Air Quality

The Metropolitan Coal air quality monitoring network consists of the following components:

- ten dust deposition gauges (DG1 to DG10) to monitor monthly dust fall out;
- one High Volume Air Sampler (HVAS) to measure 24 hour average particulate matter less than 10 microns (µm) (PM_{10}) concentrations on a 6-day cycle;
- one Tapered Element Oscillating Microbalance (TEOM) monitor to measure PM_{10} in real-time; and
- one Automatic Weather Station.

The air quality monitoring network is shown on Figure 1 and a summary of the dust deposition and particulate matter monitoring results is provided below.

Deposited Dust

Of the ten dust deposition gauges, five are monitored for compliance with Environment Protection Licence (EPL) 767 (DG1 to DG5). The remaining five dust gauges (DG6 to DG10), as well as the EPL dust gauges are used by Metropolitan Coal to guide operations and monitor the performance of on-site dust controls. It should be noted that DG4 is a control dust gauge that is located at the Helensburgh Golf Course, some 2 kilometres from the Major Surface Facilities Area.

The annual average dust deposition rates for each of the sites for the 2012 and 2013 calendar years are presented in Table 1. The monthly dust deposition monitoring results for the reporting period are shown in Chart 1.

Annual average dust deposition monitoring results at each location for the 2012 and 2013 calendar years are presented in Charts 2 and 3, respectively. The annual average dust deposition rate over the whole network was 1.4 g/m^2/month for the 2012 calendar year and 1.2 g/m^2/month for the 2013 calendar year. In comparison, dust deposition rates were 2.1 g/m^2/month, 1.4 g/m^2/month, 2.6 g/m^2/month, 1.3 g/m^2/month and 1.4 g/m^2/month for the 2007/2008, 2008/2009, 2009/2010, 2010/2011 and 2011/2012 reporting periods, respectively.

Table 1
Annual Average Dust Deposition Rates

Location	Site ID	Dust Deposition (g/m^2/month)	
		January to December 2012	January to December 2013
136 The Crescent [EPA ID 1/H]	DG1	1.5	1.4
28 Old Station Road [EPA ID 2]	DG2	0.8	0.9
Mine Entrance [EPA ID 3]	DG3	2.0	1.6
Helensburgh Golf Course [EPA ID 4]	DG4	1.7	1.3
83 Parkes Street [EPA ID 5]	DG5	1.4	1.3
55 Parkes Street [EPA ID 6]	DG6	1.1	1.0
32 Old Station Road	DG7	1.0	1.7
88 Parkes Street	DG8	2.2	1.4
Helensburgh Public School	DG9	1.2	1.4
Helensburgh Private School	DG10	1.0	0.5

g/m^2/month = grams per square metre per month

METROPOLITAN COAL - ENVIRONMENTAL MONITORING SUMMARY

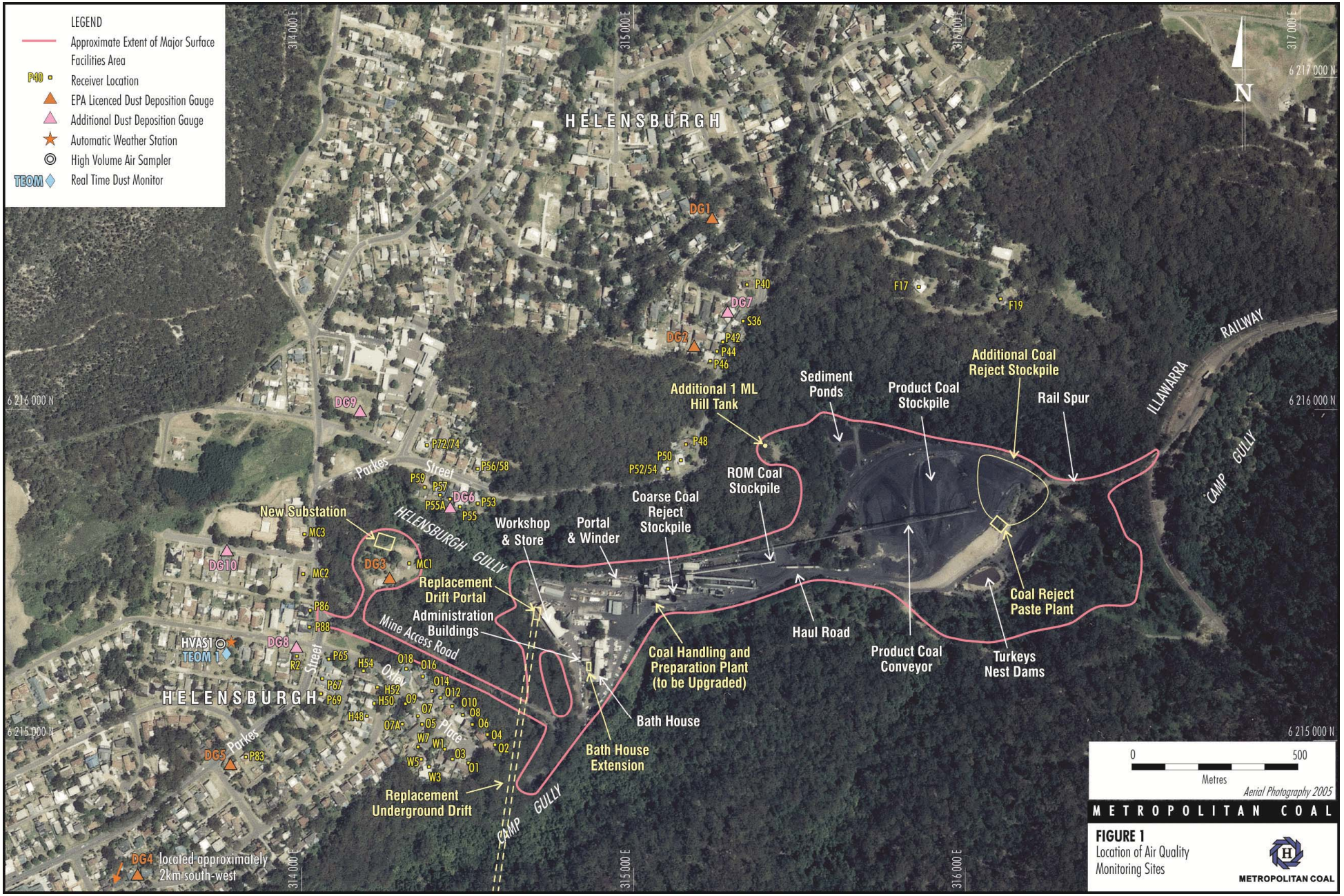

FIGURE 1
Location of Air Quality Monitoring Sites

METROPOLITAN COAL

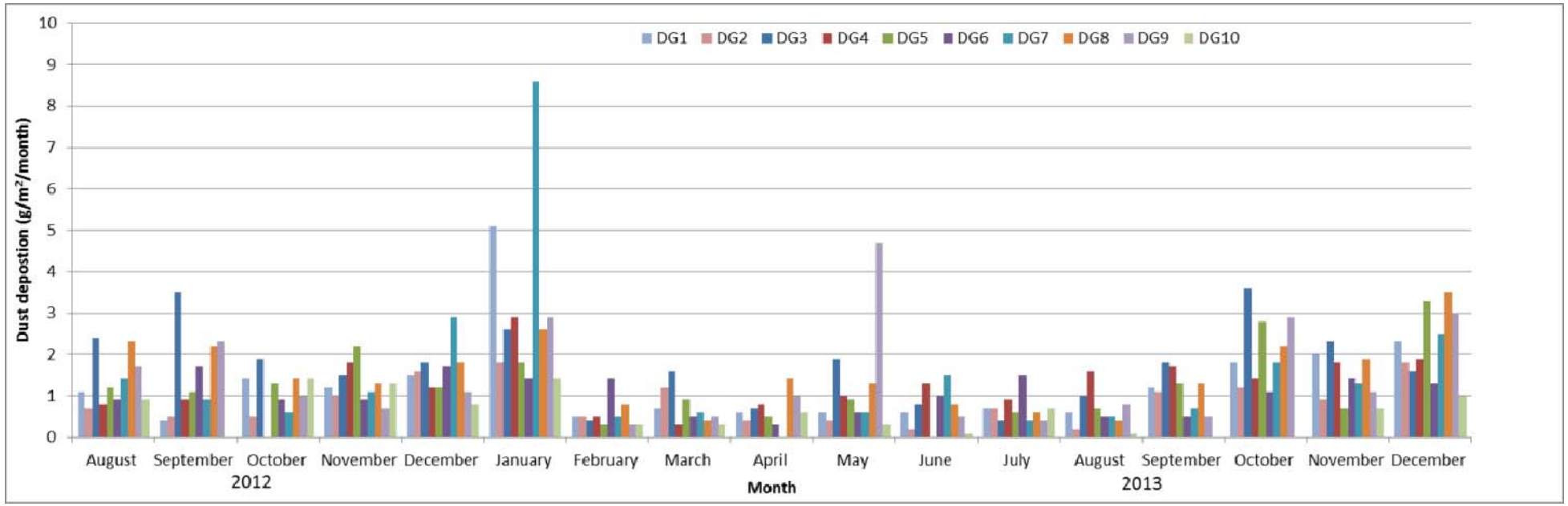

Chart 1 Dust Deposition Monitoring Data, August 2012 to December 2013

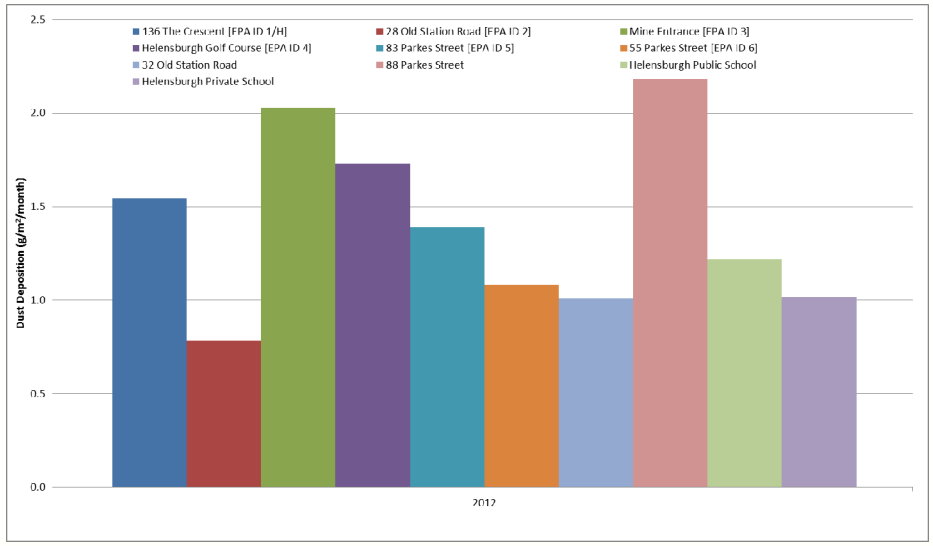

Chart 2 Annual Average Dust Deposition, January to December 2012

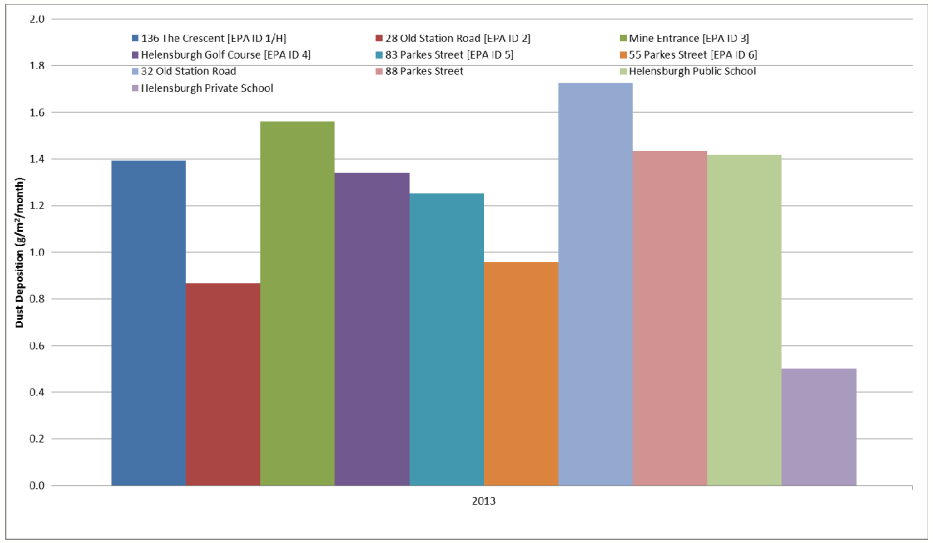

Chart 3 Annual Average Dust Deposition, January to December 2013

Particulate Matter

One TEOM and one HVAS are located near the Metropolitan Coal Mine (Figure 1). The TEOM allows for continuous measurement of PM_{10} concentrations, at five-minute intervals, while the HVAS provides an average PM_{10} concentration for a specific 24-hour period, on a six-day cycle. A discussion of PM_{10} monitoring results obtained by both the TEOM and HVAS is provided below.

Tapered Element Oscillating Microbalance (TEOM)

Chart 4 shows a plot of the 24-hour average PM_{10} concentration from 1 August 2012 to 31 December 2013. The highest 24-hour average PM_{10} concentration during the reporting period was 55.4 micrograms per cubic metre ($\mu g/m^3$), recorded on 19 October 2013. It has been established that this date coincided with bushfire activity across much of NSW.

The highest 10-minute average PM_{10} concentration recorded was 327.3 $\mu g/m^3$.

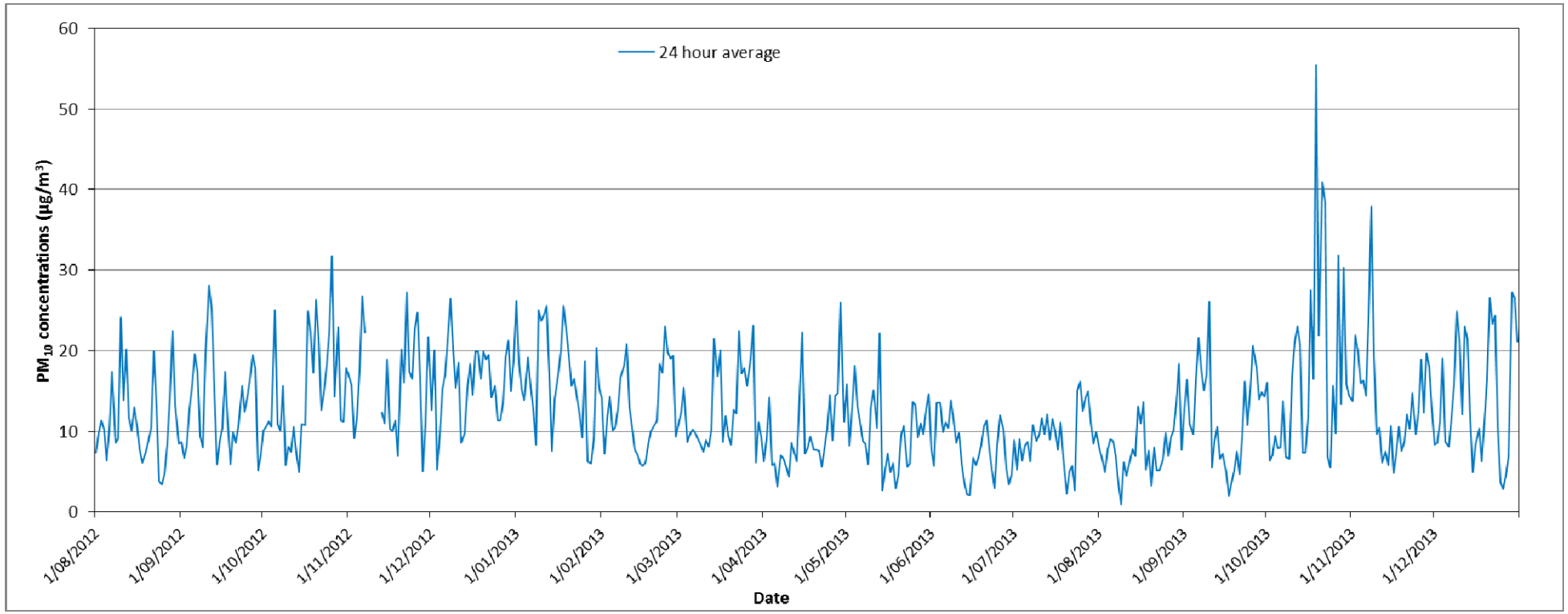

Chart 4 24-Hour Average PM_{10} Concentration (TEOM), August 2012 to December 2013

High Volume Air Sampler

The 24-hour PM_{10} monitoring results recorded at the HVAS during the reporting period are shown in Chart 5.

The maximum recorded 24-hour average PM_{10} concentration using the HVAS instrumentation was 44.5 µg/m^3 in November 2012 and the average concentration for the reporting period was 14.6 µg/m^3.

The annual average concentration for the 2012 calendar year was 14.5 µg/m^3 and the annual average concentration for the 2013 calendar year was 14 µg/m^3.

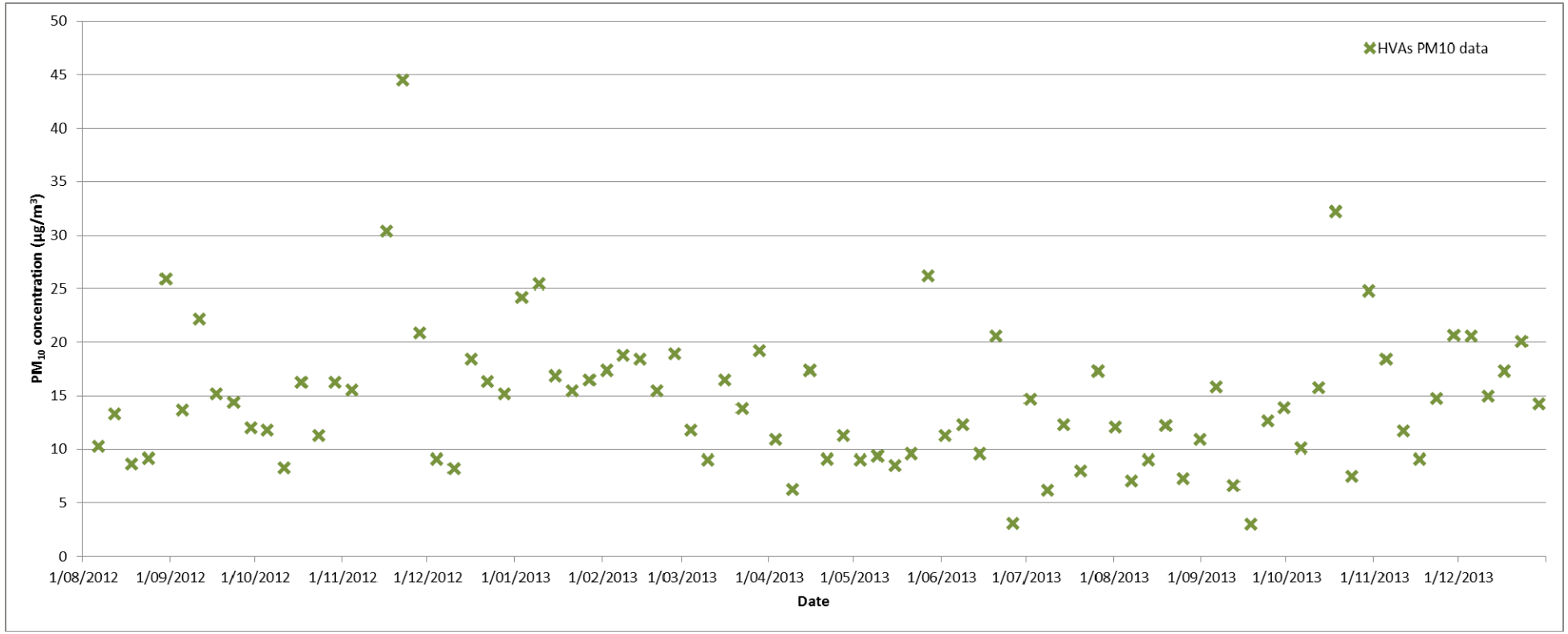

Chart 5 24-Hour Average PM_{10} Concentration (HVAS), August 2012 to December 2013

Long-term PM_{10} Analysis

Chart 6 shows the 24-hour average PM_{10} concentrations from 2007 to 2013. There are two periods where the data is missing, one from 17 March 2009 to 6 April 2009 and another from 28 August 2009 to 28 January 2010, due to maintenance issues.

Chart 6 shows that there are a higher number of elevated measurements (over 50 µg/m^3) in the 2009/2010 period relative to the 2007/2008, 2008/2009, 2010/2011, 2011/2012 and 2012/2013 reporting periods.

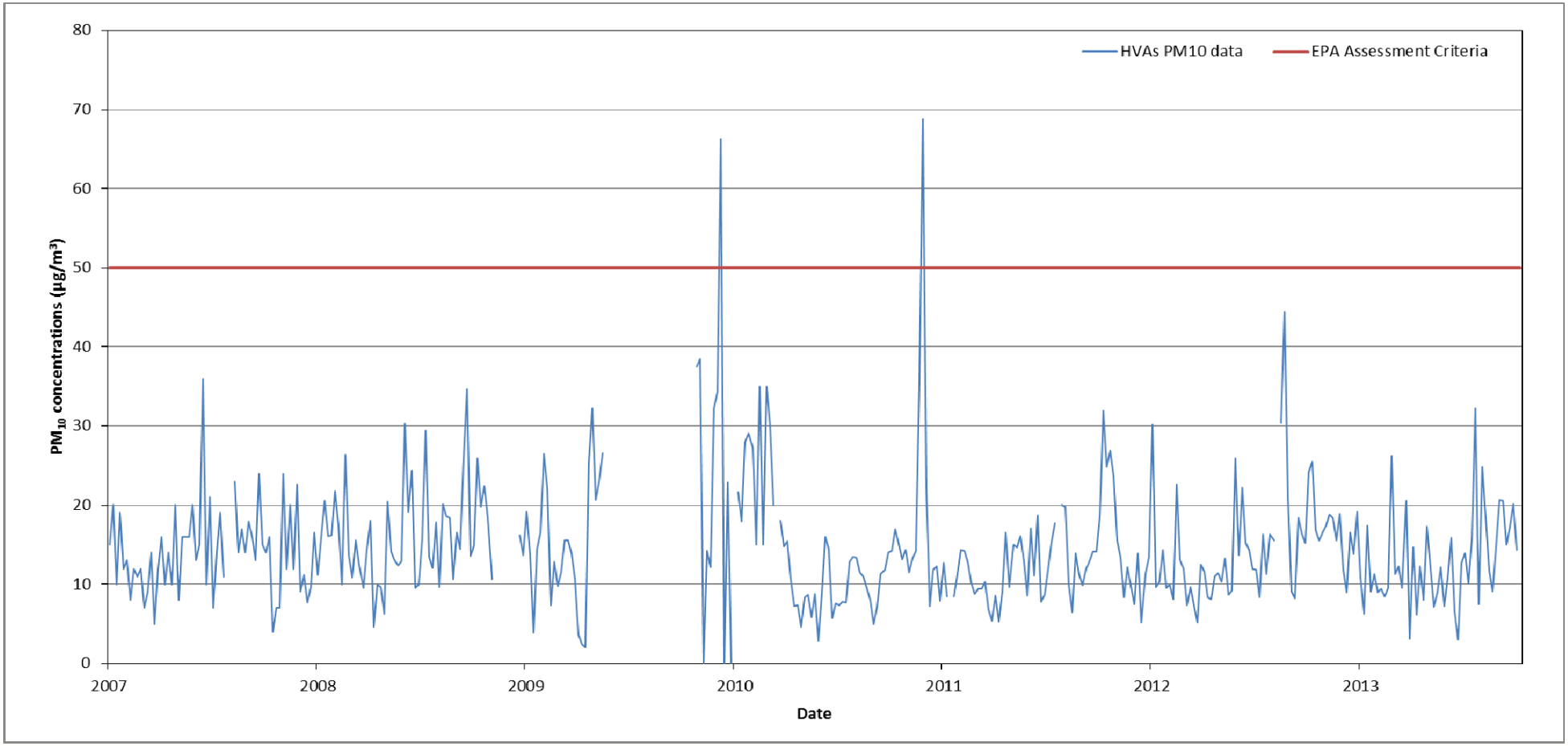

Chart 6 24-Hour Average PM_{10} Concentration (HVAS), 2007 to 2013

Chart 7 shows the annual average PM_{10} concentrations (measured by HVAS) for the 2007 to 2013 calendar years.

The annual average PM_{10} concentrations for the 2012 and 2013 calendar years are similar to those recorded by the HVAS historically at this site.

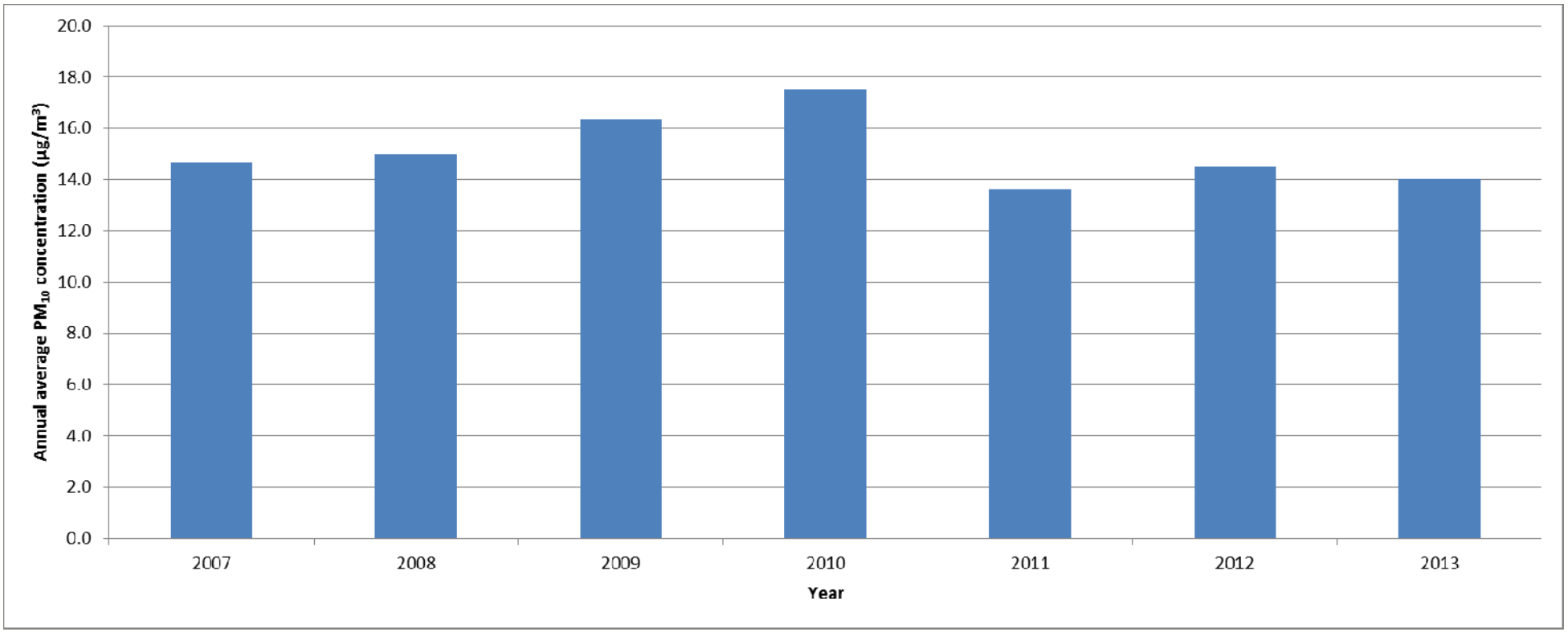

Chart 7 Annual Average PM_{10} Concentration (HVAS), 2007 to 2013

Assessment of Environmental Performance

An assessment has been conducted against the air quality performance indicators and impact criteria detailed in the Metropolitan Coal Air Quality and Greenhouse Gas Management Plan. The air quality performance indicators are outlined in Table 2 and the air quality impact criteria are outlined in Table 3.

Table 2
Air Quality Performance Indicators

Pollutant	Averaging Period	Monitoring Point	Performance Indicator	Performance Indicator Met?	Comments
PM_{10}	24 hour	HVAS1	37.5 µg/m^3	No	Chart 5 indicates that there was one exceedance of the PM_{10} 24-hour performance indicator of 37.5 µg/m^3 recorded by the HVAS1 during the reporting period, occurring in November 2012. This exceedance was not recorded by the TEOM instrument. As these instruments are located at the same site, the implication is that the HVAS exceedance was likely due to a sample contamination issue.
	Annual		25 µg/m^3	Yes	Chart 7 indicates that the annual PM_{10} performance indicator of 25 µg/m^3 was not exceeded for the 2012 and 2013 calendar years, with annual PM_{10} levels of 14.5 µg/m^3 and 14 µg/m^3, respectively being recorded by the HVAS1.
	10 minute	TEOM1	150 µg/m^3	Yes	The 10 minute average PM_{10} concentration measured at the TEOM for the reporting period was 12.7 µg/m^3.
	24 hour		37.5 µg/m^3	No	Chart 4 indicates that there were four exceedances of the PM_{10} 24-hour performance indicator of 37.5 µg/m^3 during the reporting period. Three exceedances occurred in October 2013 and once in November 2013. These exceedances coincided with a period of widespread bushfires that affected NSW air sheds.
Deposited Dust	Annual	Metropolitan Coal Dust Gauges excluding DG4	3 µg/m^3	Yes	Annual average dust deposition values were less than 3 µg/m^3 for the 2012 and 2013 calendar years (Table 1 and Charts 2 and 3).

Table 3
Air Quality Impact Assessment Criteria

Pollutant	Averaging Period	Criterion[2]	Criterion Met?	Comments
TSP[1]	Annual	90 µg/m^3	Yes	Annual average TSP concentrations can be estimated from the PM_{10} measurements by assuming that 40-50% of the TSP is comprised of PM_{10}. This relationship generally applies across the majority of airsheds, and has been validated through data collected by co-located TSP and PM_{10} monitors. Use of this relationship indicates that the annual average TSP concentration for the 2012 and 2013 calendar years is anticipated to have been less than 35 µg/m^3 and 36.3 µg/m^3, respectively, well below the TSP air quality impact assessment criteria of 90 µg/m^3.
PM_{10}	Annual	30 µg/m^3	Yes	The annual PM_{10} impact assessment criteria of 30 µg/m^3 was not exceeded for the 2012 and 2013 calendar years, with annual PM_{10} levels of 14.5 µg/m^3 and 14 µg/m^3, respectively, as measured using HVAS data (Chart 7).
	24 hour	50 µg/m^3	Yes	The maximum recorded 24-hour average PM_{10} concentration using the HVAS instrumentation was 44.5 µg/m^3 in November 2012 (Chart 5).
Deposited Dust	Annual	Maximum increase in deposited dust level of 2 g/m^2/month Maximum total deposited dust level of 4 g/m^2/month	Yes	Compliance with the dust deposition impact criteria was achieved during the reporting period. All sites show maximum total deposited dust levels that are well within the long term impact assessment criterion of 4 g/m^2/month (Table 1 and Charts 2 and 3).

1 TSP = Total suspended particulate matter 2 PM_{10} assessment criteria to be measured using HVAS data