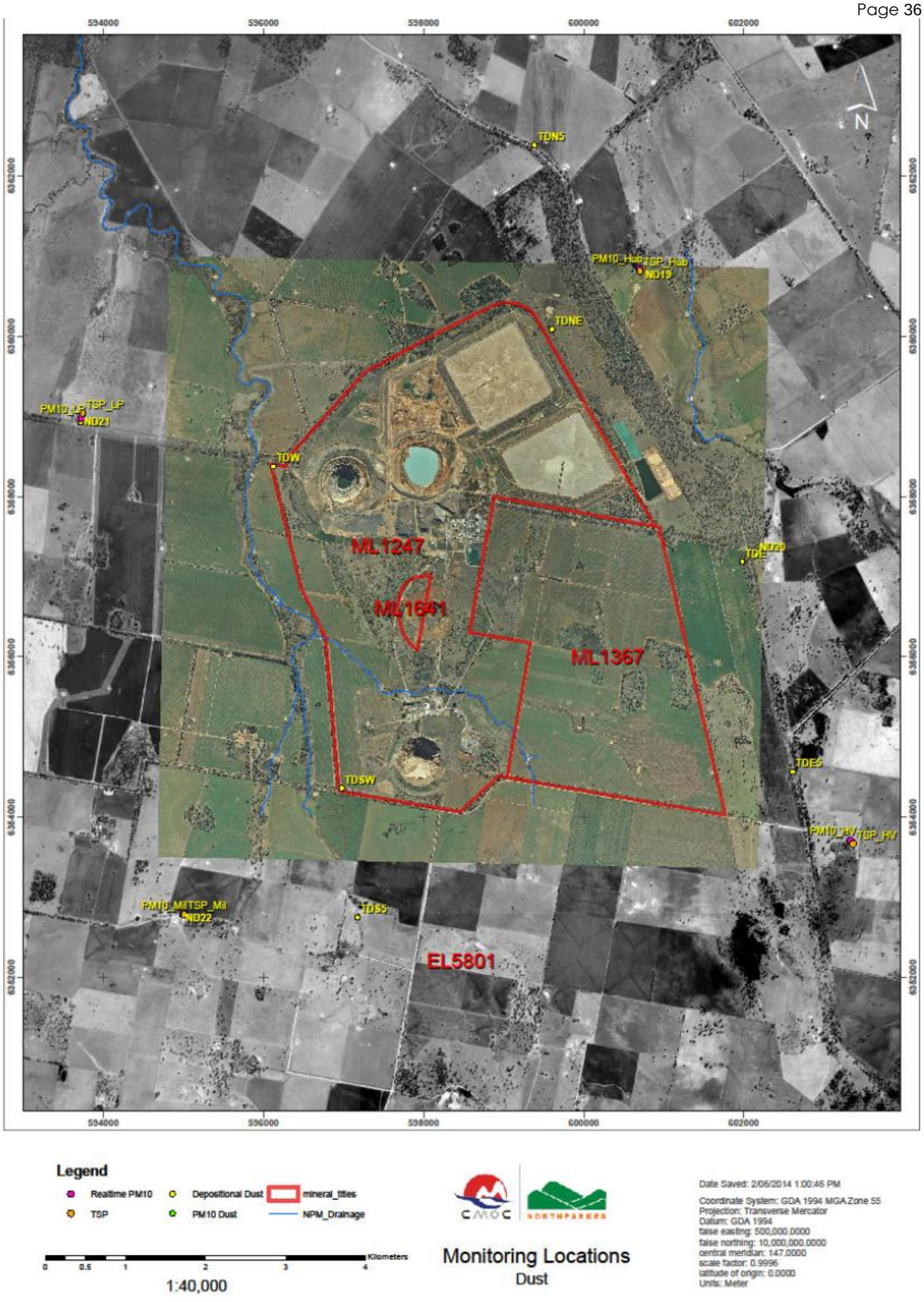


Figure 13 Northparkes Air Quality Monitoring Locations

4.4.3 Management

General Air Quality Management

Northparkes' Air Quality Management Plan provides a framework to assess, monitor and manage potential dust impact as a result of its activities.

Operational control measures include;

- NPM has a private agreement in place with the owners of "Avondale" for the property to remain unoccupied over mine life;
- major works scheduled 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 weather assessment;
- sealing high traffic roads, where possible;
- use of water carts on unsealed 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 of the operations;
- an air quality management system that uses a combination of predictive meteorological forecasting and real-time weather monitoring data to guide the day to day planning of construction and mining operations, and the implementation of both proactive and reactive air quality mitigation measures to ensure compliance with the relevant conditions and approvals; and
- a program of regular air quality monitoring of site operations to determine whether the operations are complying with the criteria set out in Northparkes Mine Extension Project, Project Approval 11_0060. This monitoring will be undertaken as real-time dust (continuous), PM10 (6-day cycle) and depositional dust (monthly) monitoring at surrounding receivers over the life of the mine.
-

Air Quality Management for the Tailings Storage Facilities

Northparkes was recognised for innovative methods of managing dust from the Tailings Storage Facilities at the NSW Minerals Council 2016 Health, Safety, Environment and Community Awards.

The Tailings storage facility dust control strategy include a combination of the below as required;

- Maintaining existing straw bale treatments;
- Chisel ploughing of surface for roughness;
- Planting of winter crops and pasture;
- Grading of windrows; and
- Utilising the travelling irrigator.
-

Approximately 4000 straw bales have been placed on TSF1 to reduce the wind velocity from predominantly the north, north easterly and north westerly directions. Bales will remain in place in areas where barley is not sown.

Trials have been conducted to assess the effectiveness of the use of winter crops on the tailings dam to reduce dust lift off.

48 hectares of TSF1 and 75 ha of TSF2 were ripped in preparation for sowing barley in April 2016. A small trial area on the north eastern end of TSF2 was sown with Barley in 2015. The barley growth was deemed to be successful and as such additional sowing was completed in 2016 along with various trials of nitro humus.

Chisel ploughing on TSF surface

Irrigator on TSF

4.4.4 Results

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.

All dust results are made publically available on the Northparkes website through the Quarterly Reports, as per PA11_0060.

The barley planting on TSF 1 & 2 in 2016 was extremely successful. The planting provided adequate ground cover to the surfaces of the TSF's to manipulate surface wind speeds. The persistence of this cover is unknown and will be monitored accordingly. This aims to provide short-medium term cover. In the presence of this ground cover, the proposed plan for 2017 is to sow a range of pasture species (both annual and perennial) that will persist and self-regenerate, providing a more medium term solution.

The application of NitroHumus was beneficial to the barley growth. Where excess amounts of NitroHumus were spread, there were distinct increase in barley plant growth and biomass, easily appreciated by eye. Unfortunately to replicate such large rates the application of such a product becomes quite price prohibitive. A similar broad scale rate of application to the one used this year is proposed ahead of the pasture species planting.

The dust management trails on TSF1 and TSF2 have minimised the risk of dust lift off from the dams through the establishment of a ground cover on TSF2 and the use of straw bales and ground cover on TSF1. This has been evidenced by no further community complaints by neighbouring landholders and visual observations.

PM_{10}

PM10 monitoring results for 'Hubberstone', 'Milpose' and 'Hillview' monitoring locations for the reporting period are displayed in Figure 14, Figure 15 and Figure 16 respectively. The criteria for exceedances (as nominated in PA11_0060), for 'Hubberstone', 'Milpose' and 'Hillview', are >30 µg/m3 for the annual average and >50 µg/m3 for a 24-hour monitoring period.

Fine dust particles, up to 10 microns in diameter, are measured as PM10. This particulate matter is monitored using continuous, carbon-14, beta-attenuation monitors (BAMs), which are fitted with a size selective inlet. Each BAM station operates continuously, in accordance with Australian Standard 3580.9.11:2008, PM10 continuous direct mass method using Beta Attenuation Measurement. This method is set to measure time-integrated mean particle concentrations for 10 minute periods. These measurements are subsequently averaged over a 24-hour period, to provide a 24h-average PM10 concentration. PM10 dust particles can be sourced from a range of mining and non-mining activities and are typically formed by mechanical disruption with a lifetime that can range from minutes to hours and travel times varying from <1km to up to 10km.

Monitoring results for the 'Hubberstone' were relatively under the air quality criteria required by the Project Approval. There were several exceedances during the month of July and August. These exceedance were attributable to localised activities in the vicinity of the PM10 location. The PM10 monitor at Hubberstone did not operate over several days between July and August, due to power surge and equipment malfunction. The EPA was notified of these incident.

Monitoring results for the 'Milpose' location shows two exceedances for the reporting period. The PM10 monitor at Milpose did not operate between 29 January to 4 February, 15 June to 30 June and 11 September to 27 September due to equipment error due to electrical fault in the equipment.

Similarly, monitoring results for the 'Hillview' location shows three exceedance for the reporting period. The PM10 monitor at' Hillview' did not operate between 6 February to 21 February, 6 April to 17 April and 24 to 25 October due to equipment error due to electrical fault in the equipment.

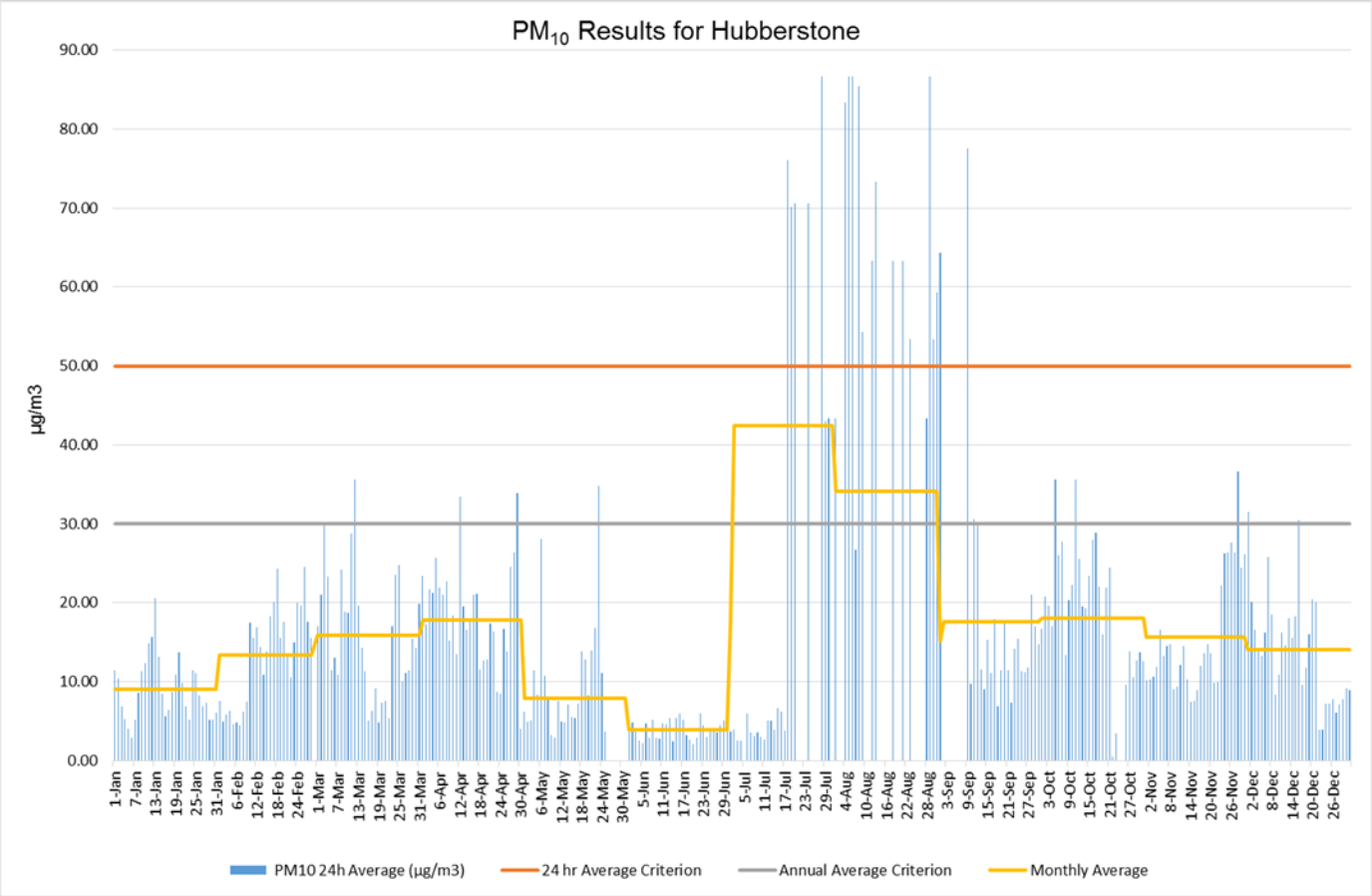


Figure 14 PM10 monitoring results- Hubberstone

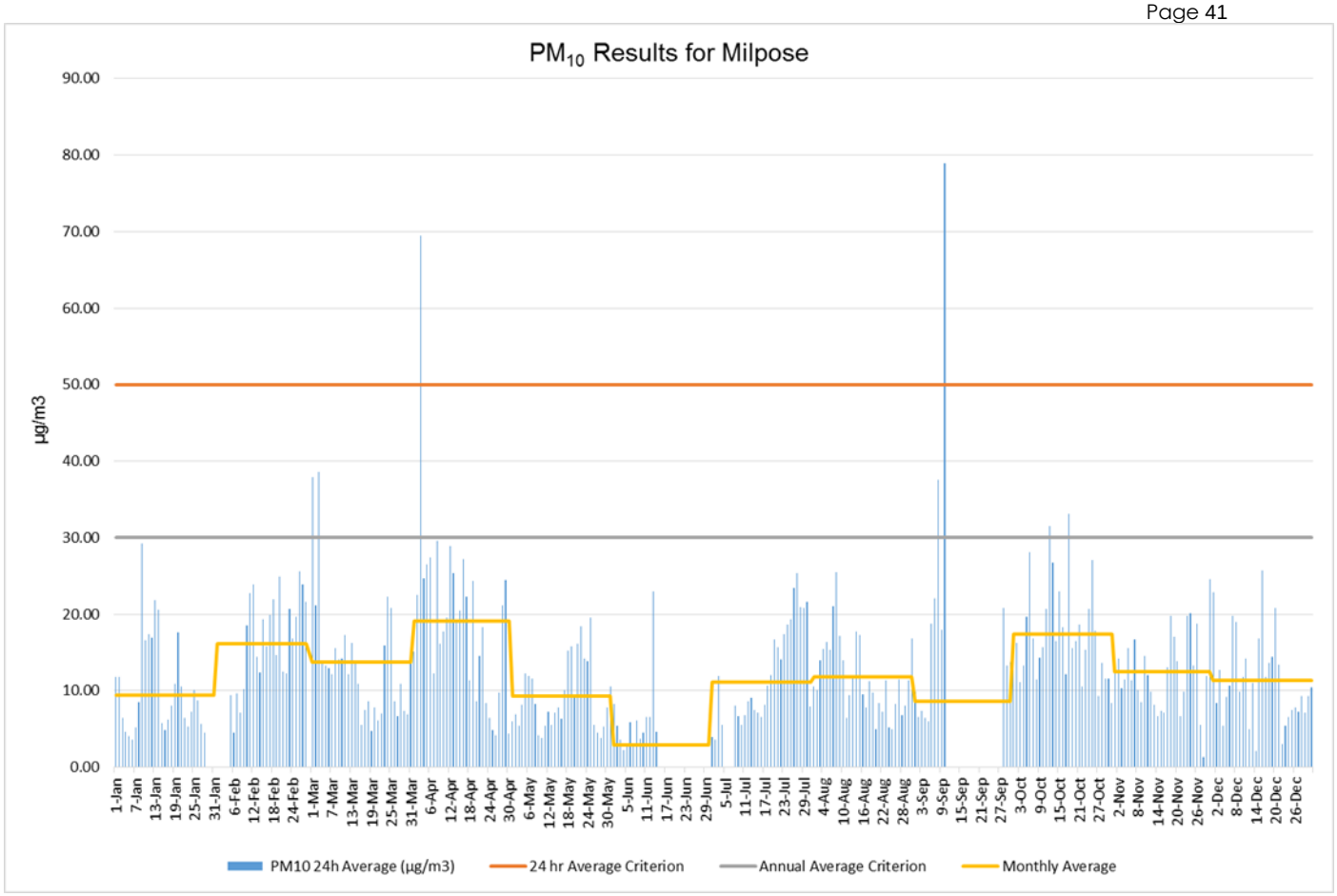


Figure 15 PM10 monitoring results – Milpose

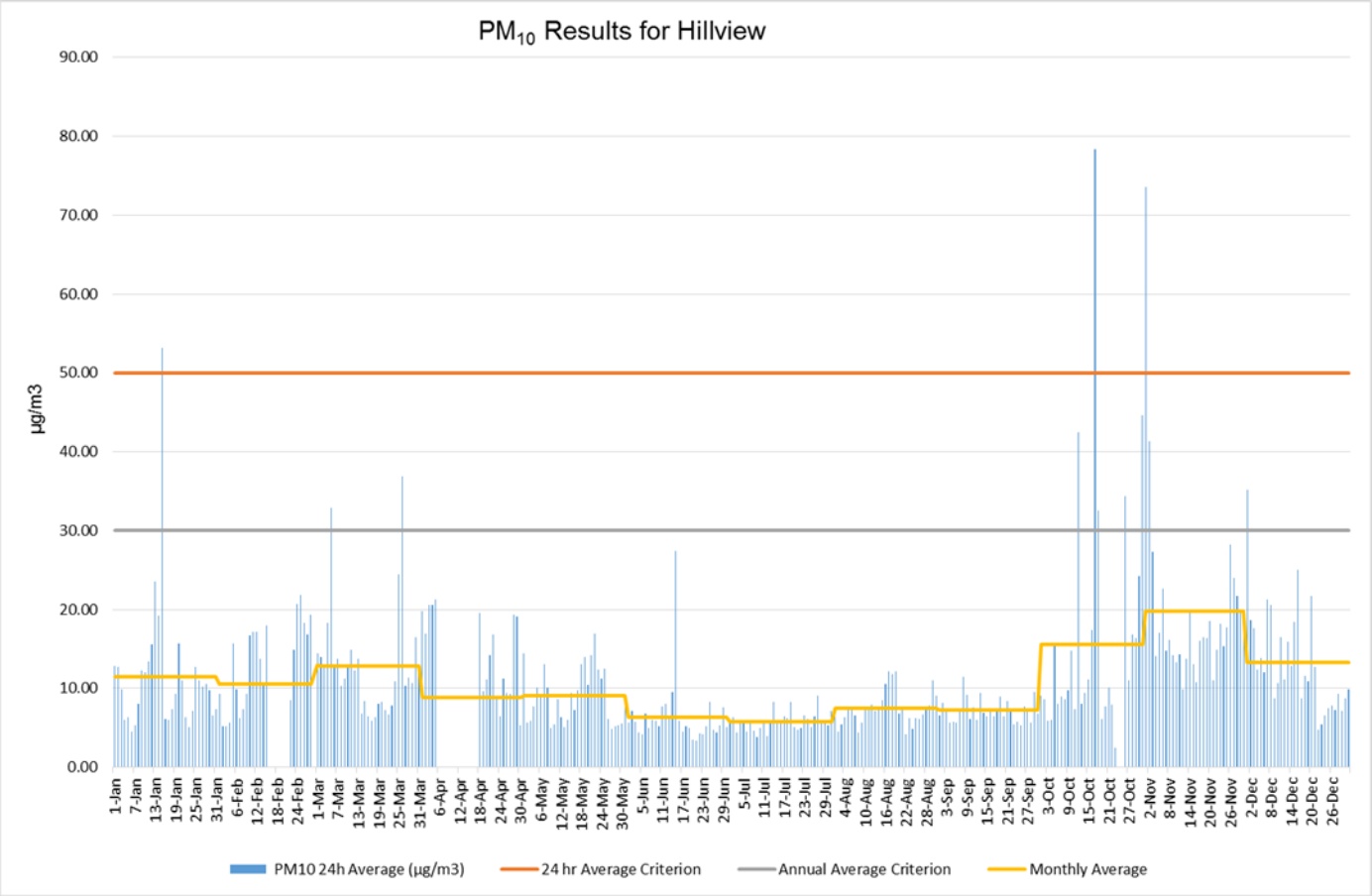


Figure 16 PM10 monitoring results – Hillview

Total Suspended Solids (TSP)

Total suspended particulate matter (TSP), is measured using a high volume sampler (Hi-Vol), which samples for 24 hours every six days. Monitoring is conducted in accordance with AS/NZS 3580.9.3:2003 – Methods for sampling and analysis of ambient air Method 9.3: Determination of suspended particulate matter—Total suspended particulate matter (TSP) — high volume sampler gravimetric method. TSP generally includes particles with an equivalent aerodynamic diameter (EAD) of less than 50 µm and can include particles generated from burning of vegetation, industrial/mining processes, combustion and natural causes

TSP monitoring commenced in 2015, to align with the commencement of the Rosedale Tailings Project. At Hubberstone, two exceedances were recorded over the reporting period, one at 113 ug/m3 on 8 March 2016 and 99.3 ug/m3 on 13 April 2016. Investigations were undertaken in both instances and revealed that the exceedance was due to farming activities and was not attributable to Northparkes mining operations.

The monitoring results at Milpose recorded one exceedance over the reporting period, on 25 February 2016, which recorded 100 ug/m3. An investigation was completed to determine the likely cause and concluded that the exceedance was attributable to shearing activities near the TSP location.

All recorded values at Hillview monitoring location were under the required criteria for 2016 monitoring period. Results are represented in Figure 17, Figure 18, and Figure 19.

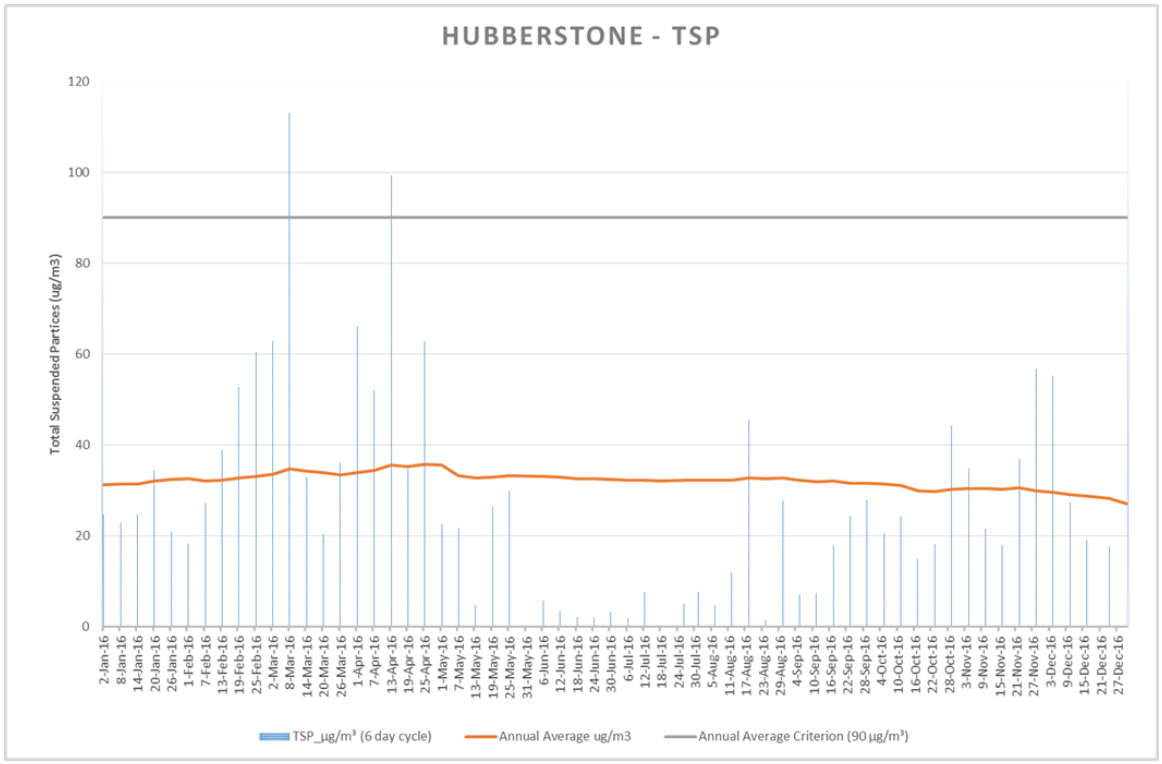


Figure 17 TSP results for Hubberstone

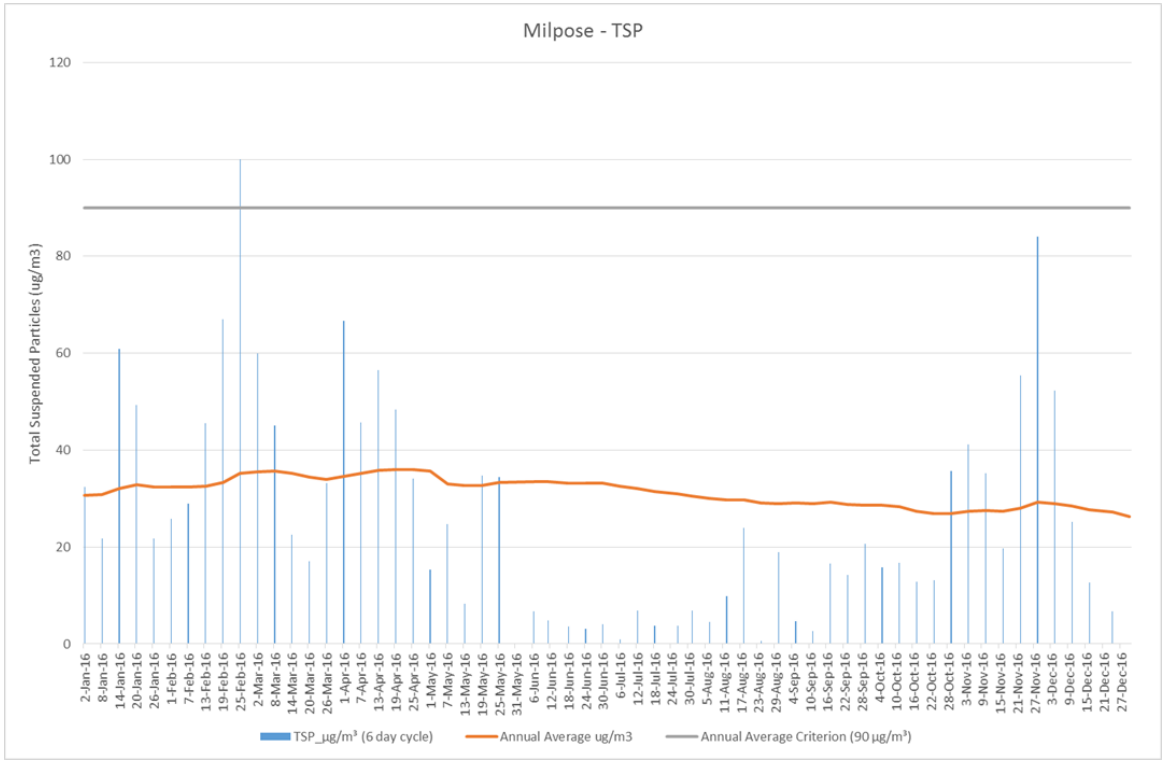


Figure 18 TSP results for Milpose

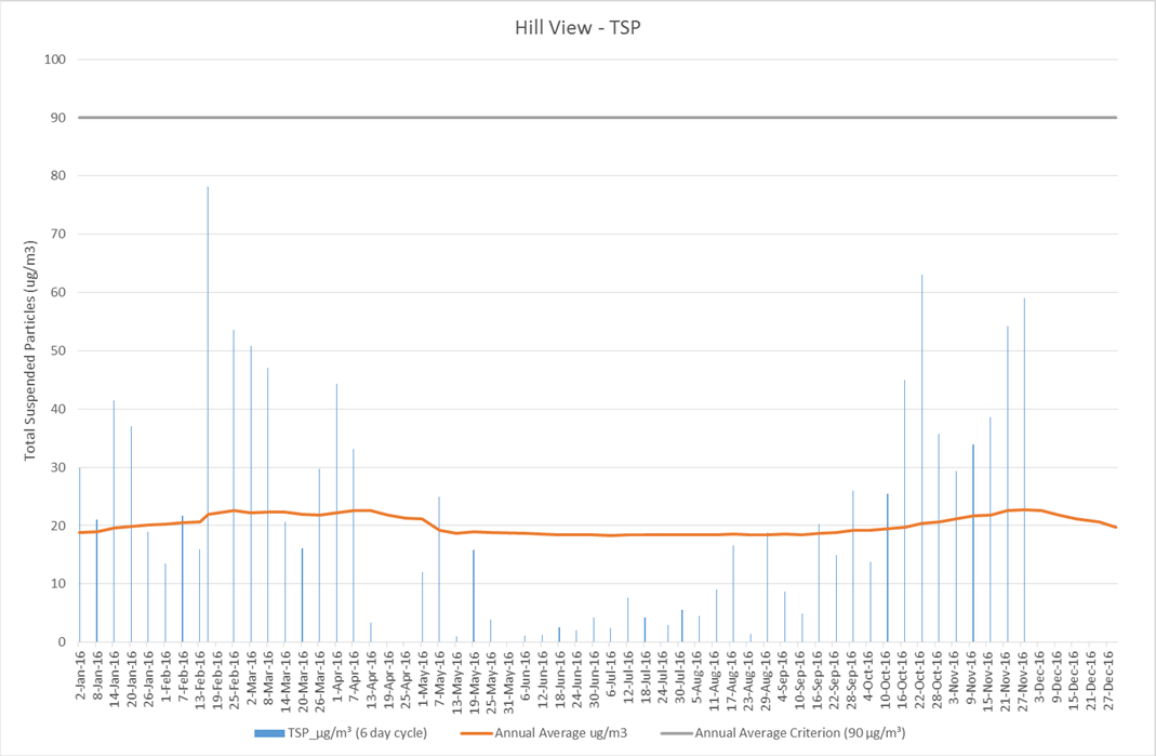


Figure 19 TSP results for Hillview

Depositional Dust

The indicative annual averages (IAAs), calculated from the monthly dust deposition results, are displayed for 2016. The current reporting period, for each of the monitoring sites.

During the reporting period, the calculated IAA dust deposition level was below the regulatory limit of 4g/m2/month IAA. However, at a number of locations, individual results greater than the internal trigger value were received and investigated, but did not result in any exceedances of the IAA in PA11_0060.

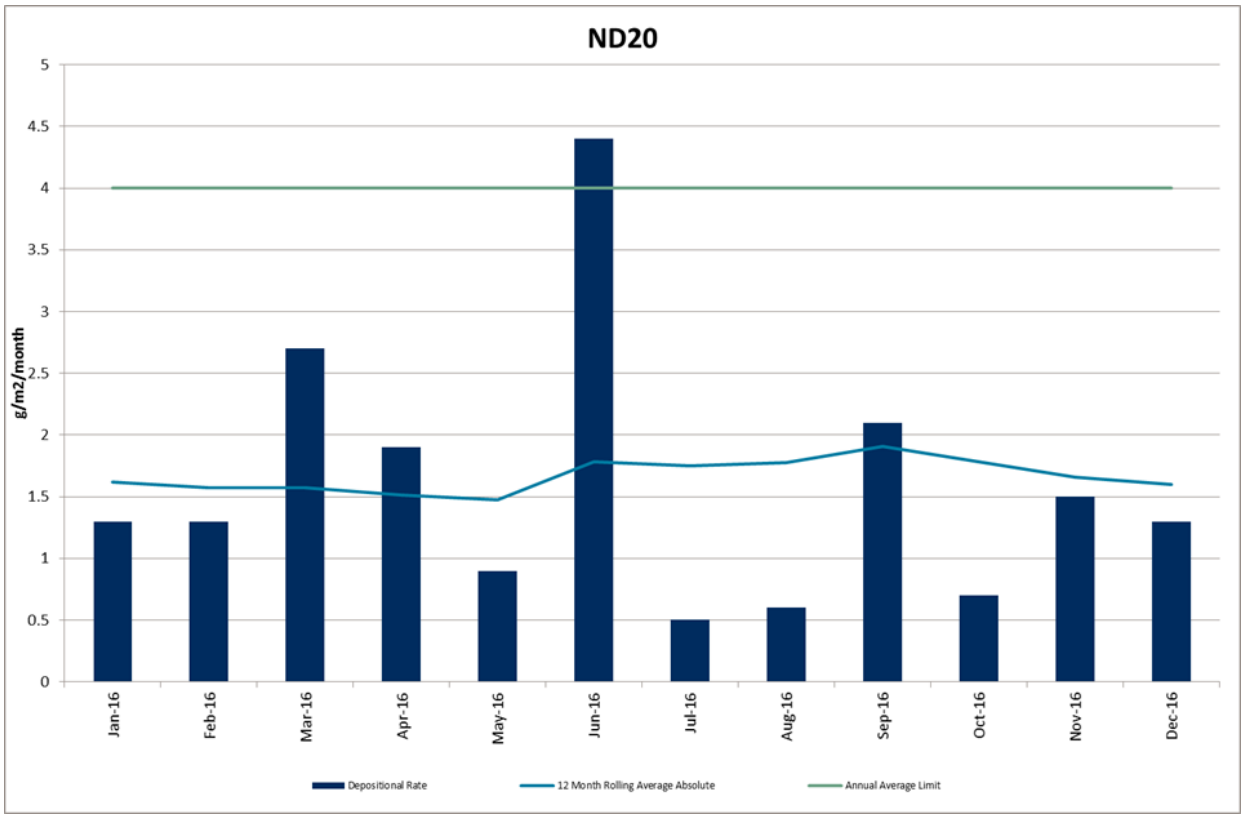
The results at dust monitoring location ND19, ND21, TDE5, TDSW and TDW included zero exceedances and the results were under the required criteria specified in the Project Approval. There was one exceedance at ND20 and ND22 location. TDN5 and TDS5 recorded two exceedances over the monitoring period, similarly TDNE recorded four exceedances and TDE recorded five exceedances over the reporting period. All exceedances were investigated to identify the likely source of dust. A high proportion of anomalous results were due to external contaminants, such as bird droppings, bugs, organic matter, and dust from local farming activities. In cases where values above the trigger value were not a result of Northparkes' activities, these results were deemed an outlier and excluded from the IAA calculation.

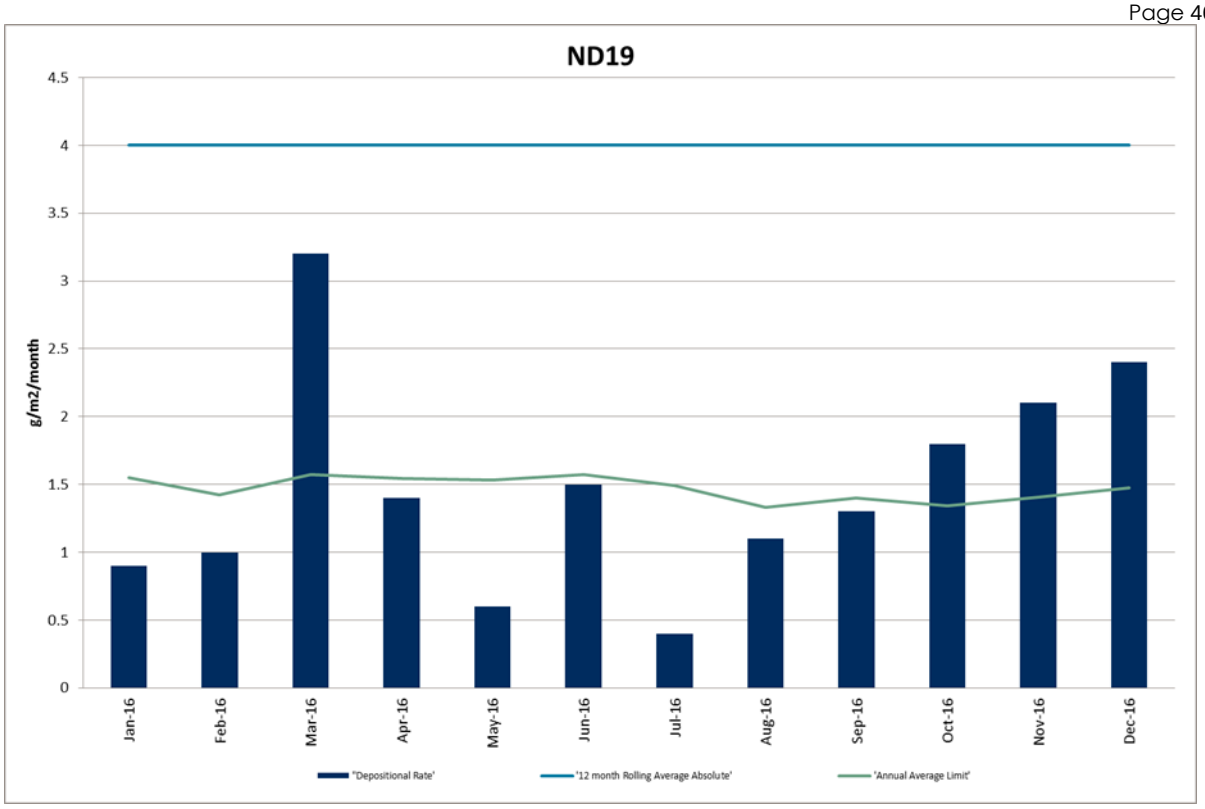
Depositional dust results are presented in Figure 20.
Table 6 summarises the results of these investigations during the reporting period.

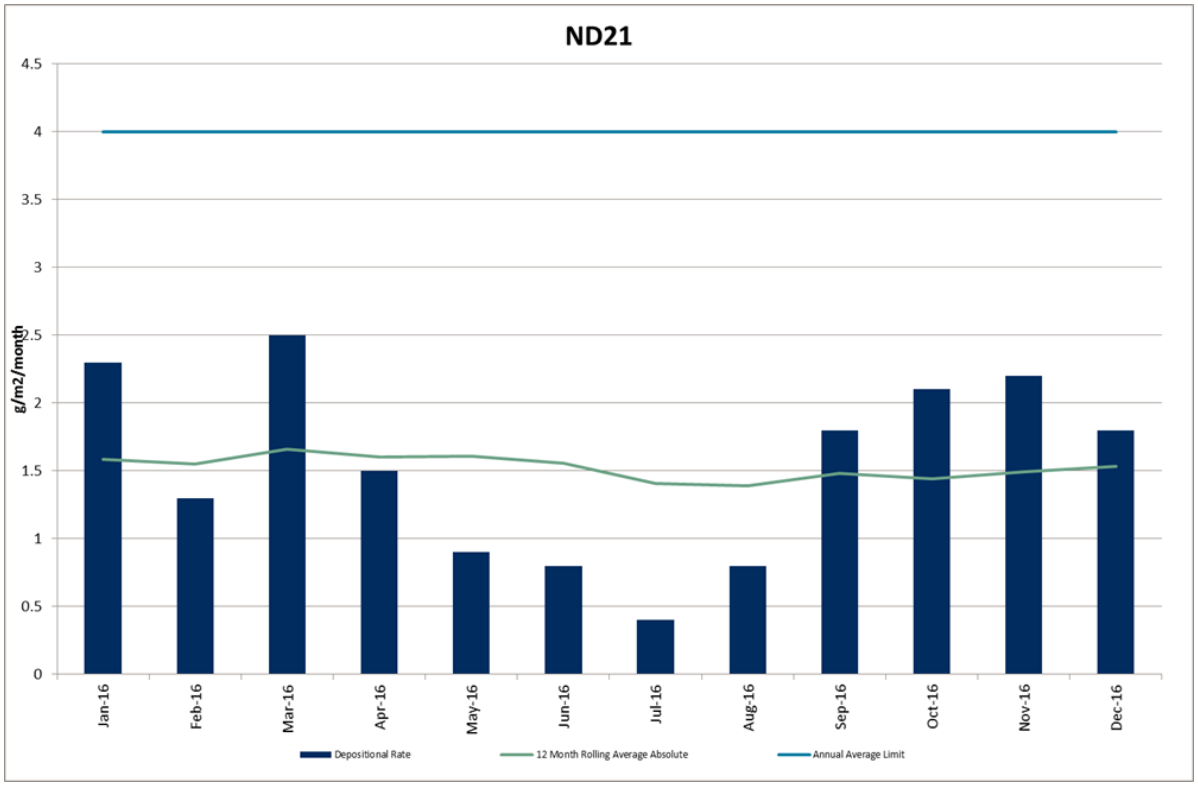
Table 6 Summary of depositional dust investigations

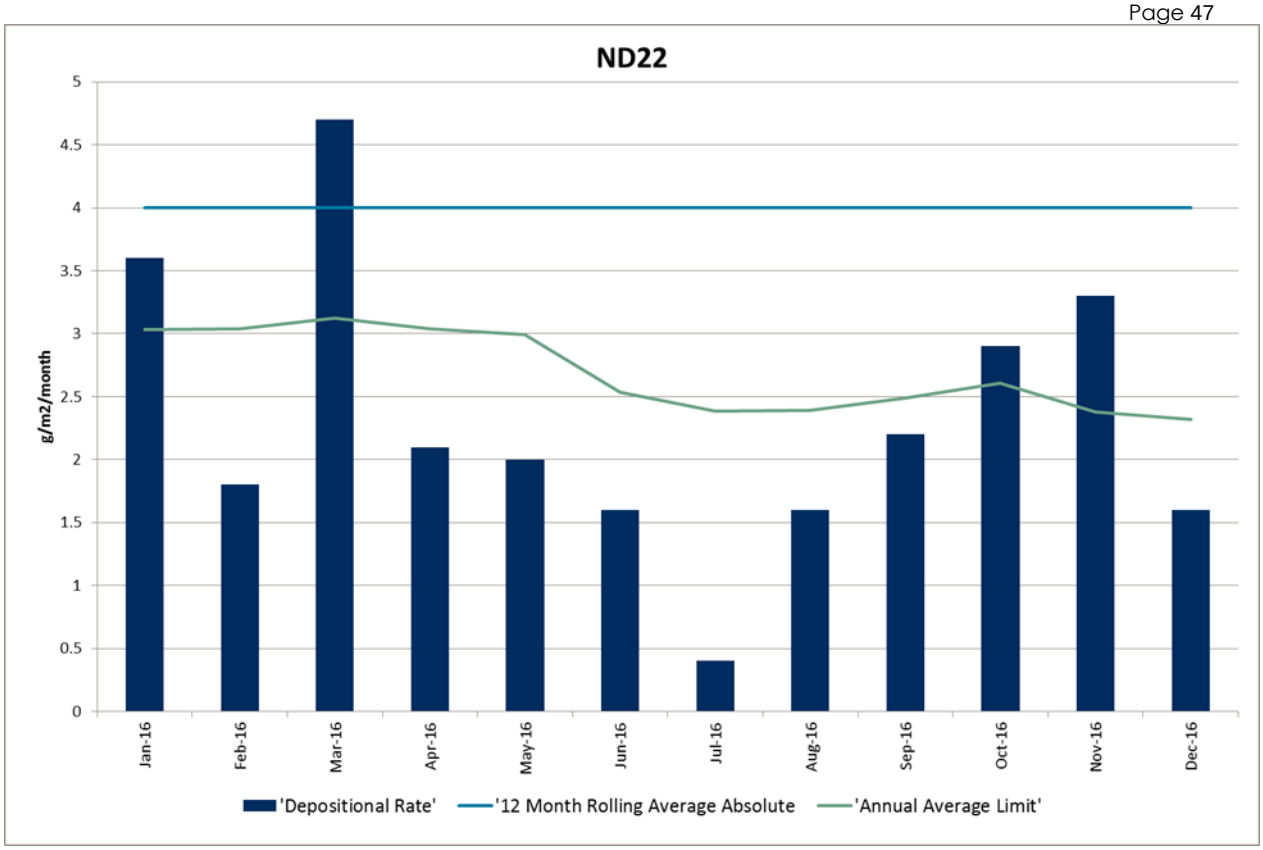
Location	Month	Contamination due to	Excluded from IAA
ND20	June	Organic matter, sheep activity	✓
ND22	March	Farming activities, Stock movement	✓

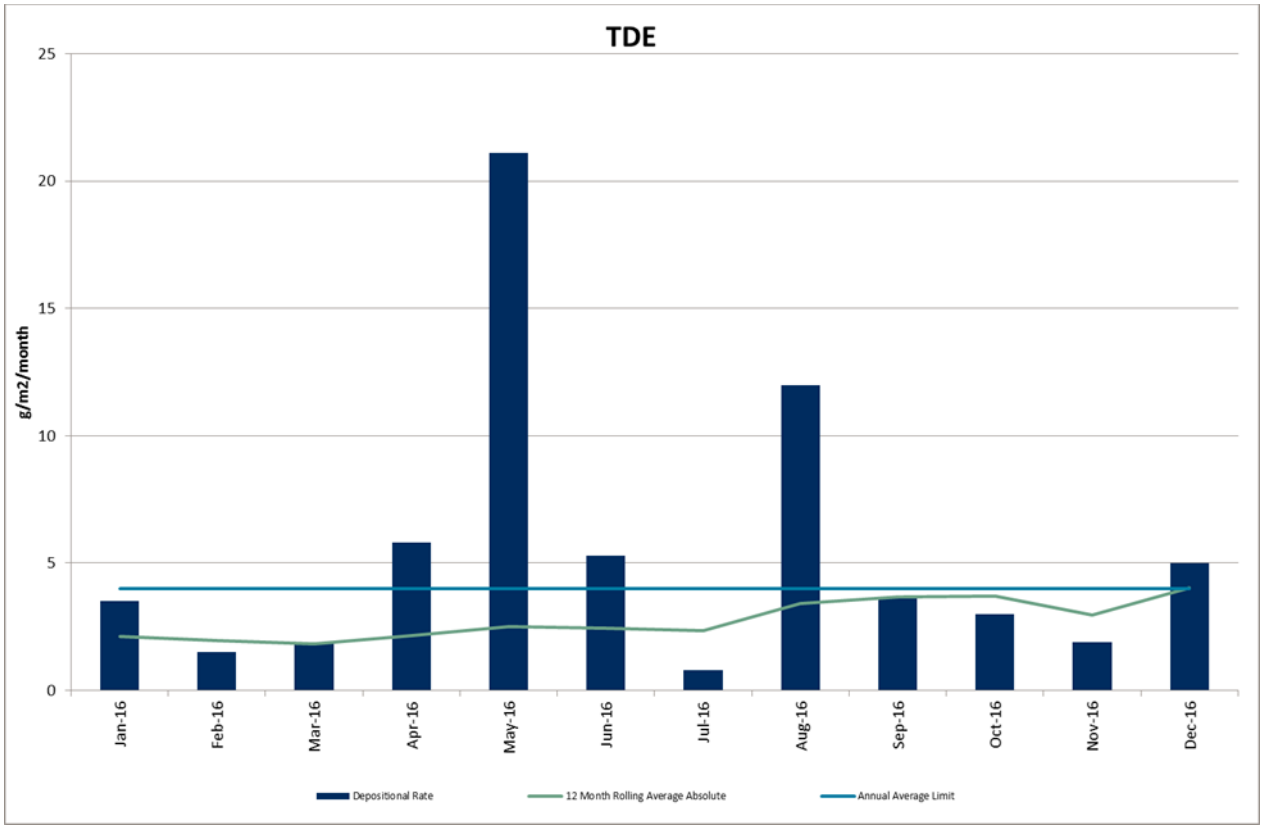
Location	Month	Contamination due to	Excluded from IAA
TDN5	May	Organic matter, bird dropping	✓
	November	Farming activities, harvesting	✓
TDS5	May	Organic matter, bird dropping	✓
	June	Sheep in nearby vicinity	✓
TDE	April	Organic matter, sheep activity	✓
	May	Farming activities, Stock movement	✓
	June	Organic matter, sheep activity	✓
	August	Farming activities	✓
	December	Harvesting in the neighbouring property	✓
TDNE	June	Stock movement	✓
	September	Localised farming	✓
	November	Stock movement, harvesting	✓
	December	Farm activity, harvesting	✓

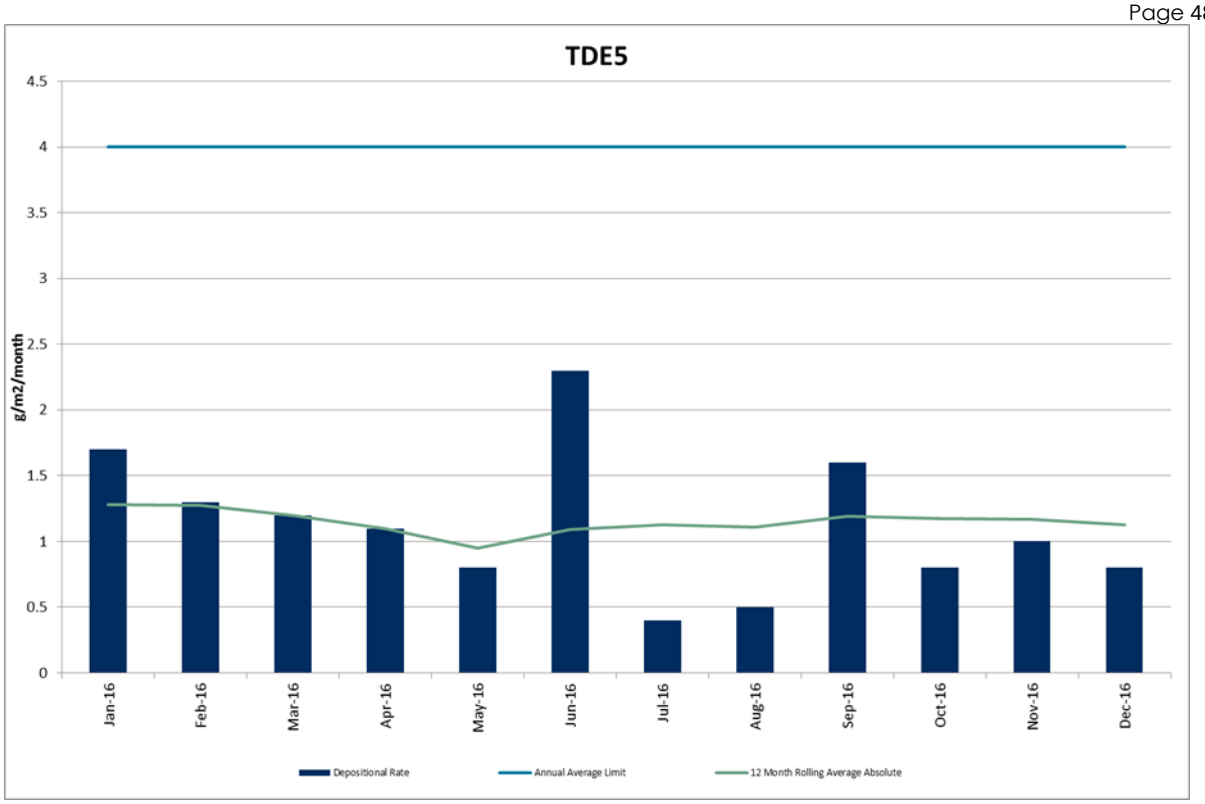


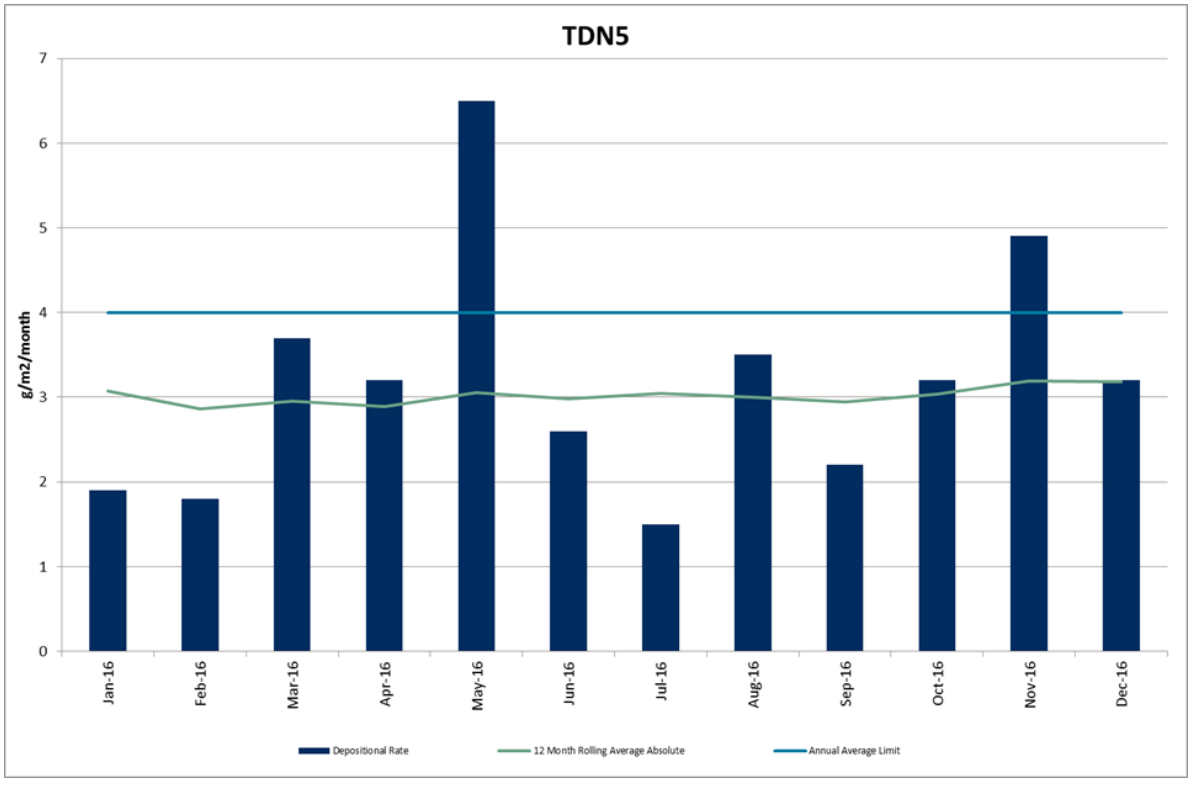

ND19
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
g/m2/month
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
'Depositional Rate'
'12 month Rolling Average Absolute'
'Annual Average Limit'

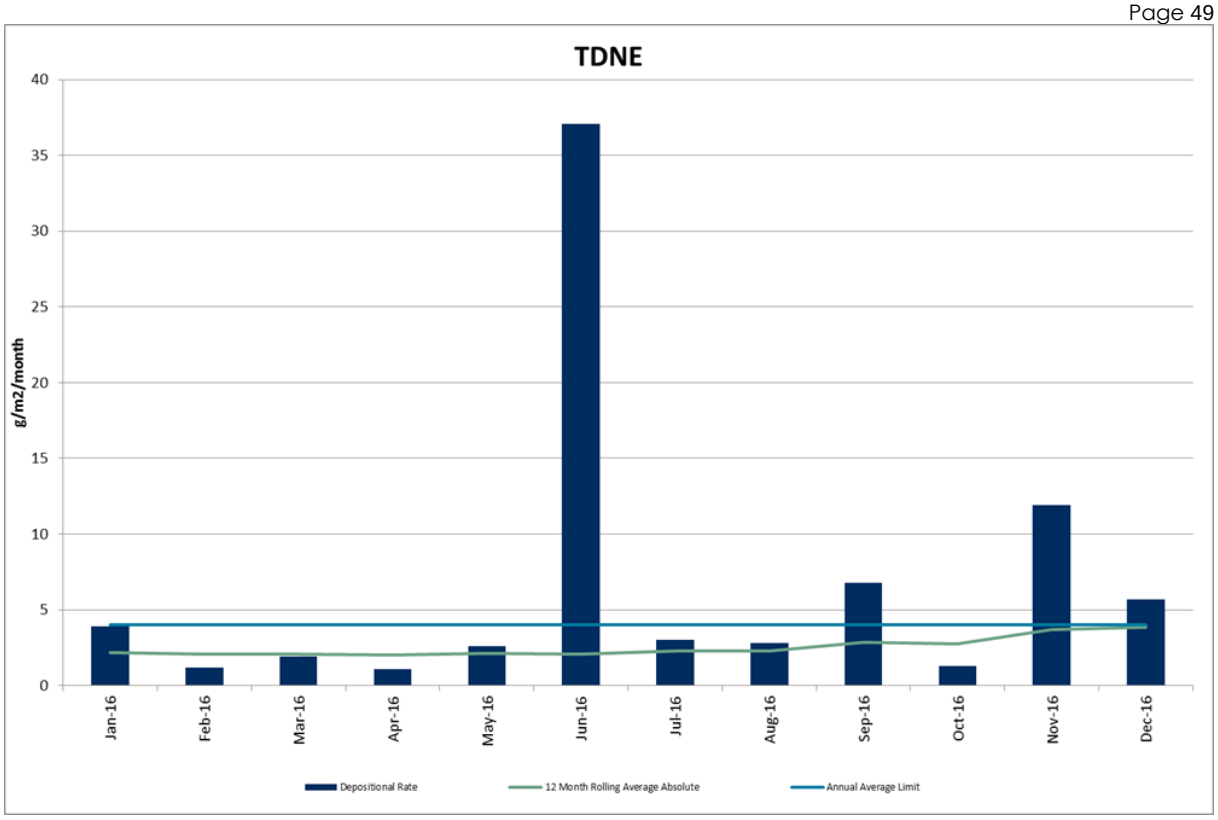

ND21
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
g/m2/month
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Depositional Rate
12 Month Rolling Average Absolute
Annual Average Limit

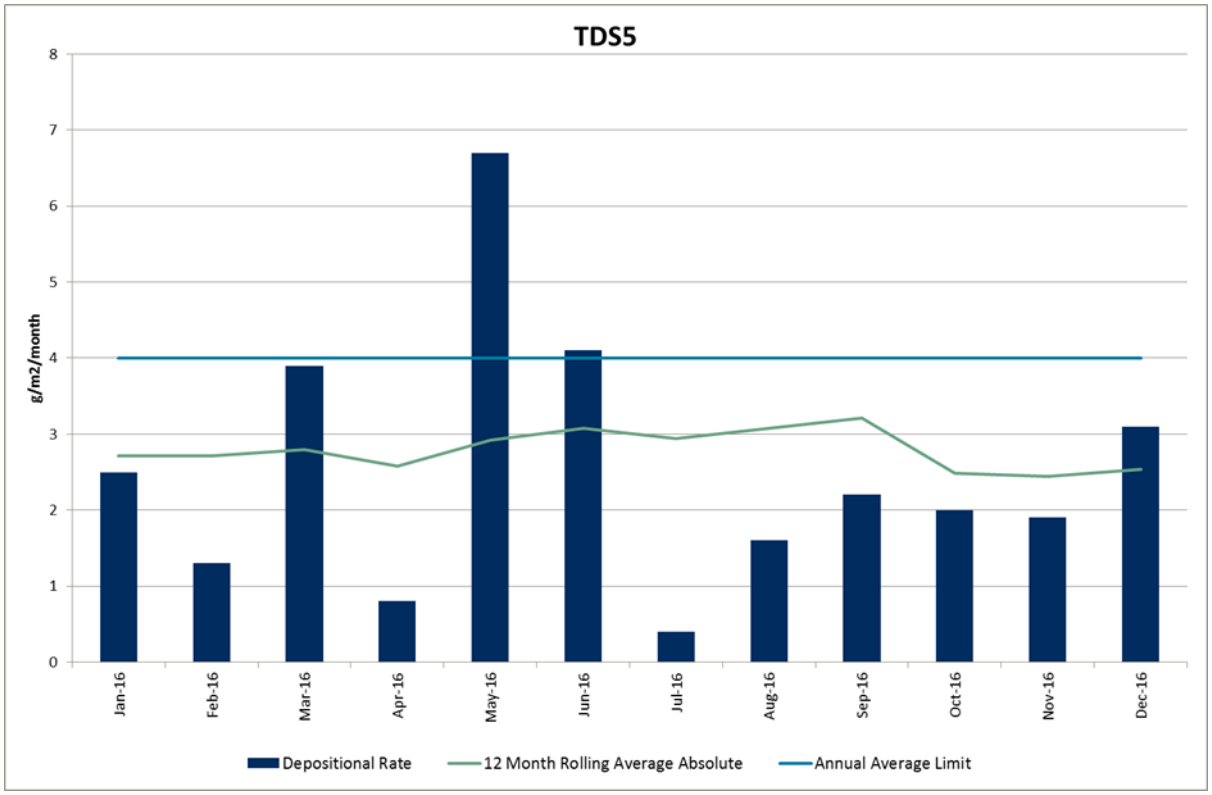

ND22
g/m2/month
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
'Depositional Rate'
'12 Month Rolling Average Absolute
'Annual Average Limit'

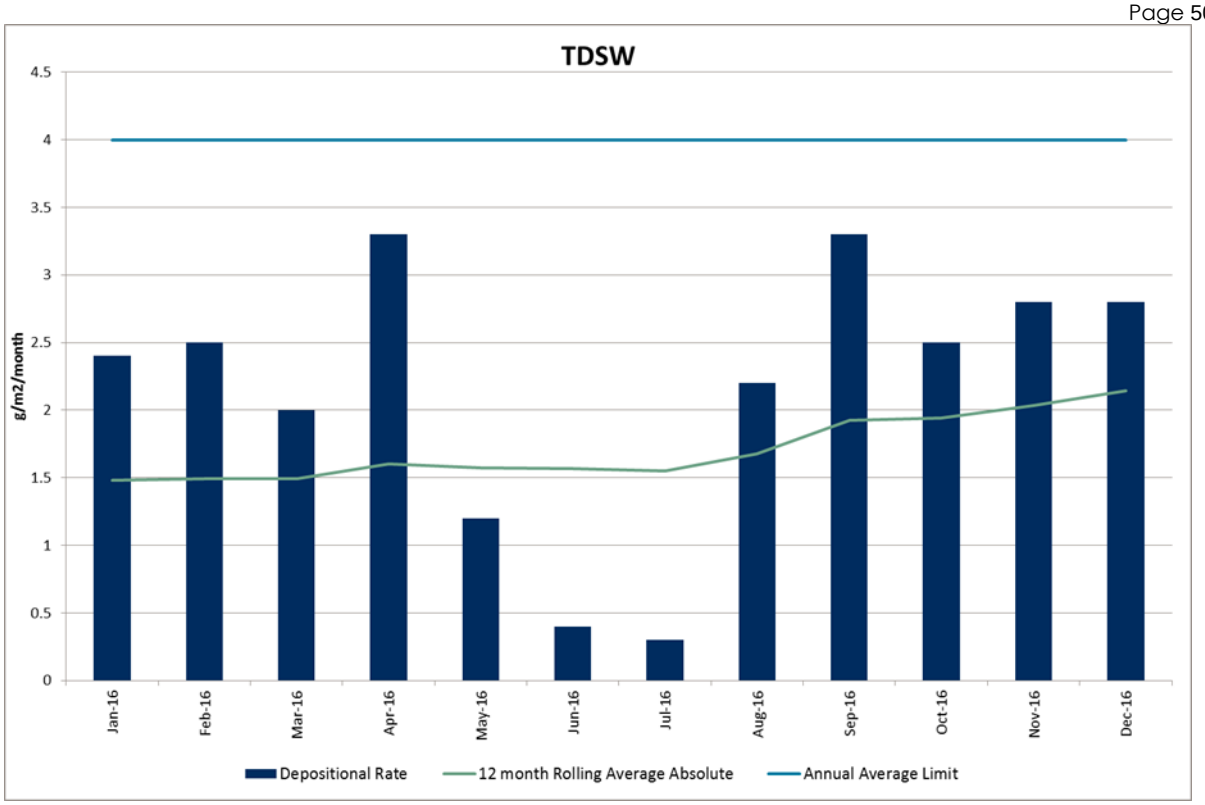

TDE
g/m2/month
25
20
15
10
5
0
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Depositional Rate
12 Month Rolling Average Absolute
Annual Average Limit


TDE5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
g/m2/month
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Depositional Rate
Annual Average Limit
12 Month Rolling Average Absolute


TDN5
7
6
5
4
3
2
1
0
g/m2/month
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Depositional Rate
12 Month Rolling Average Absolute
Annual Average Limit


TDNE
40
35
30
25
20
15
10
5
0
g/m2/month
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Depositional Rate
12 Month Rolling Average Absolute
Annual Average Limit


TDS5
8
7
6
5
4
3
2
1
0
g/m2/month
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Depositional Rate
12 Month Rolling Average Absolute
Annual Average Limit



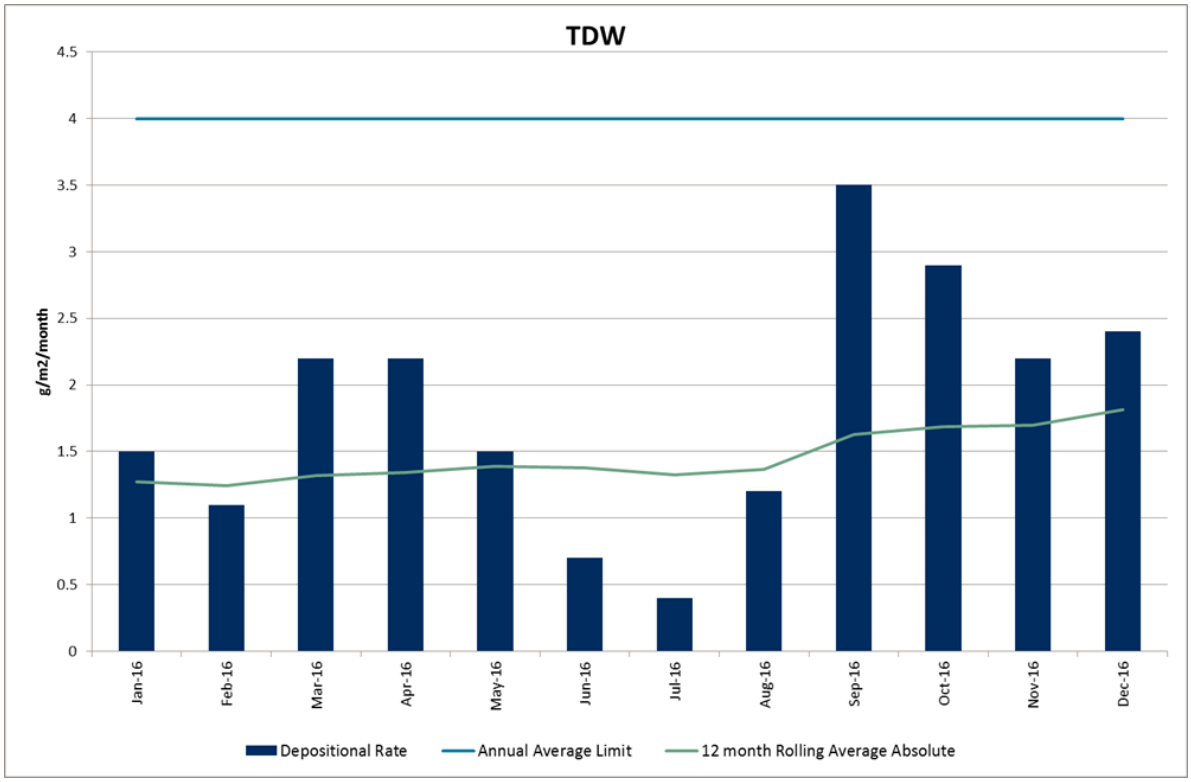


Figure 20 Depositional Dust Annual Averages

Note: All depositional dust exceedances have been investigated and reported to the relevant regulatory agency. Further details can be found in Table 6.

4.4.5 Actions proposed for 2017

- Calibrate all 24-hour real-time PM10 monitors as required in OEM;
- Analyse real time data to identify any non-compliance;
- Continue rehabilitation trails of TSF1;
- Continue Total Suspended Particles (TSP) monitoring at all three locations as required by the Project Approval (11_0060); and
- Intersow perennial and annual pasture species on TSF1 and TSF2 to provide a more sustainable ground cover to reduce risk of dust lift off from the TSF's.

4.5 Noise

4.5.1 Reporting period summary

Quarterly noise monitoring completed by external noise specialists.

Real time noise monitors have been installed at 'Hubberstone', 'Milpose' and 'Hillview'.
No exceedances of regulatory noise criteria.

Noise associated with the mining activities has the potential to affect the surrounding community. Northparkes implements a number of controls to mitigate noise that may be generated from on-site activities.

4.5.2 Monitoring

Northparkes undertakes a noise monitoring program at three locations on privately owned properties outside the mining leases. The fourth location 'Hillview' has been added into the Northparkes Noise Monitoring Program as required by the Project Approval (11_0060). The program consists of both operator-attended and unattended surveys at the four nearest occupied residences 'Hubberstone', 'Milpose', 'Lone Pine' and 'Hillview' (Figure 21).

Noise measurements are undertaken in accordance with the requirements of new Project Approval (11_0060), AS 1055, and the DECC Industrial Noise Policy, 2000. Northparkes engages external noise specialists to monitor and analyse the results. All acoustic instrumentation is designed to comply with the requirements of AS 1259.2 and carries current NATA or manufacturer calibration certificates.

Received levels from various noise sources are noted during operator-attended monitoring and particular attention is paid to the extent of the Northparkes contribution, if any, to measured noise levels. In addition, the operator quantifies and characterises the overall levels of ambient noise. Noise occurring during the surveys is recorded by the operator with an indication of the noise source, noise type, and the time of occurrence. Effect on the mine noise propagation is established by assessing prevailing weather conditions recorded at the Northparkes weather station, and at the time of the monitoring by the operator. A summary of the weather data is available in Appendix 3.

In addition to the operator-attended monitoring, unattended continuous noise logging is undertaken at the four monitoring locations. This allows Northparkes to determine the overall ambient noise amenity levels of background noise, and any noise generated by mine activity. This is undertaken continuously over the year and the information is assessed. The ambient noise levels obtained from the loggers are not necessarily the contributed noise emissions arising from Northparkes operations alone. The ambient noise level data quantifies the overall noise level at a given location independent of its source or character. The noise logger calculates the statistical noise indices and does not 'record' the actual noise.

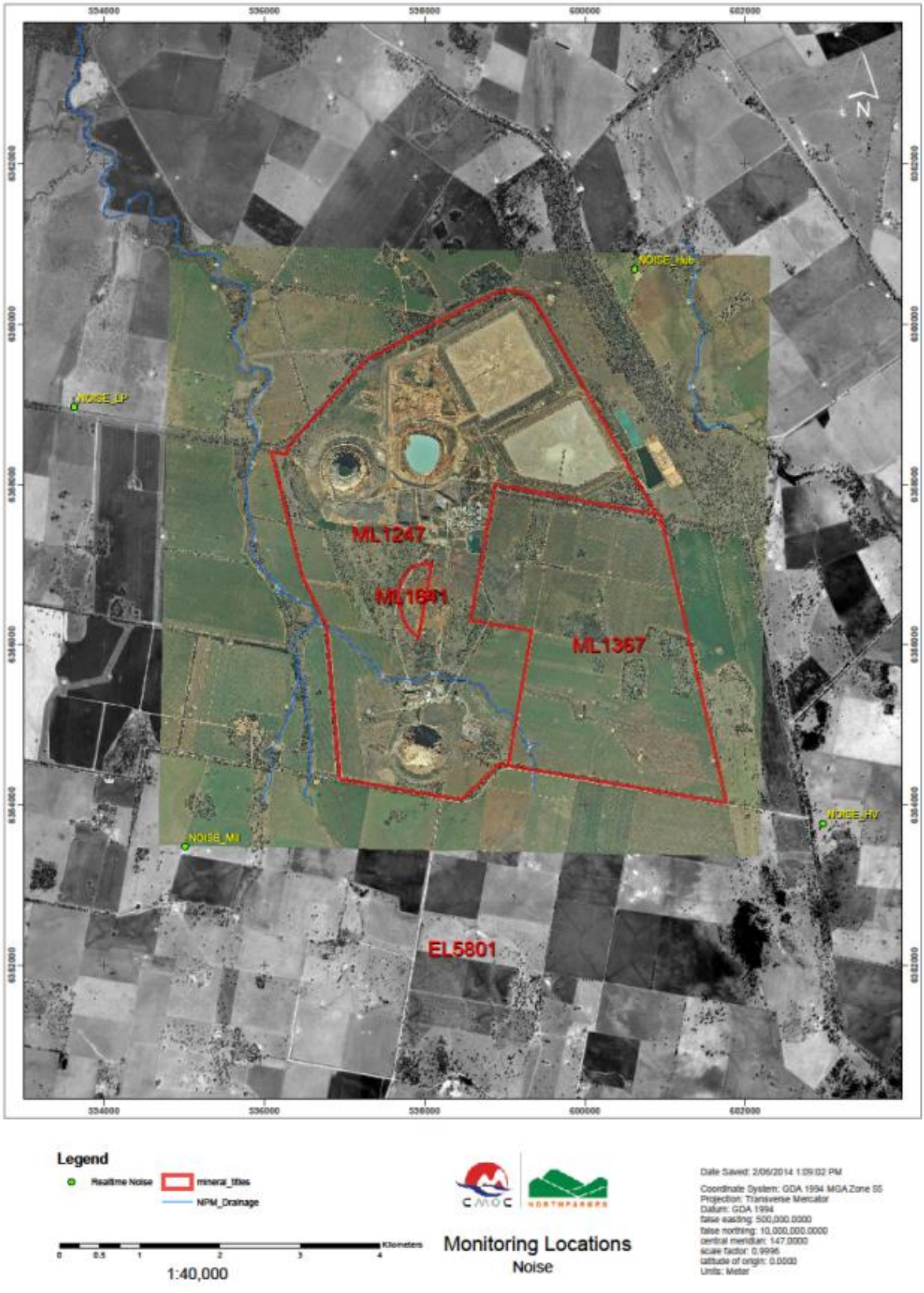


Figure 21 Northparkes Noise monitoring locations

4.5.3 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 - There are three approaches to controlling noise generated by the source: source elimination; Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA).

- Controlling the transmission of noise - There are two approaches: the use of barriers and land-use controls which attenuate noise by increasing the distance between sources and receiver.

- Controlling noise at the receiver - There are two approaches: negotiating an agreement with the landholder or acoustic treatment of dwellings to control noise.

Noise control measures at NPM are designed to comply with the Project Approval 11_0060 and the requirements of the NSW Industrial Noise Policy.

Operational control measures include:

- Northparkes has a private agreement in place with the owners of "Avondale" for the property to remain unoccupied over mine life;
- major works scheduled 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;
- avoiding the unnecessary clustering of earth moving equipment;
- 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;
- pro-active management of equipment operations, including positioning of exposed equipment to lower elevations during noise enhancing meteorological conditions and review of design options to incorporate passive noise attenuation measures into the construction process, such as provision for equipment use at lower elevations during winter evening and night periods;
- incorporation of active noise attenuation measures such as bunding and shielding around equipment during winter night time operations;
- a noise management system that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations, and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions and approvals;

- a program of regular noise monitoring of site operations to determine whether the operations are complying with the criteria set out in Northparkes Mine Extension Project, Project Approval 11_0060. 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 periods for TSFs, whilst campaign open cut mining operations occur during winter night time operations. 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 neighboring receivers. Appropriate noise mitigation measures will be implemented as required; and
- development of a Construction Noise Management Plan in consultation with relevant agencies and potentially affected receivers that will outline the impact mitigation measures to be implemented should targeted noise monitoring during construction activities identify exceedances of relevant noise impact assessment criteria.

4.5.4 Results

A total of 192 attended noise surveys were undertaken during the reporting period, of which 136 (i.e. 88 per cent) were during favourable meteorological conditions stipulated into Project Approval conditions. The surveys undertaken during unfavourable meteorological conditions were excluded from assessment. The reasons for this included the wind speed exceeding 3 m/s and rain.

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 criteria.

Monitoring results during the reporting period were in compliance with the limits specified in the new Project Approval (11_0060) and no noise exceedances were recorded with the project approval noise criteria. All attended and attended monitoring data are available in Appendix 4.

During the life of the project the noise monitoring results are in compliance with the limits specified in the new Project Approval (11_0060).

4.5.5 Actions proposed for 2017

- Real time monitoring of noise data from all four locations;
- Removal of unattended noise monitoring from noise schedule due to the installation of real-time noise monitors; and
- Technical review of all real time noise data.

4.6 Blasting

No surface blasting activities occurred in 2016.

4.6.1 Monitoring

Blast monitoring did not occur in 2016 due to there being no surface blasting activities in 2016.

4.6.2 Management

Northparkes does not currently undertake surface blasting activities. Therefore, all associated management activities are not currently applicable. If in future surface mining activities resume, management and monitoring practices will be re-established.

4.6.3 Results

There were no surface blasts in 2016 and there were no community concerns relating to blasting in 2016.

4.6.4 Actions proposed for 2017

Program will be reviewed if operational changes occur.

4.7 Water

4.7.1 Reporting Period Summary

- Total freshwater consumed was 2221 ML.
- No significant changes to water quality or level.

Northparkes sources water from numerous locations including imported water from various licences (refer Table 1). Water recycled from on-site ore processing facility, the tailings dam reclamation system and water collected through on-site infrastructure is all reused for mining purposes.

Water is essential in the processing of ore through Northparkes' concentrator to produce copper concentrate. Effective water management is therefore crucial to the long-term success of Northparkes' operations. A summary of the water storages at the beginning and end of 2016 is provided in Table 8. In addition to the storages the maximum storage capacity is also recorded in Table 8.

Table 7 Water Storage Capacities

Name	January 2016 Volume (cubic meters)	December 2016 Volume (cubic meters)	Storage Capacity (cubic meters)
Sediment Ponds			
SP3	5	15	28.8
SP4	5	15	19.9
SP10			1.8
SP15	0	1	12.8
SP16			6.3
Retention Ponds			
RP1	1.5	5	13.2
RP2	0.2	0.2	1.5
RP3	0.5	0.5	4.6
RP4	0.0	0.5	1.2
RP5			1.9
RP6			2.3
RP7			9.5
RP8			14.4
RP9 (was previously SP5)	60	70	76
RP10			0.9
RP12			0.8
RP13			2.1
RP15			2.9
RP16			5.2
RP19			3.7
RP20	5	2	5.7
RP21	0.1	0.7	0.8
RP22	0.2	0.3	1.4
RP23			0.1
RP24			0.2
RP25			0.1
RP26			10.0
RP27		.	3.5

Name	January 2016 Volume (cubic meters)	December 2016 Volume (cubic meters)	Storage Capacity (cubic meters)
RP28			0.2
RP29			1.9
RP30			1.1
RP31			1.4
Process Water Management System			
Return Water Dam	5	5	14.0
Process Water Dam	135	150	200
E22 Void	1500000	1490000	2700000
Caloola Dams	900	900	1090
SD1 and SD2			7.1

Northparkes is located in a semi-arid environment and, as such, maintains a strong focus on water management to;

- Ensure a long-term reliable water supply to site;
- Minimise impacts to natural water flows and biotic systems;
- Maximise water efficiency to reduce reliance on fresh water usage; and
- Maintain water quality.

Northparkes is a zero discharge of contaminated water and as such impact to the nearby permanent surface waters is therefore minimal.

4.7.2 Surface and Groundwater Monitoring

Water monitoring occurs at 74 surface water and 51 groundwater sampling sites every quarter. The surface water monitoring program consists of water quality sampling of various surface water courses and drainage system locations on and off the Mine Lease. In addition to the surface water quality monitoring program, water course stability is also monitored as per requirements of PA 11_0060. The groundwater monitoring program involves monitoring water levels and quality at various locations up gradient and down gradient from the site. The location of sampling sites is provided in Figure 22 and Figure 23

Water monitoring occurs on a quarterly basis and ad-hoc after significant rainfall events (during flow events). Water monitoring requirements in regards to the analytical suite monitored and frequencies is displayed in Table 8, Table 9 and Table 10

All water monitoring and sample collection, storage and transportation is undertaken in accordance with Northparkes procedures which are aligned with AS/NZS 5667 – Water Quality - Sampling. Analysis of surface water and groundwater was carried out in accordance with Environment Protection Agency approved methods by a NATA accredited laboratory.

Ground and surface water impact assessment criteria is not established under Northparkes EPL 4784 as Northparkes is a zero discharge site. Northparkes commissioned SRK to conduct an independent review of the existing ground and surface water trigger levels. SRK conducted an assessment of the current available water data (taking into consideration livestock drinking water quality). Trigger values were provided for the following groups of water monitoring locations;

- Water courses;
- Farm dams;

- Retention Ponds; and
- Sediment Ponds.

Due to the variability in water qualities for the groundwater bores, individual values were created for the following groups where sufficient data was available;

- Open cut bores;
- TSF bores;
- Underground bores; and
- Regional bores.

The updated trigger levels were presented in the updated Water Management Plan submitted to the Department of Planning and Environment in November 2016.

Northparkes is required to publish monitoring data for some of the bores as required by EPL 4784 approval. The data is published on the Northparkes website and made available for public viewing.

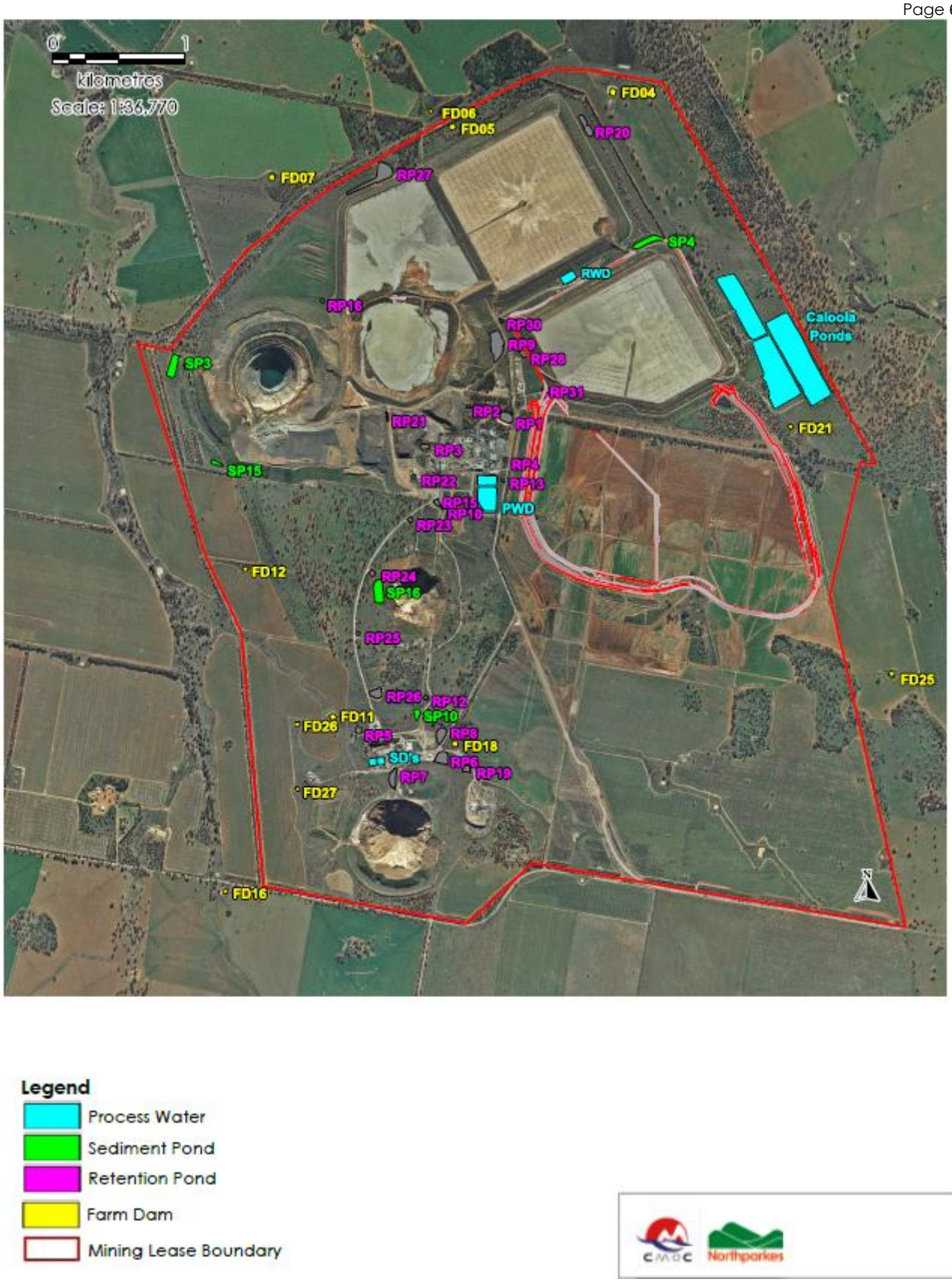


Figure 22 Northparkes Surface water monitoring locations

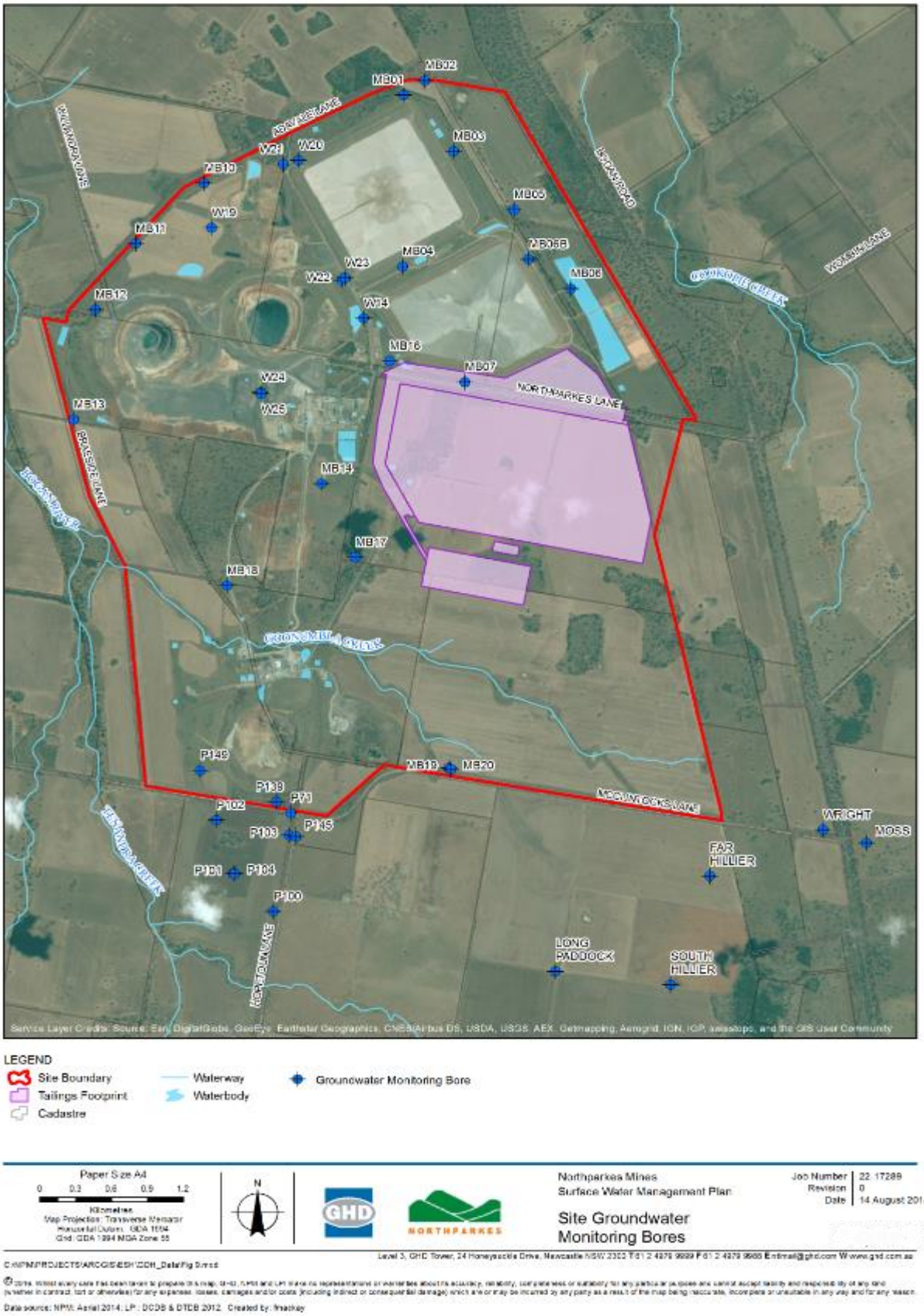


Figure 23 Northparkes Groundwater monitoring location

Table 8 Surface water monitoring program

Monitoring Locations	Frequency	Analytical Suite
Watercourses (clean water systems)	Quarterly (Minimum Annually)*	pH, EC, TSS, TDS, Cu, Na, K, Ca, Mg, Cl, SO_4, HCO_3, CO_3
Farm Dams (clean water systems)	Quarterly (Minimum Annually)*	pH, EC, TSS, TDS, Cu, NA, K, Ca, Mg, Cl, SO_4, HCO_3, CO_3
Sediment Ponds (dirty water management system)	Minimum 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, 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

*Minimum sampling frequency, with additional sampling following heavy rainfall events.
** Metals are sampled as dissolved concentrations.

Table 9 Watercourse Stability Monitoring Program

Location	Frequency	Assessment Requirements
WC13, WC14, WC3, WC5	Quarterly, additional sampling following heavy rainfall events.	Visual assessment of channel form, presence of instabilities in watercourse banks or in crossing structure (bridge/culvert).
Crossing structures – Goonumbla Creek	Quarterly, additional sampling following heavy rainfall events.	

Table 10 Groundwater monitoring program

Monitoring Locations	Frequency	Analytical Suite
TSF Bores	Quarterly	water level pH, EC, total dissolved solids, hydroxide alkalinity, carbonate alkalinity, bicarbonate alkalinity, total alkalinity,sulfate,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,ironandmercury.
Opencut Bores	Quarterly	water level pH,EC,total dissolved solids, hydroxide alkalinity, carbonate alkalinity, bicarbonate alkalinity, total alkalinity,sulfate,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,ironandmercury.
Underground Bores	Quarterly	water level pH,EC,totaldissolvedsolids, hydroxide alkalinity, carbonate alkalinity, bicarbonate alkalinity, total alkalinity,sulfate,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,ironandmercury.
Regional Bores	Quarterly	water level pH,EC,totaldissolvedsolids, hydroxide alkalinity, carbonate alkalinity, bicarbonate alkalinity, total alkalinity,sulfate,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,ironandmercury.

All water monitoring and sample collection, storage and transportation is undertaken in accordance with Northparkes procedures which are aligned with AS/NZS 5667 – Water Quality - Sampling. Analysis of surface water and groundwater was carried out in accordance with Environmental Protection Agency (EPA) approved methods by a NATA accredited laboratory.

4.7.3 Management

Northparkes sources water from numerous locations including imported water from various licences (refer Table 1). 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 Northparkes 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.

4.7.4 Results

The overall water quality of surface water and ground water remained consistent within long-term average. There were fluctuations observed in the surface water and groundwater quality which is largely attributable to higher infiltration rates due to higher than average rainfall during the reporting period. The groundwater levels remained similar to the previous reporting period and within long-term averages.

Surface Water

Surface water quality was generally within the range of the long-term average for the majority of monitoring locations.

No samples were collected at RP7, RP11, RP17, RP21, RP24, RP29, RP31, SP14, SP16, WC1, WC3, WC4, WC6, WC12, WC14 and FD12 for the reporting period as it was dry or <10% volume throughout the year. At monitoring locations RP4, RP16, RP21, RP22, RP23, RP27, RP30, GT2, SD2, WC2, WC5, WC7, WC11, WC13, FD13, FD14, FD15 and FD21 only one sampling event occurred over the reporting period, due to the locations being dry during the remainder of the year.

Copper levels were at or below the long term averages for all retention and process water monitoring locations. There were fluctuations observed at monitoring locations RP23, RP5, RP25 and RP26. The concentrations of copper increased from previous year; but were in-line with long term averages. Copper concentrations at RP23 increased from 0.132 mg/l to 1.05 mg/l, but inline with long term averages.

The copper concentrations for farm dams remained unchanged and in-line with the long term averages. The pH concentrations at FD5, FD7 and FD27 recorded higher than average results compared with the long term averages. These farm dams are located outside the mining lease in neighbouring farms. The higher than average results may be attributed to higher than average rainfall in the reporting period and also from the farm runoff water being captured. The electrical conductivity for the reporting period was inline with the long-term averages. Similarly, the monitoring results for watercourse were inline with the long term averages.

For the watercourses, pH, copper and electrical conductivity increased slightly from last reporting period, with the exception of WC5 monitoring location. The copper concentrations increased from 0.081 mg/l to 1.42 mg/l, which may be attributable to higher rainfall events in the current reporting period. The copper concentration at WC5 recorded higher than average result of 1.42 mg/l in January 2016 and the monitoring results for June and September were 0.032 mg/l and 0.084 mg/l. the copper concentrations were reverted back in line with the long term averages. WC2, monitoring location is on the downstream to WC5 and recorded copper concentration of 0.076 mg/l. this indicates it is one off high copper values recorded at WC5. In 2017, WC5 will be closely monitored for any abnormalities and investigations will be undertaken if higher copper is present.

The pH concentrations for all sediment ponds increased in the current reporting period and slightly above the long term averages. This increase is due to collection of large volumes of rainwater runoff from surrounding areas as a result of higher than average rainfall in the reporting period.

Complete results for all retention ponds monitoring are available in Appendix 8. The pH concentrations remained in-line with long term averages over the reporting period. The monitoring data for all sediment ponds and process water system are available in Appendix 7 and Appendix 9.

There were eight rainfall event which resulted in watercourse sampling. The previous monitoring results were in line with historical data and representative of freshwater quality characteristics. The complete monitoring results are available in Appendix 5.

Groundwater

Groundwater levels remained constant at all monitoring bores during the reporting period and in line with long term averages. Over the past 10 years, the groundwater levels at all bores have increased more than 2m due to higher rainfall and high infiltration rates.

The ground water levels for all the monitoring bores (TSF, opencut, underground and regional bores) are steady and in-line with long term average. There were no major variances in the standing water levels over the reporting period.

In general, pH, copper and electrical conductivity at the TSF Bores have remained in line with historical average for this reporting period. However, there was a slight increase in electrical conductivity (EC) and copper concentrations at W27 monitoring bore. These location will be closely monitored during the next monitoring period and any variances will be investigated and reported in the next reporting period.

The pH concentrations at all opencut bores increased compared to last reporting period, but inline with long tern averages with the exception of W21 which decreased from 11.38 to 9.7. W27 location will be closely monitored in all quarters for 2017 monitoring period, and if there are any large variations in pH concentrations, an investigation will be carried out to determine the likely cause. There were no major changes in the electrical conductivity results for the reporting period. The electrical conductivity are inline with long term averages.

The copper concentrations for all opencut bores increased from last reporting period. W14 and W19 recorded higher than average results; the copper concentrations at W14 bore increased from 0.051 mg/l to 0.214 mg/l and W19 from 0.002 mg/l to 0.189 mg/l. this increase may be a result of higher infiltration rates in the vicinity if the bores and also the back ground geological properties in the area.

The pH and electrical conductivity results for all underground bores were inline with long term averages. There were slight variances in the monitoring results through all quarters, but the results are similar to the last reporting period. The copper concentrations at P101, P102, and P104 increased from last reporting period. These bores are located outside the mining lease. These higher than average results may be attributable to higher volumes of groundwater infiltration rates. These bores will be closely monitored in 2017 monitoring period and any such variances will be investigated and reported.

Regional water levels remained similar to the previous reporting period and in-line with the long term averages. The groundwater pH was generally consistent will previous monitoring periods, with the exception of Long Paddock, which increased from previous reporting period. This corresponds with previous averages recorded at this location. Copper and EC concentrations for the monitoring period remain in line with historical trend.

4.7.5 Water Courses and Rainfall Events

Water quality in natural watercourses was subject to normal variations in range of the long-term average for the majority of monitoring locations. There were nine rainfall events during the reporting period that resulted in flow of nearby watercourses and required sampling. Rainfall event sampling indicated no adverse effects from Northparkes operations on watercourse quality during the reporting period. The monitoring data for water courses sampled during rain events are available in Appendix 5.
Rainfall during the reporting period was above the long-term average and eight monitoring events was undertaken due to flow events in the reporting year.

4.8 Water Balance

Northparkes has implemented a water model to capture water inputs, outputs and throughputs. The GoldSim model was updated in 2014 by external consultants to incorporate the requirements from the new Project Approval (11_0060).

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

In reviewing the mine water balance for the reporting period (Table 11) the following is of note: In 2016 year total of 699.8 mm rainfall was recorded onsite which was 66 per cent higher than 2015 rainfall.

The volume of freshwater obtained from Parkes Shire Council (PSC) increased (1808 ML in 2014 to 1913 ML in 2015 and 2221 ML in 2016) due to Sub Level Cave Underground Mine development. All water imported to site was from groundwater licence allocations. No allocations of Northparkes river water were received from Parkes Shire Council in the reporting period, as shown in Table 11.

Total water use during the reporting period was comparable to the previous reporting period with a decrease of approximately 10 per cent from 6684 ML in 2015 to 6296 ML in 2016. Water used per tonne of ore milled was higher due to more water being used to increase recovery.

Recycled water use decreased during this reporting period by 11 percent (3480 ML in 2015 and 4075 ML in 2016). This was due to an increase in pumping of stored water in E27 and Rosedale Tailings Dam into the Process Water System.

Water entrained in product increased from the previous reporting period.

Table 11 Reporting period water balance

Water Balance	Total (ML)
Total Water Input Recycled Change in storage Dewatering water discharged without use Process effluent Non process water Entrained in product, by-products or process wastes Sent to 3rd party	2221 4075 745 0 0 2405 13.7 0
Make Up Water Requirement	0
Water Use	6296
Water Return	0
Evaporation, Seepage and Other	398.5
Total Water Output	7021

Actions proposed for 2017

- Water infrastructure upgrades for the site water storage system to build capacity.
- Updating GoldSim with new changes and continue water modeling.

5. LAND MANAGEMENT AND REHABILITATION

Northparkes owns and manages approximately 10,488 hectares 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.

Additionally, in early 2015, Northparkes finalised the freehold purchase of the Kokoda Biodiversity Offset Site (Kokoda), a 350 ha property located in the Mandagery locality of the Central West Slopes of NSW. Kokoda was purchased to offset the residual impacts resulting from the Northparkes Step Change Project (PA 11_0060). This project approval includes the construction of the Rosedale Tailing Storage Facility, which commenced construction in 2015 and has had a range of preclearance and clearing supervision activities associated with its construction.

Rehabilitation activities at Northparkes incorporate the entire landholding in order to enhance the regional landscape and native habitat values. Approximately 20,000 trees has been purchased and will be planted by the end of 2017.

5.1 Northparkes, Farms and Adjacent Vegetation Monitoring

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, top soil management and 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. Onsite ecological monitoring in 2016 focused on the pine donkey orchid populations. Refer to Section 5.4 for more information on pine donkey orchid monitoring undertaken in 2016.

5.2 Offset Monitoring

Rehabilitation and ecological monitoring in 2016 focused on the Kokoda Biodiversity Offset Site. Other offset areas owned by Northparkes, including the Estcourt and Limestone Offset areas are monitored at longer intervals, and therefore were not systematically monitored in 2016.

In 2015 ongoing flora and fauna monitoring program commenced at Kokoda. This monitoring program aims to measure the success of management and restoration strategies in meeting the approval conditions and performance indicators (as outlined in the Northparkes Biodiversity Offset Management Plan (BOMP)) in a timely manner. The monitoring program incorporates annual systematic monitoring as well as biannual (twice yearly) inspections.

5.2.1 Biannual Inspections

Biannual inspections were undertaken at Kokoda in April and December 2016 and included a broad assessment of the site condition aimed at identifying any visually obvious management issue that require immediate attention. The biannual inspections at Kokoda monitor;

- Weed and pests;
- Sedimentation, erosion or salinity issues ;
- Natural regeneration success; and
- During these biannual inspections of Kokoda, maintenance checks of the boundary fence, signage, tracks and homestead were also undertaken.

5.2.2 Rehabilitation Monitoring

Northparkes engage external consultants to undertake rehabilitation monitoring at Kokoda. 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 2016 at Kokoda, refer to the 2016 Kokoda Offset Monitoring Report.

Grey Box woodlands monitoring results

The three Grey Box woodland reference sites were characterised by having a mature tree canopy and a well developed decomposing leaf litter layer with a sparse cover of native perennial forbs and grasses which collectively provided a highly functional patch area. The White Box and Ironbark woodlands also had a mature tree canopy and while both sites had a well developed leaf litter layer, native grasses and forbs were more abundant in the White Box woodland while in the Ironbark woodland there was an understorey of low and scattered shrubs with both sites having high functional patch areas. While the Grey Box revegetation sites presently existed as degraded pastures and were structurally different to the woodland reference sites, they typically had good ground cover comprised of a combination of annual and perennial plants and cryptogams and also had a high functional patch areas.

Despite the lack of a mature tree canopy, the Grey Box revegetation sites tended to be more stable than the reference sites due to the higher abundance of perennial ground covers, very hard soil crusts which were usually contained a significant abundance of cryptogam cover and subsequently there tended to be less evidence of erosion or deposition within these sites. The revegetation sites however had a lower infiltration and nutrient recycling capacity largely due to lack of a mature overstorey, undeveloped leaf litter layer and hard surface crusts.

In the reference sites the density of trees and mature shrubs (>5cm dbh) ranged from 8 – 21 individuals and were dominated by *Eucalyptus microcarpa* (Grey Box). They were typically in good to medium health but all sites contained some individuals in a state of advanced dieback or were stags. The White Box woodland had a population density of eight and was dominated by *E. albens* (White Box) but a *Callitris endlicheri* (Black Cypress Pine) and *E. blakelyi* (Blakely's Red Gum) were also present with most trees being in good to medium health. The Ironbark woodland was dominated by a mixture of *E. albens*, *E. dealbata* (Tumbledown Red Gum) and *E. sideroxylon* (Mugga Ironbark) with several *E. microcarpa* and a single *Callitris endlicheri*. Most individuals were in medium to poor health and there were several dead individuals. No trees or mature shrubs were recorded in the Grey Box revegetation areas.

Shrub and juvenile tree densities were relatively low with 1 – 18 individuals per monitoring plot (25 – 450 stems per hectare) and these were represented by 1 - 3 species. Species may have included juvenile *E. microcarpa*, *Acacia implexa* (Hickory), *A. paradoxa* (Kangaroo Thorn) or *A. doratoxylon* (Spearwood). In the White Box woodland there were one each of *Acacia implexa*, *Callitris endlicheri* and *E. blakelyi* and three *A. decora* (Western Golden Wattle). In the Ironbark woodland, the shrubby understorey was much more diverse and was dominated by *Brachyloma daphnoides*. Other species included *Acacia implexa* (Hickory) and *Cassinia laevis* (Cough Bush)with juvenile *Brachychiton populneus* (Kurrajong), *Callitris endlicheri* and *Eucalyptus dealbata*. No juvenile trees or shrubs were recorded in the Grey Box revegetation areas.

Total ground cover, which is a combination of leaf litter, annual plants, cryptogams, rocks, logs and live perennial plants (<0.5m in height) continued to be relatively high in the woodland reference sites and this year all revegetation sites met total ground cover targets except IronWood1. In the Grey Box woodland reference sites and the White Box and Ironbark woodlands, the most dominant form of ground cover continued to be provided by dead leaf litter and this year there was an increase in annual and perennial plant covers. There continued to be a small contribution of cover provided by fallen branches and due to the heavy litter layer, cryptogam cover was not an important ground cover component in the woodlands. In the derived grassland revegetation sites, annual plants were particularly abundant this year and there were increasing covers provided by perennial plants with these far exceeding minimum perennial ground cover requirements. Cover provided by cryptogams tended to decline as a result of increased plant cover however these continued to be an important ground cover component in the grassland areas.

The reference sites were also characterised by having a mature canopy cover which exceeded 6.0m in height with low hanging braches also providing occasional projected cover in the lower height classes. The White Box and Ironbark woodlands had a similar overstorey structure.

Total floristic diversity recorded within the 20 x 20m Grey Box woodland reference sites was highly variable between the sites and this year there was an increase in diversity as a result of the wet seasonal conditions with 36 – 58 species being recorded. There was an adequate total diversity of species in most of the revegetation sites, except in the derived grassland sites GBReveg4 and GBReveg5. In the woodland reference sites, native species continued to be far more diverse than exotic species but the number of exotic species tended to also increase this year. Sites GBReveg2 and the White Box and Ironbark woodlands had similar native species diversity as the reference sites and all sites except GBReveg3 had an acceptable diversity of exotic species.

In the Grey Box woodland reference sites most of the live plant cover was provided by native species however due to an increase in exotic annual plant cover this year, endemic plant cover scores were lower and ranged from 82.7 – 85.2%. There was also a decline in native plant abundance in both the White Box and Ironbark woodlands which had 68.2% and 95% endemic plant cover respectively. In the derived grasslands, there was an increase in native plant abundance in all sites except GBReveg2 this year. However there continued to be high levels of exotic plant cover in al derived grassland sites therefore these sites and the White Box woodland area were presently weedier than desired.

The White Box and Ironbark woodland were comprised of an adequate representation of the major plant groups but there was a slightly low diversity of herbs in IronWood1. In the grassland revegetation areas there was also an adequate representation of most growth forms except that there were no trees (or shrubs) and there was a low diversity of herbs.

There were 150 species recorded across the Grey Box monitoring sites with 47 (31%) of these being exotic species.This year Bothriochloa macra (Red-leg Grass) was recorded in all sites including two of the reference sites. Other native species including Austrostipa scabra subsp. scabra (Speargrass), Cheilanthes sieberi subsp. sieberi (Rock Fern), Elymus scaber (Common Wheatgrass) and Schoenus apogon (Common Bog Rush) were also recorded in all but one site. The most common exotic species included Hypochaeris glabra (Smooth Catsear), Juncus capitatus (Capitate Rush), Petrorhagia nanteuilii (Proliferous Pink) and Vulpia muralis (Rats-tail Fescue).

No species was particularly abundant in the understorey in the Grey Box woodland reference sites with only Austrostipa scabra subsp. scabra (Speargrass), Crassula colorata (Dense Stonecrop) and Einadia nutans subsp. nutans (Climbing Saltbush) meeting the required abundance criteria in GBWood1. Isolepis congrua (Slender Club-sedge) was the single most abundant species in GBWood2, while Rytidosperma racemosum (Wallaby Grass), Hydrocotyle laxiflora (Stinking Pennywort) and Arthropodium minus (Small Vanilla Lily) were the most abundant in GBWood3.

In the White Box woodland, Austrostipa scabra subsp. scabra was also the most abundant species along with Hydrocotyle laxiflora (Stinking Pennywort). In the Ironbark woodland Schoenus apogon (Common Bog Rush) provided the most ground cover this year. The derived grasslands were dominated by a different range of species with most cover provided exotic annual grasses especially Aira cupaniana (Silvery Hairgrass). This year the native perennial grass Bothriochloa macra (Red-leg Grass) was recorded in all grassland sites except GBReveg2 and provided increasing levels of ground cover.

The soils in the Grey Box reference sites were strongly acidic, with the remaining sites being similar to or within desirable levels and were non saline and non sodic, except in GBReveg4 which may have sodic soils. Most sites were also low in organic matter, Phosphorous, Nitrate and CEC. The results indicate there were significantly high concentrations of Iron in most of the monitoring sites, including the reference sites, indicating Iron is likely to be naturally occurring at Kokoda.

Performance of the woodland revegetation monitoring sites against "proposed" Primary Completion Performance Indicators

The table below indicates the performance of the woodland revegetation monitoring sites against a selection of proposed Primary Completion Performance Indicators in 2016. The selection of criteria has been presented in order of rehabilitation phases according to the ESG3 MOP guidelines (excluding Phase 1: Decommissioning). The range values of the ecological performance targets are amended annually. Revegetation sites meeting or exceeding the range values of their representative community type i.e. Grey Box woodland reference sites 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.

Table 12 Performance of the Grey Box revegetation sites against primary completion performance indicators for Grey Box woodland communities in 2016.

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	Grey Box Woodland ecosystem range 2016		GBReveg 1	GBReveg 2	GBReveg 3	GBReveg 4	GBReveg 5	WBWood 1	IronWood 1
Performance indicators are quantified by the range of values obtained from replicated reference sites				Lower	Upper	2016	2016	2016	2016	2016	2016	2016
Phase 2: Landform establishment and stability	Active erosion	No. Rills/Gullies	No.	0	0	0	0	0	0	0	0	0
Phase 3: Growth medium development	Soil chemical, physical properties and amelioration	pH	pH (5.6 - 7.3)	5.1	5.3	6.5	5.7	6.1	6.3	6.2	6.3	5.1
		Organic Matter	% (>4.5)	5.6	6.2	2.2	2.9	3.7	2.2	2.7	2.9	4.7
		Nitrate	ppm (>12.5)	1.2	3.0	1.3	1.6	1.6	2.2	3.0	2.1	1.2

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	Grey Box Woodland ecosystem range 2016		GBReveg 1	GBReveg 2	GBReveg 3	GBReveg 4	GBReveg 5	WBWood 1	IronWood 1
Phase 4: Ecosystem & Landuse Establishment	Landscape Function Analysis (LFA): Landform stability and organisation	LFA Stability	%	63.4	66.3	78.7	74.5	73.0	73.0	76.1	73.0	66.0
		LFA Landscape organisation	%	100	100	100	100	100	100	100	100	100
	Vegetation diversity	Diversity of shrubs and juvenile trees	species/area	1	3	0	0	0	0	0	4	6
			% population	100	100	0	0	0	0	0	100	100
		Exotic species richness	<No./area	15	20	20	13	21	17	20	15	3
	Vegetation density	Density of shrubs and juvenile trees	No./area	1	18	0	0	0	0	0	6	150
	Ecosystem composition	Trees	No./area	1	2	0	0	0	0	0	3	6
		Shrubs	No./area	0	2	0	0	0	0	0	3	5
		Herbs	No./area	28	39	24	27	22	16	20	37	26
Phase 5: Ecosystem & Landuse Development	Landscape Function Analysis (LFA): Landform function and ecological performance	LFA Infiltration	%	53.2	55.1	48.7	39.9	42.8	43.3	44.6	54.1	47.7
		LFA Nutrient recycling	%	50.2	54.2	48.5	42.7	44.3	44.6	46.7	55.2	45.7
	Protective ground cover	Perennial plant cover (< 0.5m)	%	8	24	27	31	40	32.5	33.5	33.5	9
		Total Ground Cover	%	99	100	100	99.5	100	100	100	100	97.5
	Native ground cover abundance	Percent ground cover provided by native vegetation <0.5m tall	%	83	85	34.3	52.3	38.1	46.3	33.1	68.2	95

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	Grey Box Woodland ecosystem range 2016		GBReveg 1	GBReveg 2	GBReveg 3	GBReveg 4	GBReveg 5	WBWood 1	IronWood 1
	Ecosystem growth and natural recruitment	shrubs and juvenile trees 0 - 0.5m in height	No./area	**1**	**9**	**0**	**0**	**0**	**0**	**0**	**5**	**110**
		shrubs and juvenile trees 1.5 - 2m in height	No./area	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Ecosystem structure	Foliage cover 0.5 - 2 m	% cover	**0**	**0**	**0.5**	**0**	**0**	**0**	**0**	**0**	**0**
		Foliage cover >6m	% cover	**48**	**55**	**0**	**0**	**0**	**0**	**0**	**53**	**35**
	Tree diversity	Tree diversity	%	**100**	**100**	**0**	**0**	**0**	**0**	**0**	**100**	**100**
	Ecosystem health	Live trees	% population	**85**	**100**	**0**	**0**	**0**	**0**	**0**	**100**	**82.1**
		Healthy trees	% population	**0**	**52**	**0**	**0**	**0**	**0**	**0**	**50**	**5.1**
		Flowers/fruit: Trees	% population	**0**	**38**	**0**	**0**	**0**	**0**	**0**	**62.5**	**23.1**

Dwyer's Red Gum woodlands monitoring results

The Dwyer's Red Gum (DRG) woodland reference sites were also characterised by having a mature tree canopy and a well developed decomposing leaf litter layer and a sparse cover of native perennial forbs and grasses. The low quality Dwyer's Red Gum woodland site was characterised with having an open mature tree canopy, moderate cover of annual and perennial ground cover species and typically had a well developed leaf litter layer but this was patchy. The Dwyer's Red Gum revegetation sites presently existed as degraded pastures but they typically had good ground cover comprised of a combination of annual and perennial plants and cryptogams and also had a high functional patch areas.

There were 9 – 25 trees and/or mature shrubs (>5cm dbh) in the DRG reference sites, equating to a density of 225 – 625 stems per hectare. They were typically in medium health but there were also a large percentage of stags in DWood1 and DWood2 as a result of self thinning. The reference sites were dominated by Callitris endlicheri (Black Cypress Pine) but there may also have been scattered individuals of Allocasuarina verticillata (Drooping Sheoak), E. dwyeri, E. dealbata (Tumbledown Red Gum), E. sideroxylon and/or E. microcarpa. In the low quality woodland there were nine individuals and all trees were in medium health or in a state of advanced dieback. The population was dominated by E. dwyeri and contained one E. albens (White Box). In the derived native grassland sites no trees or mature shrubs were present.

There was a large variation on the number of shrubs and juvenile trees (<5cm dbh) recorded in the Dwyer's Red Gum reference sites with densities ranging from 25 – 928 individuals equating to a density of 625 – 23,200 stems per hectare. In the low quality woodland there continued to be eight shrubs and juvenile trees. There were 11 seedlings recorded in DReveg1 with one seedling each recorded this year in DReveg 2 and DReveg 3.

In the woodland reference sites there were 3 - 7 species of shrubs and juvenile trees with the most abundant species being young Callitris endlicheri seedlings. There were also low occurrences of a range of other species including Acacia doratoxylon (Spearwood), Brachyloma daphnoides, E. dwyeri, E. sideroxylon, E. dealbata, E. albens, Allocasuarina verticillata, Dillwynia spp., and Cassinia laevis (Cough Bush). In DWood3 there was a high density of Callitris endlicheri and Calytrix tetragona (Fringe Myrtle). In DReveg1 most individuals were E. dwyeri saplings but this year one A. decora seedlings was also recorded. One A. decora seedling was also recorded in DReveg2 this year.

Total ground cover in the DRG woodland reference sites ranged from 88.5 – 100% and all revegetation sites and the low quality woodland had a total ground cover that was similar to the reference sites. In the reference sites and the low quality woodland the most dominant form of ground cover was dead leaf litter however this has declined over the past year due to an increased abundance of annual and perennial plants. There was some cover by provided by fallen branches, cryptogams and there may have been an occasional rock. The low quality woodland had similar features in similar proportions but did not tend to have fallen branches. The reference sites and the low quality woodland were also characterised by having a mature canopy cover which exceeded 6.0m in height with low hanging branches (and scattered shrubs) also providing occasional projected cover in the lower height classes.

In comparison the revegetation sites were presently dominated by various proportions of annual plants and dead leaf litter and this year both DReveg1 and DReveg2 had adequate covers of perennial plants and cryptogams. DReveg 3 however was almost entirely dominated by annual plants and did not meet perennial plant targets.

Total floristic diversity recorded within the 20 x 20m Dwyer's Red Gum monitoring sites has increased over the past year as result of the favourable seasonal conditions with 46 – 52 species being recorded. There was negligible increase in species diversity in the low quality woodland and with 51 species was similar to the reference sites. In the derived grassland sites a decline in diversity was recorded in DReveg1 and this site continued to have the lowest total diversity of 33 species. While an increase was recorded in DReveg2 and DReveg 3 there were 40 and 41 species respectively but these were lower than recorded in the reference sites. In the reference sites there were 4 – 11 exotic species and in DReveg2 there were an acceptable number of exotic species with 10 exotics species. The remaining sites had more exotic species than desired.

In the Dwyer's Red Gum woodland reference sites most of the live plant cover was provided by native species but these were slightly lower this year due to the increase in exotic annual plant cover. This year native plants provided 65.6 – 86.0% of the total plant cover. This year there was also an abundance of exotic annual plants in DWoodLQ however with 58% native plant cover was weedier than desired. Despite an improvement in native plant cover over the past thirteen months, all grassland sites had a higher abundance of exotic species compared to the reference sites and continued to be weedier than desired.

The low quality woodland site had similar composition of the herbaceous ground covers, but it had a low diversity of tree and shrub species and no sub – shrubs were recorded. In the grassland revegetation areas there was presently a low diversity of trees and shrubs and no sub-shrubs were recorded. In DReveg 1 there was also a low diversity of herbs.

There were 125 species recorded across the Dwyer's Red Gum monitoring sites with 32 (26%) of these being exotic species. The exotic annuals Aira cupaniana (Silvery Hairgrass), Cicendia quadrangularis (Square Cicendia), Hypochaeris glabra (Smooth Catsear), Juncus capitatus (Capitate Rush), Tolpis umbellata (Yellow Hawkweed) and Trifolium arvense (Haresfoot Clover) were recorded in all four revegetation sites, with some of these also occurring within at least one reference site. Common native species included Bothriochloa macra (Red-leg Grass), Drosera peltata (Pale Sundew), Isolepis congrua (Slender Club-sedge) and Schoenus apogon (Common Bog Rush).

No species was particularly abundant in the understorey in the Dwyer's Red Gum woodland reference sites but this year the exotic annuals Aira cupaniana and Hypochaeris glabra were quite abundant in DWood1 as well as the native perennial Gonocarpus elatus (Hill Raspwort). Schoenus apogon (Common Bog Rush) was the most abundant in DWood2 and Scleria spp., an annual sedge was the most abundant in DWood2. No species single species was dominant in the low quality woodland. The derived grasslands also tended to have a high abundance of the exotic annual Aira cupaniana as well as the natives Schoenus apogon and Aristida ramosa (Threeawn Grass). Other abundant species were the exotic annuals Briza minor (Shivery Grass), Trifolium dubium (Yellow Suckling Clover) and Hypochaeris glabra and the natives Rytidosperma racemosum and Isolepis congrua.

The soils were moderately to strongly acidic in all monitoring sites and in DReveg1 and DReveg3 these were just within the desirable agricultural range. The soils in the derived grasslands were non saline and non sodic and all sites were low in organic matter, Phosphorous, Nitrate and CEC but were typically quite similar to the DRG woodland reference sites.

Performance of the DRG woodland revegetation monitoring sites against "proposed" Primary Completion Performance Indicators

The table below indicates the performance of the woodland revegetation monitoring sites against a selection of proposed Primary Completion Performance Indicators in 2016. The selection of criteria has been presented in order of rehabilitation phases according to the ESG3 MOP guidelines (excluding Phase 1: Decommissioning). The range values of the ecological performance targets are amended annually. Revegetation sites meeting or exceeding the range values of their representative community type i.e. Dwyer's Red Gum woodland reference sites 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.

Table 13 Performance of the Dwyer's Red Gum revegetation sites against primary completion performance indicators for Dwyer's Red Gum woodland communities in 2016.

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	Dwyer's Red Gum Woodland ecosystem range 2016		DReveg 1	DReveg 2	DReveg 3	DWoodLQ
Performance indicators are quantified by the range of values obtained from replicated reference sites				Lower	Upper	2016	2016	2016	2016
Phase 2: Landform establishment and stability	Active erosion	No. Rills/Gullies	No.	0	0	0	0	0	0
Phase 3: Growth medium development	Soil chemical, physical properties and amelioration	pH	pH (5.6 - 7.3)	5.2	5.7	5.9	5.2	5.9	5.5
		Organic Matter	% (>4.5)	3.0	6.0	2.8	3.3	2.7	3.2
		Nitrate	ppm (>12.5)	0.9	2.0	1.7	1.0	1.7	1.0
Phase 4: Ecosystem & Landuse Establishment	Landscape Function Analysis (LFA): Landform stability and organisation	LFA Stability	%	65.9	70.0	78.0	73.5	74.5	67.5
		LFA Landscape organisation	%	100	100	100	100	100	100
	Vegetation diversity	Diversity of shrubs and juvenile trees	species/area	3	7	2	1	1	3
			% population	100	100	100	100	100	100
		Exotic species richness	<No./area	4	11	18	10	23	19
	Vegetation density	Density of shrubs and juvenile trees	No./area	25	928	11	1	1	8

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	Dwyer's Red Gum Woodland ecosystem range 2016		DReveg 1	DReveg 2	DReveg 3	DWoodLQ
	Ecosystem composition	Trees	No./area	3	5	1	0	1	2
		Shrubs	No./area	2	4	1	1	0	2
		Herbs	No./area	25	35	18	27	26	30
Phase 5: Ecosystem & Landuse Development	Landscape Function Analysis (LFA): Landform function and ecological performance	LFA Infiltration	%	47.1	54.3	48.9	47.1	43.6	54.2
		LFA Nutrient recycling	%	49.7	52.9	47.1	49.2	46.4	52.4
	Protective ground cover	Perennial plant cover (< 0.5m)	%	4	22	9.5	22.5	3.5	11.5
		Total Ground Cover	%	89	100	100	98	100	100
	Native ground cover abundance	Percent ground cover provided by native vegetation <0.5m tall	%	66	86	40.0	60.7	45.0	58.0
	Ecosystem growth and natural recruitment	shrubs and juvenile trees 0 - 0.5m in height	No./area	25	792	1	1	0	8
		shrubs and juvenile trees 1.5 - 2m in height	No./area	0	0	1	0	0	0
	Ecosystem structure	Foliage cover 0.5 - 2 m	% cover	0	12	0	0	0	0
		Foliage cover >6m	% cover	16	50	0	0	0	34
	Tree diversity	Tree diversity	%	100	100	0	0	0	100
	Ecosystem health	Live trees	% population	28	82	0	0	0	100

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	Dwyer's Red Gum Woodland ecosystem range 2016		DReveg 1	DReveg 2	DReveg 3	DWoodLQ
		Healthy trees	% population	0	36	0	0	0	0
		Flowers/fruit: Trees	% population	9	73	0	0	0	22.2

Conclusion and Management Recommendations

The proposed revegetation activities within the derived grassland areas as described in the BOMP aim to increase biodiversity and habitat values through the removal of livestock grazing to allow natural regeneration, supplemented with tubestock planting. These activities are likely to result in the cleared grassland areas developing into woodland communities and therefore meeting most ecological performance indicators in the medium to longer term. The reference sites at Kokoda are typically degraded and of low quality which subsequently have provided low performance targets. In the Grey Box woodlands in particular, 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.

Strategic grazing is also likely to be a critical management strategy which will be required to maintain biodiversity, encourage tree and shrub regeneration and to reduce fuel loads as part of the integrated and adaptive management strategy for the Kokoda Offset Area. As part of the BOMP it would be beneficial to implement strategic grazing management to manipulate the grassy understorey biomass in order to;

- Promote natural tree and shrub recruitment;
- Reduce cover abundance of exotic annual grasses, in favour of native perennial grasses (grazing late summer/early autumn and/or late winter early spring);
- Promote and maintain diversity in the herbaceous understorey cover;
- Reduce understory growth in preparation for direct seeding and/or tubestock planting;
- Reduce the incidence of bush-fire and bush-fire intensity;
- Prevent invasion from weeds via the maintenance of strong native perennial pastures and high ground cover levels;
- Assist ongoing site maintenance and monitoring by providing better access around the property.

This year several species of orchids were observed at various locations around the property. As part of the management of the Kokoda property, the location of these populations should be considered when undertaking revegetation, weed control and strategic grazing, particularly as most orchids are only identifiable during a limited time period.

Other potential management issues at Kokoda may be related to high density Callitris endlicheri regeneration which was observed to be occurring within and adjacent to woodland areas where mature Callitris were present. Strategic grazing may reduce the density of existing seedlings and regulate the degree of Callitris regeneration through manipulation of the herbaceous understorey and germination niches.

Herbivory by feral and pests species may also become an increasingly important management issue which should be regularly monitored as specified in the BOMP. Safe and easy access should always be maintained around main access tracks and boundary fences to facilitate monitoring, property maintenance and bushfire management. Regular inspections should be undertaken with slashing and/or strategic grazing management implemented on a needs basis. There were little other management issues that have not already been addressed in the BOMP.

5.3 Management

5.3.1 Northparkes, Farms and Adjacent Vegetation

Land management is conducted in accordance with the Mine Operations Plan (MOP), Conceptual Mine Closure Plan and the BOMP. Other management plans pertaining to land management include the Heritage Management Plan and the Flora and Fauna Management Plan. The key objectives for Northparkes are to develop an integrated and strategic approach to land management including;

- Reducing Northparkes' footprint and impacts
- Land preservation and rehabilitation
- Conservation and improvement of biodiversity
- Land conservation through sustainable agricultural management
- Establishment of environmental offsets on the Northparkes properties
- Interaction with adjoining land holders and communities to address cross border and regional land use issues

Agricultural land around the mine site is used primarily for crop farming in combination with native vegetation. Some of the native vegetation areas around the mine site serves as biodiversity offsets for the mining operations (such as Estcourt Offset Site and the Limestone State Forest) while other provide wildlife corridors facilitating fauna movement and gene flow across the broader landscape. Since acquiring its various land 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;
- Soil conservation works; and
- Stubble retention.

Northparkes has maintained large sections of remnant vegetation within its landholding wherever possible. 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.

Revegetation activities are designed for erosion control, aesthetic improvement and ecosystem regeneration. These activities are undertaken on constructed landforms such as waste rock dumps, tailings storage facilities, topsoil stockpiles, and other disturbed areas. Revegetation is also undertaken to create wildlife corridors. Northparkes has committed to planting 10,000 trees in wildlife corridors on an annual basis. Table 14 provides a summary of the areas of disturbance for each domain as required in the Northparkes MOP.

Table 14 Areas of Disturbance as required in the Northparkes MOP

Domain	Area Disturbed		
	Total Area at January 2016	Total Area at December 2016	Total expected at end of December 2017
Mine Lease Area			
ML 1247, 1367, 1641,ML1743	2674.22	2674.22	2674.22
Active Mining Area	66.9	66.9	66.9
Infrastructure Area			
Active	46.93	64.25	64.25
Decommissioning	0	0	
Landform Establishment	0	0	
Growth Medium Development	0	0	
Ecosystem Establishment	0	0	
Ecosystem Development	0	0	
Relinquished Land	0	0	
Total	46.93	64.25	64.25
Tailings Storage Facilities			
Active (TSF1, TSF2, TSF3)	336	680.2	680.2
Decommissioning	0	0	
Landform Establishment	7.25	7.25	7.25
Growth Medium Development	0	0	
Ecosystem Establishment	0	0	
Ecosystem Development	81	81	
Relinquished Land	0	0	
Total	424.25	768.45	768.45
Water Management Plan			
Active	67	67	67
Decommissioning	0	0	
Landform Establishment	0	0	
Growth Medium Development	0	0	
Ecosystem Establishment	0	0	
Ecosystem Development	0	0	
Relinquished Land	0	0	

Domain	Area Disturbed		
	Total Area at January 2016	Total Area at December 2016	Total expected at end of December 2017
Total	14.3	24.5	24.5
Overburden Emplacement			
Active	88.6	88.6	88.6
Decommissioning	0	0	
Landform Establishment	0	0	
Growth Medium Development	0	0	
Ecosystem Establishment	0	0	
Ecosystem Development	18	18	18
Relinquished Land	0	0	
Total	106.6	106.6	106.6
Stockpile Material			
Active	9.5	9.5	9.5
Decommissioning	0	0	
Landform Establishment	0	0	
Growth Medium Development	0	0	
Ecosystem Establishment	0	0	
Ecosystem Development	0	0	
Relinquished Land	0	0	
Total	9.5	9.5	9.5
Voids			
Active	30.7	30.7	30.7
Decommissioning	0	0	
Landform Establishment	0	0	
Growth Medium Development	0	0	
Ecosystem Establishment	0	0	
Ecosystem Development	0	0	
Relinquished Land	0	0	
Total	30.7	30.7	30.7
Buffer Lands			
Active	68	68	68
Decommissioning	0	0	
Landform Establishment	0	0	

Domain	Area Disturbed		
	Total Area at January 2016	Total Area at December 2016	Total expected at end of December 2017
Growth Medium Development	0	0	
Ecosystem Establishment	0	0	
Ecosystem Development	0	0	
Relinquished Land	0	0	
Total	68	68	68
Limestone Forest			
Active	45.14	45.14	45.14
Decommissioning	0	0	
Landform Establishment	0	0	
Growth Medium Development	0	0	
Ecosystem Establishment	0	0	
Ecosystem Development	0	0	
Relinquished Land	0	0	
Total	45.14	45.14	45.14

5.3.2 Kokoda Offset Site

Kokoda is managed in accordance with the Northparkes BOMP, which outlines the short, medium and long-term management strategies, monitoring actions, and performance and completion criteria for Kokoda. The Northparkes BOMP was approved by the NSW Department of Planning and Environment in December 2016.

5.3.3 Revegetation and Rehabilitation

Rehabilitation works during 2016 have been associated with the rehabilitation of temporary drill pads established as part of Northparkes exploration drilling program.

Rehabilitation works scheduled for 2017 include the commencement of the development of the final landform for TSF1. This project is scheduled to occur in 2017/18 in accordance with the designs proposed in the current MOP.

5.4 Research and Rehabilitation Trials and Use of Analogue Sites

Northparkes has commissioned two research projects regarding the development of rehabilitation methodologies for the TSF1 final landform (Landloch, 2016).

Landloch were engaged to;

- complete a detailed anlaysis and design on proposed slopes of the TSF walls; and
- review batter performance against ANCOLD 2012 Guidelines.

The study made the following conclusions;

- For low gradient areas (1% or less), vegetative cover of 50% or more would be required to minimise erosion risk;
- Where gradients alter from 1:25 to 1:4, rock placement is recommended 10 m up gradient of the change in slope;
- Placement of 300-350 mm deep layer of mixed rock and topsoil is strongly recommended;
- Trails to determine appropriate methods of mixing topsoil and rock are recommended;
- Vegetation to be dominated by grass including several winter active medic species;
- Shrubs to be included in vegetation mix with a density of less than 100 stems per hectare;
- Fertilizer and amendments are recommended to improve rehabilitation success.

Northparkes has been working with the CMLR on a series of studies associated with the rehabilitation of TSFs from 2008.
The CLMR work has been undertaken in four stages;

- Stage 1 - Review of site environmental data and literature review;
- Stage 2 - Field sampling of geochemical and physical characteristics;
- Stage 3 - Hydrological and geochemical modelling; and
- Stage 4 - Conduct small scale field trials to validate required cover system.

The Stage 4 field trials involve setting up four small trial plots 20m X 20m with different levels and layers of cover over the tailings. In each of these trial plots different arrays of suction plates, suction sensors and moisture sensors have been installed. The design depth of each plot is illustrated below in Figure 24 Design depths of capping trail plots Figure 24.

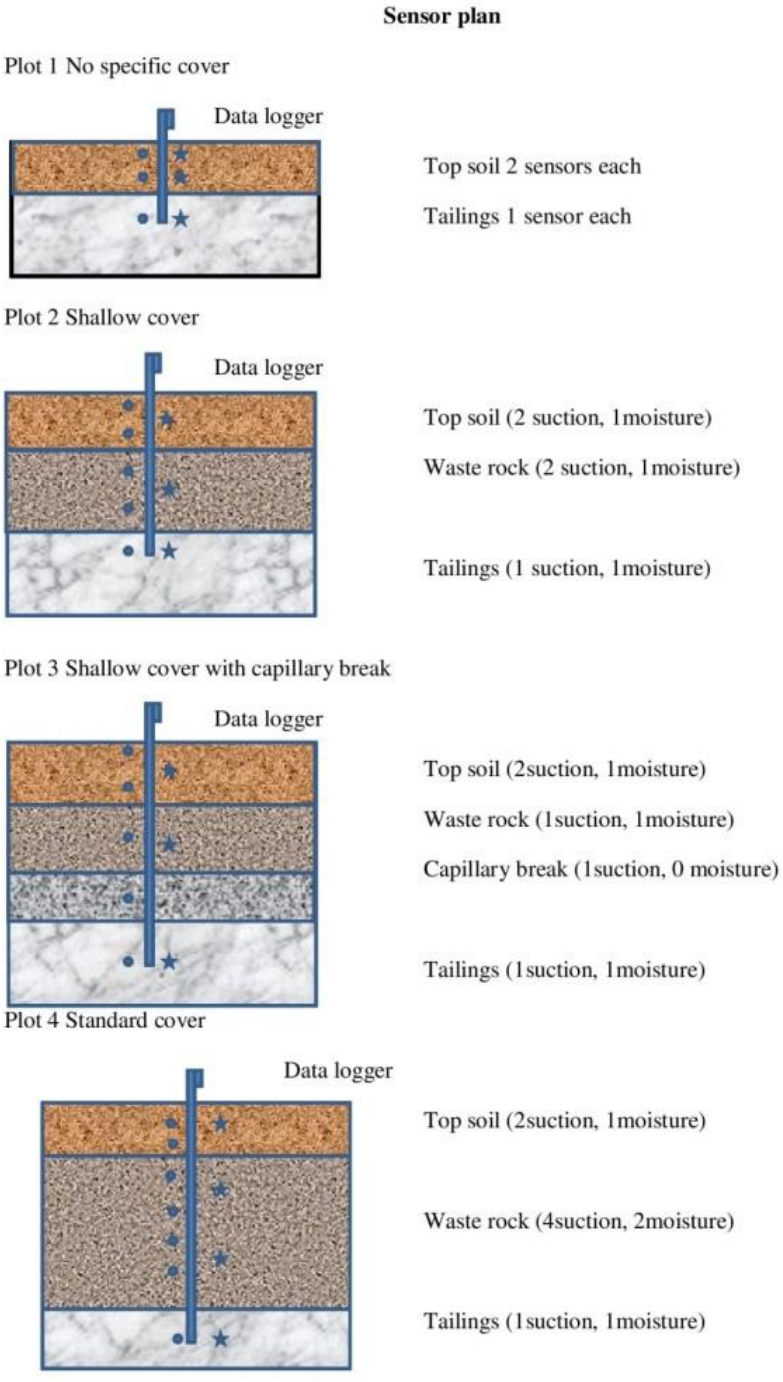


Figure 24 Design depths of capping trail plots

Table 15 Stage 4 Capping trail design specifications

Design	Plot 1	Plot 2	T3	T4
	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
Water balance parameters to be monitored:				
Suction (# of sensors)	3	5	5	7
Moisture content (# of sensors)	3	3	3	4
Deep drainage with suction plate	1	1	1	1
Geochemical parameters to be monitored				
Seepage quality	✔	✔	✔	✔
Potential salt movement from tailings into cover	✔	✔	✔	✔

5.5 Analysis

The research trials evidenced that the tailings at Northparkes generally contain low concentrations of sulphide bearing minerals and some residual metals from processing 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.

Vegetation establishment is critical for the stabilisation of the TSF surface against water or wind erosion. It positively supports the reduction of moisture in the cover and improves the buffer capacity for rainfall. Based on the results from previous studies and numerical modelling on the hydrology of various scenarios of cover designs, four different designs were selected for a field trial.

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.

The critical design criteria based on the findings of the previous studies were summarised as depth of cover and depth of topsoil. 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.

All plots were equipped with soil moisture monitoring sensors recording water content and water potential in various depths and electrical conductivity at these depths. For events of deep drainage following rainfall, a set of 16 suction plates were installed at each plot close to the surface of the tailings and covered with sand. Controlled by the lowest soil water potential sensor, the suction plates were switched on once the water potential passed the threshold for gravitational flow (-10kPa) to capture any free draining water. The amount of water was manually recorded at defined time intervals.

Results of the monitoring conducted in 2016 were similar to that recorded in 2015.

The exceptional high amounts of rainfall during the winter months 2016 are obvious in profile B and C, although the latter only shows moistening to depth during a few major rain events, while plot B is moist throughout this period of time. The moisture regime of Plot A indicates drying between rain events during this wet period of time, i.e. despite the shallow soil depth, water is not ponding over prolonged periods of time, if at all.

Water infiltration to depth into the tailings is less in Plot 3 than Plot 1 and 2. Elevated water content in Plot 2 and 3 were identified at 50 and 70 cm respectively, where at Plot 1 moist conditions were identified below a depth of 25cm.

The salt profiles (EC) of all plots shows that salt levels are well below any critical value for plants.

6. BIODIVERSITY AND ECOLOGY

6.1 Summary

The following ecological works were undertaken in 2016:

- Finalisation of the ecological aspects of the Rosedale Project;
- Flora and fauna monitoring at the Kokoda Biodiversity Offset Site; and
- Annual pine donkey orchid population monitoring survey.

6.2 Rosedale Project

Ecological reporting associated with the construction of the Rosedale Tailings Storage Facility was finalised in 2016. This information was consolidated in the Northparkes Environment Protection and Biodiversity Conservation Act Compliance Report and approved by the Commonwealth Department of Environment and Energy in July 2016.

In November 2016, a small number of trees were removed as part of the Rosedale Project for the construction of the Tailing Storage Facilities Eastern Clean Water Drain. Pre-clearance and clearing supervision surveys undertaken established that no hollows suitable for superb parrot nesting were present in these trees.

Nest boxes suitable for superb parrot as well as a range of fauna species observed during clearing supervision surveys were constructed by the local Men's shed and will be installed around the mine site and across Northparkes offset properties in 2017.

Additionally, in 2016 Northparkes worked with the NSW Department of Primary Industries – Fisheries to create habitat for Murray Cod, a nationally threatened species. As part of this project, approximately 80 old growth grey box trees removed as part of the Rosedale Project were donated to Fisheries to be placed in a stretch of the Macquarie River between Narromine and Dubbo. These trees, known as snags once they are submerged in the water, will over time create habitat for Murray Cod, which require complex habitat such as rocks and snags to thrive. In addition to creating habitat, the snags have the added benefit of armouring the banks of the Macquarie River against further erosion.

6.3 Kokoda Ecological Monitoring

A range of baseline ecological field surveys were undertaken across the Kokoda Biodiversity Offset Site in 2016. These included:

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

6.3.1 Floristic Data Using Plot-Based Surveys

A total of seventeen 20 by 20 metre permanent flora sampling sites (plots) were undertaken at Kokoda in 2016. The location of survey sites were 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. For more information on the methodologies used to conduct the flora surveys, refer to the 2016 Kokoda Offset Monitoring Report.

Floristic plot-based survey at Kokoda in 2016 recorded 173 plant species; including 50 non-native (exotic) species and 123 native species. No threatened flora species were detected in the flora plots during field surveys. For more information on the floristic diversity at Kokoda, refer to the 2016 Kokoda Offset Monitoring Report.

6.3.2 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.

For information on LFA monitoring undertaken at Kokoda during 2016, refer to the 2016 Kokoda Offset Monitoring Report.

6.3.3 Targeted Bird Surveys at Kokoda

Targeted bird surveys were carried out at Kokoda Offset Site in winter and spring 2016. Bird surveys were conducted at six sites across one day in winter and 12 sites across four days in spring. Surveys consisted of 2 x 2 ha area searches for 20 minutes in suitable habitat within Kokoda.

All bird surveys undertaken at Kokoda in 2016 were undertaken by a minimum of two people. 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, in most cases once in the early morning and once in the afternoon (specifically between sunrise and 10:30 am and between 3:00 pm and sunset) 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 2016, a total of 41 bird species were recorded during winter and a total of 51 bird species during spring. During surveys in 2016, two threatened bird species were recorded at the Kokoda. These included:

Super parrot (Polytelis swainsonii) (EPBC: V/ TSC: V)- observed during spring surveys only
Grey-crowned babbler (eastern sub-species) (Pomatostomus temporalis)(TSC-V)- observed during winter and spring surveys

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

In addition, nine species listed as marine and/ or migratory under the EPBC Act were recorded during surveys in 2016. These included;

- Australiasian pipit (Anthus novaeseelandiae)(listed marine)- observed during spring;
- Black-faced cuckoo-shrike (Coracina novaehollandiae) (listed marine)- observed during winter;

- Welcome swallow (Hirundo neoxena) (listed marine)- observed during winter and spring;
- Magpie lark (Gracilla cyanoleuca) (listed marine)-observed during winter and spring;
- Nankeen kestrel (Falco cenchroides) (listed marine)- overserved during spring;
- Rainbow bee-eater (Merops ornatus) (listed marine, migratory (JAMBA))- observed during spring;
- Sacred kingfisher (Todiramphus sanctus) (listed marine) - observed during spring;
- Satin flycatcher (Myiagra cyanoleuca) (listed marine; migratory (Bonn)) - observed during spring; and
- Whistling kite (Haliastur sphenurus) (listed marine)- observed during spring.
-

6.3.4 Biometric Vegetation Surveys

Biometric vegetation surveys were undertaken at the Kokoda Biodiversity Offset Site in 2016 to support Northparkes Voluntary Conservation Agreement (VCA) for the site. The VCA for Kokoda will be submitted in 2017, as per Northparkes project approvals.

6.3.5 Qualitative Biannual Inspections

Biannual inspections of the Kokoda Biodiversity Offset Site were undertaken on 21 April 2016 and 2 December 2016 and recorded weed, pests and maintenance activities that were required action. For more details on the biannual inspections undertaken in 2016, refer to the 2016 Biannual Inspection Report for the Kokoda Biodiversity Offset Site.

6.4 Pine Donkey Orchid Population Monitoring

Field surveys of the two populations of the pine donkey orchid (Diuris tricolor) associated with the Northparkes Mine mining lease was carried out on 4 and 5 October 2016. Populations were surveyed within the following two pine donkey orchid management zones;

- E48 Subsidence zone; and
- Adavale Lane.

The survey comprised marking the locations of each individual plant encountered along the walking transect, using a GPS-generated point. Transects were generally between 5 and 10 metres apart to achieve comprehensive spatial coverage of each population, with the aim of locating every individual orchid visible.
One thousand and eighty-eight individual pine donkey orchids (Diuris tricolor) were recorded in the two Diuris tricolor Management Zones surveyed in spring 2016. These included:

- 485 individual plants in E48 Subsidence Zone; and
- 603 in Adavale Lane.

It is suspected that the earlier survey period contributed to the dramatic increase in pine donkey orchids recorded during the 2016 surveys in comparison to the 2015 surveys.

7. WASTE AND HAZARDOUS MATERIAL MANAGEMENT

Year Summary

- 45 percent of total waste recycled
- 18 percent decrease in total waste generated from previous reporting period
- Chemical audit successfully completed.

7.1 Monitoring

Onsite non-mineral waste storage facilities are inspected on a regular basis. These inspections target non-mineral waste segregation, general housekeeping, and management of hydrocarbons and chemicals.

Northparkes undertake inspections at offsite waste disposal facilities receiving non-mineral waste from Northparkes. Frequency and detail of these inspections are based on the level of risk associated with that waste stream.

Northparkes also undertakes an annual chemical audit on-site which reviews the usage, storage, labelling, quantities, MSDS availability, and approval to be on-site. All chemical approvals are managed on-site via the ChemAlert database.

In March 2016, Northparkes engaged third party auditors to undertake internal audit for licence conditions. As part of the audit, all fuel storage and hydrocarbon storage areas were inspected and improvement actions were identified.

7.2 Management

Northparkes mining and processing activities generate non-mineral waste such as tyres, waste hydrocarbons, batteries, steel and domestic rubbish. Northparkes waste management hierarchy is to eliminate, reduce and recycle where possible and set internal targets to drive this behaviour.

A site wide non-mineral waste management system has been implemented at Northparkes. The system is managed by waste management specialists and includes the following;

- Provision of suitable waste receptacles;
- Collection and disposal of waste materials;
- Waste tracking and reporting;
- Awareness training; and
- Identification of improvement opportunities.

The system aims to minimise waste generation, and maximise reuse and recycling. This is assisted by a bin colour-coding system to facilitate non-mineral waste segregation at the source of generation. No non-mineral waste was disposed of on-site at Northparkes during the reporting period. All non-mineral waste quantities are removed offsite for disposal and are tracked and reported on a monthly basis by Northparkes waste service provider.

Northparkes manages hazardous materials through an internal approval process and the ChemAlert program. All chemicals brought to and used onsite are registered in a central database. This database contains the Material Safety Data Sheets and can be accessed at any computer terminal to provide guidance on storage, use, and disposal to personnel.

All waste bins onsite (general and recycle) bins are labelled which enables Northparkes to monitor for waste types and quantity which also provides opportunity to implement waste reduction programs onsite.

7.3 Results

Total non-mineral waste generated in the reporting period represents an 18 percent decrease from the previous reporting period. Minor improvement opportunities were sighted in individual workplaces predominantly associated with the clearness of signage.

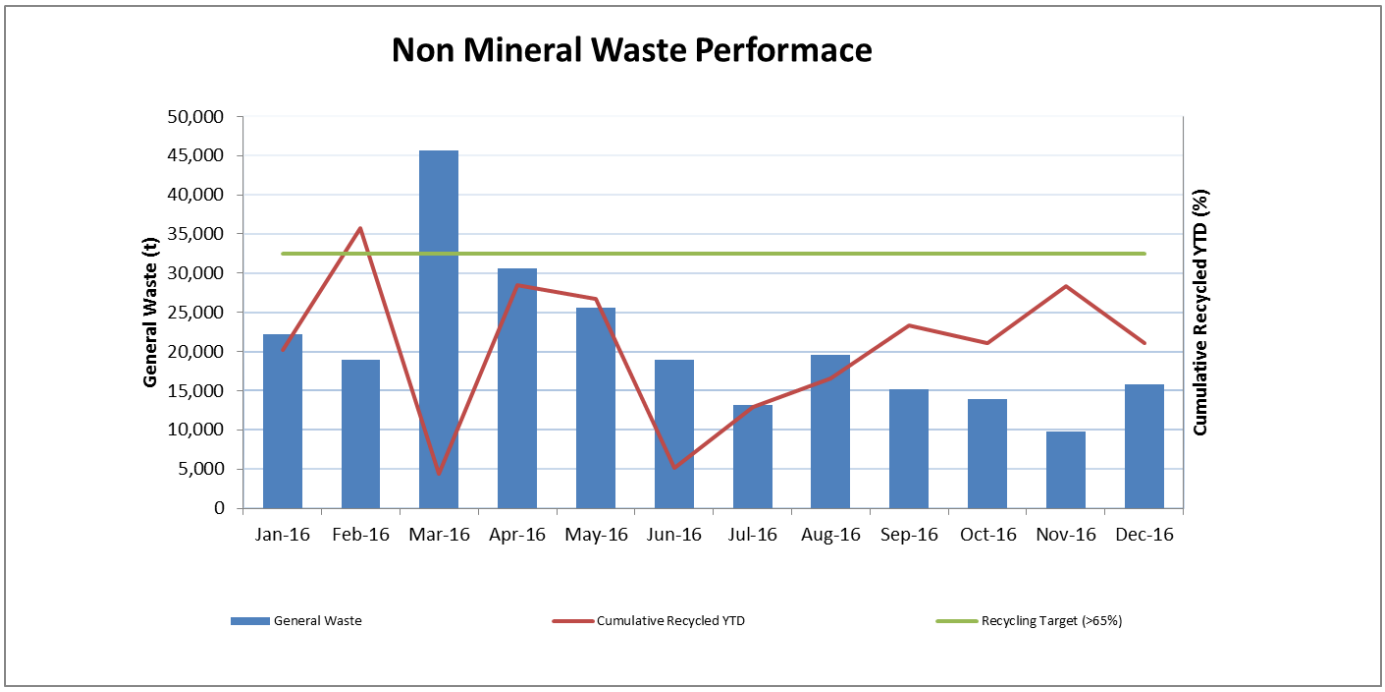


Figure 25 Non Mineral Waste Performance

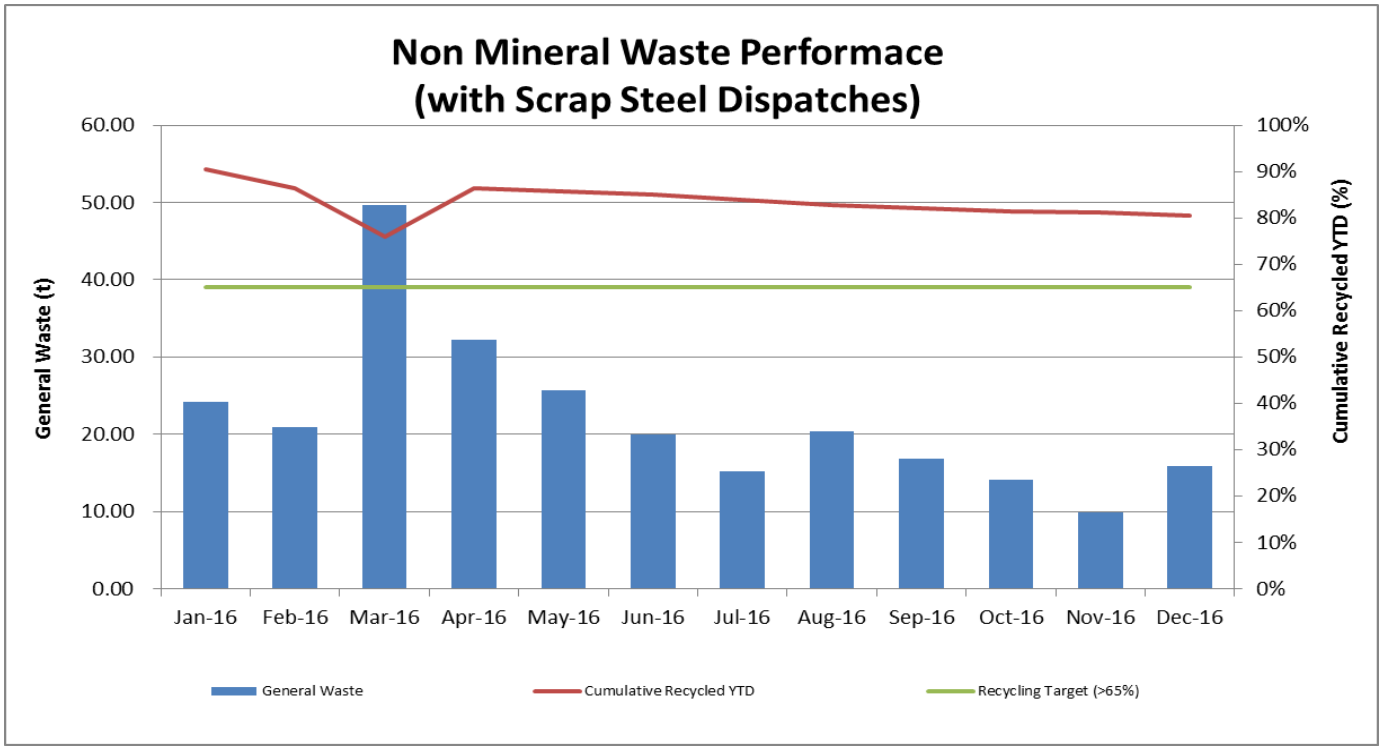


Figure 26 Scrap steel performance

7.4 Actions Proposed for 2017

- Continue and implement opportunities for waste recycling, re-used and reduction
- Training and awareness sessions for Northparkes personnel and contractors
- Commission the new onsite hydrocarbon waste treatment
- Decommission the existing waste hydrocarbon areas
- Investigate the use of incinerator for hydrocarbon spill waste disposal methods
- Environmental audit of JR Richards waste recycling facilities to ensure compliance with Northparkes requirements.

-

8. TAILINGS AND MINERAL WASTE

Reporting Period Summary

- 5.93 million tonnes of tailings deposited
- 64,652 tonnes of waste rock deposited on waste dumps
- Dust mitigation trails on TSF1 and TSF2 using vegetation growth medium and chisel ploughing

- Northparkes currently has four TSFs on-site, TSF1, TSF2, Rosedale and Estcourt TSF, which incorporated in-pit deposition into a former open cut pit E27. TSF1 is currently at capacity, with approval for an additional wall lift of four meters. Active tails deposition is occurring in Estcourt TSF, Rosedale TSF and E27.
-
- Northparkes also has a number of waste dumps on-site (Figure 27), E26 lift 2 Waste Dump is currently being utilised primarily to accommodate waste material from on-going underground development.

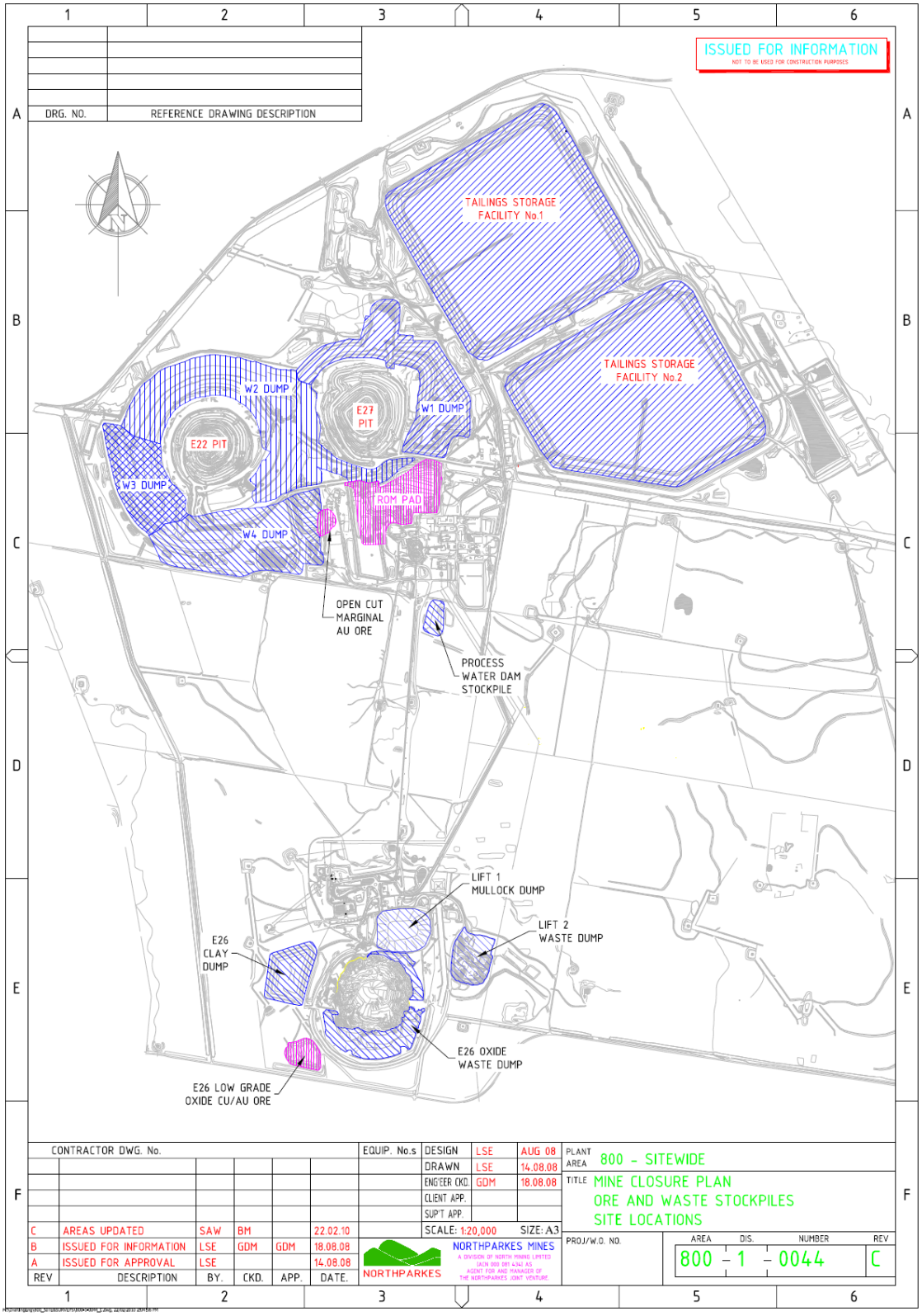


Figure 27 Existing ore, waste rock dump and stockpile locations

8.1 Management

8.1.1 Tailings

A total of approximately 100.2 Mt of tailings has been deposited at Northparkes operations to date. All tailings have been deposited within TSF1, TSF2, E27 pit, Rosedale and Estcourt TSF located approximately 2km from the processing plant. The tailings are sub-aerially deposited into the active TSF and tailings liquid and runoff is contained and directed to the internal central decant tower.

The TSFs have been designed to provide;

- Safe and permanent containment of all tailings 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 Operators Manual.

The site tailings strategy is regularly reviewed, with the most optimal disposal strategy utilised. The future tailings deposition strategy involves alternating deposition between the E27 pit, Estcourt TSF, Rosedale TSF and TSF2.

Trials continued on TSF1 and TSF2 to manage issues associated with air quality. This included seeding barley directly into the tailings surface along with pasture trial and the use of nitro humus. Visual inspections have indicated that the barley has taken well to the tailings surface and where established has reduced the risk of wind erosion of the tailings surface.

Approximately 4000 straw bales have been placed on TSF1 to reduce the wind velocity from predominately the north, north easterly and north westerly directions. Bales will remain in place in areas where the barley is not sown.

Neighbouring landholders were invited to Northparkes to conduct a site tour of the TSF's and view the work being conducted to minimise impact on air quality from the tailings dam.

8.1.2 Waste Rock

- Geochemical tests of waste rock are conducted for underground activities to determine the nature of the material prior to excavation for disposal onto a surface dump or stockpile. Waste rock and clay across the operations are stored in either stockpiles or dumps, as detailed in Figure 27.
-
- Generally underground waste rock has been placed in the E26 Lift 2 Waste Dump. Mineral waste is reused for construction activities.
-
- Within the constraints of mineral waste management practices these waste dumps and stockpiles may be utilised for construction purposes such as TSF walls, TSF capping, or as road base following testing to confirm that there is minimal risk of contamination from leachate from exposed rock materials.

8.2 Monitoring

8.2.1 Tailings

- Northparkes maintains an extensive monitoring program to manage impacts associated with tailings storage. Anomalies from the monitoring program are recorded and reported internally for action.

  Daily inspections monitor:

  - Tailings lines and discharge spigots;
  - Tailings walls for any breaches, cracks or structural changes;
  - Water levels in the retention ponds, TSFs, decant ponds, sediment ponds, and stilling ponds;
  - Pump and pipeline integrity from the plant to the TSF;
  - Rainfall measurements; and
  - Density of tailings stream.
- Weekly inspections monitor;
  - Water pressures measured at the TSF1 and TSF2 piezometers;
  - Monthly inspections of the outer surface of the TSF walls monitor;
  - Wall stability, cracking and erosion rills;
  - Vegetative cover; and
  - Seepage.
- Quarterly water monitoring of the surface and groundwater quality surrounding the tailings storage facilities is conducted.
- The mine is currently depositing into the Estcourt TSF and E27 pit.
- Tailings deposition in 2016 occurred in Estcourt TSF and E27 from January to June. Tailings deposition from June to December was in the Rosedale TSF.
- Erosion of TSF1 and TSF2 drop structures continued to be monitored as part of routine surveillance inspections.
- Mineral waste monitoring includes a monthly composite sample of the tailings slurry. The sample is sent for full sulphide and mineralogical analysis to determine plant efficiencies and chemistry of the tailings.

8.2.2 Waste Rock

- Northparkes undertakes testing programs to characterise the nature of rock material considered waste from the mining process.
-
- The samples were submitted for the following tests;
  - Paste pH and EC;
  - Total Sulphur;
  - Acid Neutralising Capacity (ANC;)
  - Net Acid Generation (NAG) test; and
  - Multi-Element Chemical Assay.
-

- Results indicate that the primary waste rocks from the ore bodies are low in sulphur with high acid-neutralising capacity and a negative net acid-producing capacity.
- Solubility analyses and leachate tests showed that potentially toxic elements are not mobile at the natural pH of the waste rock and elevated levels are not expected in leachates or pore water.
- Using a conservative management approach, waste rock is tested for its acid forming potential even though acid rock drainage does not pose a significant risk for the operations.
- Tailings sample indicate low total sulphur content with moderate acid neutralising capacity. All tailings are high content of gold, copper and selenium compared to average crustal abundances.
- The Environment team regularly inspects the waste rock dumps for density of vegetative cover, slumping / movement, weed growth, erosion, and drainage lines.
-

8.3 Results

8.3.1 Tailings

- In the reporting period, 5,932,555 tonnes of tailings were deposited between Estcourt TSF, E27 and Rosdale TSF.
-

8.3.2 Waste Rock

- A total of 64,652 tonnes of waste rock from underground development was placed on the Lift 1 Mullock Dump during the reporting period. This was primarily from the Brazen, Discovery and Conviction development drives.
- The waste movement for this reporting period decreased from the previous reporting period due to the completion of construction activities of the Estcourt TSF.
- No significant issues were identified from the inspections of waste rock dumps across site in the current reporting period.
-

8.4 Actions Proposed for 2017

- ANU dust wind vane trials to commence; and
- Longer term salt bush seeding for air quality management of tailings surface.

9. CULTURAL HERITAGE

Reporting period summary

- Three cultural heritage surveys were conducted in 2016. These were conducted by Robb Clegg (Chairperson Wiradjuri Council of Elders). One survey was conducted at the Underground area where drainage works were constructed to divert clean water away from working areas. There were no aboriginal objects found in this survey.
- The second survey was conducted near the Rosedale eastern clean water drain. This identified one aboriginal object which was left in situ.
- The third survey was conducted for the Rosedale decant bypass.
-

9.1 Monitoring

- No monitoring of current registered sites were conducted in the reporting period.
-

9.2 Management

- Northparkes has implemented a Heritage Management Plan (HMP) that provides the framework for the identification, assessment, monitoring and management of Aboriginal cultural heritage on site.
- In accordance with the HMP, the WEC met on a regular basis throughout the reporting period, with four meetings held in February, May, August and November. The WEC is a consultation forum to enable appropriate review of current Northparkes Aboriginal heritage management practices and identify potential improvement opportunities in the community. The WEC reviews all Site Disturbance Permits (SDP) at their quarterly meetings.
- Northparkes utilises a SDP approval system to manage the protection of heritage sites on the mine lease. This approval process applies to activities planned in previously 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.
-

9.3 Results

- Works undertaken by the WEC in the reporting period included:
  - Review of all site disturbance permits issued by Northparkes at regular meetings;
  - Feedback on selection of Northparkes Indigenous Scholarship recipients;
  - Review of and support for the Strong Young Mums sponsorship program; and
  - Commitments outlined in 2016 work plans in four areas: business development, community programs, cultural heritage, education, training and employment.
  -

9.4 Actions Proposed for 2017

- Continue quarterly WEC meetings;
- Develop and complete 2017 work plans in the four identified areas: business development, community programs, cultural heritage, education, training and employment;
- Timely review of SDPs and opportunity to suggest possible improvements;

- Support the Northparkes Indigenous Scholarship Program by identifying candidates and providing input during the program;
- Raise employee awareness and knowledge of Cultural Heritage via 2017 re-inductions; and
- Review and update the existing Heritage Management Plan in accordance with PA 11_0060 and OEH consultation requirements with Registered Aboriginal Parties (RAP's).

10. COMMUNITY RELATIONS

10.1 Reporting Period Summary

- The Northparkes Stakeholder Communications Management 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 2016, Northparkes:
  - Expanded stakeholder relationships, worked closely with the community and proactively addressed priorities and concerns;
  - This included the maintenance of the SMS alert system for high-risk windy days;
  - Participated in community initiatives such as the Parkes Elvis Festival, Trundle Bush Tucker Day,, White Ribbon Day and the Parkes Show;
  - Invested in the future of the community through meaningful partnerships in the order of $353,000;
  - Provided in-kind support to community groups through the Central West via its award-winning Volunteer Leave Program - Northparkes employees volunteered 1220 hours in the reporting period (compared to 1047 hours in 2015);
  - No community complaints were reported to Northparkes during the year; and
  - Northparkes recognises the importance of positive relations with its community and takes this into account in the operation of its business and the decisions made.

10.2 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 Northparkes' operations.
- 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 approximately seven community members and three Northparkes personnel. Two meetings were held in the reporting period in May and December. No significant issues were raised during the meetings held with the community during the reporting period.
- A separate sub-committee helps Northparkes make decisions regarding sponsorship requests from the local community, as part of the Northparkes Community Investment Program.
- Northparkes respects the need for regular communication with its nearby neighbours. Neighbours meetings are typically held with Northparkes' closest neighbours biannually to provide consultation and feedback in regards to mining activities.
- Two regular Neighbours Meetings were held in the reporting period in March and September.
- In June, Northparkes distributed its annual Northparkes Report (previously known as the Sustainable Development Report) to key stakeholders. This Report was also shared on the website and made available to all employees.
- The "Source" community newsletter was distributed twice during the reporting period with positive feedback from community members on the content, design and intent of the newsletter. The newsletter was published in May and October via insert in the Parkes Champion Post and Forbes Advocate.
- The Northparkes Facebook page was used actively as a two-way communication channel by both Northparkes and the community in 2016.

10.3 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 partnership programs.
- In 2016, Northparkes continued to provide financial assistance to local organisations that deliver benefits to the community. Approximately $353,000was invested in various sporting, educational, cultural, industry, environmental and agricultural programs.
- This funding was complemented by the nationally recognised Northparkes Volunteer Leave Program. This program allows Northparkes employees to volunteer for two days each year to help community groups throughout the Central West. Employees receive time in lieu if volunteering takes place outside of work hours. During the reporting period employees donated 1220 hours to groups and projects throughout the Central West.
- The major initiatives in the current reporting period programs included:
    - 214 employees participated in 22 volunteering initiatives, which included helping prepare for local agricultural shows, building a playground at Ronald MacDonald House, first aid training at Parkes High School and assisting with the Trundle Bush Tucker day. This represented 1220 volunteer hours (compared to 1047 hours in 2015);
    - A Grants Officer Program in conjunction with Parkes Shire Council;
    - An Aboriginal project officer in conjunction with Parkes Shire Council;
    - A Sports Grant Program with the Parkes Shire Council;
    - Five-year partnership with CentaCare – Strong Young Mums (2016marked the fifth year of this commitment);
    - Sponsorship of the Parkes, Forbes and Trundle agricultural shows;
    - Supporting education through the Peer Tutoring Program at Parkes High School and Parkes Life Education Program;
    - A community equipment pool which provides community groups access to equipment such as marquees, a blow up TV screen, a PA system, eskies etcetera for use free of charge; and
    - Increased sponsorship of the Parkes Elvis Festival.

10.4 Complaints

10.4.1 Management

- 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. This contact numbers are advertised on the Northparkes website (www.northparkes.com).
- Registered neighbours of Northparkes also received via post a magnetised contact list including all relevant contact numbers of Northparkes personnel.
-
- The website provides information about all aspects of Northparkes operations, and has a facility for the community to submit enquiries, concerns or complaints via e-mail direct to the Community and External Relations team.
- All complaints received across site are referred to the Community and External Relations team, 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 AEMR and the annual Northparkes Report.

- Northparkes maintained its dust risk notification communication strategy in 2016. The Northparkes Environment team distributes a weekly weather report, internally. If there is a high risk dust day, the Community and External Relations team 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 team if people have concerns or questions.
- During the reporting period Northparkes received no complaints from community members.