Northparkes Mines

Environmental Monitoring Results Summary

01 October to 30 December, Quarter 4, 2016

Name of Mine	Northparkes Mines
Name of Leaseholder and Mine Operator	CMOC Mining Pty Ltd
Mining Leases	ML 1247, ML 1367 and 1641
Environment Protection Licence	EPL 4784
Development Consent	PA11-0060, (Mod 1& Mod 2)

Reviewed by	**Michael Priest**
Title	Superintendent - Environment & Farming
Date	2/2/17
Signature	
Approved by	**Stacey Kelly**
Title	Manager – People, Safety and Environment
Date	2 FEB 2017
Signature	

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Introduction

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

1. INTRODUCTION

The Northparkes copper-gold mine (Northparkes) is located in central western New South Wales, approximately 27 kilometres north north-west of the town of Parkes. Northparkes consists of underground operations accessing several copper sulphide porphyry ore bodies. The mined rock is processed onsite using conventional crushing, semi-autogenous grinding and flotation circuits to obtain copper concentrate. The concentrate is then thickened, filtered and stockpiled ready to be transported from site by road train to nearby Goonumbla rail siding. From there, it is railed to Port Kembla for shipping to overseas customers.

1.1 Regulatory context

In October 2014, Northparkes received Project Approval (PA11_0060), which superseded the previous approval DC 06_0026). In June 2015, approval was granted for PA11_0060 Mod 1, for Sub Level Caving mining In April 2016, approval was granted for PA11_0060 Mod 2 to incorporate work proposed under MLA514 including the Caloola ponds.

1.2 Scope of report

This report provides a summary of monitoring results for the period from 1 October 2016 to 31 December 2016. 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. WEATHER CONDITIONS

Northparkes is located in a temperate weather zone. Weather conditions are recorded at an onsite weather station, as required in PA11_0060. A summary of

the weather conditions experienced during the reporting quarter are provided in Table 1 and Figures 1, 2 and 3.

Table 1 Summary of weather conditions for the reporting quarter

	October	November	December
Total rainfall (mm)	35.6	41.4	56.6
Long term average rainfall (mm)*	47.4	39.6	41.6
Total number of wet days	8	5	5
Minimum temperature (°C)	2.4	1.2	6.9
Maximum temperature (°C)	31.1	37.1	39.9

*Long term average data sources from www.weatherzone.com.au
All other weather conditions data sourced from Northparkes Mines weather station

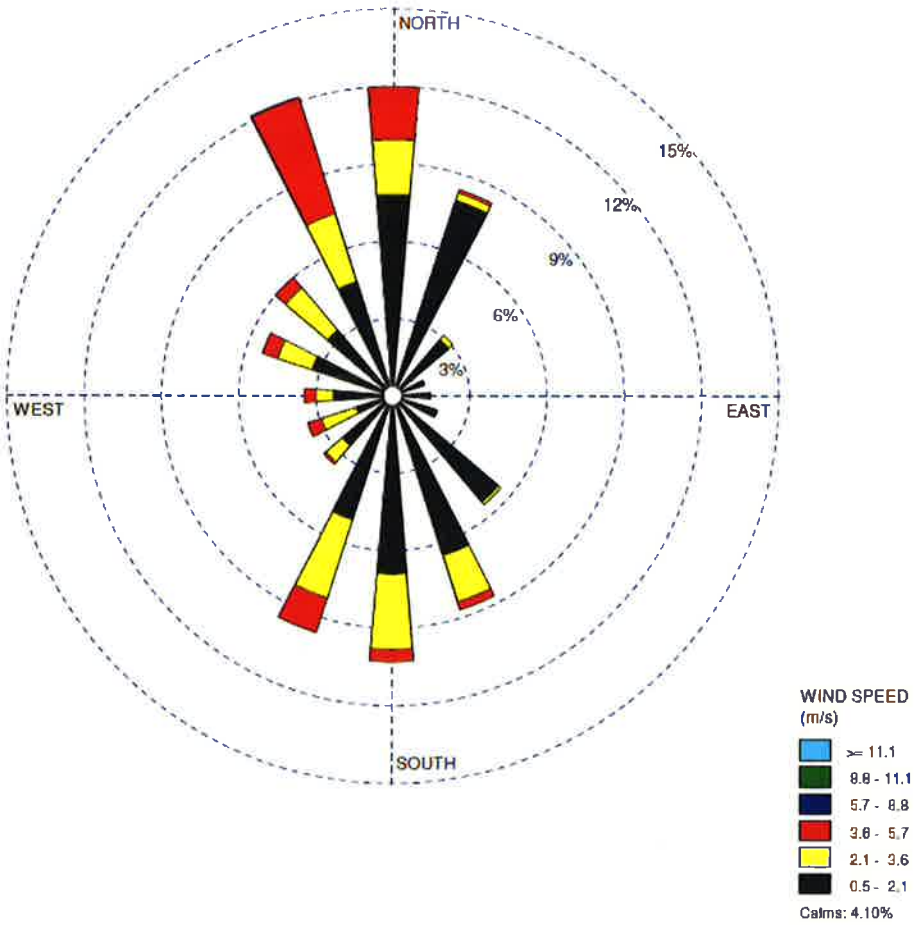


Figure 1 Wind direction and speed for the month of October 2016

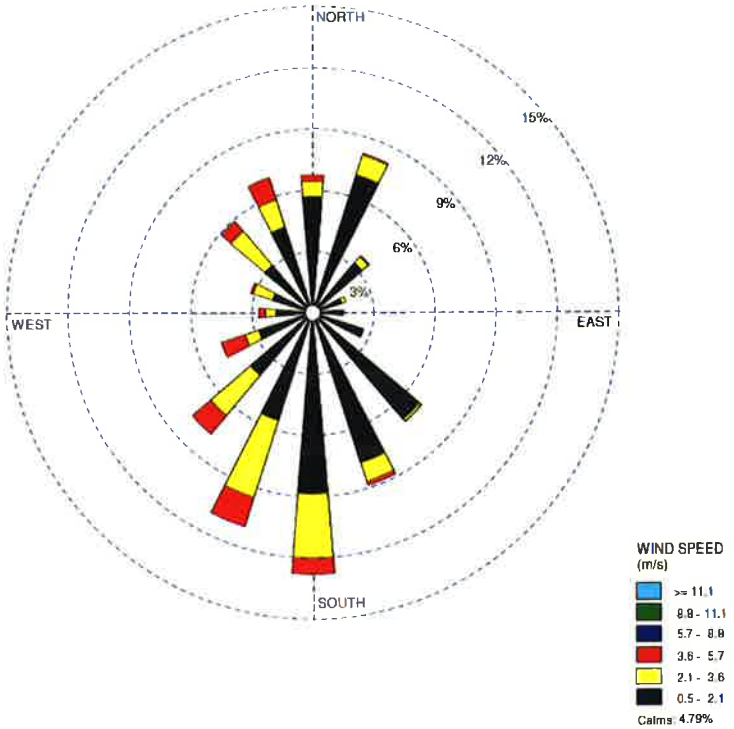


Figure 2 Wind direction and speed for the month of November 2016

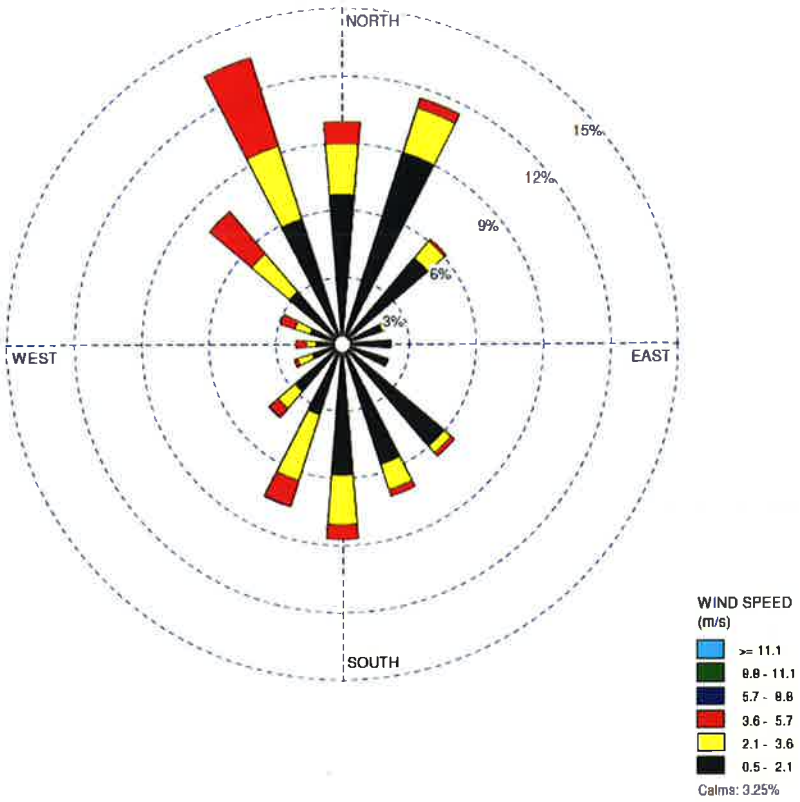


Figure 3 Wind direction and speed for the month of December 2016

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.

1. PARTICULATE MATTER

Fine dust particles, up to 10 microns in diameter, are measured as PM_{10}. 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, PM_{10} continuous direct mass method using Beta Attenuation Measurement*. This method is set to measure time-integrated mean particle concentrations for 10 min period. These measurements are subsequently averaged over a 24-hour period, to provide a 24h-average PM_{10} concentration. PM_{10} 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.

Total suspended particulate matter (TSP), is measured using a high volume sampler (Hi-Vol), which samples for 24 hours every 6-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.

1.1 Overview

TSP and PM_{10} monitoring has been undertaken at three nearby farm residences Hubberstone, Milpose and Hillview, refer Figure 4 for monitoring locations. Results were obtained using both Hi-Volume samplers and Real-Time Beta Attenuated Monitors. Summaries of the monitoring results are provided below.

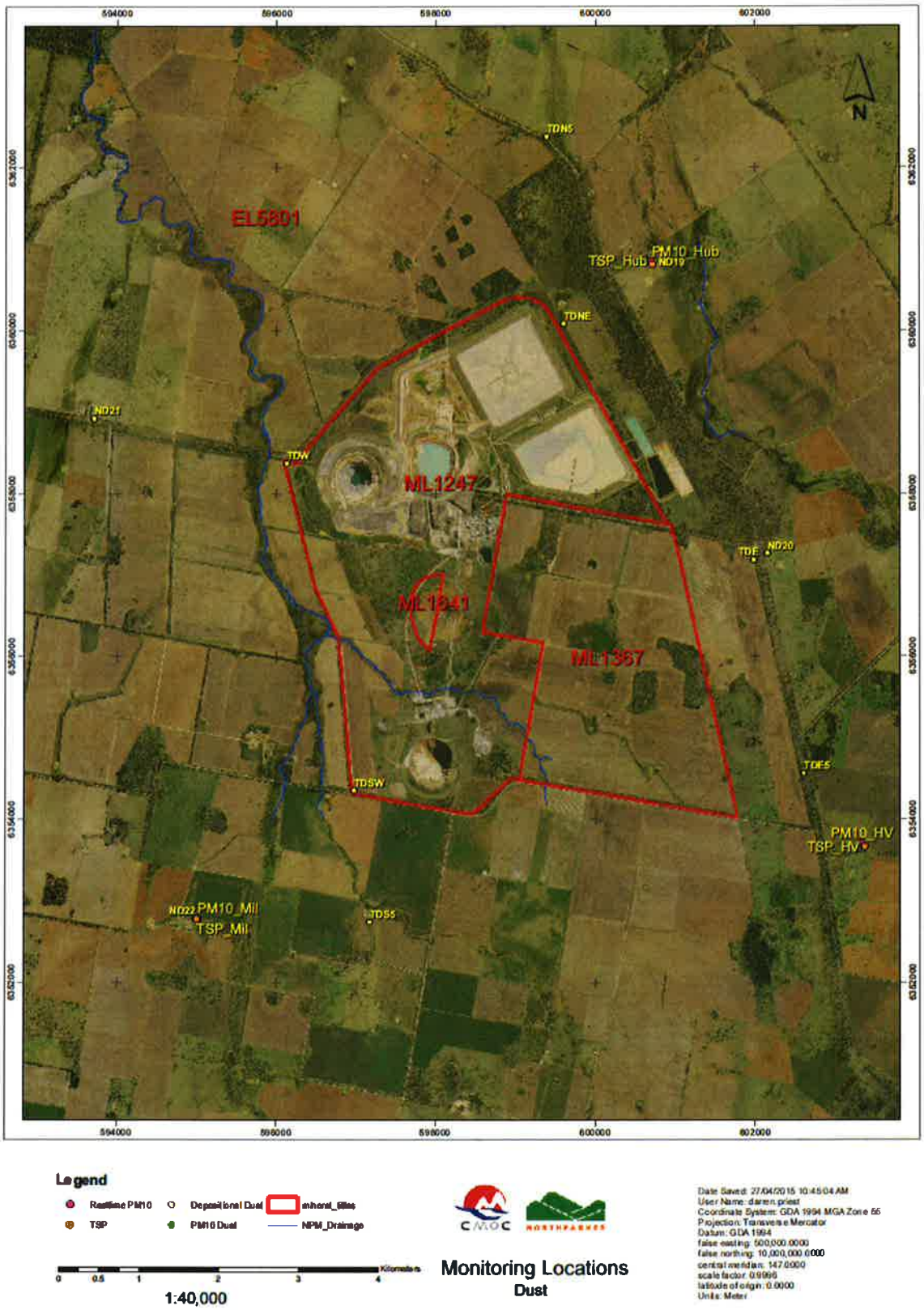


Figure 4 Northparkes Air Quality Monitoring Location (TSP, PM_{10} and Depositional Dust)

1.2 Quarterly monitoring analysis

All PM10 monitoring data collected during this reporting period was sampled using real-time beta-attenuation monitoring units. There were no exceedances under the PM10 criterion that were recorded during the reporting period at all three locations.

The PM_{10} monitor did not run from 22/10/2016 to 25/10/2016 at Hubberstone and 24/11/2016 to 25/11/2016 at Hillview during the reporting period, due to power issues that have occurred at this residence. At present, Northparkes is considering a process of relaying a new electricity source to the monitoring unit to eliminate power outrage in the future. The indicative annual average was below the annual average criterion at all locations during the reporting period except Hillview on 17 October 2016, which recorded 78.36 ug/m3 and on I November 2016 which recorded 74.2 ug/m3.

For more information on PM_{10} results for the reporting period, refer to Figure 5 to Figure 13.

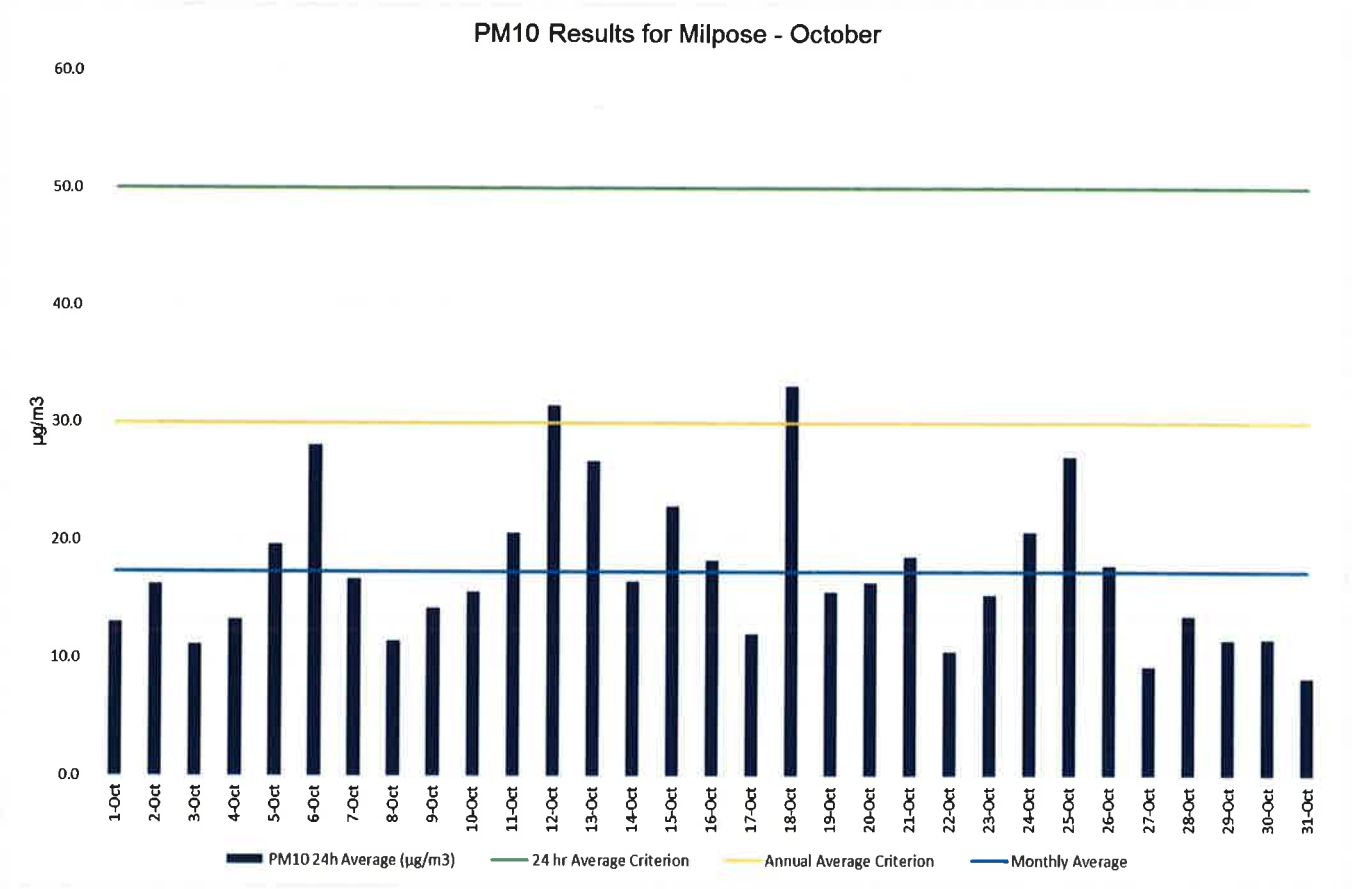


Figure 5 PM_{10} results for Milpose residence for October 2016

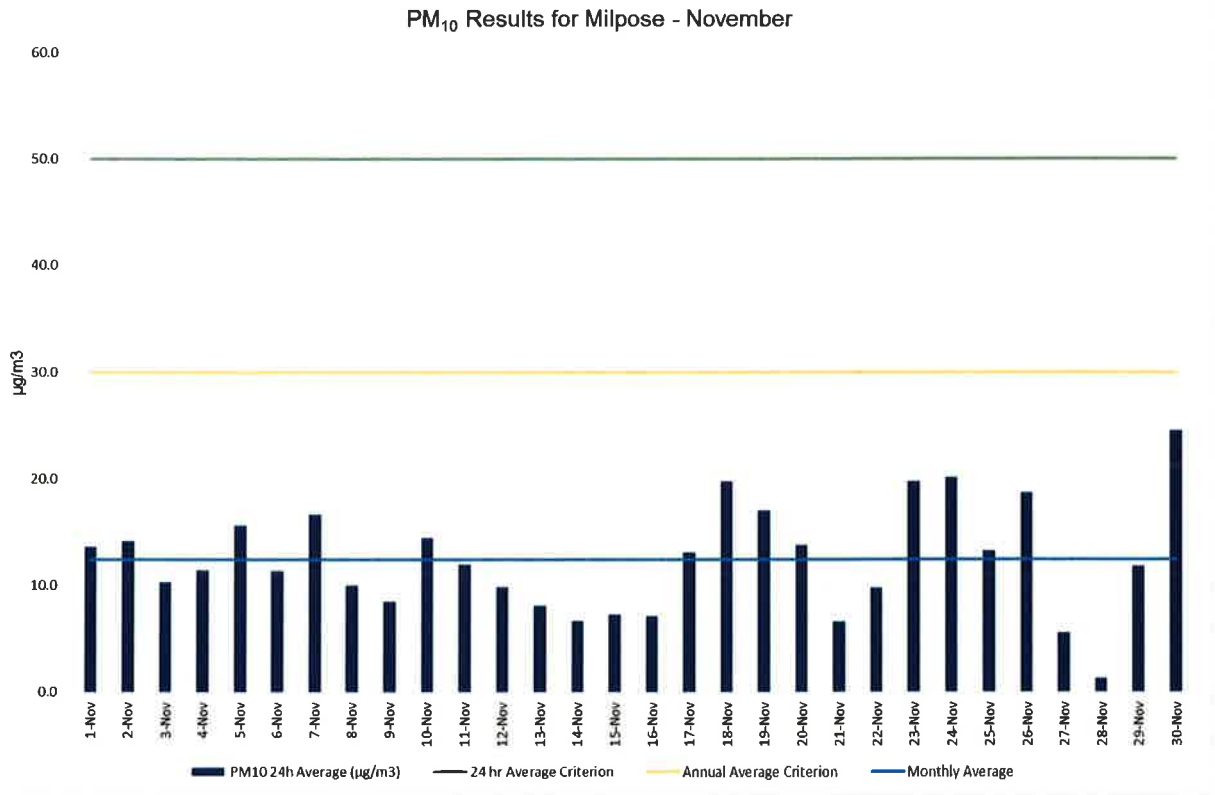


Figure 6 PM_{10} results for Milpose residence for November 2016

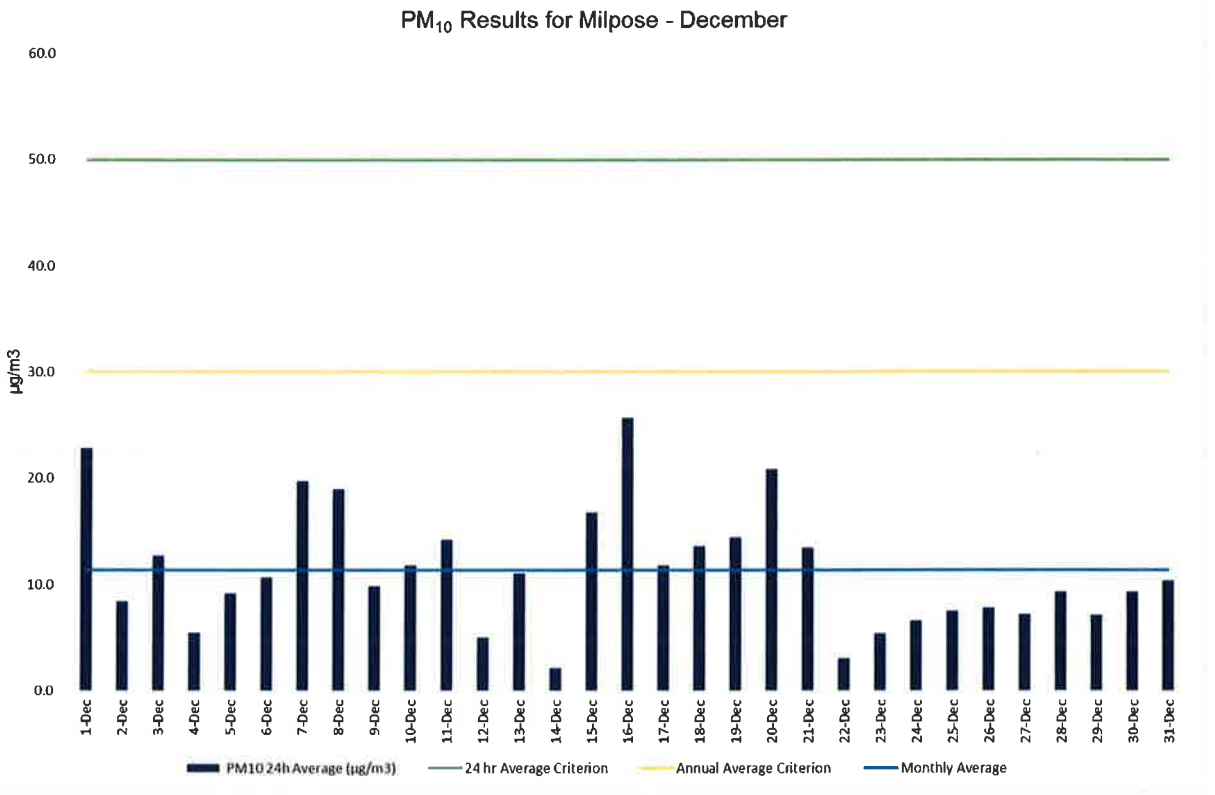


Figure 7 PM_{10} results for Milpose residence for December 2016

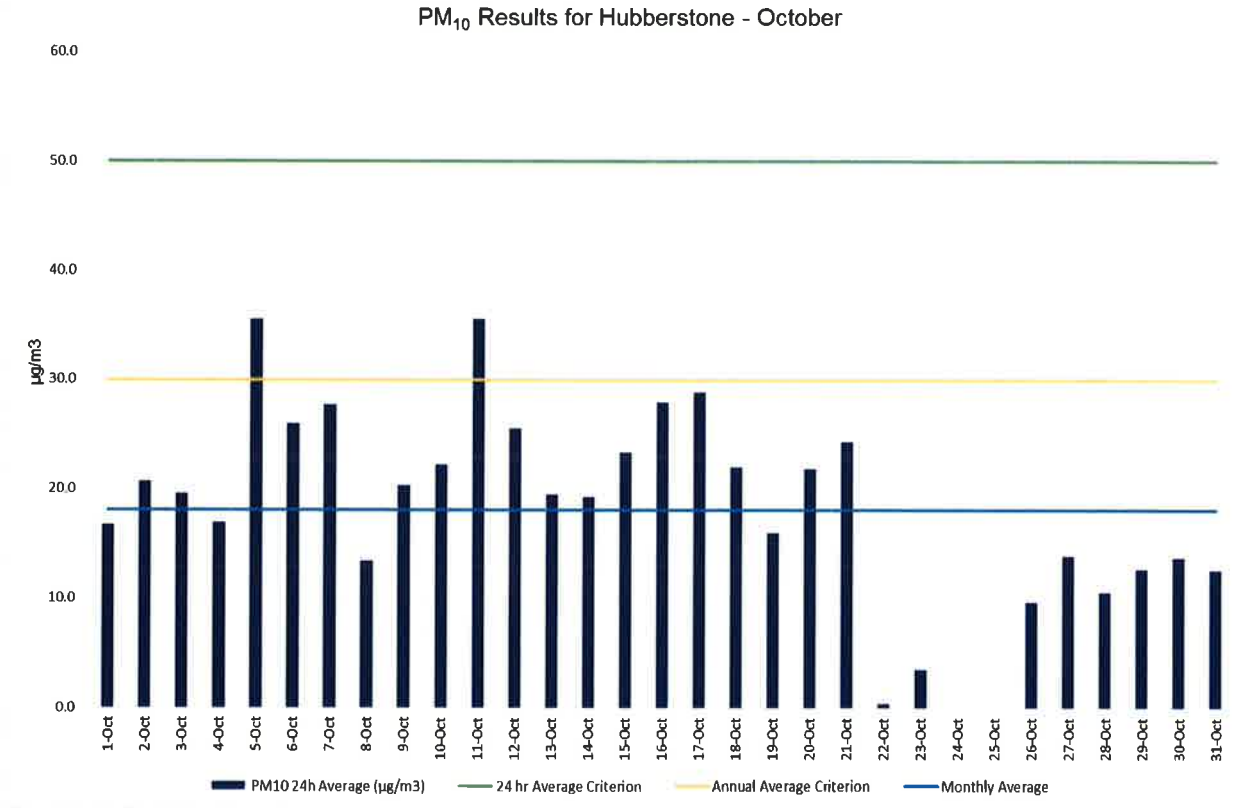


Figure 8 PM_{10} results for Hubberstone residence for October 2016

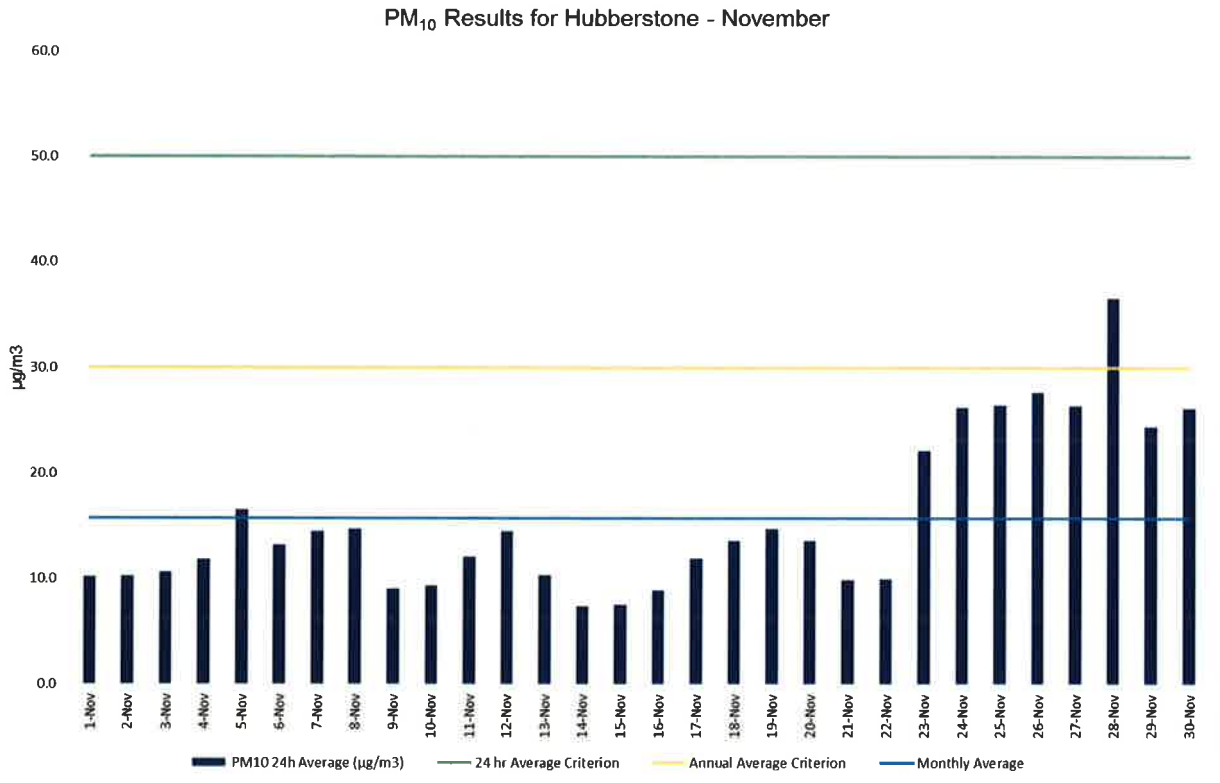


Figure 9 PM_{10} results for Hubberstone residence for November 2016

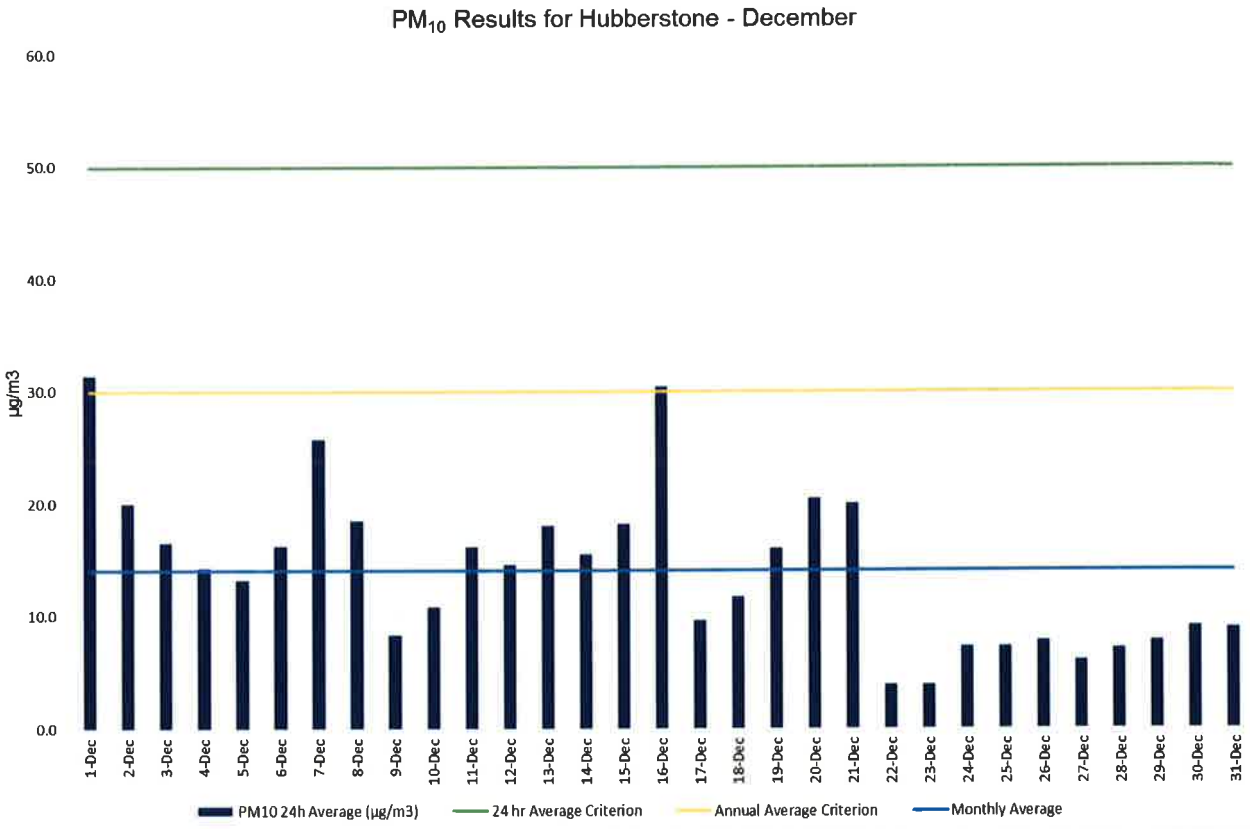


Figure 10 PM_{10} results for Hubberstone residence for December 2016

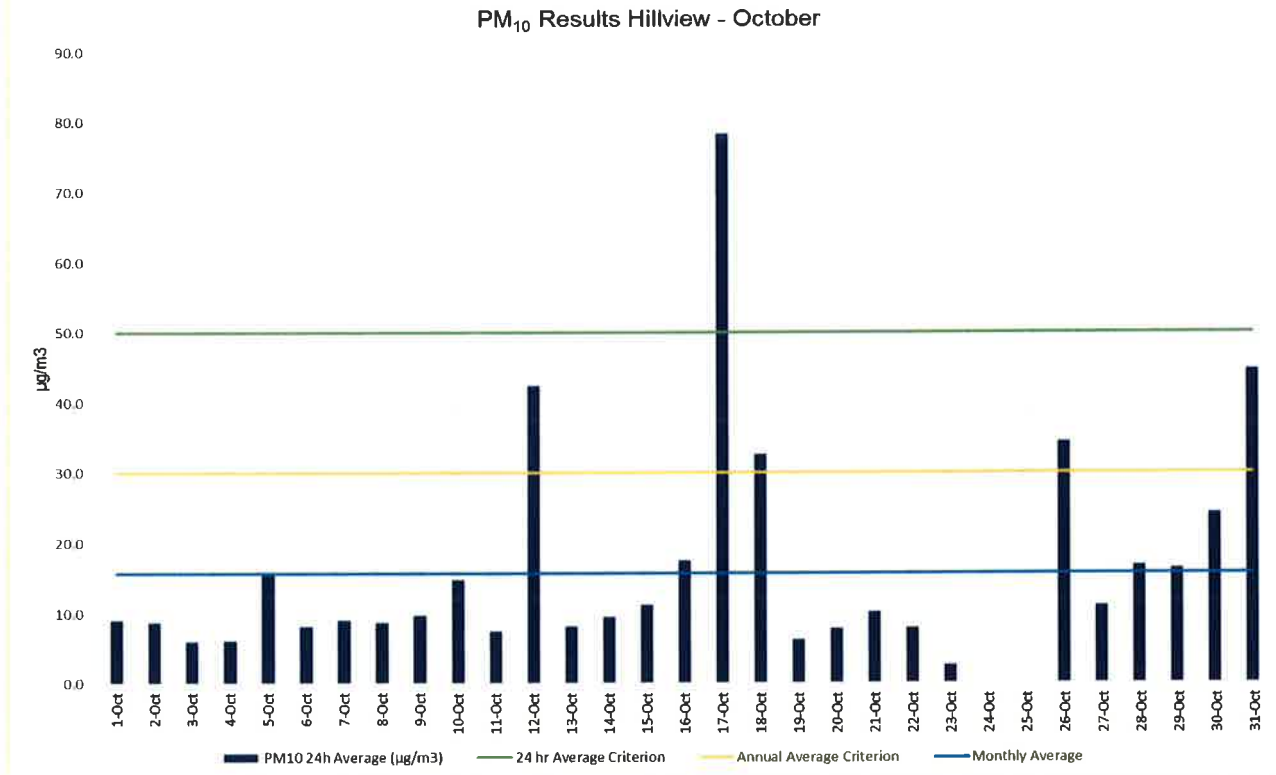


Figure 11 PM_{10} results for Hillview residence for October 2016

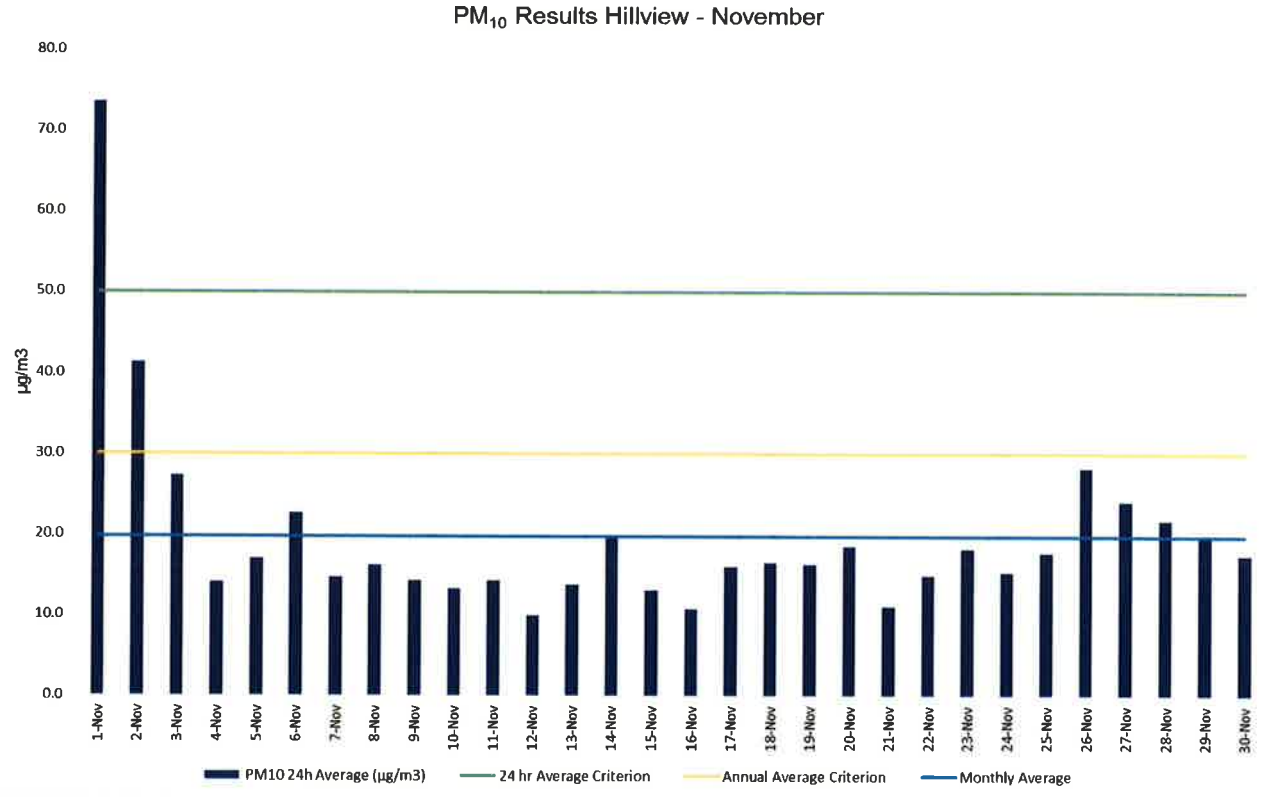


Figure 12 PM_{10} results for Hillview residence for November 2016

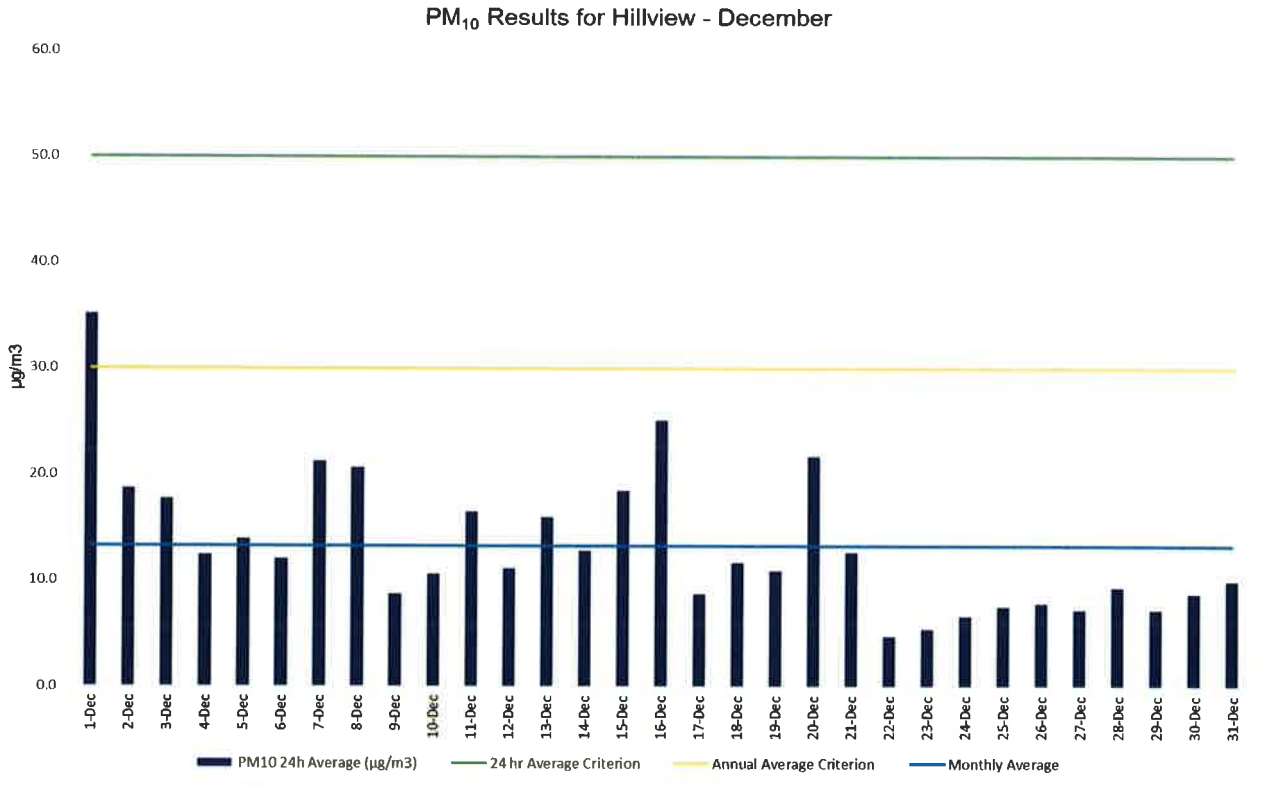


Figure 13 PM_{10} results for Hillview residence for December 2016

Total Suspended Particles (TSP) Monitoring

TSP monitoring commenced on 7th March 2015, to align with the beginning of the Rosedale Tailings Project. TSP data shows that levels are well below the annual average criterion across all locations. For more information on TSP results for the reporting period, refer to Figure 14 - Figure 16.

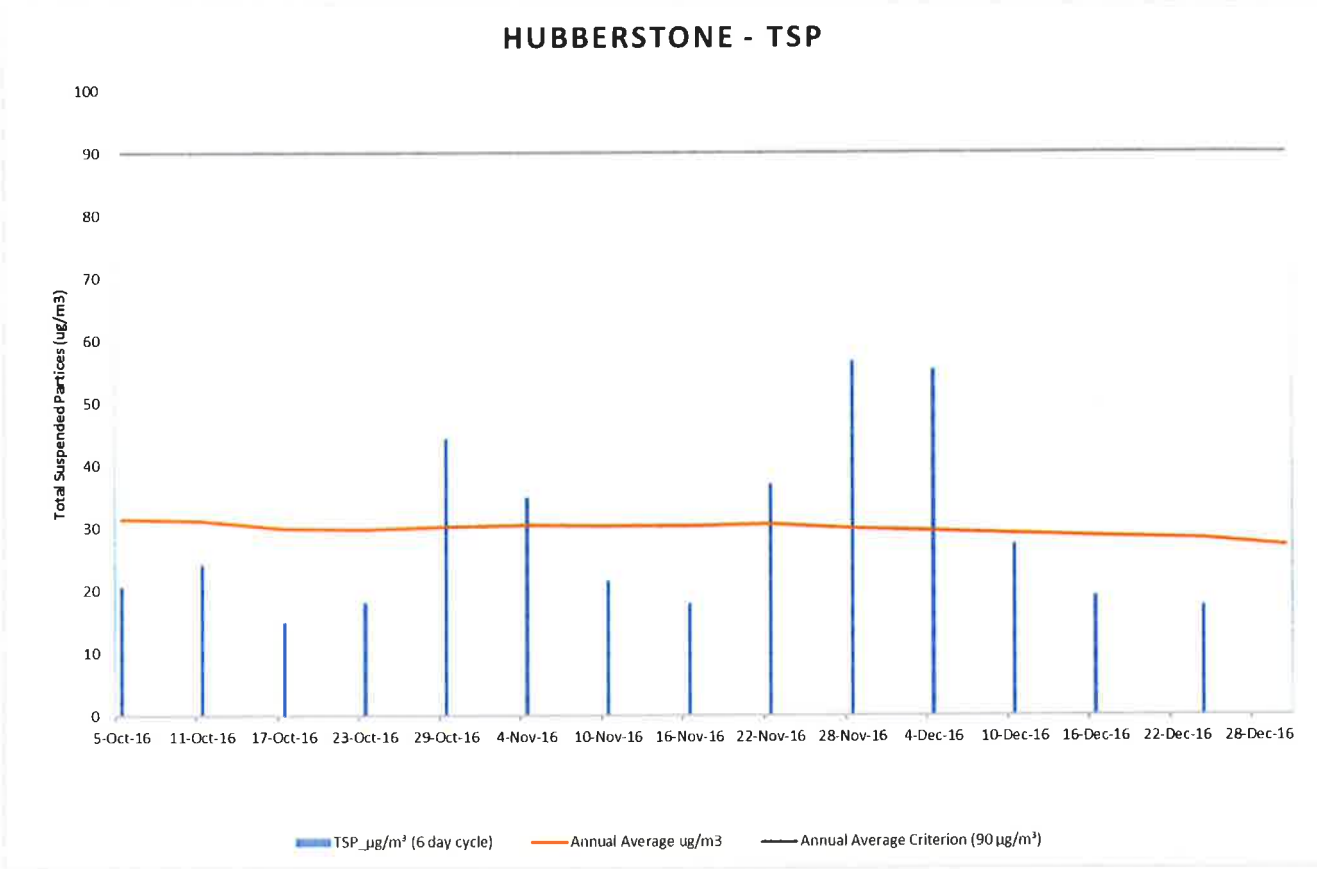


Figure 14 TSP results for Hubberstone for Q4 2016

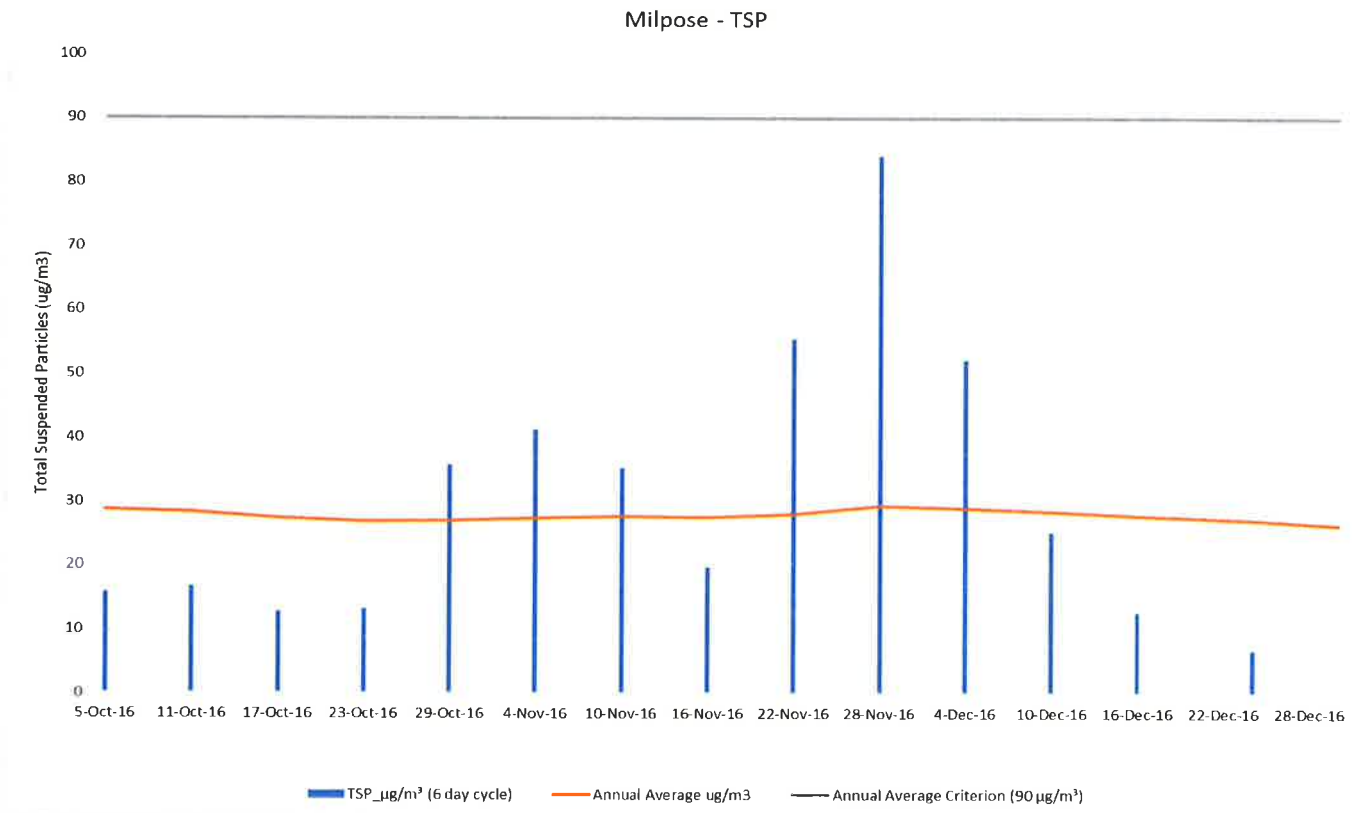


Figure 15 TSP results for Milpose residence for Q4 2016

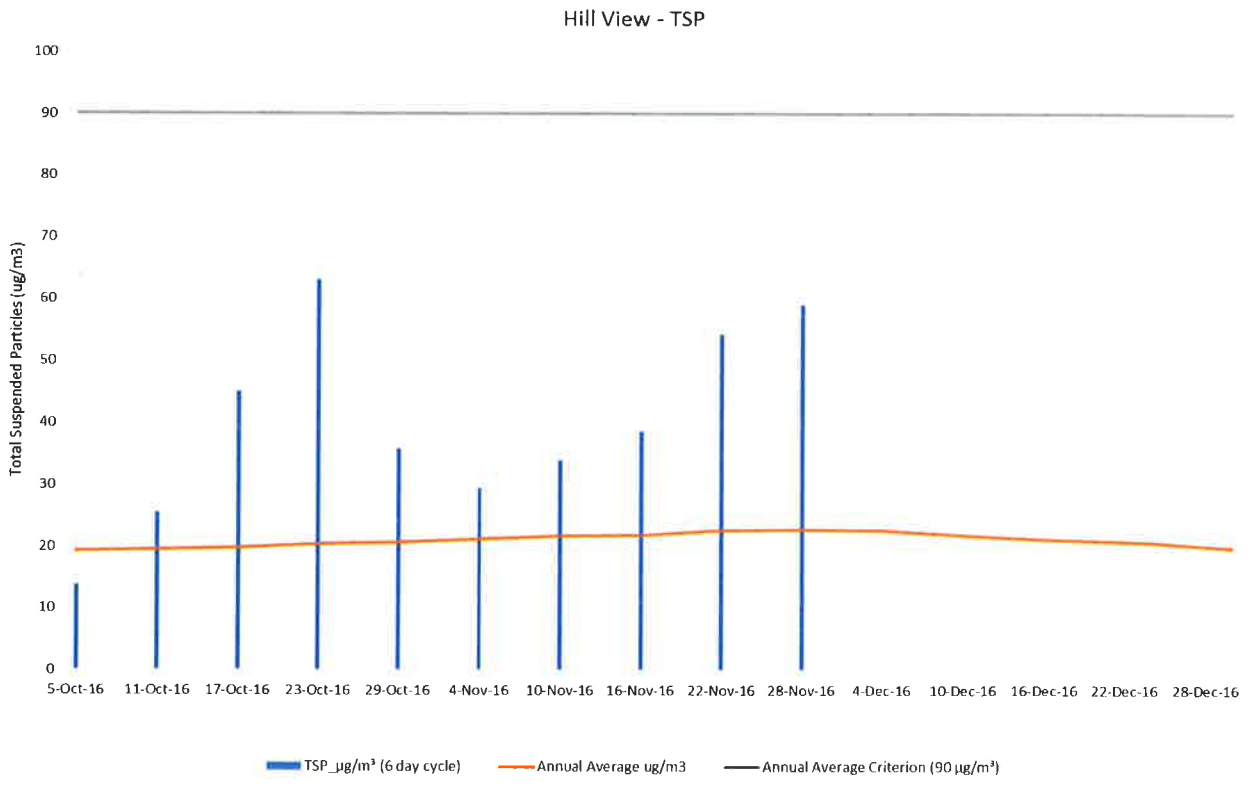


Figure 16 TSP results for Hill-View residence for Q4 2016

2. DEPOSITIONAL DUST

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

Eleven depositional dust gauges are located across the mining lease and neighbouring residential properties to monitor atmospheric dust in a monthly period. For a summary of the monthly monitoring results for Q4 2016 at each monitoring location, refer to Figure 17 - Figure 19.

2.1 Quarterly monitoring analysis

There were two exceedances for the quarter; TDW for both November and December, exceeded the trigger levels in Q4 2016 monitoring period and investigations concluded it is due to localised farming activities in the area.

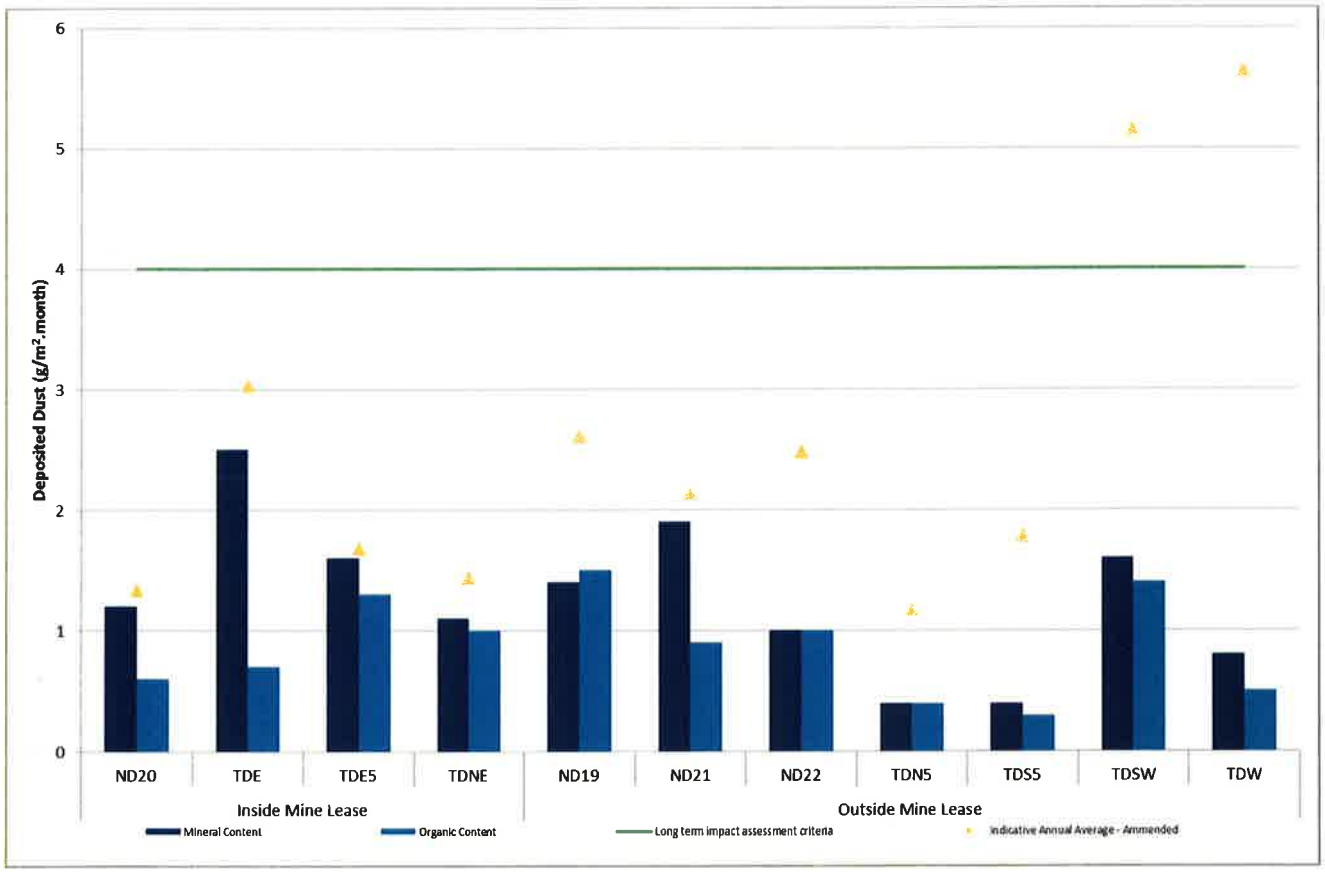


Figure 17 Depositional dust monitoring results for October 2016

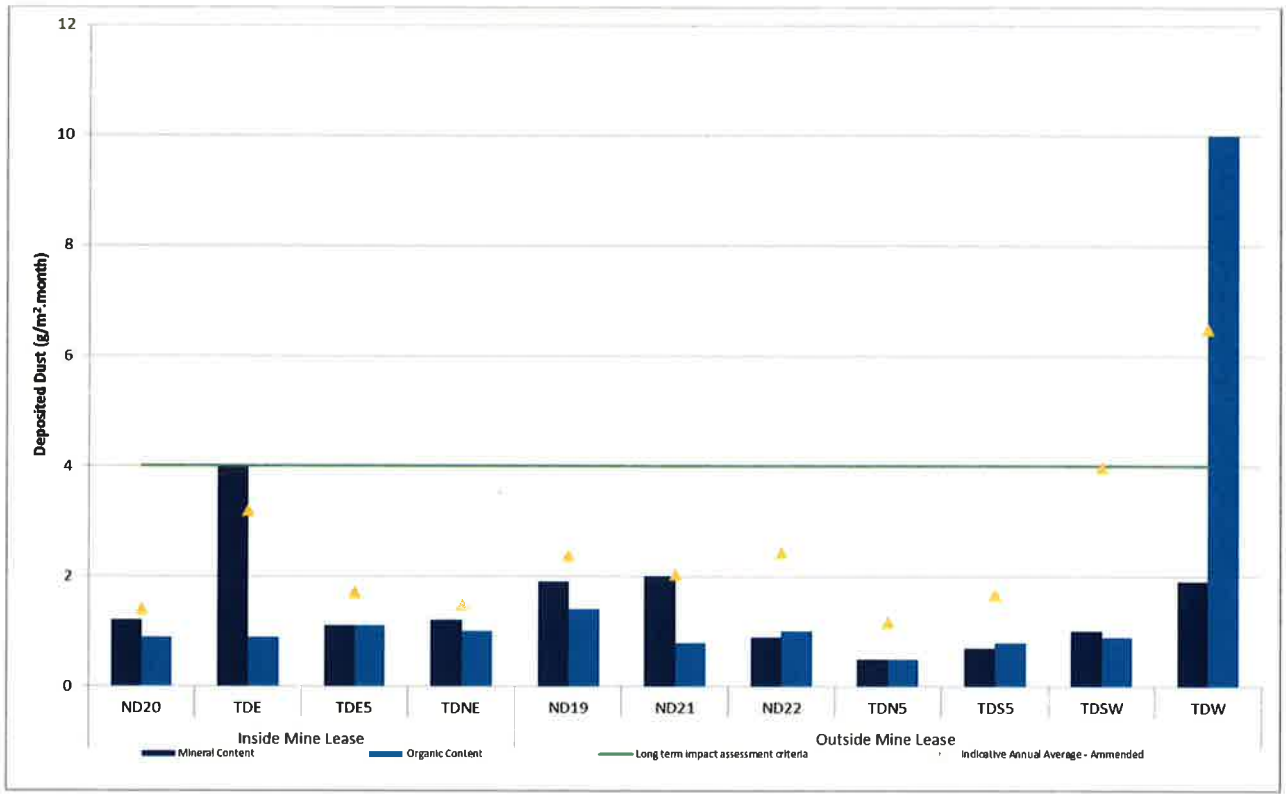


Figure 18 Depositional dust monitoring results for November 2016

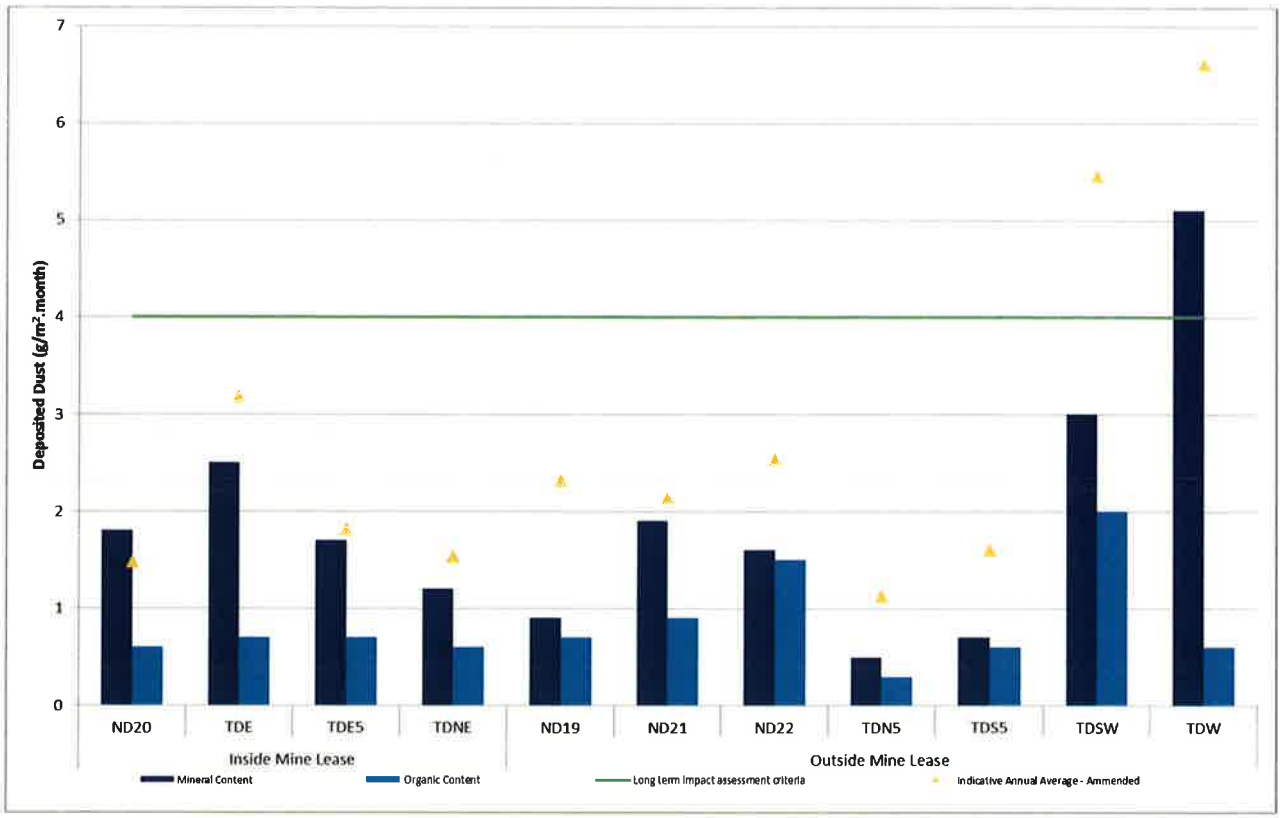


Figure 19 Depositional dust monitoring for December 2016

Water

Surface water and groundwater resources are monitored for quality and quantity. All water samples are analysed at an independent National Association of Testing Authorities (NATA) accredited laboratory.

1. SURFACE WATER

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. Refer to figure 20 for the Surface water monitoring locations.

Water recycled from ore processing activities, in addition to surface water captured on the mine lease, forms the process water system. This is a closed system, which is monitored for internal purposes and not summarised in this report.

1.1 Overview

Water monitoring occurs routinely on a quarterly basis or after significant rainfall events that result in natural water flow through monitoring site(s). Northparkes is a zero process water discharge operation and impact to nearby water courses is not expected.

Monitoring results are assessed and interpreted utilising historical trend analysis and internal water quality criteria and trigger levels to identify potential changes.

Northparkes Surface Water Monitoring Locations

Figure 20 Northparkes Surface Water Monitoring Locations

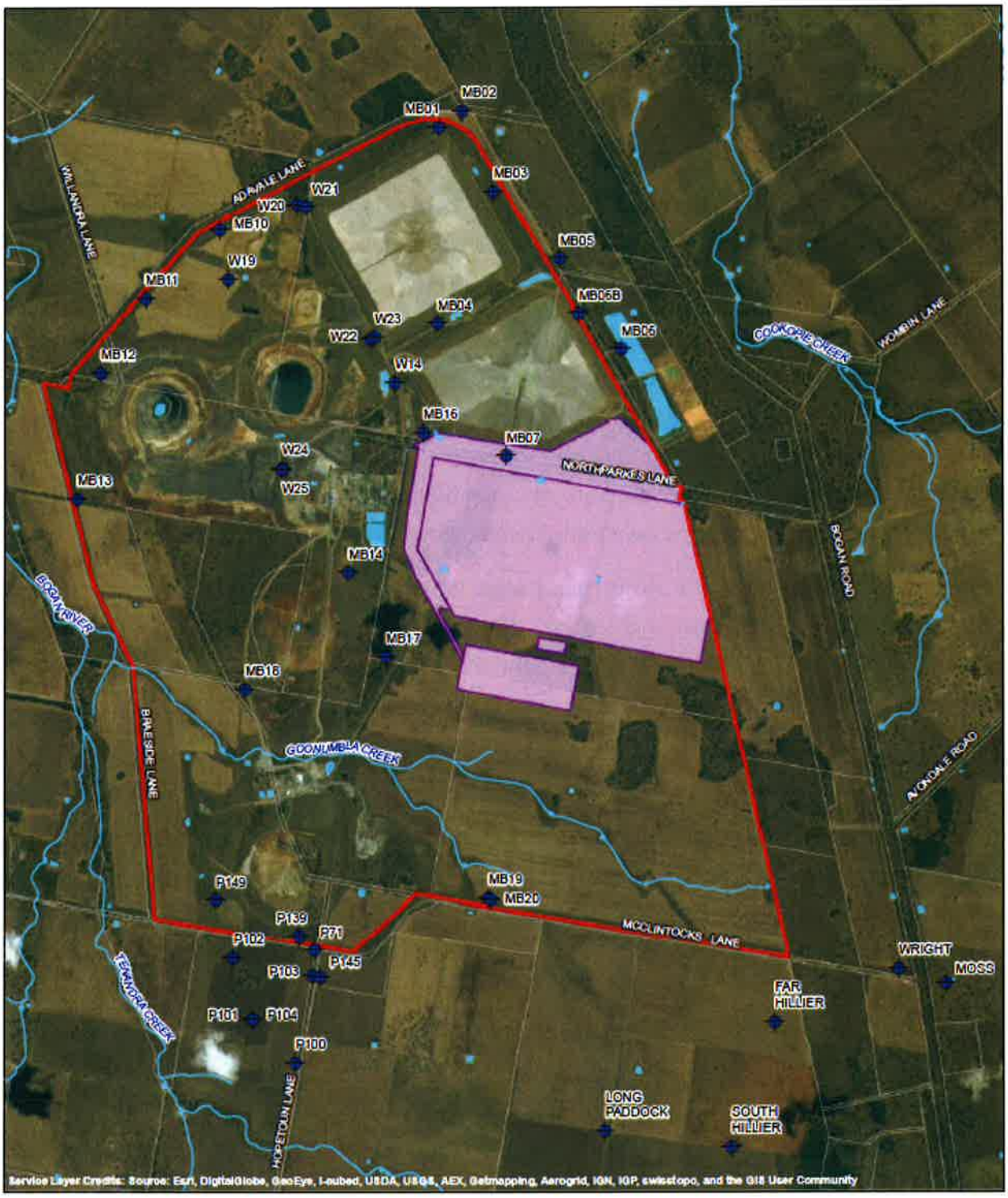


Figure 21 Northparkes Groundwater Monitoring Locations

1.2 Quarterly monitoring analysis

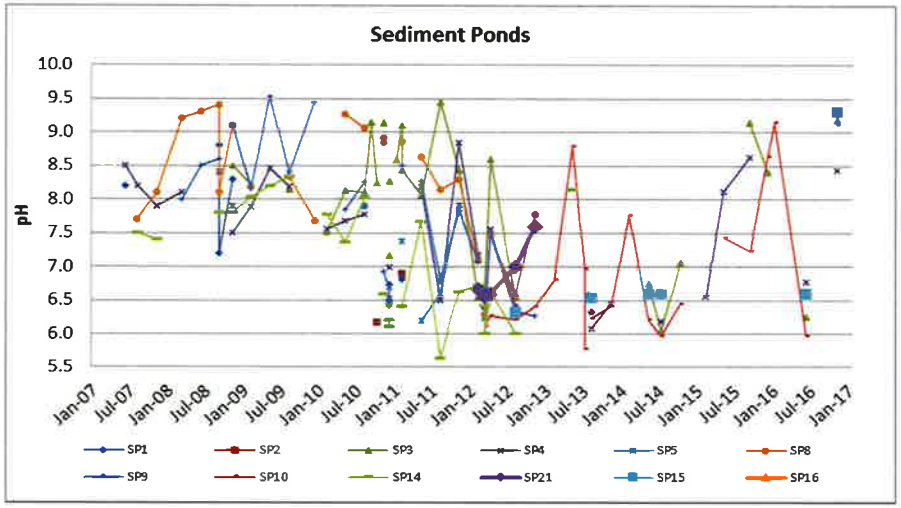
Water quality of onsite sediment ponds are presented in Figure 22. There was an increase in pH and EC but the copper concentrations reduced from last monitoring period.

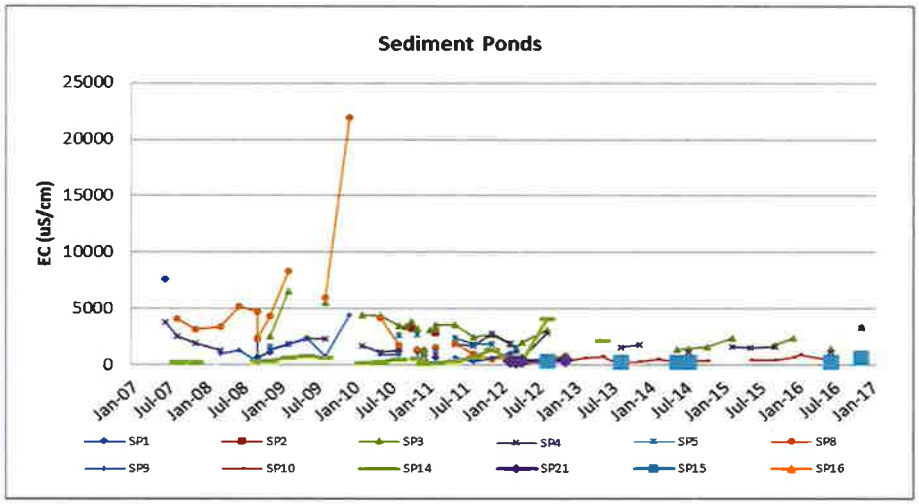
Copper levels were at or below the long term averages for all retention and process water monitoring locations. There were fluctuations observed at monitoring locations RP23, RP5, RP25 and RP26. The concentrations of copper increased from previous year; but were in-line with long term averages.

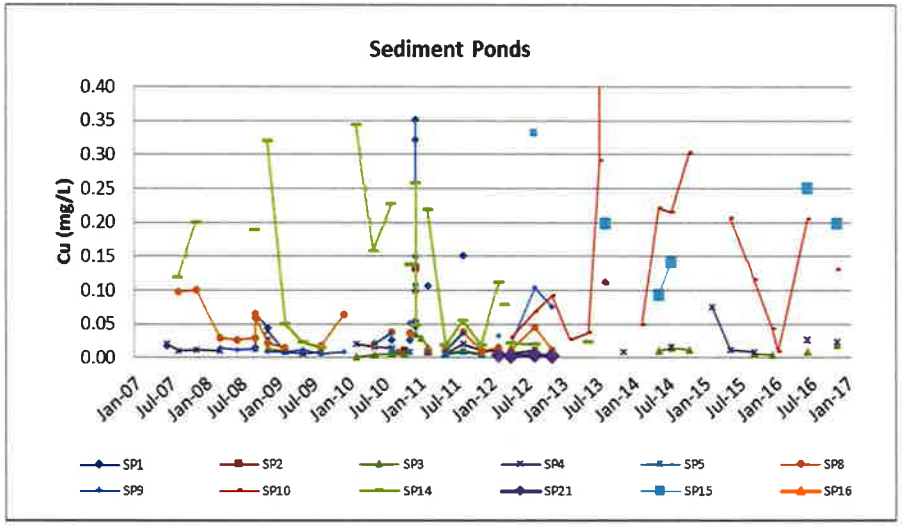
The copper concentrations for farm dams remained unchanged and in-line with the long term averages. The pH concentrations at FD5, FD7 and FD27 recorded higher than average results compared with the long term averages. These farm dams are located outside the mining lease in neighbouring farms. The higher 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. The 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 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. There were no large rainfall event which resulted in watercourse sampling. The previous monitoring results were in line with historical data and representative of freshwater quality characteristics.







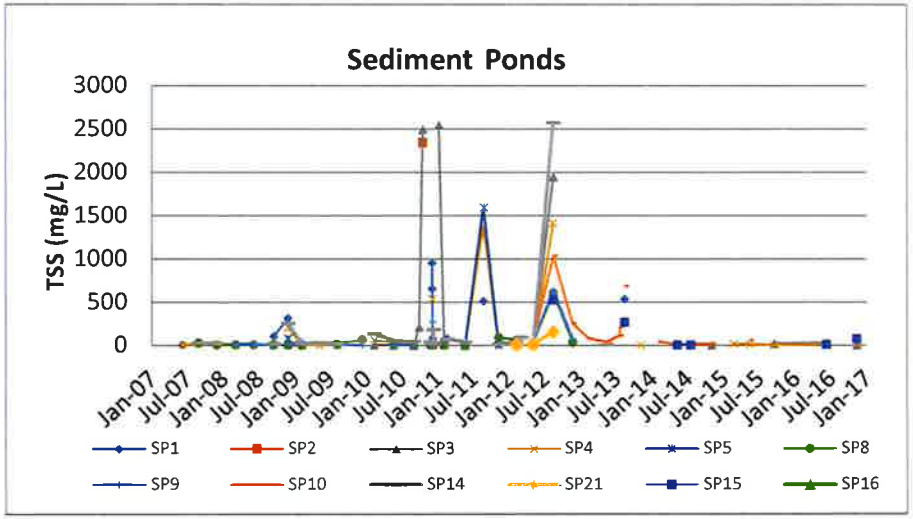
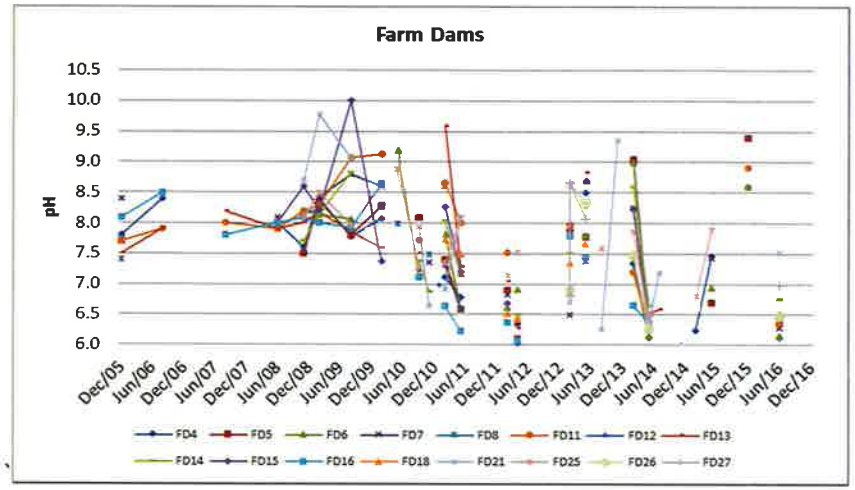
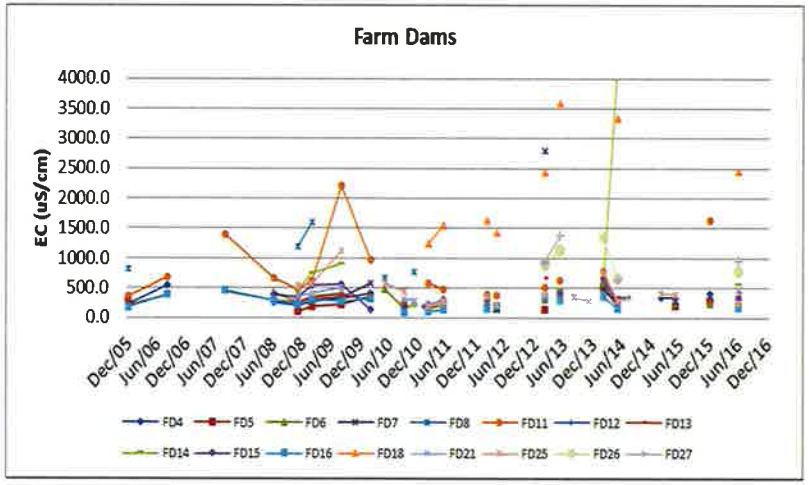
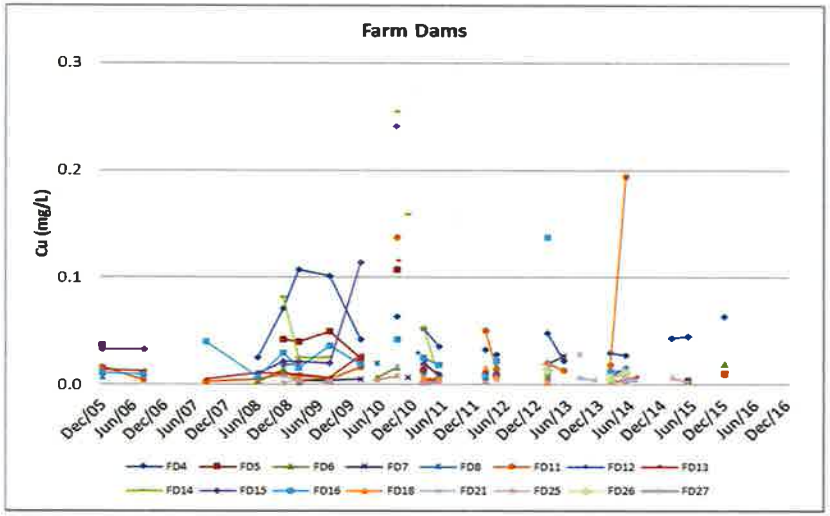


Figure 22 Surface water quality results – Sediment Dams







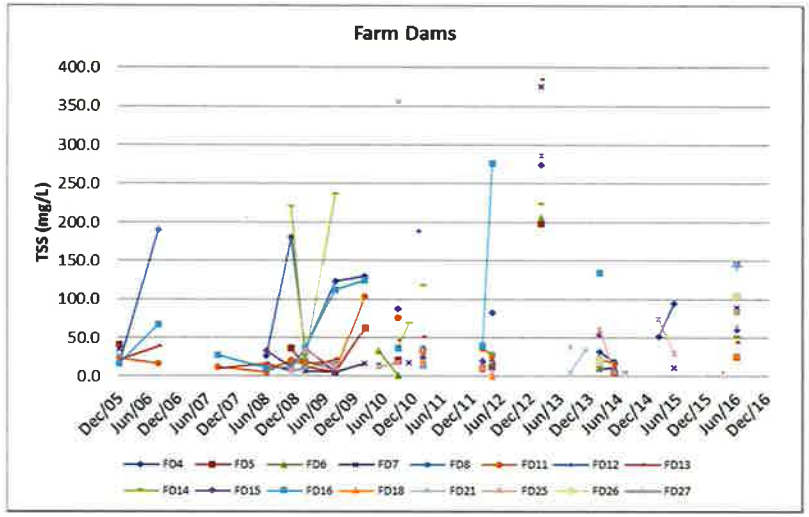
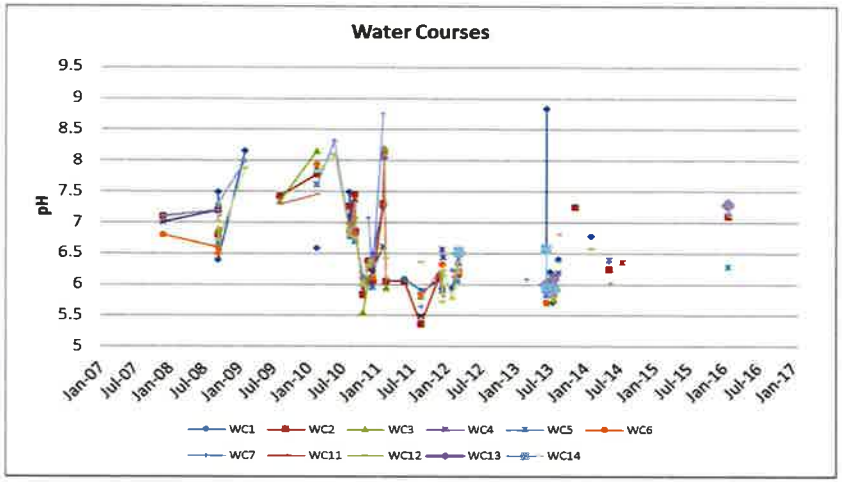
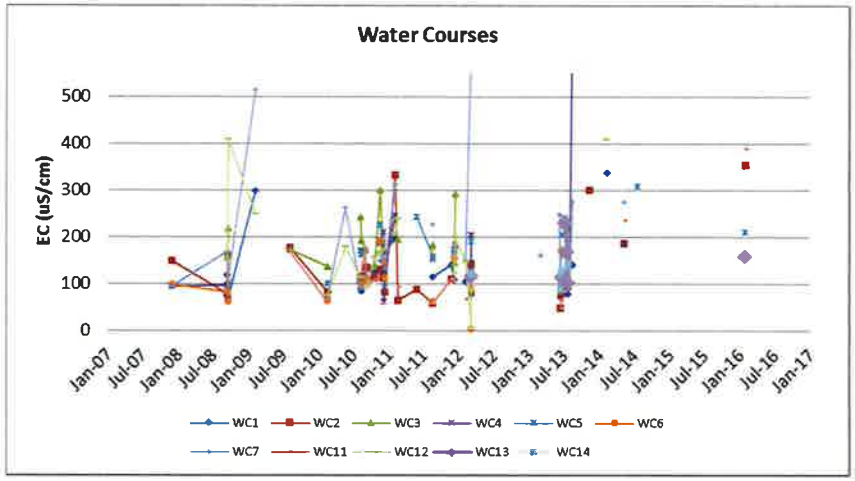
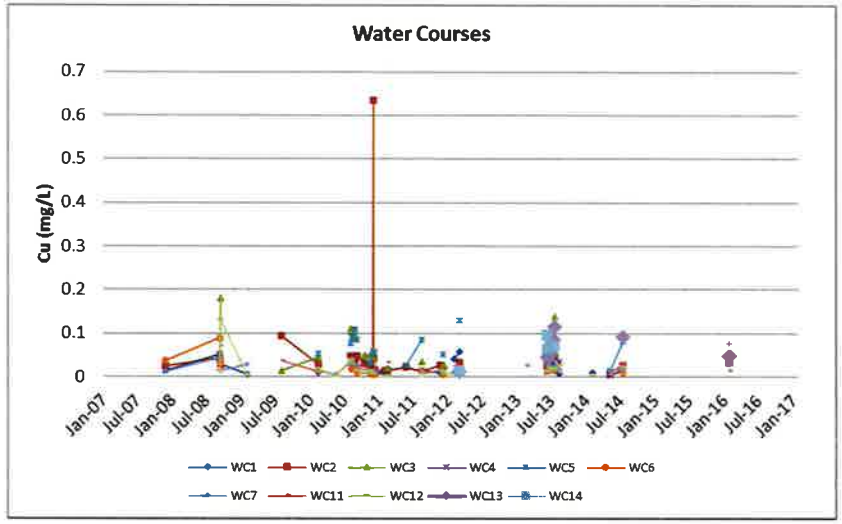


Figure 23 Surface water quality results – Farms Dams







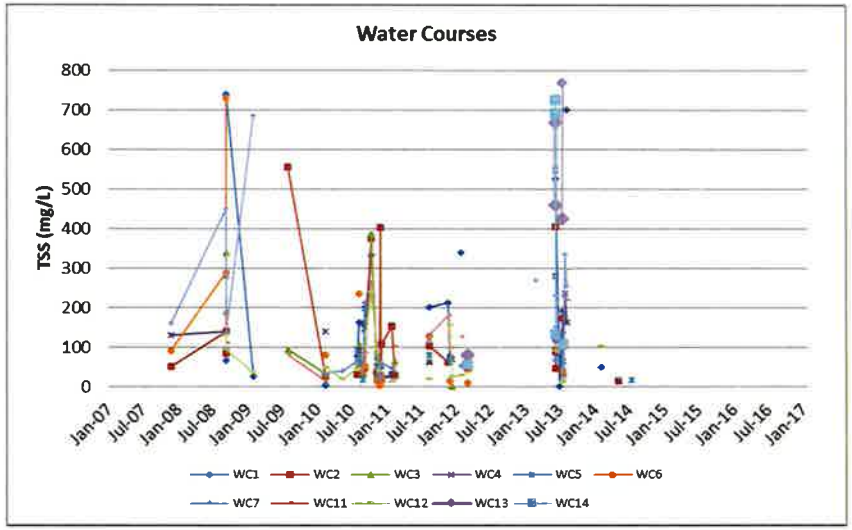


Figure 24 Surface water quality – Water Course

2. GROUNDWATER

2.1 Overview

The groundwater monitoring program involves the monitoring of water levels and water quality at various locations upstream and downstream of the site, to determine any potential impacts as a result of Northparkes activities. Refer to figure 21 for the Groundwater monitoring locations. All groundwater quality results are assessed against historical baseline and set water quality criteria and trigger levels.

2.2 Quarterly monitoring analysis

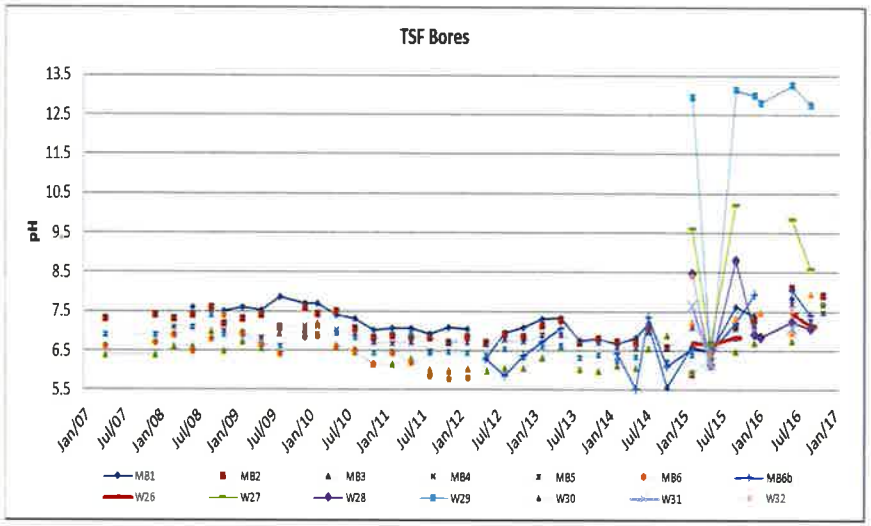
The ground water levels for all the monitoring bores (TSF, opencut, underground and regional bores) are steady and in-line with long term average. There were no major variances in the standing water levels over the reporting period.

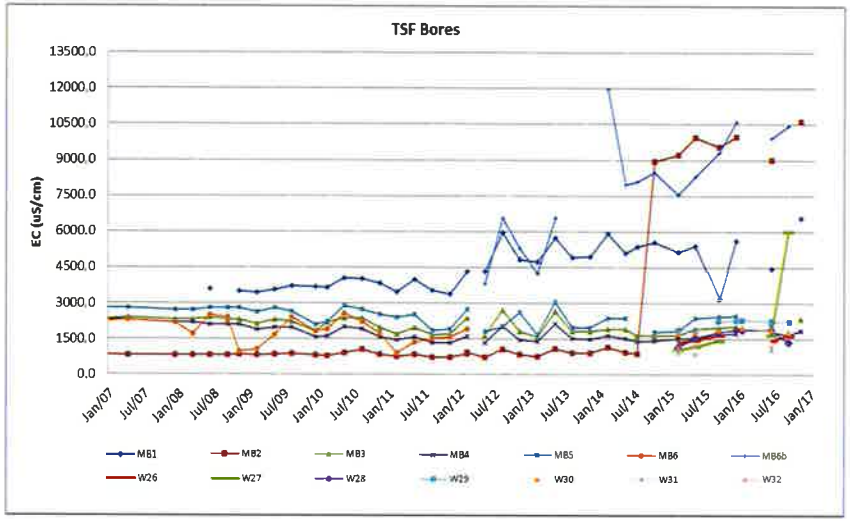
In general, pH, copper and electrical conductivity at the TSF Bores have remained in line with historical average for this reporting period. However, there was a slight increase in electrical conductivity (EC) and copper concentrations at W27 monitoring bore. These location will be closely monitored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

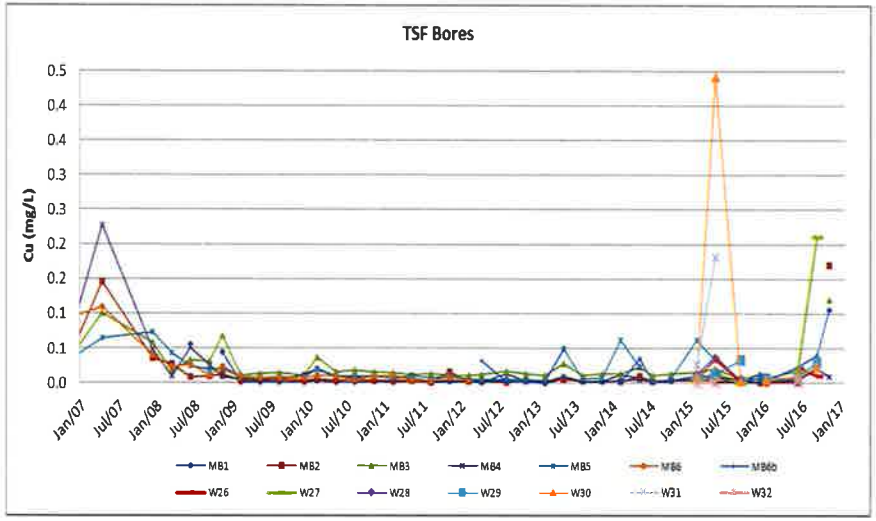
The pH concentrations at all opencut bores increased compared to last reporting period, but inline with long tern averages with the exception of W21 which decreased from 11.38 to 9.7. W27 location will be closely monitored in all quarters for 2017 monitoring period, and if there are any large variations 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.







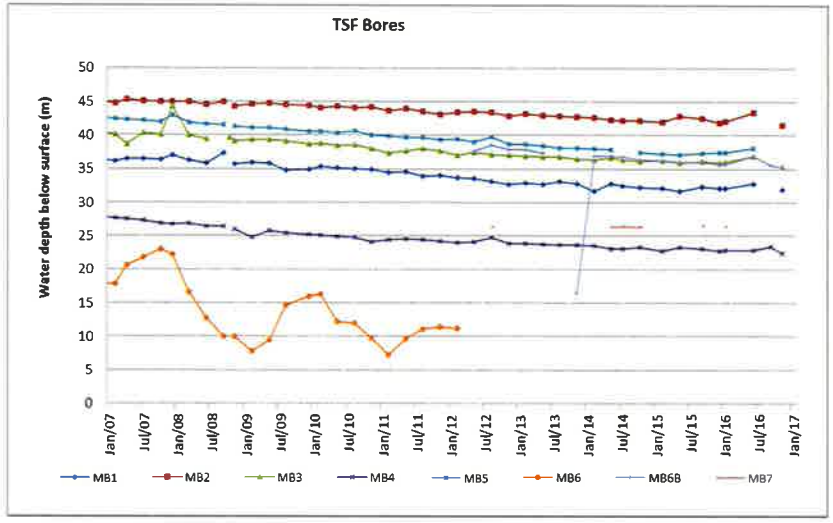
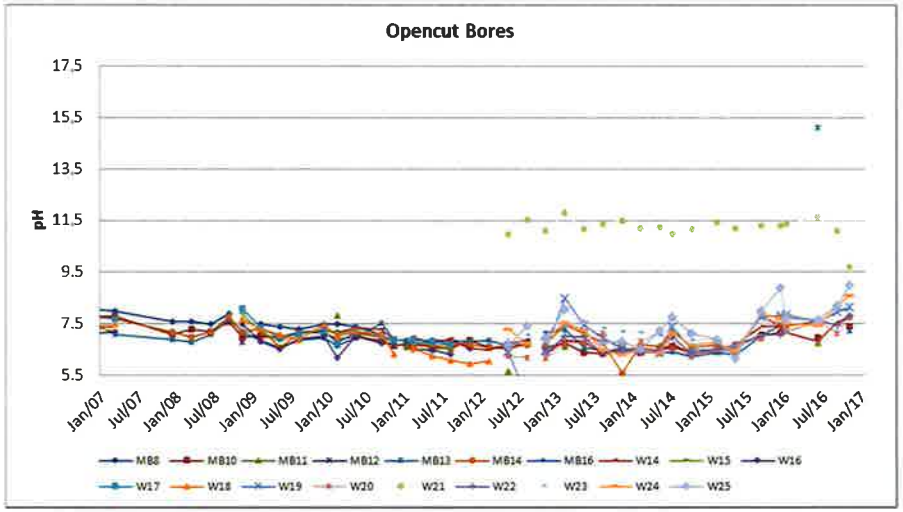
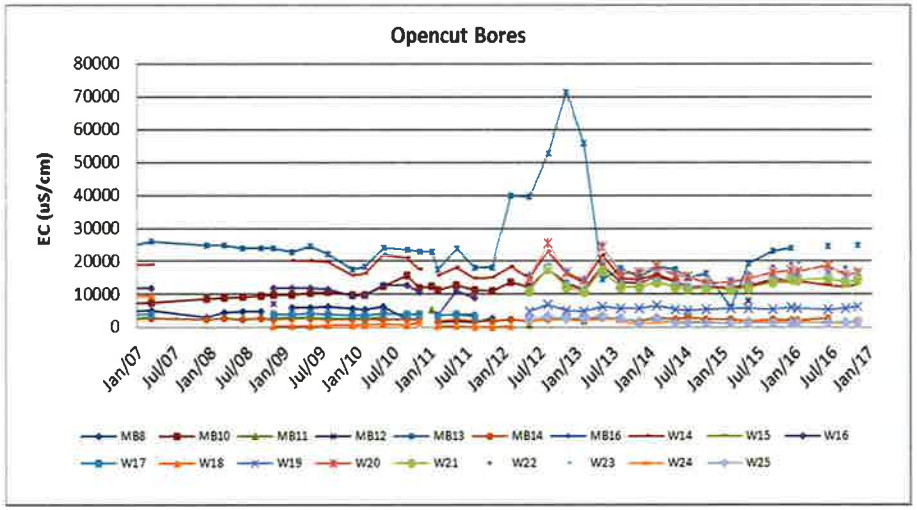
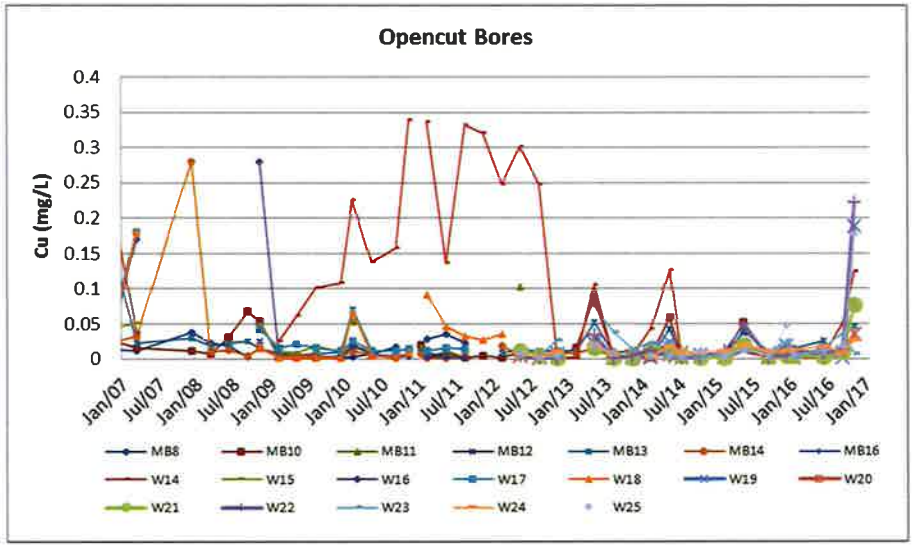


Figure 25 Groundwater quality and water levels – Tailings dam bores







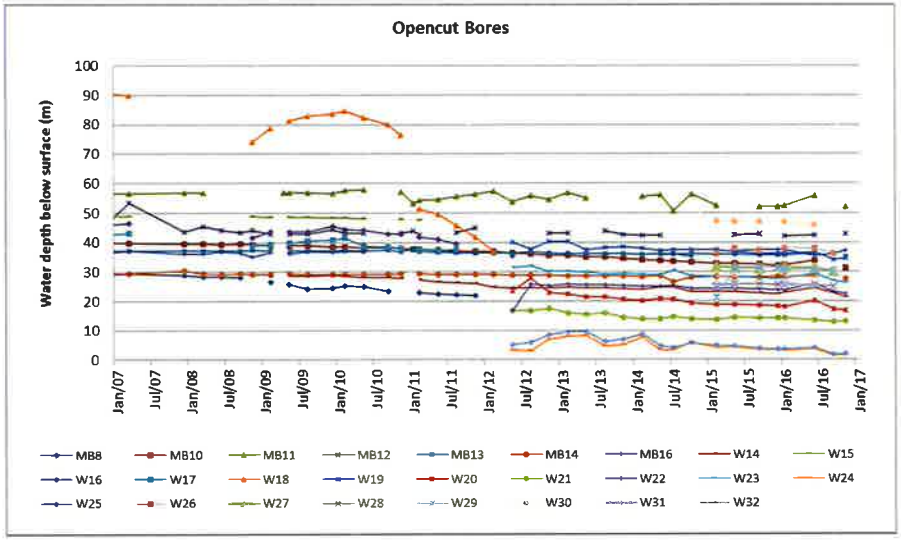
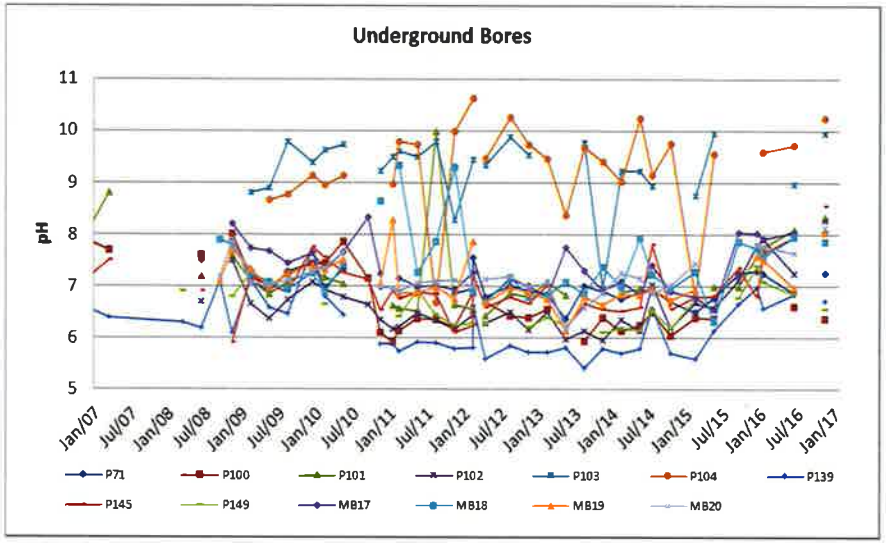
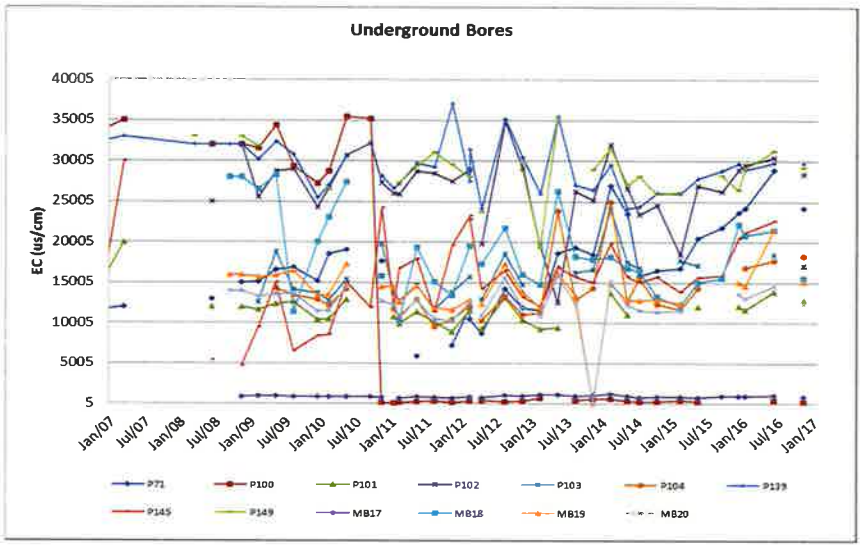
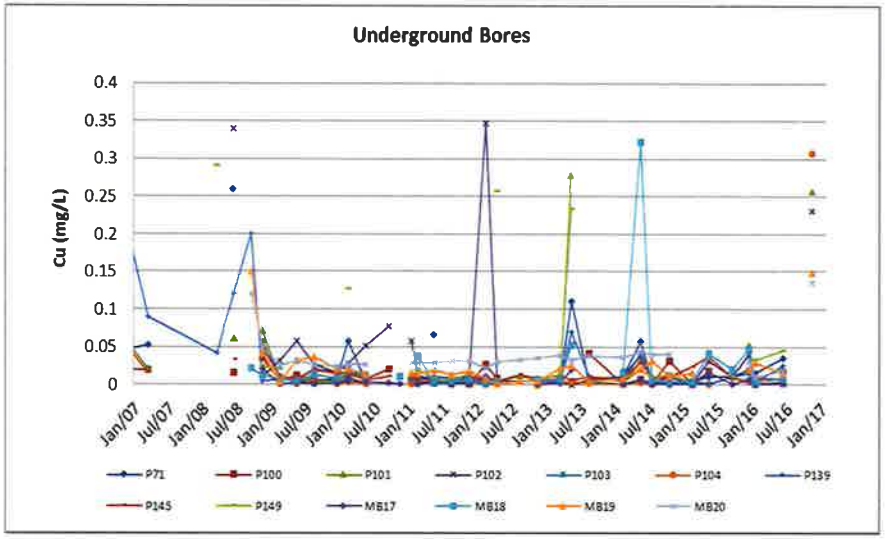


Figure 26 Groundwater quality and water levels – Opencut bores







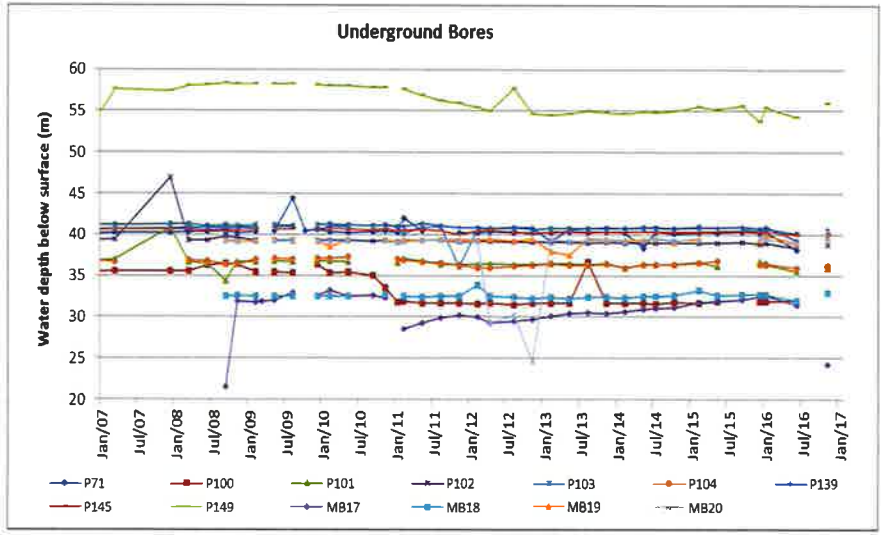
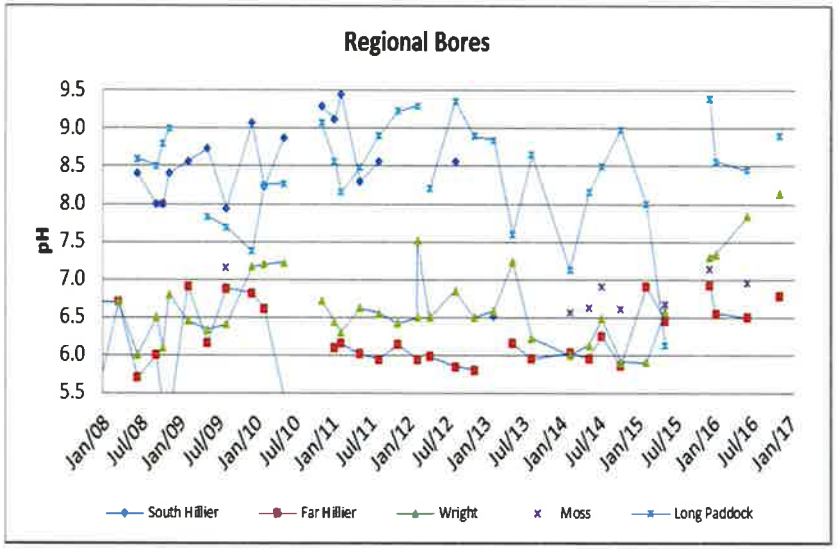
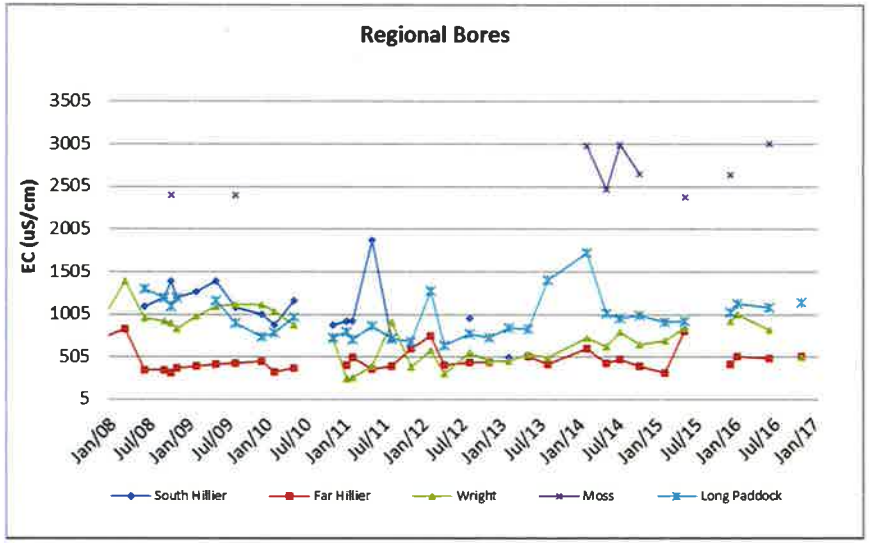
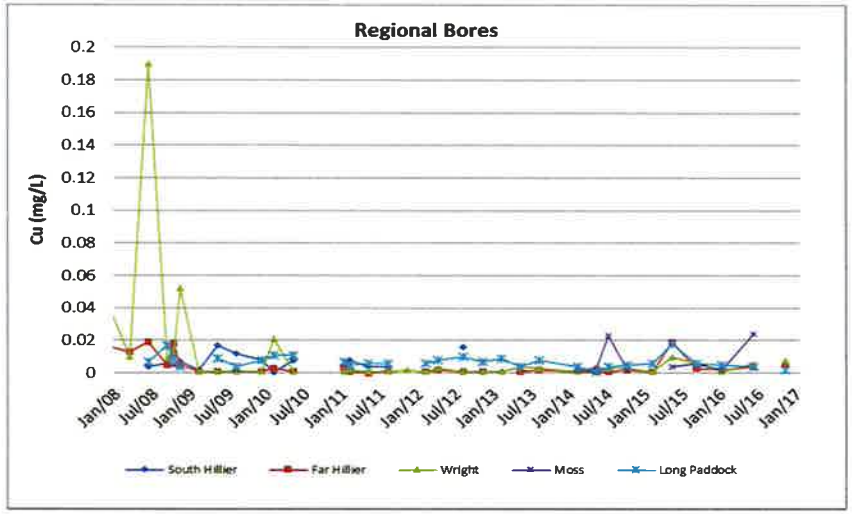


Figure 27 Groundwater quality and water levels – Underground bores







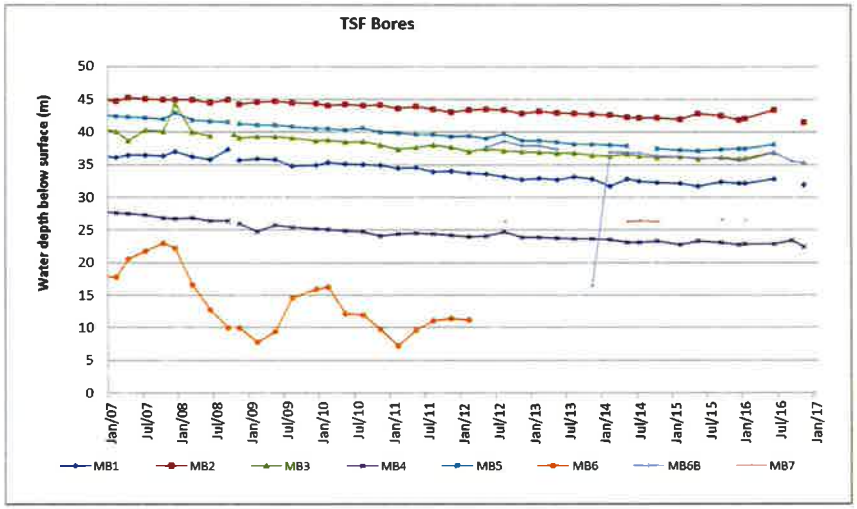


Figure 28 Groundwater quality and water levels – Regional bores

Noise and vibration

Noise and vibration monitoring is included in the NPM environmental monitoring program to assess potential impact of its operations on nearby communities and neighbours.

1. BLAST AND VIBRATION

Surface blasting activities are not undertaken currently on the Northparkes site. As such no blast and vibration monitoring has been undertaken. Noise - Operator attended noise monitoring

1.1 Overview

Operator-attended noise measurements and recordings shall be conducted in order to quantify the intrusive noise emissions from construction and of general mine activity as well as the overall level of ambient noise.

Operator attended noise monitoring records a L_{A1} and L_{Aeq} measurement at each of the designated monitoring locations. L_{A1} is the noise level which is exceeded for 1 per cent of the monitoring time. L_{Aeq} is the average noise energy experience during the monitoring period. This noise monitoring was undertaken by an independent and suitably qualified noise professional.

Results include all noise sources; it should be noted that Northparkes generated noise cannot be differentiated from other noise within the area (e.g. air craft, wildlife, and vegetation noise) and therefore, Northparkes may not necessarily be responsible for all measured noise levels.

Noise monitoring undertaken must comply with minimum weather condition requirements outlined in the Project Approval 11_0060. Noise levels recorded when the wind speed is above 3 metres per second must be discounted as the source of noise is unable to be determined.

1.2 Quarterly monitoring analysis

1.2.1 Attended noise monitoring

Conditions were less than ideal during the attended monitoring period. High winds impacted both the day and evening monitoring periods. Attended noise monitoring during conforming wind conditions complied with the $L_{Aeq(15\ min)}$ 35 dB limit at each of the measurement locations.

Attended monitoring was impacted by insect, bird and frog noise. Specifically, adjustments were required for one Hillview day measurement, Milpose, Lone Pine and Hubberstone, evening measurements and also all Lone Pine night measurements. Excluding the Hillview day measurement, which was affected by bird noise, these measurements were impacted by significant insect noise resulting in elevated noise levels in the 4kHz band i.e. from 40 dB to 50dB at 4kHz. Measurements indicate compliance with the 15 minute LAeq limitation of 35 dB at all locations. This is despite noise from the mine being audible at each location at various times.

Measurements indicate compliance with the night limit of LA1 45 dB at all locations.

It is understood that the mine was operating as normal during the monitoring period. High levels of road traffic required frequent pausing of the SLM at Hillview during day and evening monitoring.

Where possible, extraneous noise sources have been excluded from attended measurements by pausing the sound level meter when non-NPM sources predominate (e.g. passing traffic or aircraft) and/or subtracting the component of the frequency spectrum that is caused by non-NPM sources (e.g. wildlife noise, livestock noise or foliage noise). Extraneous noise sources may contribute as much as 15 to 20 dB to the overall measured noise levels.

1.2.2 Unattended noise monitoring

In accordance with Project Approval 11_0600, Appendix 5, Clause 3, "attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent". Specifically, unattended monitoring is therefore not to be used to evaluate compliance with the Project Approval criteria. Nonetheless, ESP notes that average night-time results from unattended monitoring indicated compliance with the LA1 45 dB limit at all locations except Lone Pine.

Unattended noise measurements will invariably include noise levels that cannot be directly attributed to NPM. Road traffic, farm machinery, livestock, wildlife and air traffic are some of the noise sources that contribute to noise levels logged during unattended noise monitoring. Extraneous noise sources are expected to have a higher contribution during the day and evening period. It is also noted that there is an observable correlation between wind speed and recorded noise level evident in the graphs.

Noise levels were continuously monitored over a period of seven days from the 9th December to 16th December 2016. These summarised levels include extraneous noise which cannot be excluded from the continuous monitoring conducted; the results do not include measurements where the wind speed, measured at each location, exceeded three meters per second. (Note: Wind speed data is not collected at Lone Pine therefore data from Northparkes's weather station were used.)

Table 2 Summary of unattended noise monitoring (07/09/2016 – 14/09/2016)

Location	$L_{Aeq\ (15min)}$			$L_{A1\ (1min)}$
	Day	Evening	Night	Night
Hillview	51	41	35	37
Hubberstone	40	38	35	39
Lone Pine	44	47	43	48
Milpose	50	44	36	39

Table 3 Attended noise monitoring levels (Measured in decibels (dB)) – Day

Location	Date and Time	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A90} dB	Compliance?	Notes
Milpose	09/11/16 13:05	40	34	**31**	25	Yes	Bird noise. Wind up to 5 m/s for first two measurements. Wind constantly above 3 m/s for 3rd measurement. Mine audible.
	09/11/16 13:20	39	35	**33**	27	Yes	
	09/11/16 13:35	50	42	**40**	34	NA	
Lone Pine	09/11/16	39	36	**33**	32	Yes	Insect noise. Truck movements & truck idling near house. Mine inaudible.
	09/11/16	44	36	**35**	30	Yes	
	09/11/16	39	36	**35**	35	Yes	
Hubberstone	09/11/16 15:55	41	37	**35**	32	Yes	Some bird noise. Continuous insect noise. Winds up to 4 m/s. Mine inaudible.
	09/11/16 16:10	41	37	**35**	33	Yes	
	09/11/16 16:25	41	37	**35**	31	Yes	
Hillview	09/11/16 14:05	44	39	**35**	36	Yes (adj.)	Constant bird noise during first measurement. Some rain Winds up to 4 m/s. Mine clearly audible.
	09/11/16 14:20	37	35	**33**	30	Yes	
	09/11/16 14:35	42	37	**35**	31	Yes	

Table 4 Attended noise monitoring levels (measured in decibel (db)) - Evening

Location	Date and Time	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A90} dB	Compliance?	Notes
Milpose	10/11/16 20:00	54	53	**32**	51	Yes (adj.)	Incessant insect noise necessitating adjustment of all measurements Frog noise. Mine inaudible.
	10/11/16 20:15	53	52	**27**	50	Yes (adj.)	
	10/11/16 20:30	52	51	**27**	49	Yes (adj.)	
Lone Pine	10/11/16 21:05	47	46	**27**	44	Yes (adj.)	Incessant insect noise necessitating adjustment. Dogs barking. Truck idling at property opposite. Mine barely audible.
	10/11/16 21:20	49	45	**27**	43	Yes (adj.)	
	10/11/16 21:35	50	49	**27**	43	Yes (adj.)	
Hubberstone	09/11/16 18:00	42	38	**35**	28	Yes	Bird & insect noise becoming continuous for 2nd & 3rd measurements. Mine inaudible.
	09/11/16 18:15	44	40	**34**	32	Yes (adj.)	
	09/11/16 18:30	51	43	**34**	29	Yes (adj.)	
Hillview	09/11/16 18:50	43	33	**32**	28	Yes	Some bird & insect noise. Mine audible.
	09/11/16 19:05	39	35	**32**	27	Yes	
	09/11/1619:20	47	34	**33**	26	Yes	

Table 5 Attended noise monitoring levels (measured in decibel (db)) - Night

Location	Date and Time	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A90} dB	Compliance?	Notes
Milpose	11/11/16 00:50	**39**	30	**29**	26	Yes	
	11/11/16 01:05	**37**	35	**33**	27	Yes	Some bird noise. Mine audible.
	11/11/16 01:20	**31**	28	**27**	26	Yes	
Lone Pine	10/11/16 22:00	**44**	43	**27**	41	Yes (adj.)	Continuous insect noise necessitating adjustment. Truck idling on farm opposite. Mine audible.
	10/11/16 22:15	**44**	44	**27**	42	Yes (adj.)	
	10/11/16 22:30	**41**	40	**28**	38	Yes (adj.)	
Hubberstone	10/11/16 22:55	**35**	34	**31**	27	Yes	
	10/11/16 23:10	**34**	31	**29**	27	Yes	Alarm from mine audible. Mine audible.
	10/11/16 23:25	**33**	31	**30**	27	Yes	
Hillview	10/11/16 23:50	**30**	26	**25**	24	Yes	
	11/11/16 00:05	**38**	29	**27**	22	Yes	Frogs & some traffic noise. Insect noise. Mine clearly audible,
	11/11/16 00:20	**30**	24	**22**	20	Yes	

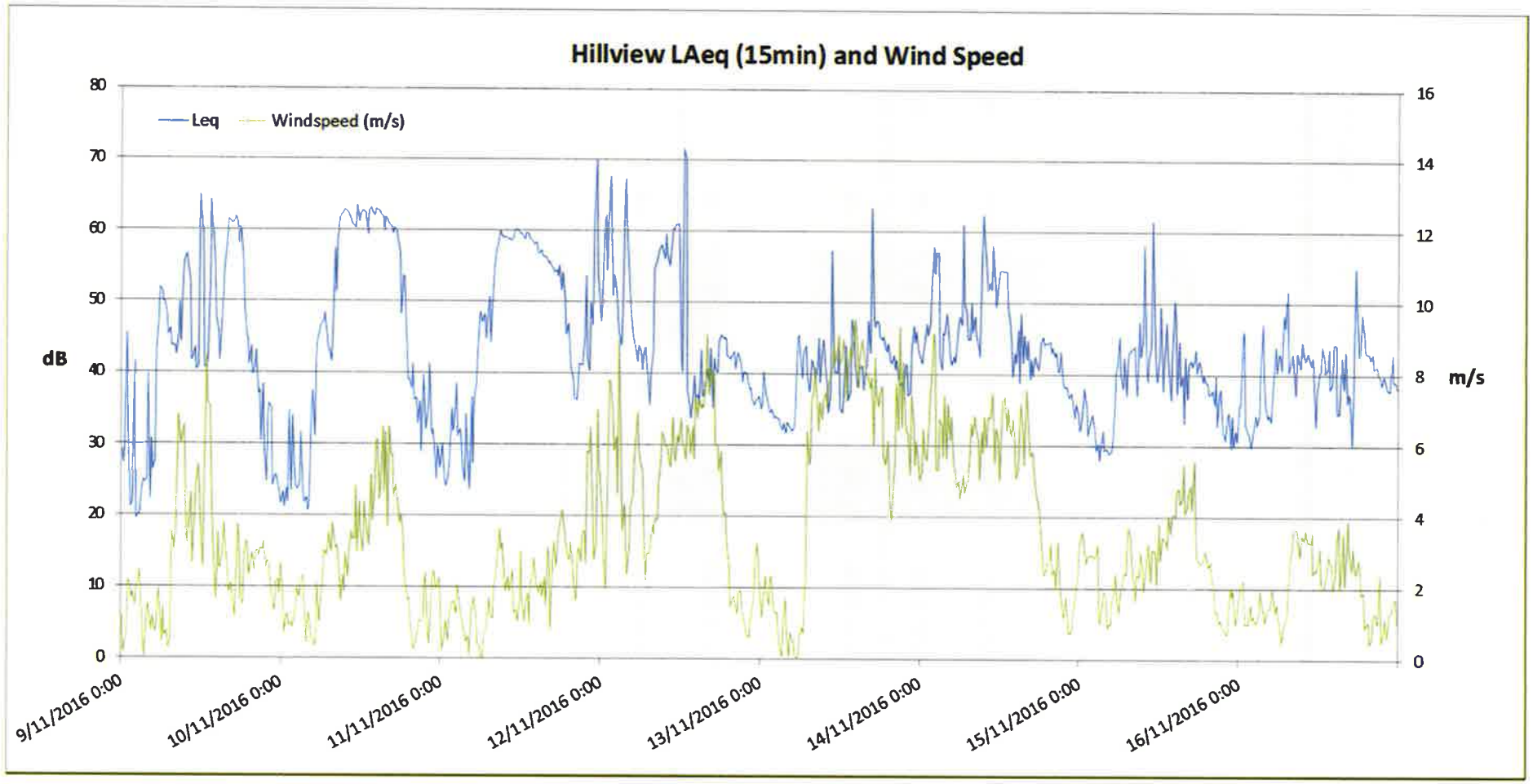


Figure 29 Hillview L_{Aeq} and Wind Speed

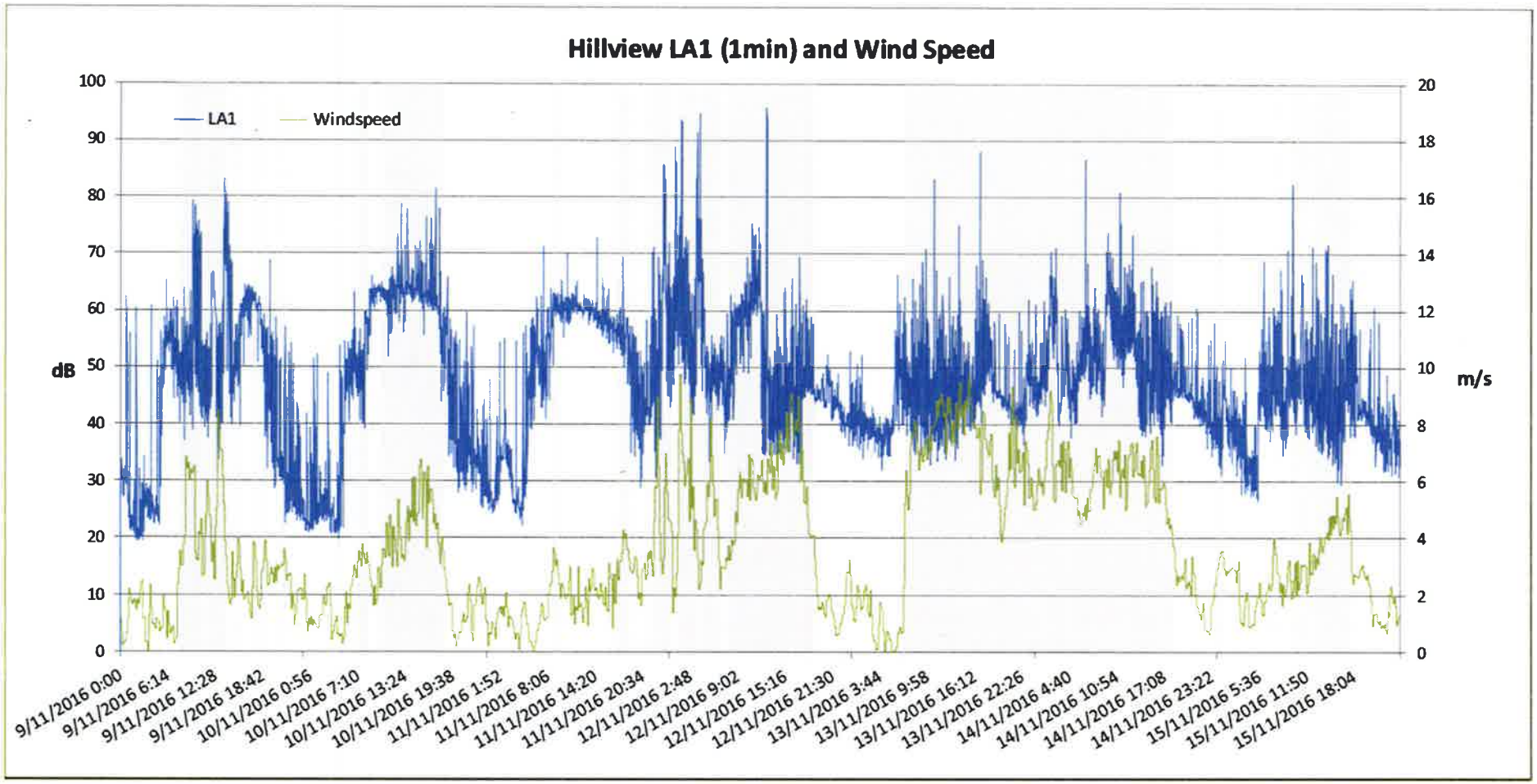


Figure 30 Hillview $L_{A1\ (1min)}$ and Wind Speed

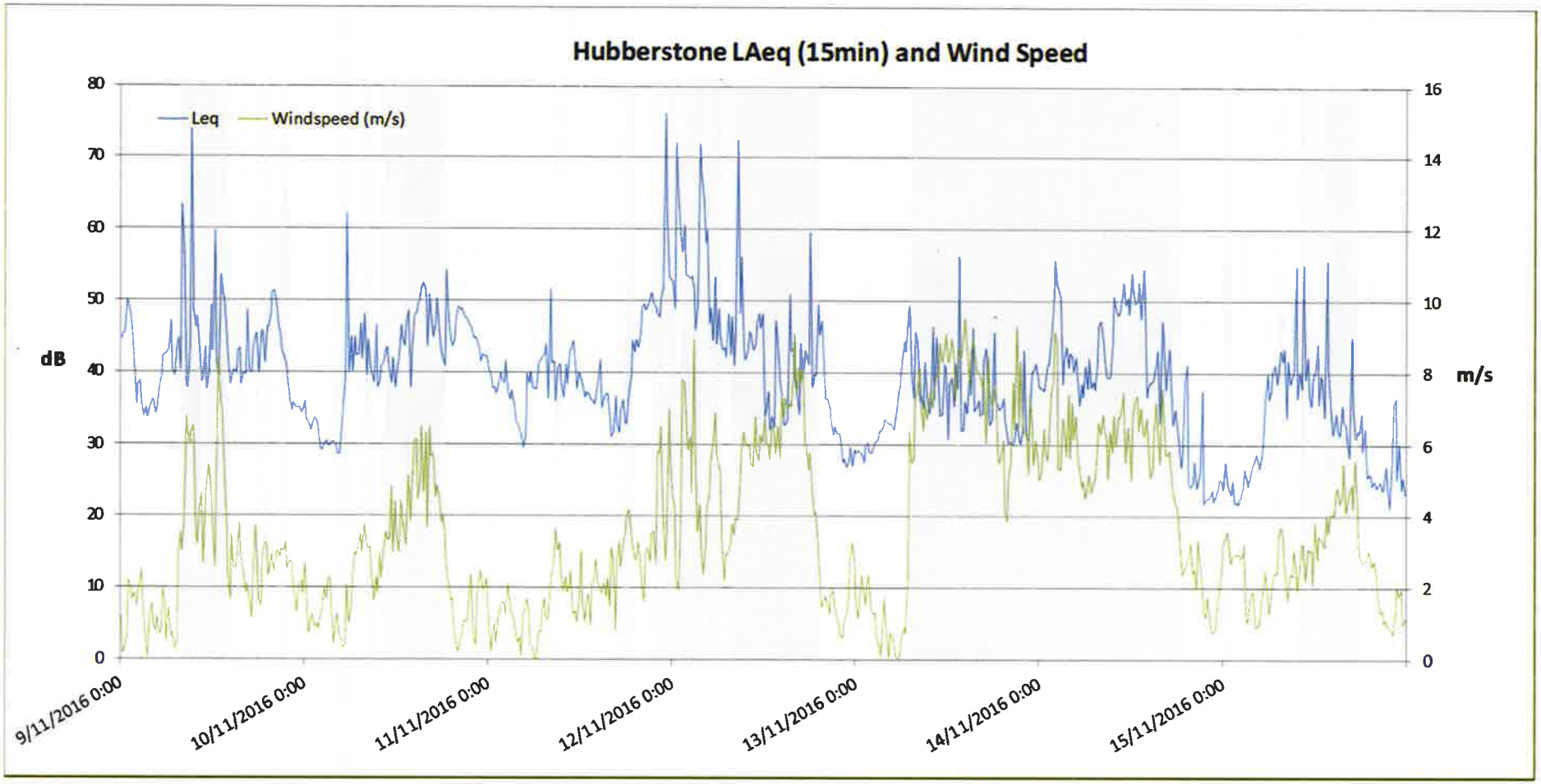


Figure 31 Hubberstone L_{Aeq} and Wind Speed

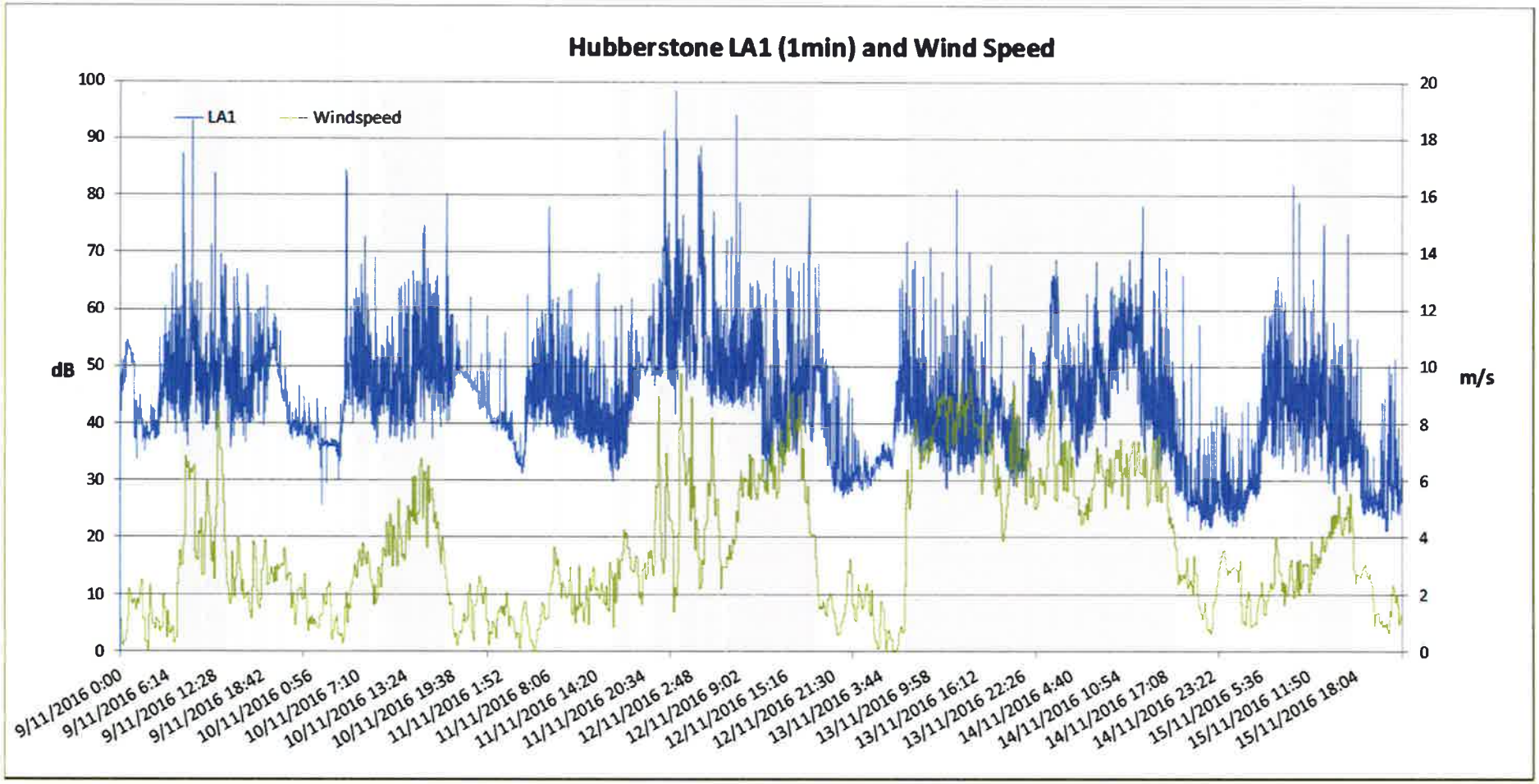


Figure 32 Hubberstone $L_{A1\ (1min)}$ and Wind Speed

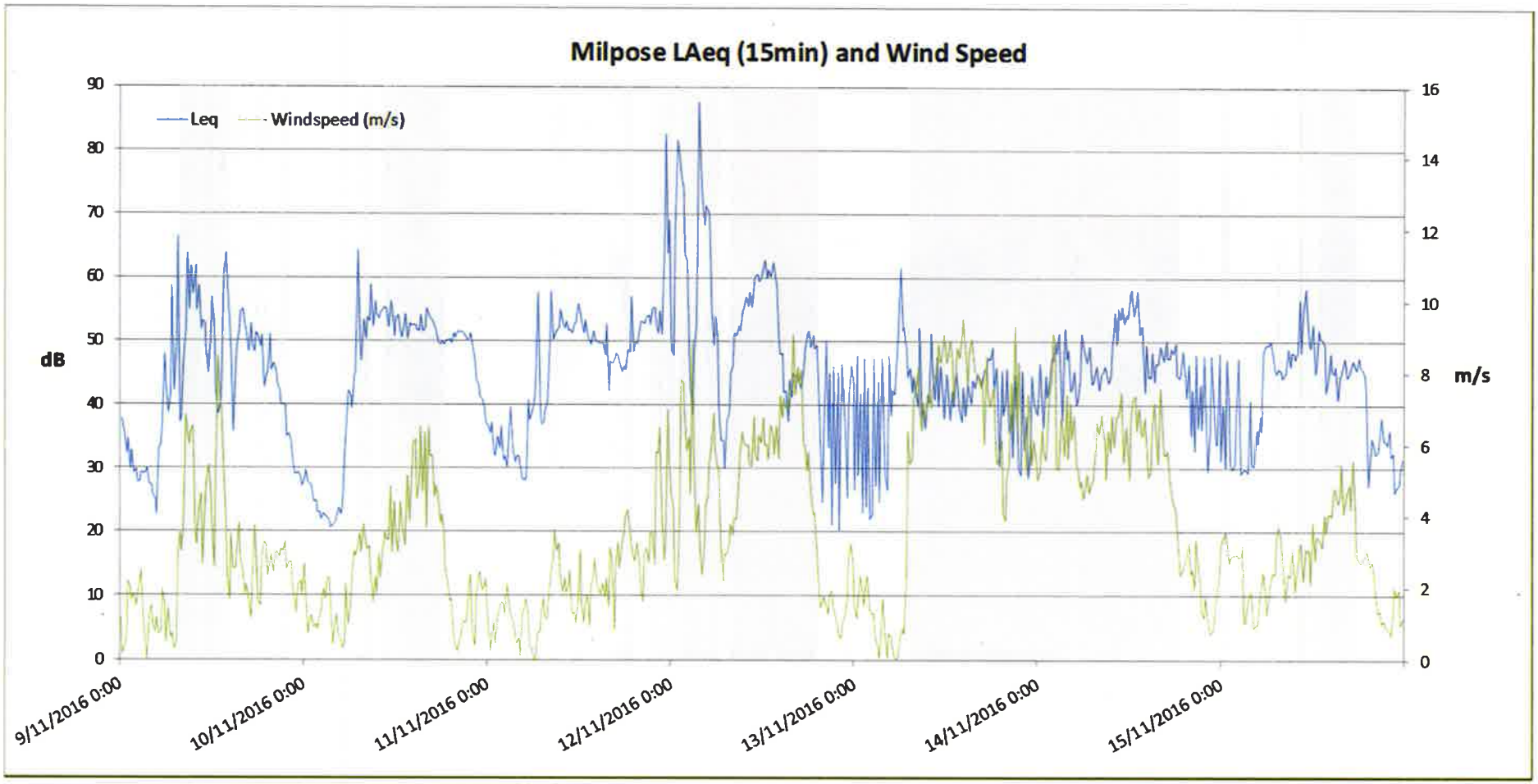


Figure 33 Milpose L_{Aeq} and Wind Speed

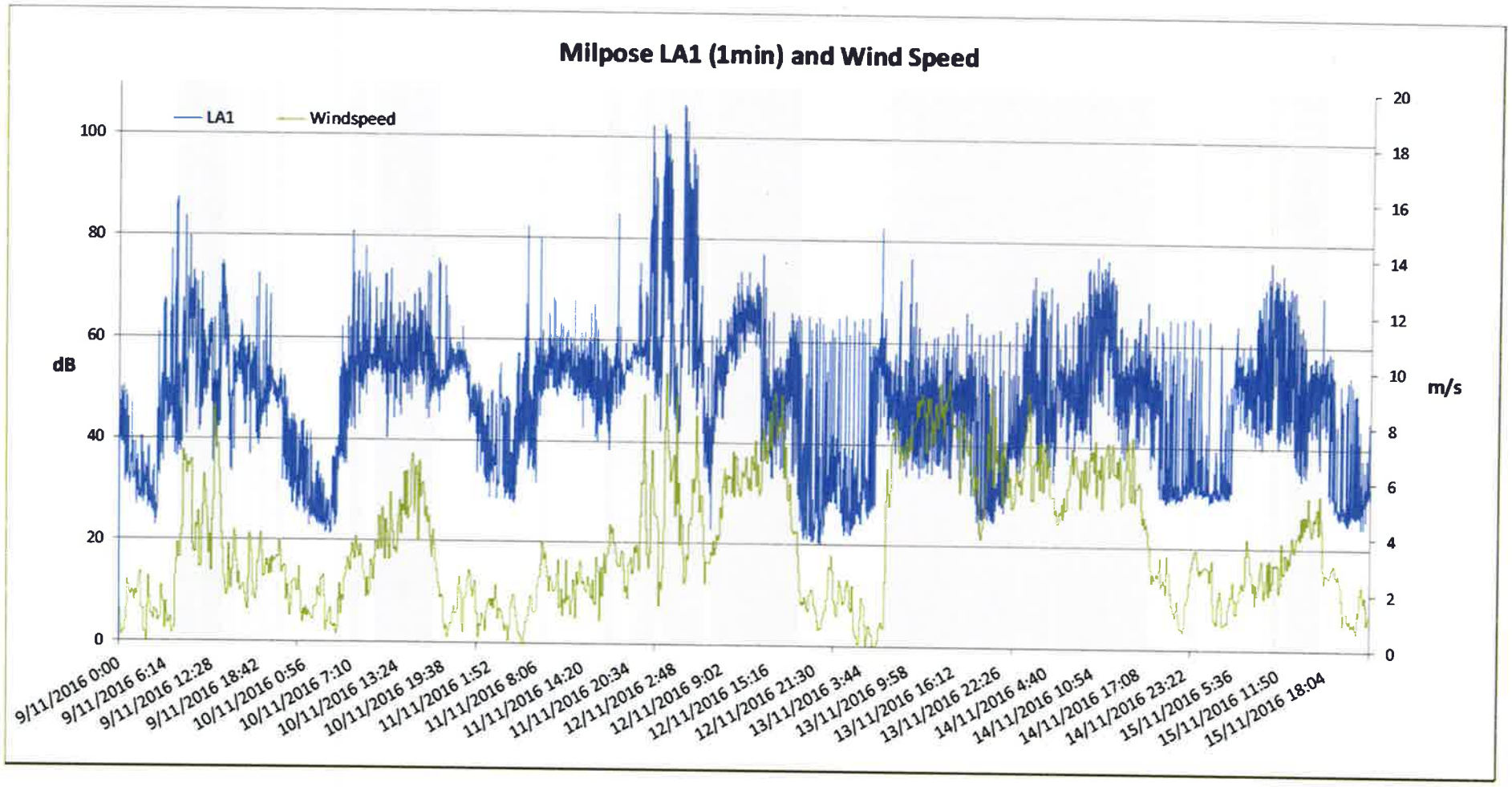


Figure 34 Milpose $L_{A1\ (1min)}$ and Wind Speed

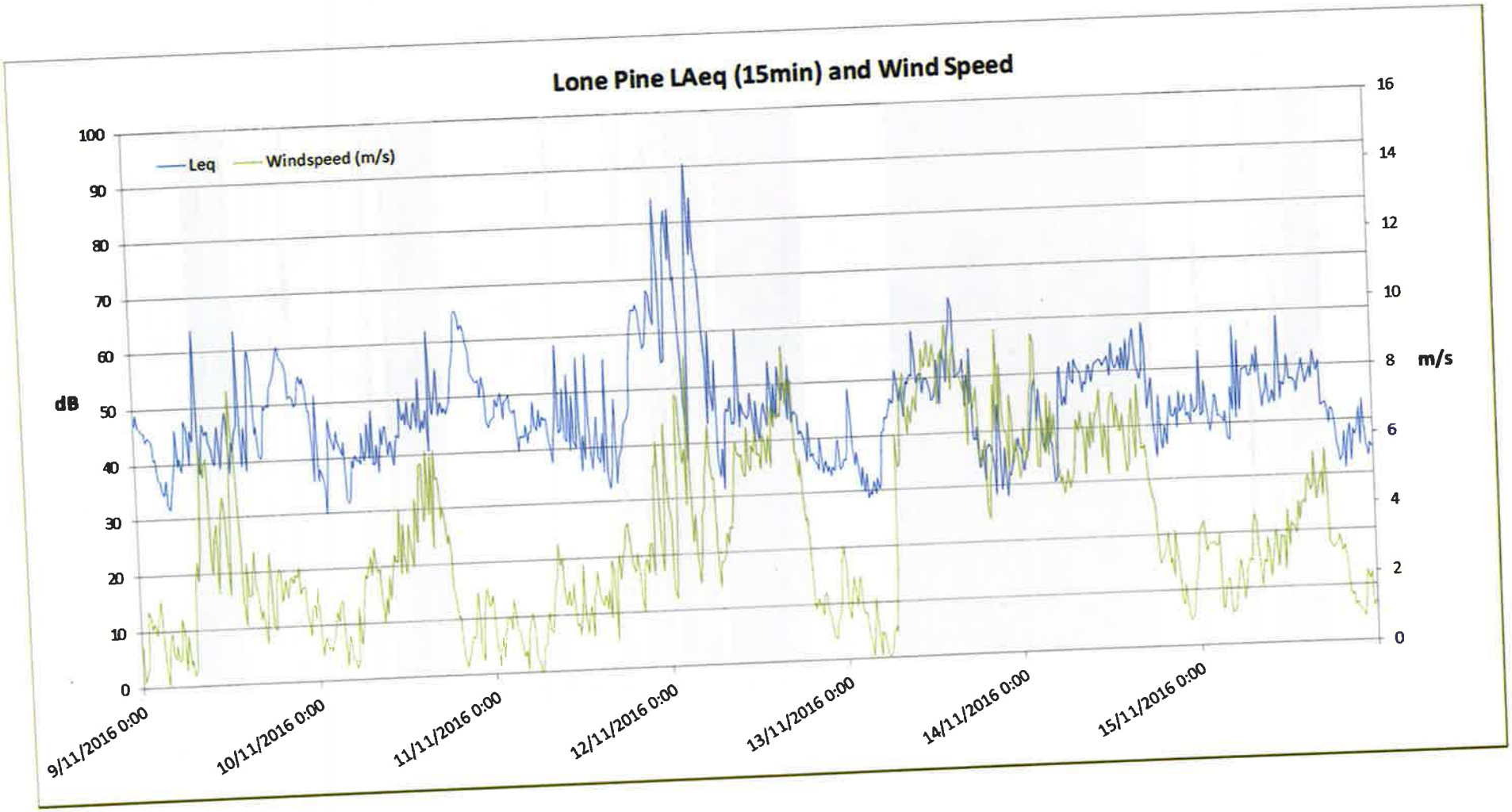


Figure 35 Lone Pine L_{Aeq} and Wind Speed

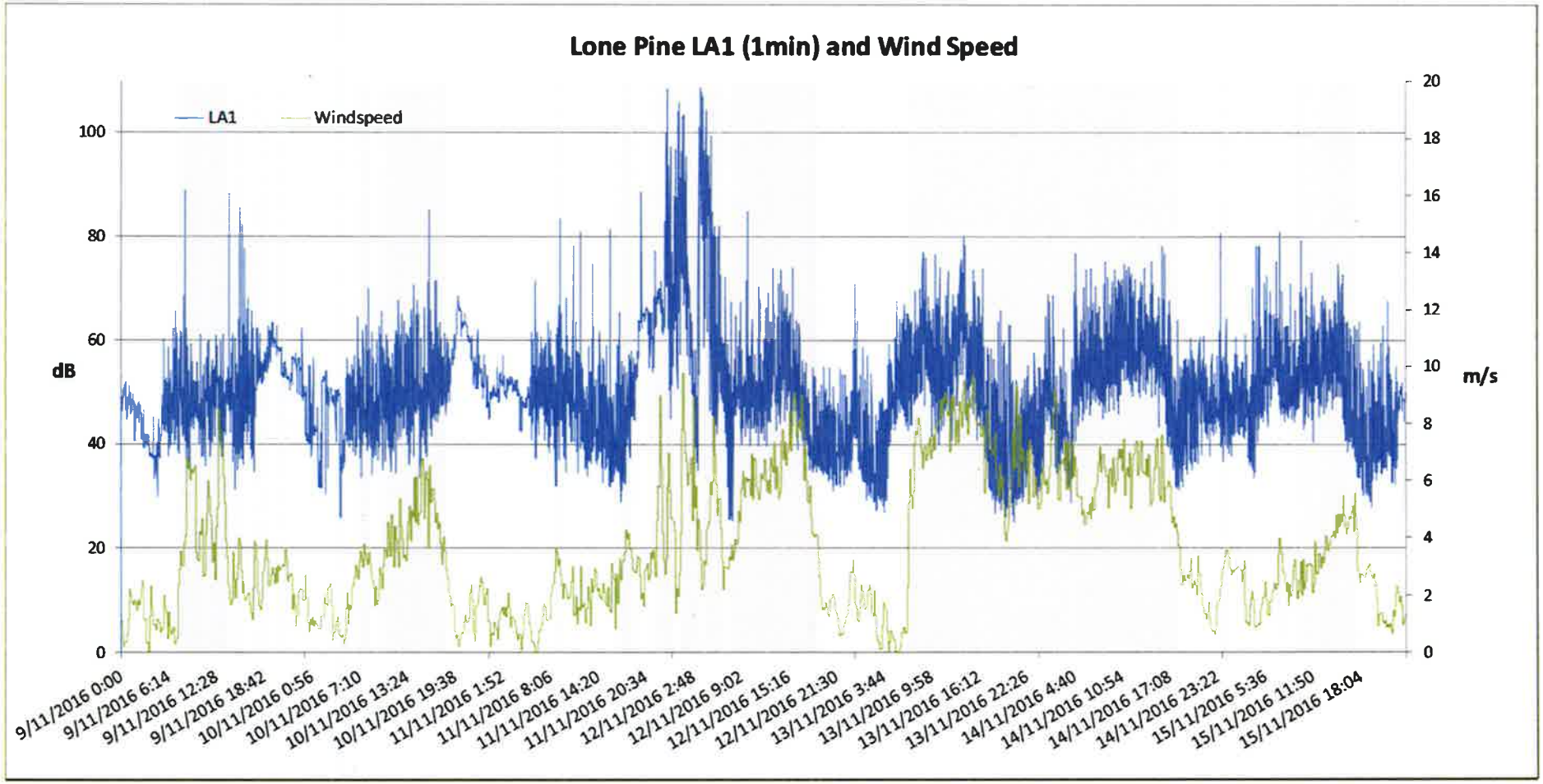


Figure 36 Lone Pine $L_{A1\ (1min)}$ and Wind Speed