Northparkes Mines
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1 October to 31 December 2020 - Quarter 4

Environmental Monitoring Results Summary

Name of Mine	Northparkes Mines
Name of Leaseholder and Mine Operator	CMOC Mining Pty Ltd
Mining Leases	ML1247, ML1367, ML1641 and ML1743
Environment Protection Licence	EPL 4784
Development Consent	DC11_0060, (as modified)

Reviewed by	**Chris Higgins**
Title	Superintendent – Environment and Farms
Date	30 March 21
Signature	
Approved by	**Stacey Kelly**
Title	Manager – People, Safety and Environment
Date	30 MARCH 2021
Signature	

1. SCOPE OF REPORT

This report provides a summary of monitoring results for the period from 1 October to 31 December 2020. This monitoring is undertaken in accordance with the Environmental Monitoring Program (available at www.northparkes.com.au). Details of air quality, noise and water monitoring locations are available in the Environmental Monitoring Program.

2. AIR QUALITY

The air quality monitoring program utilises PM_{10} (beta attenuated monitors), TSP's (high volume air samplers (HVAS)) and depositional dust gauges. Monitoring locations are strategically positioned around the mine lease and neighbouring properties. TSP and PM_{10} monitoring have been undertaken at three nearby farm residences Hubberstone, Milpose and Hillview. A summary of the monitoring results are provided below.

2.1 PM10

PM10 monitoring results for the 'Hubberstone', 'Milpose' and 'Hillview' monitoring locations, for the reporting period, are displayed in Figure 1, Figure 2 and Figure 3 respectively. The criteria for exceedances (as nominated in the Development Consent DC11_0060, known as the Consent), are >30 µg/m^3 for the annual average and >50 µg/m^3 for a 24-hour monitoring period. Refer to Appendix A for map of all PM10 monitoring locations.

During the reporting period there were two elevated 24hr readings recorded at the Hubberstone monitoring location. The elevated results triggered the internal investigation process and their likely causes are detailed below:

- 20 Nov 2020 (61.8 µg/m^3) – Analysis of PM10 data shows that periods recording high levels of particulate matter occur when the prevailing winds come from a Northerly and Northeasterly direction. As this is the opposing direction to the mine, it is highly unlikely that the elevated reading was caused by mining operations and has since been omitted from results.
- 4 Dec 2020 (53.5 µg/m^3) – Northparkes operations are predominantly to the southwest of the monitoring location with no elevated results recorded when winds have prevailed from this direction. Elevated periods of particulate matter correlate during a change of wind direction to the South Southeast and reduction in wind speed from 3.9m/s to 1.2m/s. Due to the low wind speeds and prevailing direction adjacent to the mine, the source is likely to be within close proximity to the monitoring location and has therefore been determined non-mine related.

Annual averages recorded at all monitoring locations are below the Consent criteria of 30 µg/m^3, recording 13.0 µg/m^3 at Hubberstone, 14.1 µg/m^3 at Milpose, and 11.3 µg/m^3 at Hillview.

Missing data for Hillview from 7 – 9 November was an operator error where the machine did not get started again after downloading information. Missing data at Hillview from 22 Dec – 31 Dec was due to instrumental issues. All other missing data was found to be impacted on by non-mining related activities was removed as outliers.

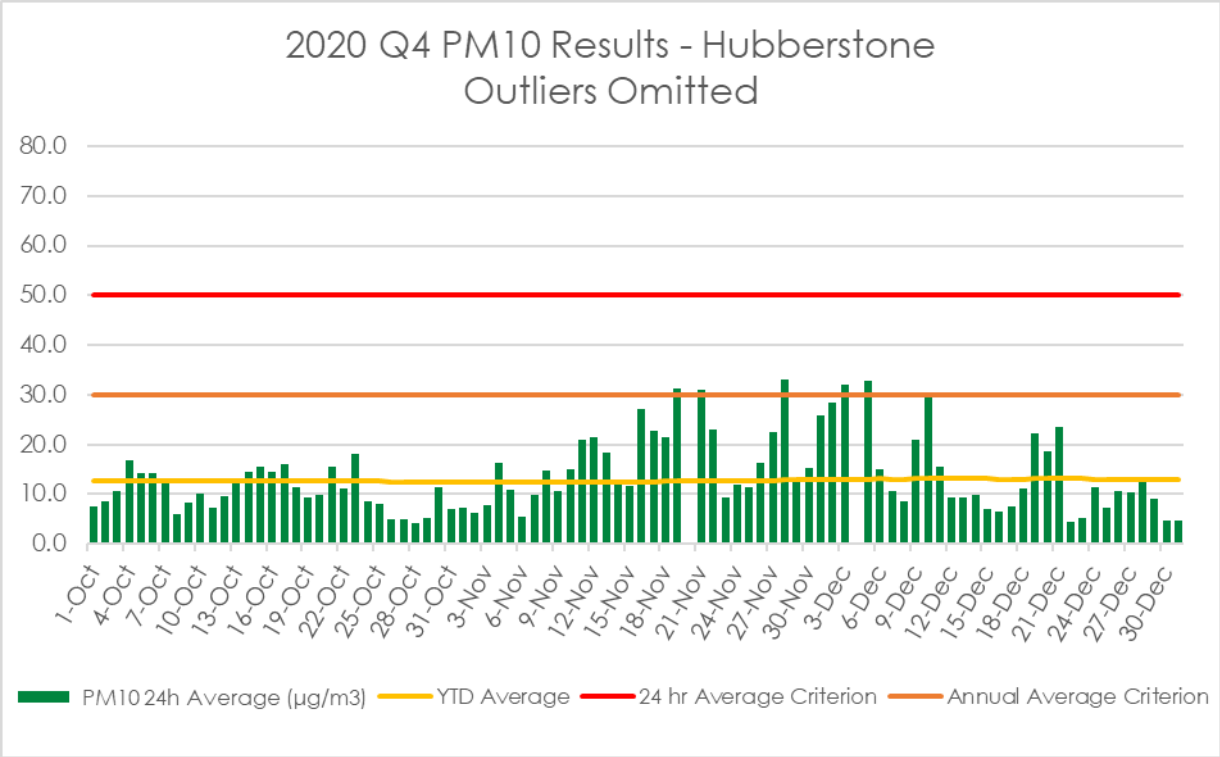


Figure 1: Hubberstone

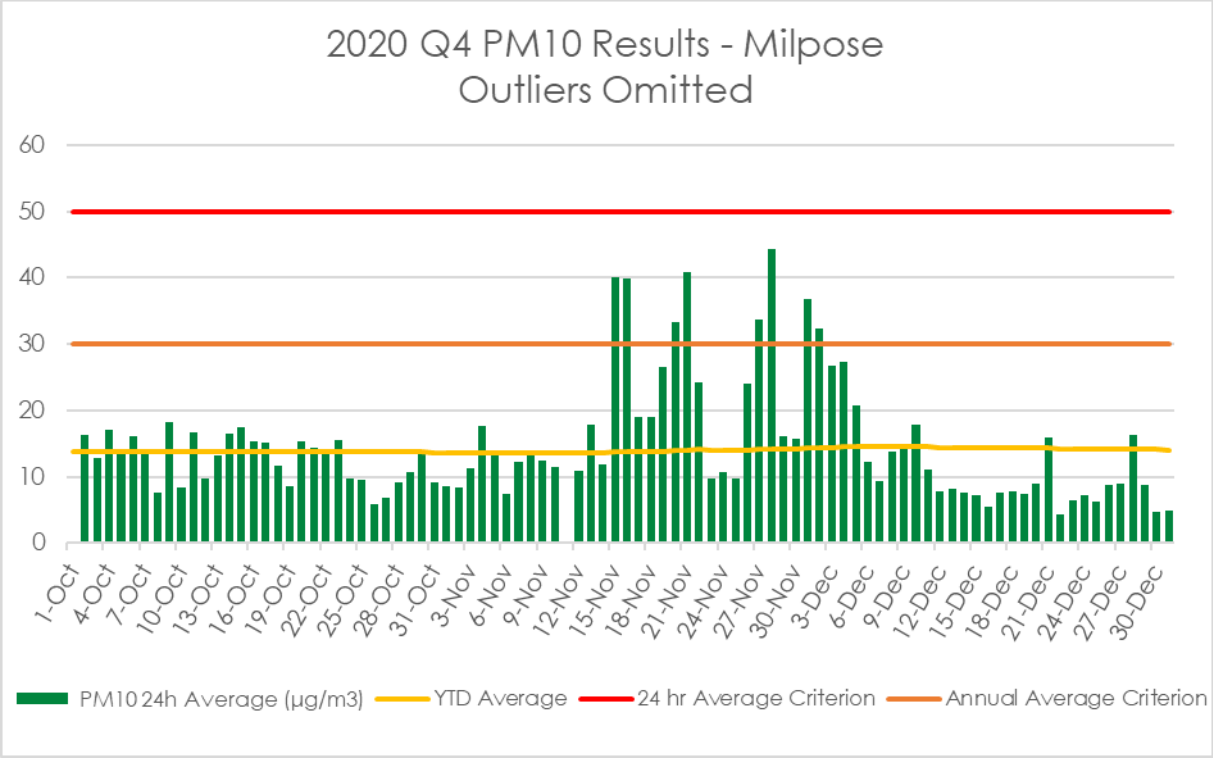


Figure 2: Milpose

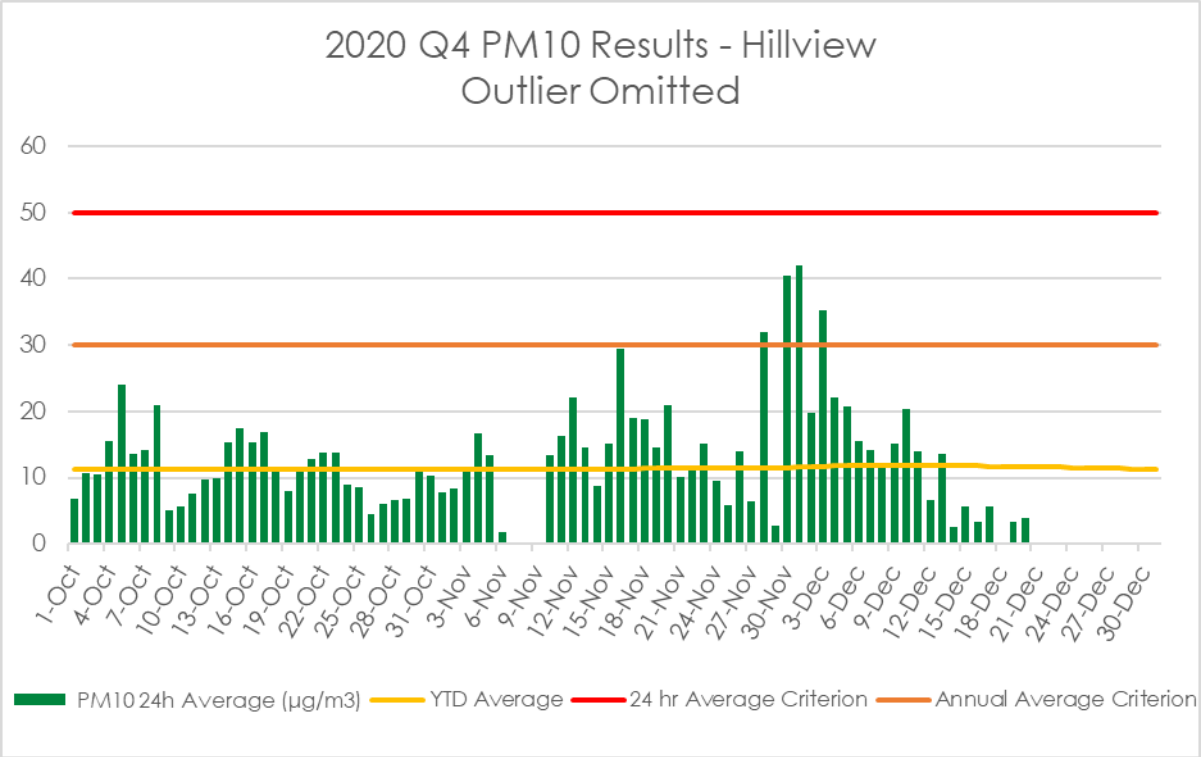


Figure 3: Hillview

2.2 TSP

All recorded dust levels at all TSP monitoring locations were under the required average annual criteria set by the Consent (90 µg/m^3) for the quarter for the reporting period. Refer to Appendix A for map of all TSP monitoring locations.

During the reporting period there were no elevated readings recorded.

The missing data for 30 October – 11 November at Milpose was due to an electrical fault in the unit.

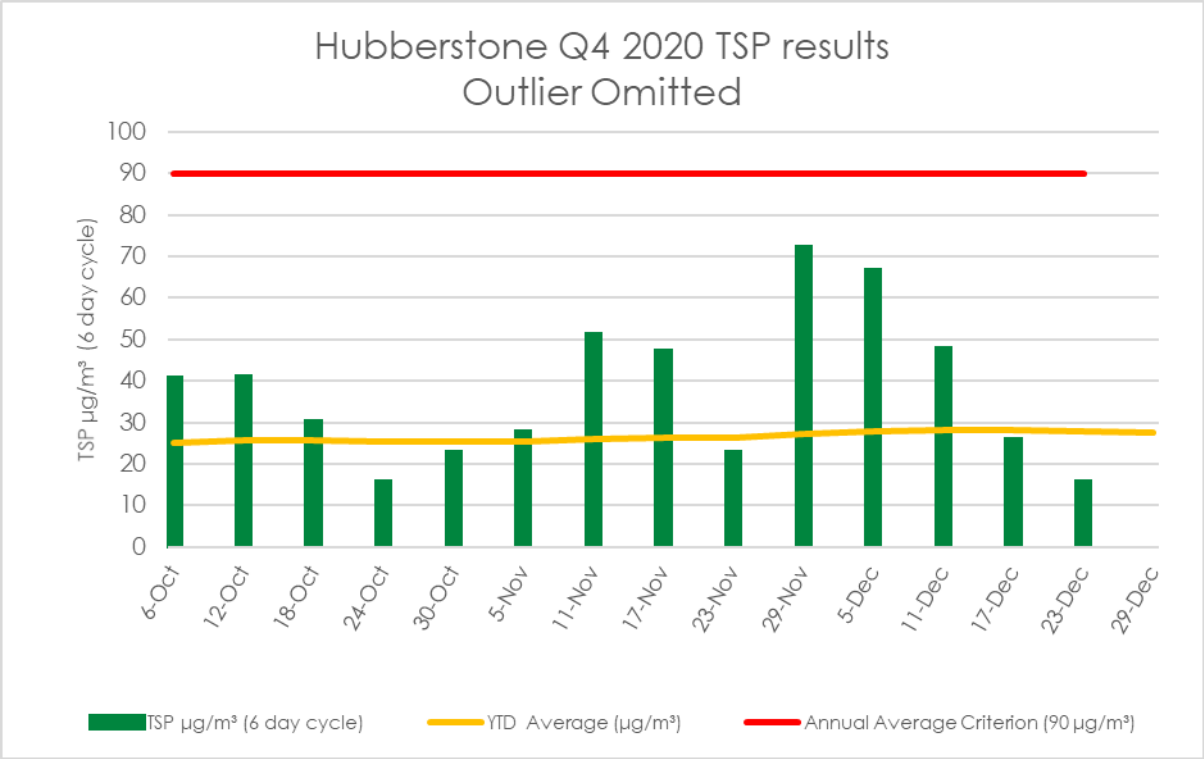


Figure 4: Hubberstone

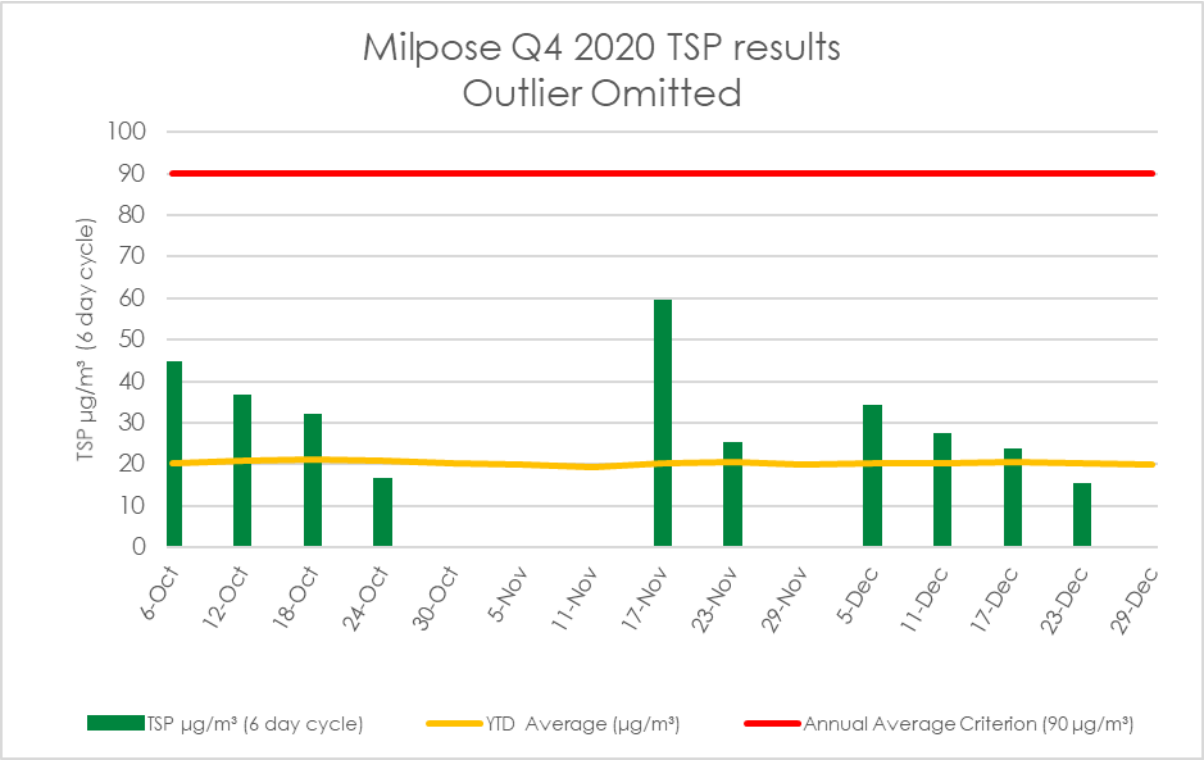


Figure 5: Milpose

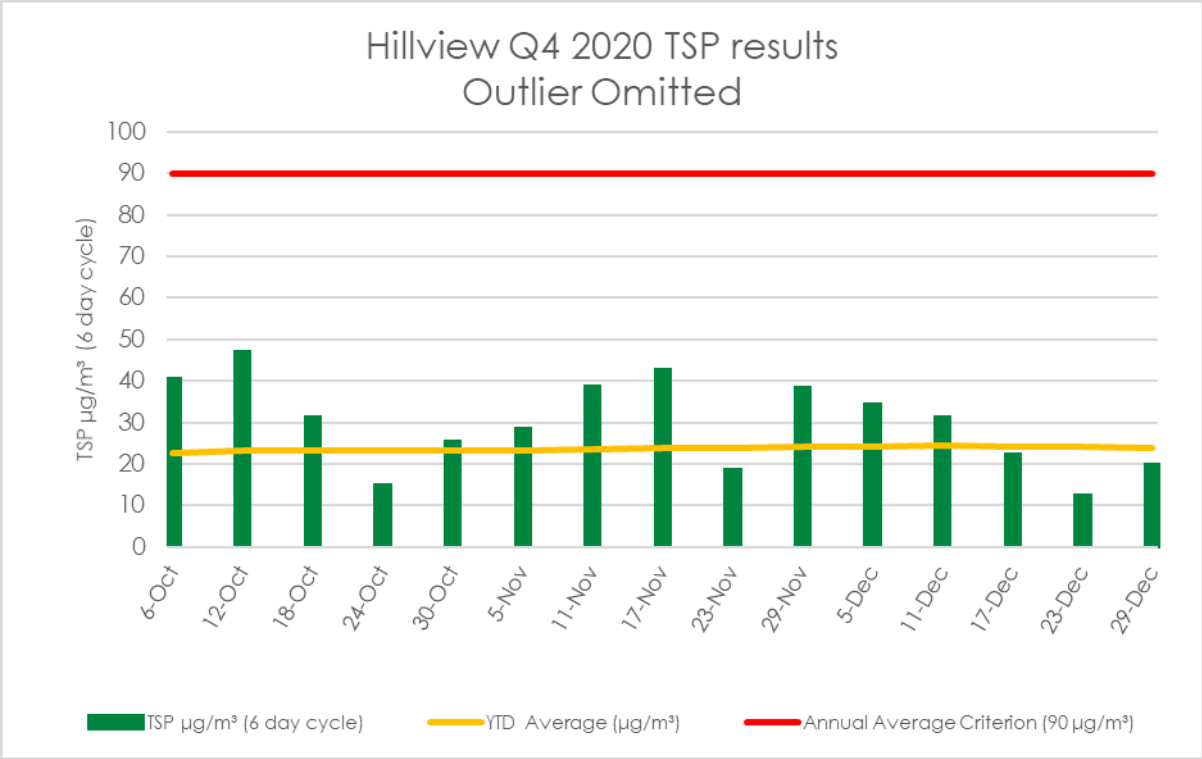


Figure 6: Hillview

2.3 Depositional Dust

Depositional dust gauges record the total of deposited dust for a month-long period and are a measure of broad scale changes to the local air quality.

Eleven depositional dust gauges are located across the mining lease and neighbouring residential properties to monitor atmospheric dust. A summary of the monthly monitoring results at each monitoring location are presented the figures below. Please be advised that only monitoring locations ND19, ND20, ND21 & ND22 are regulated by the criteria stated in the Consent, as they are the only depositional dust gauges that are at a residence on privately-owned land. All other depositional dust gauges are used to inform operational activities. Refer to Appendix B for map of all depositional dust monitoring locations.

The indicative annual average for all locations are below the long-term impact assessment criteria (4 g/m^2/month), complying with the conditions of the Consent.

During the quarter, TDE monitoring location recorded elevated results for months of October (14.1 g/m^2/month) and November (10.1 g/m^2/month), and TDNE in November (5.3 g/m^2/month) and December (4.8 g/m^2/month). Although both monitoring location recorded results above 4 g/m^2, their corresponding residential locations (ND19 and ND20) were well below the licence condition criteria.

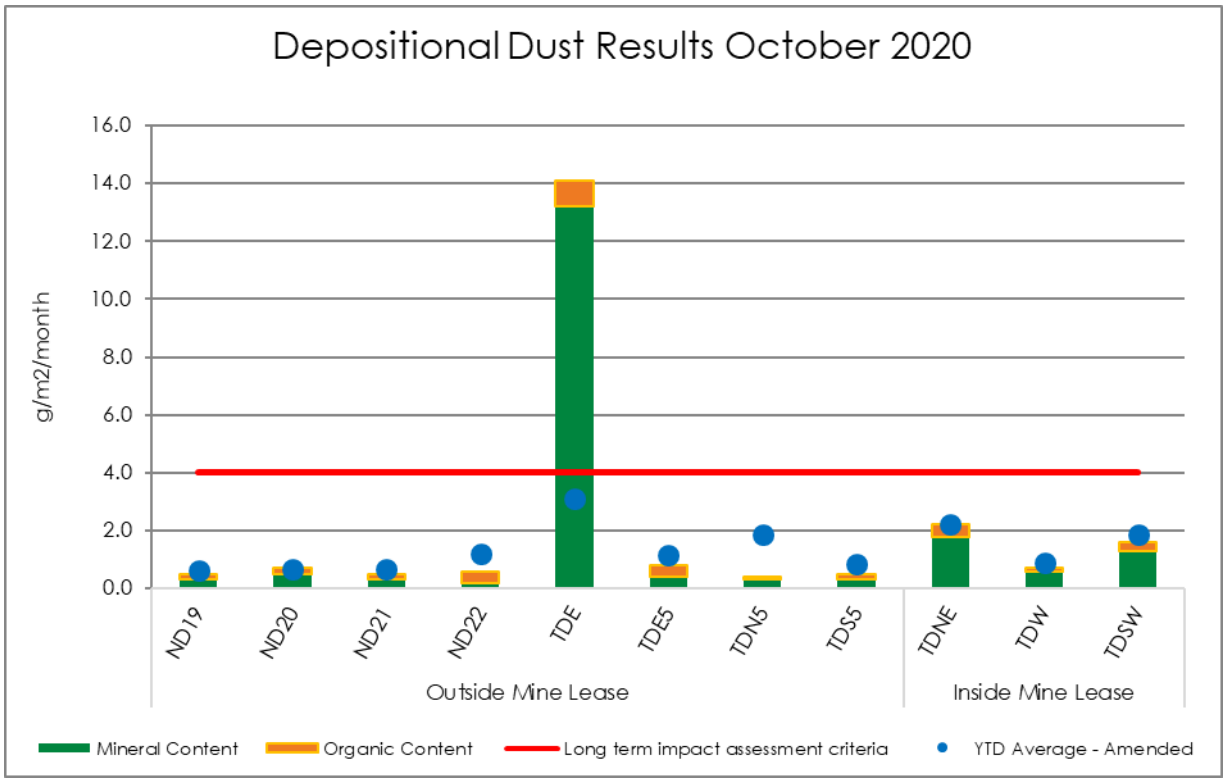


Figure 7: October depositional dust results for all locations

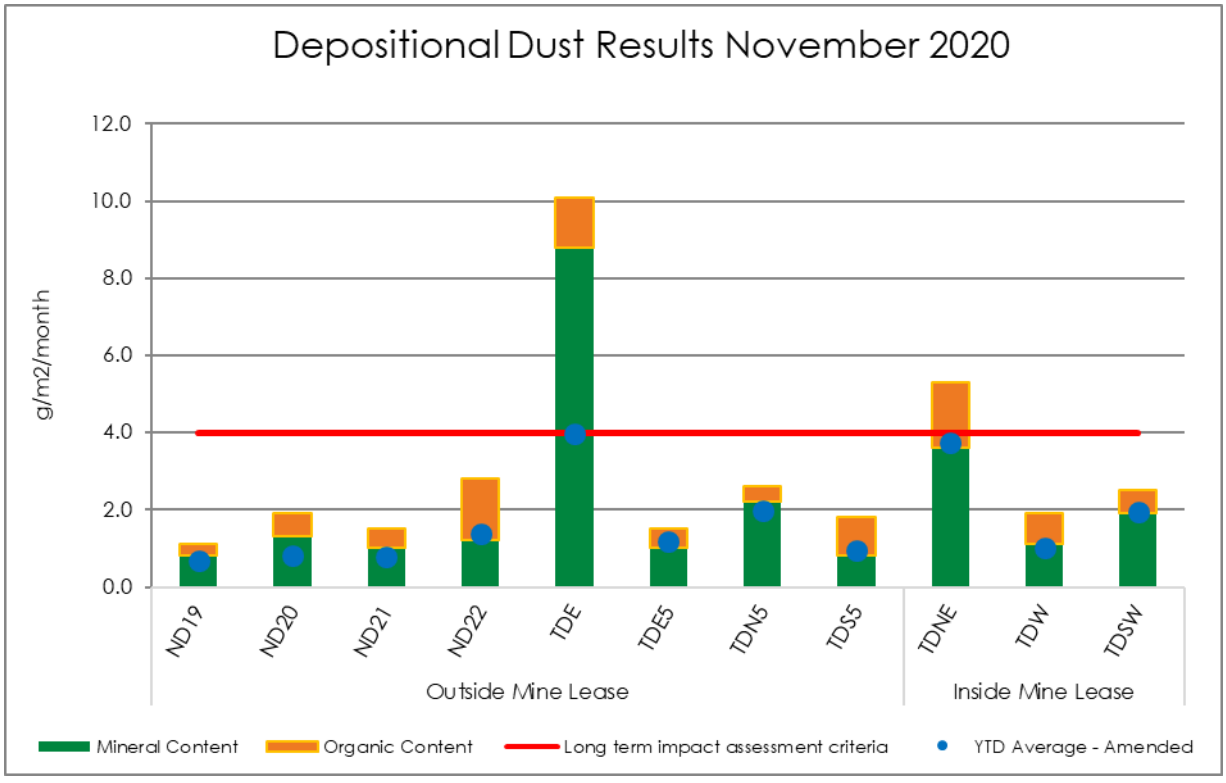


Figure 8: November depositional dust results for all locations

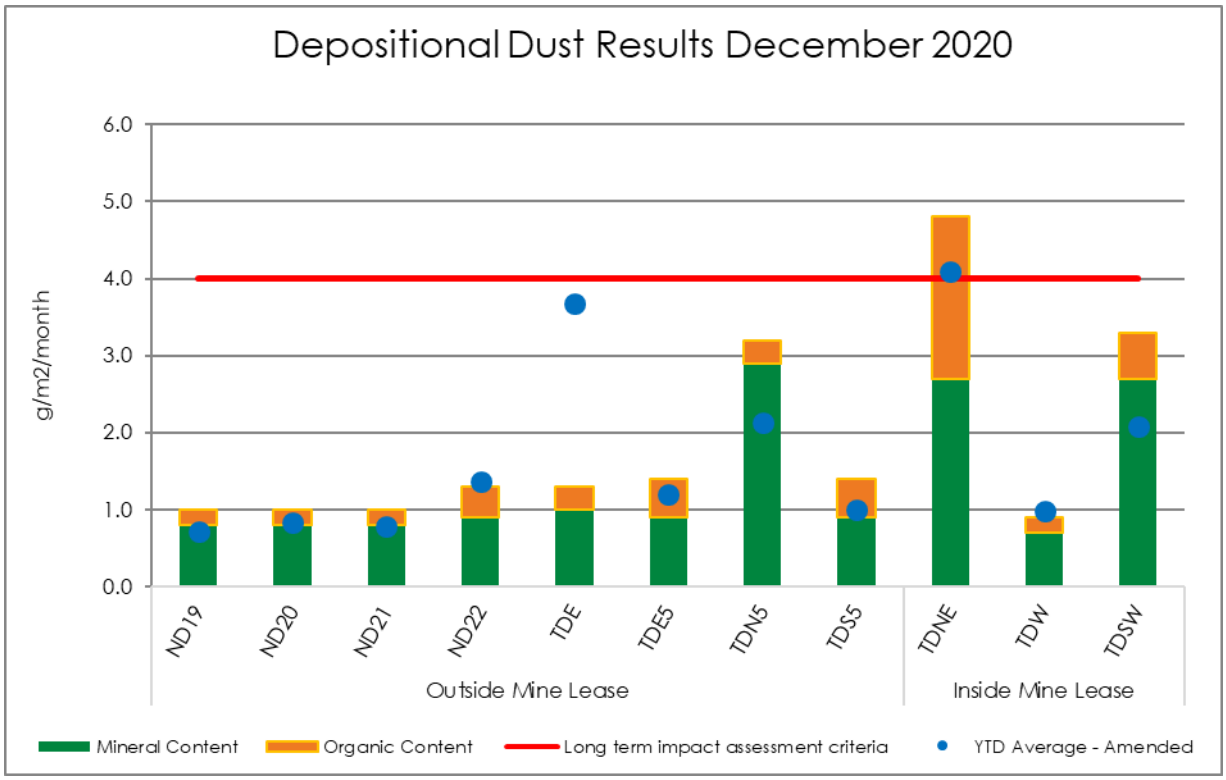


Figure 9: December depositional dust results for all locations

3. WATER

3.1 Overview

Water management at Northparkes is undertaken in accordance with approved management plans, prepared in accordance with the Consent. All water samples are analysed at an independent National Association of Testing Authorities (NATA) accredited laboratory.

Surface water quality monitoring is undertaken at Northparkes specifically within the three defined water management systems of;

- Clean water management system, which includes farm dams and watercourses;
- Dirty water management system, which includes settlement ponds; and
- Contaminated water management system, which includes all aspects of ore processing, and retention ponds.

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

Monitoring results are assessed and interpreted utilising historical trend analysis and internal water quality criteria and trigger levels to identify potential changes. Refer to Appendix C & D for map of all surface and groundwater dust monitoring locations.

3.2 Quarterly Monitoring Analysis

Water quality monitoring was carried out generally in accordance with the Consent, with no significant changes to the pH, EC or copper concentrations for all locations. Many of the surface water monitoring locations had a significant increase in volume compared to the previous reporting period. A summary of the monitoring results at each location sampled are presented in Tables 1-6 below.

Table 1: Process Water System

Location	RP01	RP02	RP03	RP05	RP06	RP07	RP08	RP09	RP12	RP13	RP15	RP16	RP19	RP20
pH	7.99	7.82	7.88	7.62	8.02	9.34	7.56	8.04	8.28	7.76	7.8	9.83	7.05	8.68
EC (uS/cm)	348.02	1,382.2	1,721.6	493.61	482.29	757.88	1,656.4	3,279.6	222.42	599.45	1,959.4	211.18	2,596.7	2,589.1
Cu (mg/L)	0.098	0.048	0.063	0.017	0.02	0.026	0.039	0.022	0.024	0.059	0.032	0.01	0.011	0.029

Table 1 continued: Process Water System

Location	RP21	RP22	RP23	RP25	RP26	RP32	RP33	GT01	GT02	PWD	Caloola
pH	7.46	7.5	8.09	7.91	8.57	8.17	8.26	7.93	8.86	8.14	8.12
EC (uS/cm)	1,246.8	354.61	517.87	305.22	262.56	704.14	993.96	271.89	1,600.9	1,405.3	3,279.9
Cu (mg/L)	0.016	0.036	0.031	0.025	0.03	0.013	0.036	0.018	0.065	0.043	0.019

Table 2: Farm Dams

Location	FD04	FD05	FD06	FD07	FD11	FD12	FD16	FD18	FD25	FD26	FD27
pH	7.73	8.12	7.64	7.73	8.02	Dry	7.81	6.18	7.98	8.07	8.75
EC (uS/cm)	146.02	96.48	139.64	106.06	237.06	Dry	177.34	2,002.6	129.88	243.38	193.0
Copper (mg/L)	0.012	0.012	0.01	0.009	0.054	Dry	0.014	0.009	0.01	0.019	0.011

Table 3: TSF Bores

Location	MB01	MB02	MB03	MB05	MB6B	W26	W27	W28	W29	W30	W31	W32
pH	7.0	7.13	6.19	6.51	6.94	7.09	10.92	6.61	12.58	7.41	7.56	11.57
EC (uS/cm)	4,317.5	6,885.9	15,726.0	17,458.0	12,213.0	9,630.5	11,214.0	11,575.0	14,843.0	1,760.4	497.17	1,553.0
Copper (mg/L)	0.01	0.01	0.019	0.007	0.015	0.016	0.014	0.013	0.036	0.011	0.021	0.014

Table 4: Opencut Bores

Location	MB10	MB13	MB14	MB16	W14	W19	W20	W21	W22	W23	W24	W25
pH	6.8	6.59	7.01	6.41	7.36	7.33	6.88	10.04	6.95	7.1	7.41	7.67
EC (uS/cm)	9,923.8	16,924.0	1,896.0	12,329.0	4,989.3	4,223.6	9,375.1	11,583.0	10,921.0	12,175.0	111.4	1,411.6
Copper (mg/L)	0.01	0.015	0.008	0.018	0.015	0.013	0.007	0.009	0.009	0.016	0.007	0.015

Table 5: Underground Bores

Location	MB17	MB18	MB19	MB20	P101	P102	P139	P145	P149
pH	7.63	11.79	7.27	7.27	6.84	6.82	6.07	6.98	7.21
EC (uS/cm)	618.98	3,875.0	10,420.0	8,907.0	7,865.1	20,195.0	20,434.0	67.8	20,560.0
Copper (mg/L)	0.006	0.017	0.009	0.039	0.001	0.001	0.003	0.003	0.007

Table 6: Regional Bores

Location	Far Hilliers	Long Paddock	Moss	Wright
pH	6.71	8.02	7.08	6.96
EC (uS/cm)	398.52	755.29	1,653.1	904.09
Copper (mg/L)	0.006	0.016	0.013	0.002

4. NOISE

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

4.1 Overview

CMOC undertakes a noise monitoring program that consists of both operator-attended and unattended surveys at the five nearest occupied residences 'Hubberstone', 'Milpose', 'Lone Pine', 'Hillview' and 'Adavale'. Refer to Appendix E for map of all attended noise monitoring locations.

Operator-attended noise measurements and recordings are undertaken outside the mining leases in order to quantify the intrusive noise emissions from construction and of general mine activity as well as the overall level of ambient noise. This noise monitoring was undertaken by an independent and suitably qualified noise professional.

4.2 Quarterly Monitoring Analysis

Attended noise monitoring was undertaken between 2 and 3 December 2020.

The assessment was completed to quantify site noise emissions against relevant noise criteria pertaining to Northparkes operations in accordance with Conditions 1 to 5 of Schedule 3 of the NSW Development Consent Conditions (DC11_110060), Northparkes Noise Management Plan (NMP, 2019) and Traffic Management Plan (TMP, 2019).

Road noise monitoring identified that vehicle movements associated with shift change generated levels below the relevant road noise criteria specified in the RNP and NMP. A concentrate truck contribution was not available this quarter due to very infrequent truck movements.

Attended monitoring has identified that operational emissions generated by Northparkes comply with relevant noise criteria at all monitoring locations for all assessment periods. Furthermore, project related noise emissions are generally barely audible at monitoring locations. Extraneous non-mining sources such as traffic, insects, wind in trees, birds, aircraft, and agricultural noise were audible during the monitoring period. A summary of the monitoring results at each monitoring location are presented in Tables 7-12 below.

In Q4, 'Adavale' location was added to the monitoring program following internal identification that some level of mine related noise was experienced at the residence. The survey identified that NPM was inaudible during the day measurements and audible throughout the evening and night periods, although remained below relevant criteria. Contributions from Northparkes were characterised as exhaust fan noise from site during the evening and night periods, and onsite vehicle movements during the night period. Generally, traffic, wind in tress, dogs barking, insects, aircraft, and birds were all audible during the monitoring period.

Table 7: Attended noise monitoring results for Hubberstone

Date/Time (hrs) Duration 15min	Noise Descriptor (dBA re 20 µPa) LAmax	LAeq	LA90	Meteorology	Description and SPL, dBA
Day					
03/12/2020 16:18	68	48	34	WD: S WS: 2.0m/s Stab Class: D	Birds 25-66 Traffic 25-46 Livestock 30-73 Wind 25-38 NPM not audible
03/12/2020 16:33	73	50	34		
03/12/2020 16:48	70	45	34		
Site $LA_{eq(15min)}$ Contribution					<30
Evening					
02/12/2020 18:01	65	49	44	WD: S WS: 2.0m/s Stab Class: D	Traffic 35-47 Birds 32-71 Wind 32-51 Agriculture 35-56 Farm Vehicles 32-71 NPM not audible
02/12/2020 18:16	71	52	43		
02/12/2020 18:31	70	45	33		
Site $LA_{eq(15min)}$ Contribution					<35
Night					
03/12/2020 01:00	50	29	25	WD: S WS: 0.5m/s Stab Class: E	Insects 20-30 Dog Barking 25-52 Livestock 20-40 Agriculture 20-30 NPM not audible
03/12/2020 01:15	42	28	24		
03/12/2020 01:30	52	33	24		
Site $LA_{eq(15min)}$ Contribution					<25
Site $LA_{1(1min)}$ Contribution					<35

Note: NPM denotes Northparkes Mines.

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Table 8: Attended noise monitoring results for Lone Pine

Date/Time (hrs) Duration 15min	Noise Descriptor (dBA re 20 µPa) LAmax	LAeq	LA90	Meteorology	Description and SPL, dBA
Day					
03/12/2020 15:19	64	44	33	WD: SE WS: 2.0m/s Stab Class: D	Birds 30-70 Wind 27-45 Traffic 30-68 Insects <30 NPM Not Audible
03/12/2020 15:34	68	45	35		
03/12/2020 15:49	70	43	36		
Site $LA_{eq(15min)}$ Contribution					<30
Evening					
02/12/2020 18:59	54	35	29	WD: SW WS: 1.5/s Stab Class: E	Birds 24-55 Wind 28-36 Traffic 30-66 Insects 25-35 NPM Site Hum <25
02/12/2020 19:14	66	40	28		
02/12/2020 19:29	61	39	30		
Site $LA_{eq(15min)}$ Contribution					<25
Night					
03/12/2020 00:01	56	36	32	WD: SE WS: 1.5m/s Stab Class: E	Birds 25-38 Insects 27-45 Wind 27-43 Livestock 30-40 Operator 47-56 NPM Site Hum <25-33
03/12/2020 00:16	47	34	31		
03/12/2020 00:31	49	34	31		
Site $LA_{eq(15min)}$ Contribution					<30
Site $LA_{1(1min)}$ Contribution					<40

Note: NPM denotes Northparkes Mines.

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Table 9: Attended noise monitoring results for Milpose

Date/Time (hrs) Duration 15min	Noise Descriptor (dBA re 20 µPa) LAmax	LAeq	LA90	Meteorology	Description and SPL, dBA
Day					
03/12/2020 13:24	47	33	26	WD: SE WS: 1.0m/s Stab Class: B	Birds 23-47 Agriculture <20-39 NPM Not Audible
03/12/2020 13:39	46	35	27		
03/12/2020 13:54	47	34	26		
Site $LA_{eq(15min)}$ Contribution					<25
Evening					
02/12/2020 21:01	58	43	37	WD: S WS: <0.1m/s Stab Class: D	Insects <30-35 Agriculture 33-58 Operator 51 NPM Not Audible
02/12/2020 21:16	50	43	38		
02/12/2020 21:31	54	43	38		
Site $LA_{eq(15min)}$ Contribution					<30
Night					
02/12/2020 22:00	47	32	26	WD: SE WS: 0.5m/s Stab Class: D	Insects 22-34 Agriculture 20-58 Aircraft 28-47 NPM Not Audible
02/12/2020 22:15	45	31	26		
02/12/2020 22:30	58	31	25		
Site $LA_{eq(15min)}$ Contribution					<25
Site $LA_{1(1min)}$ Contribution					<40

Note: NPM denotes Northparkes Mines.

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Table 10: Attended noise monitoring results for Hillview

Date/Time (hrs) Duration 15min	Noise Descriptor (dBA re 20 µPa) LAmax	LAeq	LA90	Meteorology	Description and SPL, dBA
Day					
03/12/2020 12:10	64	43	30	WD: E WS: 1.0m/s Stab Class: B	Birds 27-64 Traffic 25-58 Insects 25-35 Wind 25-36 NPM Not Audible
03/12/2020 12:25	58	40	31		
03/12/2020 12:40	54	38	30		
Site $LA_{eq(15min)}$ Contribution					<30
Evening					
03/12/2020 18:00	62	47	36	WD: S WS: 0.5m/s Stab Class: E	Traffic 29-59 Agriculture <25-36 Birds 26-42 Residential Noise 40-64 NPM Not Audible
03/12/2020 18:15	64	46	32		
03/12/2020 18:30	59	45	32		
Site $LA_{eq(15min)}$ Contribution					<30
Night					
03/12/2020 1:57	34	22	<20	WD: SE WS: 0.5m/s Stab Class: D	Insects <25 Agriculture <25-28 Operator 34-40 NPM Not Audible
03/12/2020 2:12	40	20	<20		
03/12/2020 2:27	40	21	<20		
Site $LA_{eq(15min)}$ Contribution					<25
Site $LA_{1(1min)}$ Contribution					<40

Note: NPM denotes Northparkes Mines.

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Table 11: Attended noise monitoring results for Adavale

Date/Time (hrs) Duration 15min	Noise Descriptor (dBA re 20 µPa) LAmax	LAeq	LA90	Meteorology	Description and SPL, dBA
Day					
03/12/2020 14:21	49	28	22	WD: SE WS: 1.0m/s Stab Class: C	Birds 20-51 Insects <20-25 Wind <20-39 NPM Not Audible
03/12/2020 14:36	50	31	23		
03/12/2020 14:51	51	33	24		
Site $LA_{eq(15min)}$ Contribution					<25
Evening					
03/12/2020 20:01	54	31	25	WD: S WS: 0.5m/s Stab Class: E	Traffic 20-50 Birds 20-54 Dogs Barking 24-35 Insects 20-36 Aircraft 25-53 NPM Site Exhaust Fan <20-25
03/12/2020 20:16	53	38	24		
03/12/2020 20:31	46	26	23		
Site $LA_{eq(15min)}$ Contribution					<25
Night					
02/12/2020 23:01	44	34	30	WD: SE WS: 1.0m/s Stab Class: G	Insects <25 Wind 25-44 Operator 53 NPM Site Exhaust Fan <20-45 NPM Vehicle Movements 25-34 (Infrequent <30 second durations)
02/12/2020 23:16	47	37	32		
02/12/2020 23:31	53	30	28		
Site $LA_{eq(15min)}$ Contribution					34
Site $LA_{1(1min)}$ Contribution					<40

Note: NPM denotes Northparkes Mines.

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Table 12: Attended road noise survey results

Date/Time (hrs) Duration 1 hour	Measured Noise Level (re 20 µPa) dB $LA_{eq\ (1hr)}$	Meteorology	Criteria dB $LA_{eq(1hr)}$	Description and SPL dBA
03/12/2020 12:10 (Day)	40	WD: E WS: 1.0m/s Stab Class: B	55	Birds 27-64 Traffic 25-58 Insects 25-35 Wind 25-36 Vehicles Enter/Exit NPM Site Approx. 18
03/12/2020 18:00 (Evening)	46	WD: S WS: 0.5m/s Stab Class: E	55	Traffic 29-59 Agriculture <25-36 Birds 26-42 Residential Noise 40-64 Vehicles Enter/Exit NPM Site Approx. 99

Note: NPM denotes Northparkes Mines.

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Appendix A - PM10/TSP Monitoring Locations

Dust,PM10 Realtime

Dust,TSP

Tenement Boundary

0 1 2 3 Km

CMOC Northparkes

Monitoring Locations

March 2019

Spatial Reference
Name: GDA 1994 MGA Zone 55
User: darren.priest
Date Saved: 6/03/2019 11:57 AM

Appendix B – Depositional Dust Monitoring Locations

Depositional Dust

Tenement Boundary

0 1 2 3 Km

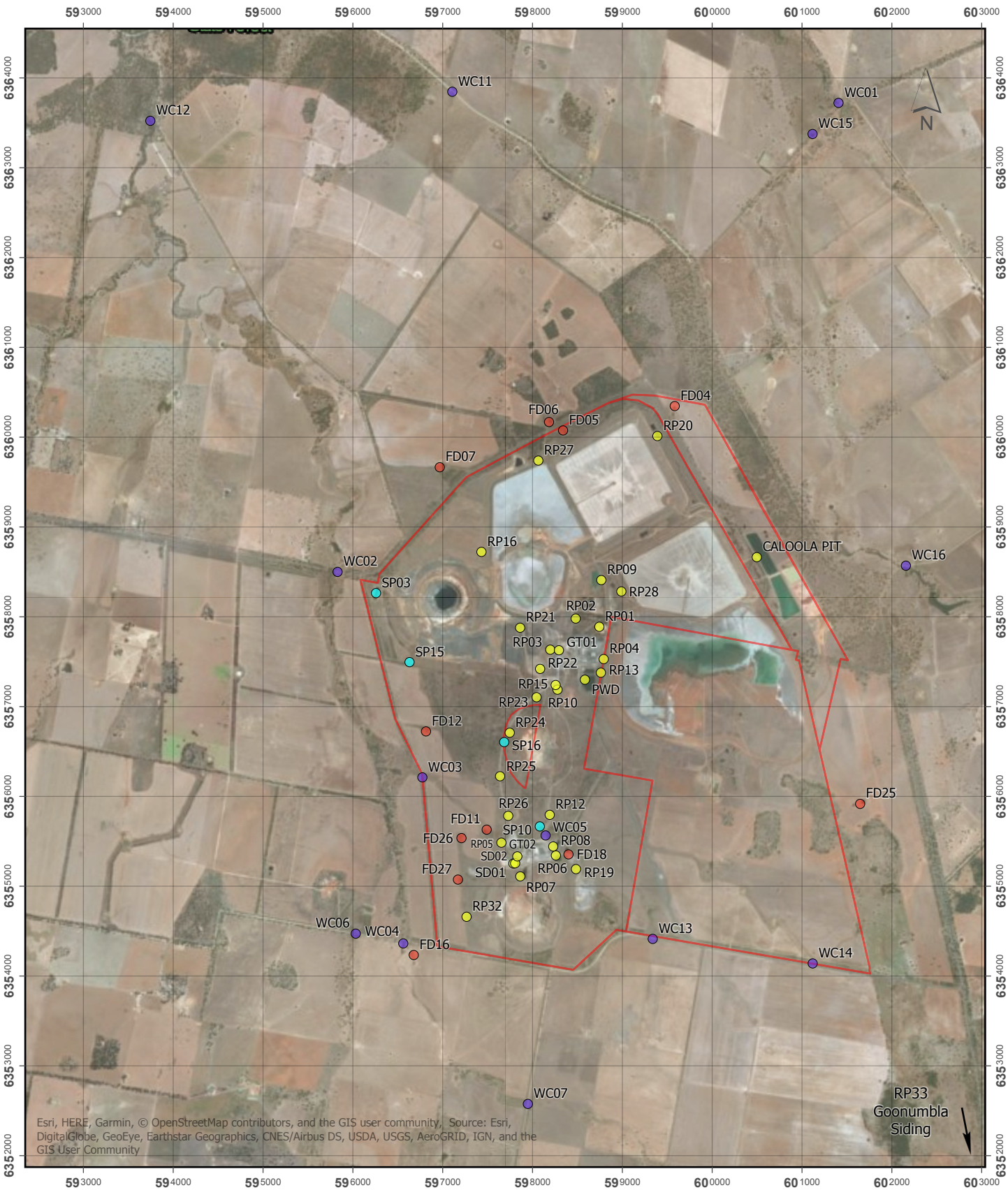
CMOC Northparkes

Monitoring Locations

March 2019

Spatial Reference
Name: GDA 1994 MGA Zone 55
User: darren.priest
Date Saved: 6/03/2019 11:56 AM

Appendix C – Surface Water Monitoring Locations



Farm Dams
Process Water
Surface Water
Water Course
Tenement Boundary

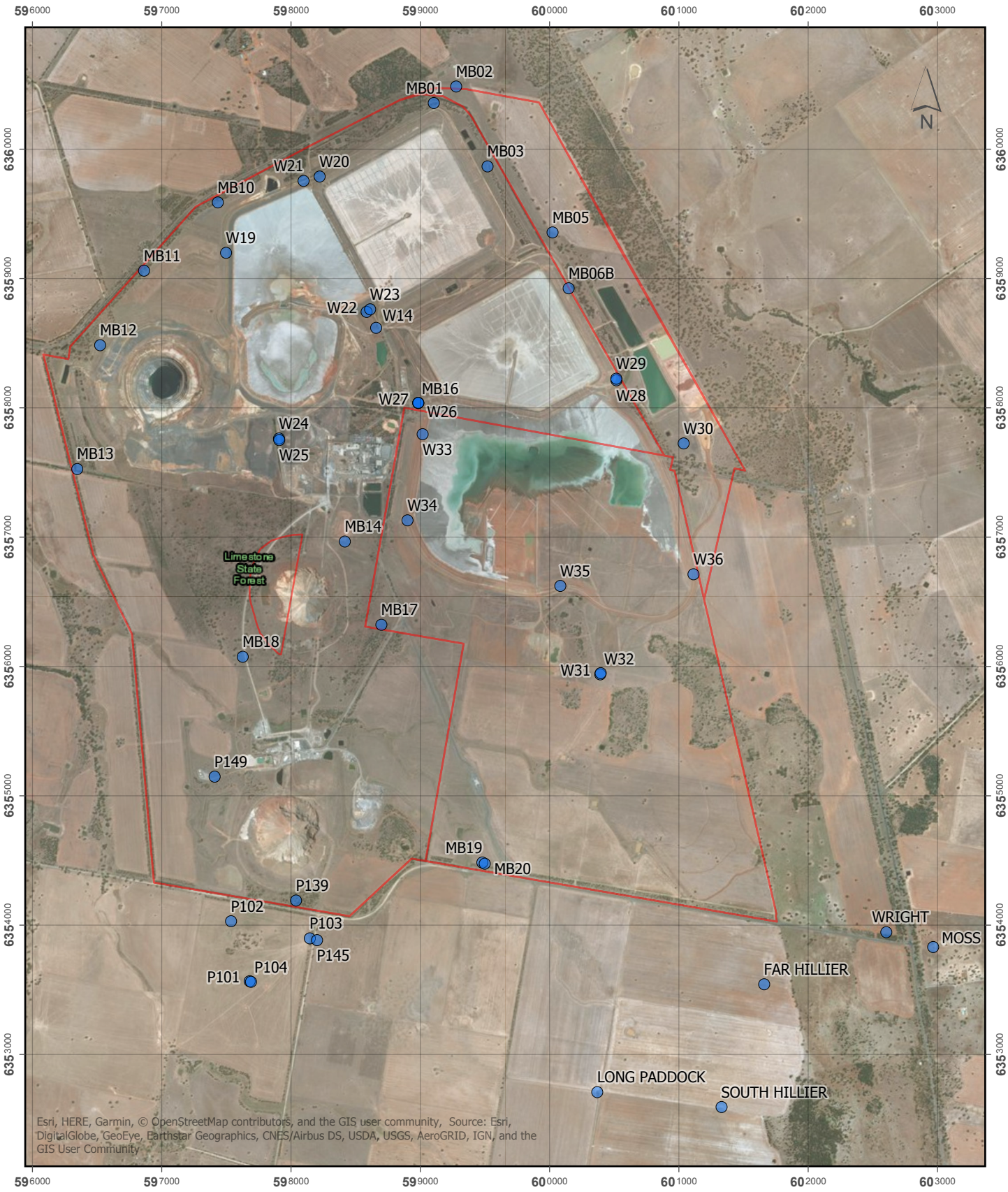
0 1 2 3 Km

CMOC Northparkes

Monitoring Locations
March 2019

Spatial Reference
Name: GDA 1994 MGA Zone 55
User: darren.priest
Date Saved: 14/03/2019 8:44 AM

Appendix D - Groundwater Monitoring Locations



GroundWater

Tenement Boundary

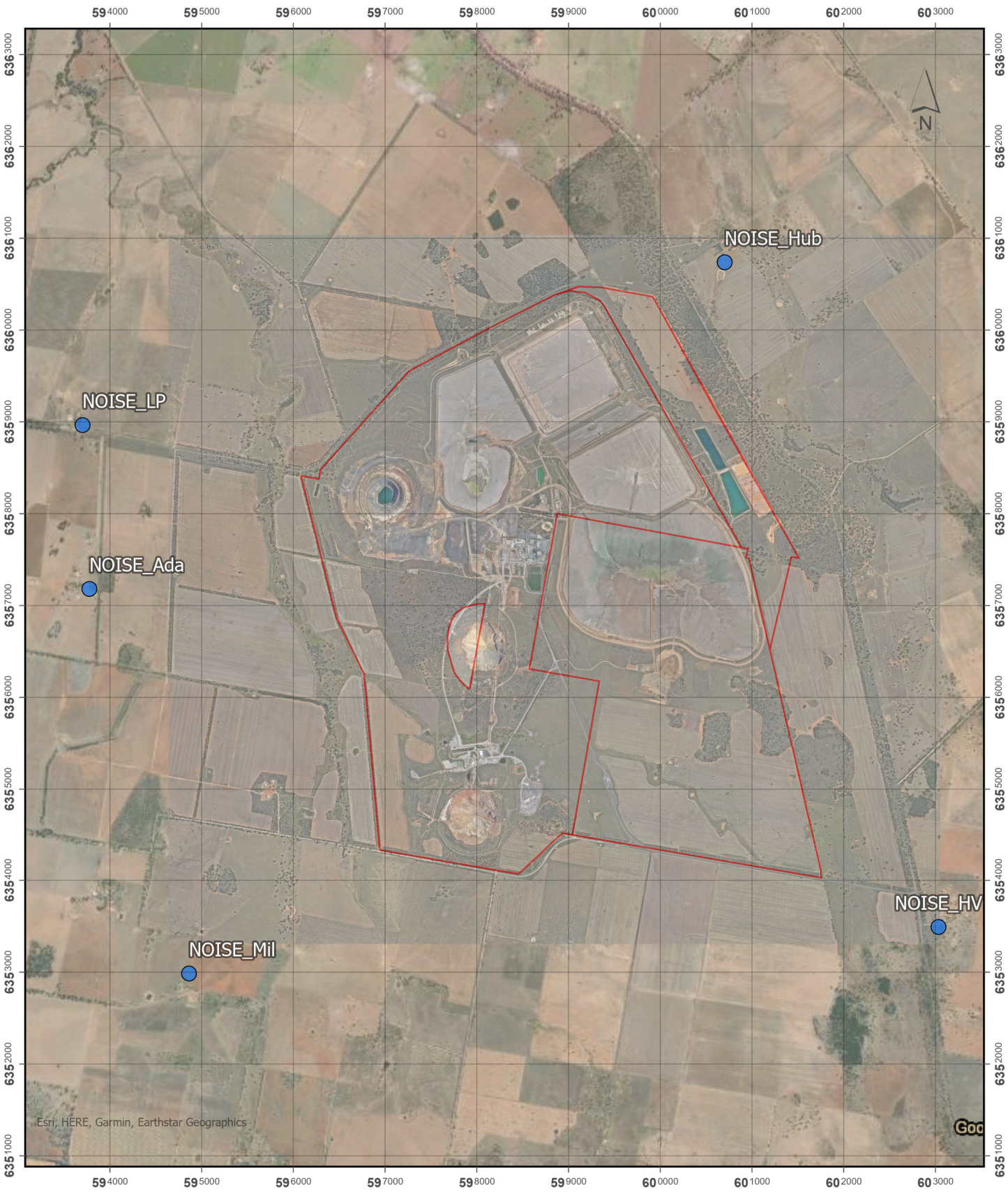
0 1 2 Km

CMOC Northparkes

Monitoring Locations
March 2019

Spatial Reference
Name: GDA 1994 MGA Zone 55
User: darren.priest
Date Saved: 6/03/2019 12:01 PM

Appendix E – Attended Noise Monitoring Locations



Noise

Tenement Boundary

0 1 2 3 Km

CMOC Northparkes

Monitoring Locations
March 2021

Spatial Reference
Name: GDA 1994 MGA Zone 55
User: darren.priest
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