



## **Test Report: Annual Dust Deposition Monitoring Report**

Prepared for  
**Sasol Secunda**  
**AS892 35.911\_A S-SEC**

**Sampling period: January – December 2015**



**Facility Accreditation Date: 25 November 2009**



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## EXECUTIVE SUMMARY

A network of dust fallout monitors has been operational at Sasol Secunda since May 2012. This annual report presents dust fall data collected during the monitoring period of January to December 2015. The dust deposition monitoring was based on the ASTM International standard method for collection and analysis of dust fall (ASTM D1739: 1970), with certain modifications.

The results presented in this report are compared to the South African National Dust Control Regulations, 2013.

This monitoring network comprised thirty nine single buckets for the monitoring period in review. Sites 1 to 13 and Sites 22 to 25 were commissioned in April 2012; Sites 17 to 21 were commissioned in May 2012; Sites 14 to 16 and Sites 26 to 30 were commissioned in October 2012; Sites 31 to 34 were commissioned in April 2015 and Sites 35 to 39 were commissioned in September 2015. Data availability for the Sasol Secunda monitoring network during the monitoring period in review was 99%. The exposure period complied with the standard sampling exposure period of  $30 \pm 3$  days throughout the monitoring period.

There was No Data recorded at Impumulelo East in November 2015 as the sample was contaminated by a dead bird.

Syferfontein Workshop exceeded the Residential limit for the months of October and November. Fine Ash West 2 exceeded the Residential limit for the month of November. Impumulelo North exceeded the Residential limit for the month of November. This is permissible as these sites are categorised as Non-residential sites.

There were no exceedances noted during the monitoring period of January to December 2015. All the monitoring sites recorded annual averages below the RESIDENTIAL threshold limit. All the monitoring months recorded temporal averages below the RESIDENTIAL threshold.

Majority of dust fall for the period in review were characterised by the RESIDENTIAL range category with much less occurrence of the NON-RESIDENTIAL dust fall and missing data.

**Table 1: Evaluation of results for Sasol Secunda for the period January to December 2015.**

Site Name	Site Code	Classification	Dustfall meets National Dust Control Regulations, 2013 Criteria	Assessment
Thubelisha North	1	Non-residential	Yes	No exceedance of non- residential limit
Thubelisha South	2	Non-residential	Yes	No exceedance of non- residential limit
Thubelisha West	3	Non-residential	Yes	No exceedance of non- residential limit
Thubelisha East	4	Non-residential	Yes	No exceedance of non- residential limit
Game Park	5	Non-residential	Yes	No exceedance of non- residential limit
Halvepan Dam	6	Non-residential	Yes	No exceedance of non- residential limit
Resm 3	7	Non-residential	Yes	No exceedance of non- residential limit
Langverwacht	8	Non-residential	Yes	No exceedance of non- residential limit
Resm 9	9	Non-residential	Yes	No exceedance of non- residential limit
Pump Station	10	Non-residential	Yes	No exceedance of non- residential limit
SCS	11	Non-residential	Yes	No exceedance of non- residential limit
Twistdraai East	12	Non-residential	Yes	No exceedance of non- residential limit
Twistdraai Export 1 (West)	13	Non-residential	Yes	No exceedance of non- residential limit
Twistdraai Export 2 (South)	14	Non-residential	Yes	No exceedance of non- residential limit
Twistdraai Export 3 (East)	15	Non-residential	Yes	No exceedance of non- residential limit
Twistdraai Export 4 (North)	16	Non-residential	Yes	No exceedance of non- residential limit
Syferfontein Veld	17	Non-residential	Yes	No exceedance of non- residential limit
Syferfontein Workshop	18	Non-residential	Yes	Two exceedances of residential limit
Syferfontein Farm	19	Non-residential	Yes	No exceedance of non- residential limit
Syferfontein Main Road	20	Non-residential	Yes	No exceedance of non- residential limit
Syferfontein Dam	21	Non-residential	Yes	No exceedance of non- residential limit
Impumelelo West	22	Non-residential	Yes	No exceedance of non- residential limit
Impumelelo South	23	Non-residential	Yes	No exceedance of non- residential limit
Impumelelo East	24	Non-residential	Yes	No exceedance of non- residential limit
Impumelelo North	25	Non-residential	Yes	No exceedance of non- residential limit
Impumelelo Conveyor	26	Non-residential	Yes	No exceedance of non- residential limit
Shondoni North	27	Non-residential	Yes	No exceedance of non- residential limit
Shondoni East	28	Non-residential	Yes	No exceedance of non- residential limit
Shondoni South	29	Non-residential	Yes	No exceedance of non- residential limit
Shondoni West	30	Non-residential	Yes	No exceedance of non- residential limit
Nitro Dam Wall	31	Non-residential	Yes	No exceedance of non- residential limit

Site Name	Site Code	Classification	Dustfall meets National Dust Control Regulations, 2013 Criteria	Reason for Assessment
Nitro Export Entrance	32	Non-residential	Yes	No exceedance of non- residential limit
Nitro Cellphone Tower	33	Non-residential	Yes	No exceedance of non- residential limit
Nitro Explosives Entrance	34	Non-residential	Yes	No exceedance of non- residential limit
Fine Ash West	35	Non-residential	Yes	No exceedance of non- residential limit
Fine Ash West 1	36	Non-residential	Yes	No exceedance of non- residential limit
Fine Ash West 2	37	Non-residential	Yes	One exceedance of residential limit
Coal Separation East	38	Non-residential	Yes	No exceedance of non- residential limit
Coal Separation West	39	Non-residential	Yes	No exceedance of non- residential limit

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## ABBREVIATIONS

l	Litres
m	Metres
mg/m <sup>2</sup> /day	Milligrams per metre squared per day
ml	Millilitres
mm	Millimetres

# 1 INTRODUCTION

Dust emissions can be separated into two broad categories: process sources and fugitive dust sources. Process source emissions are those associated with industrial operations that alter the chemical or physical characteristics of the feed material and are generally emitted from a stack. Fugitive dust sources are emissions of solid particles by the forces of wind or machinery acting on exposed material. Typical examples include materials handling activities, vehicle entrainment of road dust and wind erosion off stockpiles and tailings impoundments. Particulates may contribute to visibility reduction, pose a threat to human health, or be a nuisance due to their soiling potential.

Dust monitoring networks generally fulfil four main functions:

- Quantification of the companies operation's contribution to dust deposition in the area;
- Identification of possible problem areas;
- Tracking of progress of control measures being implemented; and
- Demonstration of compliance with accepted air quality standards.

Results from the dust deposition monitoring network for the period January to December 2015 are presented in this report. Tabular and graphic summaries of the data are included. In the analysis of the dust fallout samples the total gravimetric mass is recorded. Fluctuations in dust fall rates are a function of variations in the meteorological conditions of the site and/or changes in source characteristics. The meteorological characteristics of the site impact on the rate of emissions from fugitive sources and govern the dispersion and eventual removal of pollutants from the atmosphere.

Fugitive dust emission rates are predominantly a function of the wind speed and the intensity and duration of the activity generating the dust (e.g. traffic volumes, extent of batch drop operations). Evaporation rates and precipitation levels also influence fugitive emission rates due to their impact on the moisture content of materials being handled or stored. The review of meteorological data, including wind speed and precipitation data is undertaken in the current study in order to assist in the analysis of dust fall rates recorded during the period under review.

## 2 METHODOLOGY

Dust fall monitoring at Sasol Secunda began in May 2012. Windblown settle able dust fall-out is monitored based on the American Society of Testing and Materials standard method for collection and analysis of dust fall (ASTM D1739: 1970), with certain modifications. This method employs a simple device consisting of a cylindrical 5 l container half-filled with de-ionised water exposed for one calendar month ( $30 \pm 3$  days). The water is treated with an inorganic biocide to prevent algal growth in the buckets. The most common reagent used for this is a 5 % copper sulphate solution.



**Figure 1: Single bucket monitoring unit showing a sampling bucket with bird ring and security clamps**

The bucket stand comprises a ring that is raised above the rim of the bucket to prevent contamination from perching birds (Figure 2.1). The bucket holder is connected to a 2.1 m galvanised steel pole, which is either directly attached to a fence post or can be attached to a galvanised steel base plate, which is buried to a depth of 500 mm. This allows for a variety of placement options for the fallout samplers. Exposed buckets, when returned to the SGS Environmental laboratories, are rinsed with de-ionised water to remove residue from the sides of the bucket, and the bucket contents filtered through a 1 mm sieve to remove insects and other coarse organic detritus. The sample is then filtered through a pre-weighed paper filter to remove the insoluble fraction, or dust fallout. This residue and filter are dried, and gravimetrically analysed to determine the insoluble fraction (dust fallout).

### 3 STANDARD FOR DUST DEPOSITION

#### 3.1 *National Environmental Management: Air Quality Act, 2004; (Act No. 39 of 2004) National Dust Control Regulations*

Table 2: Extract from the National Dust Control Regulations, No.36974 Government Gazette, 1 November 2013

Restriction Areas	Dust fall rate (D) (mg/m <sup>2</sup> /day, 30- days average)	Permitted frequency of exceeding dust fall rate
Residential area	$D < 600$	Two within a year, not sequential months
Non-residential area	$600 < D < 1200$	Two within a year, not sequential months

The method to be used for measuring dust fall rate and the guideline for locating sampling points shall be ASTM D1739: 1970, or equivalent method approved by any internationally recognized body.

#### 3.2 *Residential and non-residential areas*

A residential area means any area classified for residential use in terms of local town planning scheme;

A non-residential area means any area not classified for residential use as per local town planning scheme



## 4 THE SAMPLING NETWORK

The dust-monitoring network at Sasol Secunda currently comprises of thirty nine single buckets for the monitoring period in review. Site names, site numbers and dates when each site was commissioned are given in Table 3. Sampling dates and comments regarding the Sasol Secunda monitoring network for the period January to December 2015 are summarized in Table 4. Please note that compliance with respect to the National Dust Control Regulations is provisional as the site classifications in terms of these regulations will need to be confirmed by the client by considering the town planning of the area of operation.

Table 3: Sasol Secunda monitoring network: Site description and site numbers.

Site Name	Site Number	Site Classification	Commission Date
Thubelisha North	1	NON-RESIDENTIAL	April 2012
Thubelisha South	2	NON-RESIDENTIAL	April 2012
Thubelisha West	3	NON-RESIDENTIAL	April 2012
Thubelisha East	4	NON-RESIDENTIAL	April 2012
Game Park	5	NON-RESIDENTIAL	April 2012
Halvepan Dam	6	NON-RESIDENTIAL	April 2012
Resm 3	7	NON-RESIDENTIAL	April 2012
Langverwacht	8	NON-RESIDENTIAL	April 2012
Resm 9	9	NON-RESIDENTIAL	April 2012
Pump Station	10	NON-RESIDENTIAL	April 2012
SCS	11	NON-RESIDENTIAL	April 2012
Twistdraai East	12	NON-RESIDENTIAL	April 2012
Twistdraai Export 1 (West)	13	NON-RESIDENTIAL	April 2012
Twistdraai Export 2 (South)	14	NON-RESIDENTIAL	October 2012
Twistdraai Export 3 (East)	15	NON-RESIDENTIAL	October 2012
Twistdraai Export 4 (North)	16	NON-RESIDENTIAL	October 2012
Syferfontein Veld	17	NON-RESIDENTIAL	May 2012
Syferfontein Workshop	18	NON-RESIDENTIAL	May 2012
Syferfontein Farm	19	NON-RESIDENTIAL	May 2012
Syferfontein Main Road	20	NON-RESIDENTIAL	May 2012
Syferfontein Dam	21	NON-RESIDENTIAL	May 2012
Impumelelo West	22	NON-RESIDENTIAL	April 2012
Impumelelo South	23	NON-RESIDENTIAL	April 2012
Impumelelo East	24	NON-RESIDENTIAL	April 2012
Impumelelo North	25	NON-RESIDENTIAL	April 2012
Impumelelo Conveyor	26	NON-RESIDENTIAL	October 2012
Shondoni North	27	NON-RESIDENTIAL	October 2012
Shondoni East	28	NON-RESIDENTIAL	October 2012

Site Name	Site Number	Site Classification	Commission Date
Shondoni South	29	NON-RESIDENTIAL	October 2012
Shondoni West	30	NON-RESIDENTIAL	October 2012
Nitro Dam Wall	31	NON-RESIDENTIAL	April 2015
Nitro Export Entrance	32	NON-RESIDENTIAL	April 2015
Nitro Cellphone Tower	33	NON-RESIDENTIAL	April 2015
Nitro Explosives Entrance	34	NON-RESIDENTIAL	April 2015
Fine Ash West	35	NON-RESIDENTIAL	September 2015
Fine Ash West 1	36	NON-RESIDENTIAL	September 2015
Fine Ash West 2	37	NON-RESIDENTIAL	September 2015
Coal Separation East	38	NON-RESIDENTIAL	September 2015
Coal Separation West	39	NON-RESIDENTIAL	September 2015

## 4.1 Sampling locations of all sites

Table 4: Coordinates of sampling locations

Site Name	Latitude	Longitude
Thubelisha North	S26°27'31.0"	E029°17'23.7"
Thubelisha South	S26°27'56.7"	E029°17'29.8"
Thubelisha West	S26°27'36.3"	E029°17'04.8"
Thubelisha East	S26°28'08.5"	E029°17'04.8"
Game Park	S26°31'52.8"	E029°11'38.7"
Halvepan Dam	S26°31'12.2"	E029°07'24.8"
Resm 3	S26°32'44.6"	E029°07'47.4"
Langverwacht	S26°33'05.6"	E029°06'44.8"
Resm 9	S26°34'10.1"	E029°08'37.0"
Pump Station	S26°34'39.3"	E029°08'15.5"
SCS	S26°34'22.3"	E029°09'15.8"
Twistdraai East	S26°32'33.5"	E029°20'23.2"
Twistdraai Export (West)	S26°33'33.5"	E029°11'45.3"
Twistdraai Export 2 (South)	S26°34'16.6"	E029°11'53.4"
Twistdraai Export 3 (East)	S26°33'58.3"	E029°12'28.9"
Twistdraai Export 4 (North)	S26°33'26.4"	E029°12'15.1"
Syferfontein Veld	S26°24'56.18"	E029°11'36.77"
Syferfontein Workshop	S26°25'06.62"	E029°14'35.38"
Syferfontein Farm	S26°25'00.31"	E029°11'23.10"
Syferfontein Main Rd	S26°26'06.40"	E029°14'49.38"
Syferfontein Dam	S26°25'00.31"	E029°11'23.10"
Impumelelo West	S26°38'38.9"	E028°52'41.5"
Impumelelo South	S26°38'31.7"	E028°53'20.3"
Impumelelo East	S26°38'09.5"	E028°53'24.5"
Impumelelo North	S26°38'00.0"	E028°53'06.1"
Impumelelo Conveyor	S26°37'53.1"	E028°53'23.6"
Shondoni North	S26°28'23.9"	E029°02'40.9"
Shondoni East	S26°28'38.1"	E029°02'45.9"
Shondoni South	S26°28'40.3"	E029°02'35.5"

Site Name	Latitude	Longitude
Shondoni West	S26°28'31.8"	E029°02'33.1"
Nitro Dam Wall	S26°34'53.9"	E029°11'33.7"
Nitro Export Entrance	S26°34'42.6"	E029°10'52.8"
Nitro Cellphone Tower	S26°34'59.6"	E029°10'54.0"
Nitro Explosives Entrance	S26°35'12.7'	E029°11'0.2"
Fine Ash West	S26°34'15.2'	E029°06'21.3"
Fine Ash West 1	S26°33'54.2'	E029°09'24.6"
Fine Ash West 2	S26°34'56.0'	E029°07'09.6"
Coal Separation East	S26°24'03.0'	E029°10'33.1"
Coal Separation West	S26°50'47.1'	E30°01'08.4"

Figure 2: Map illustrating the monitoring Sites around Sasol Secunda.





Figure 3: Map illustrating the monitoring sites at Twistdraai Export.



Figure 4: Map illustrating the monitoring site at Twistdraai East.

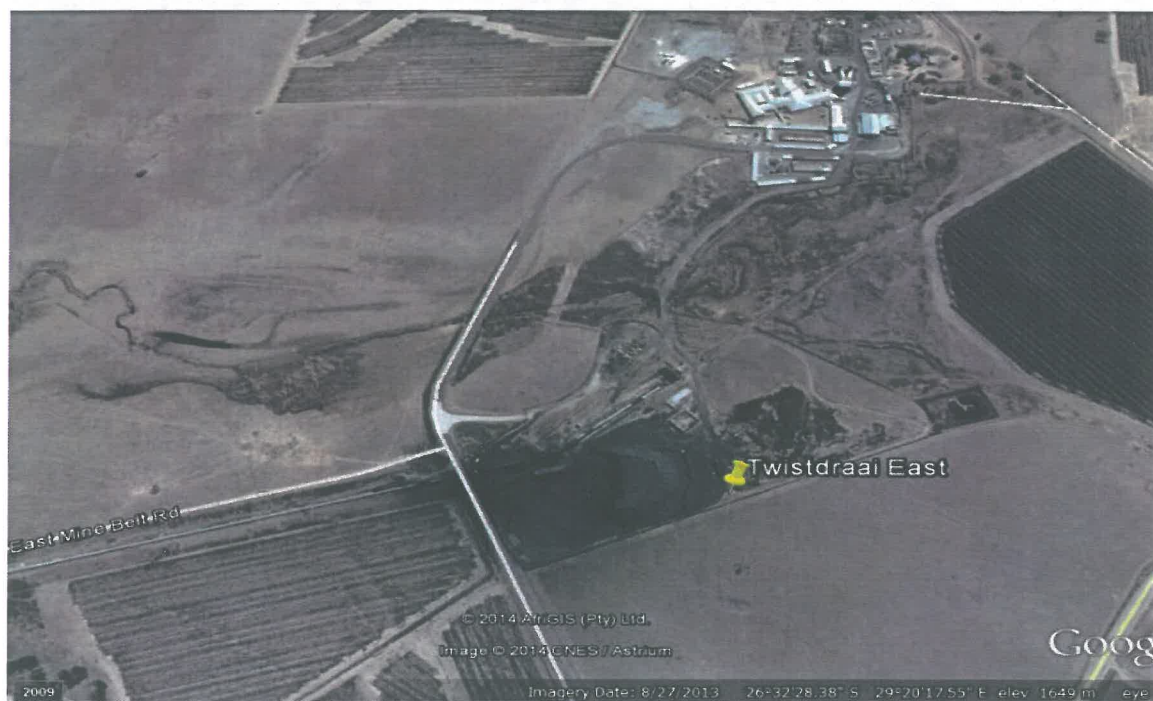


Figure 5: Map illustrating the monitoring sites at Impumelelo.



Figure 6: Map illustrating the monitoring sites at Thubelisha Mine.

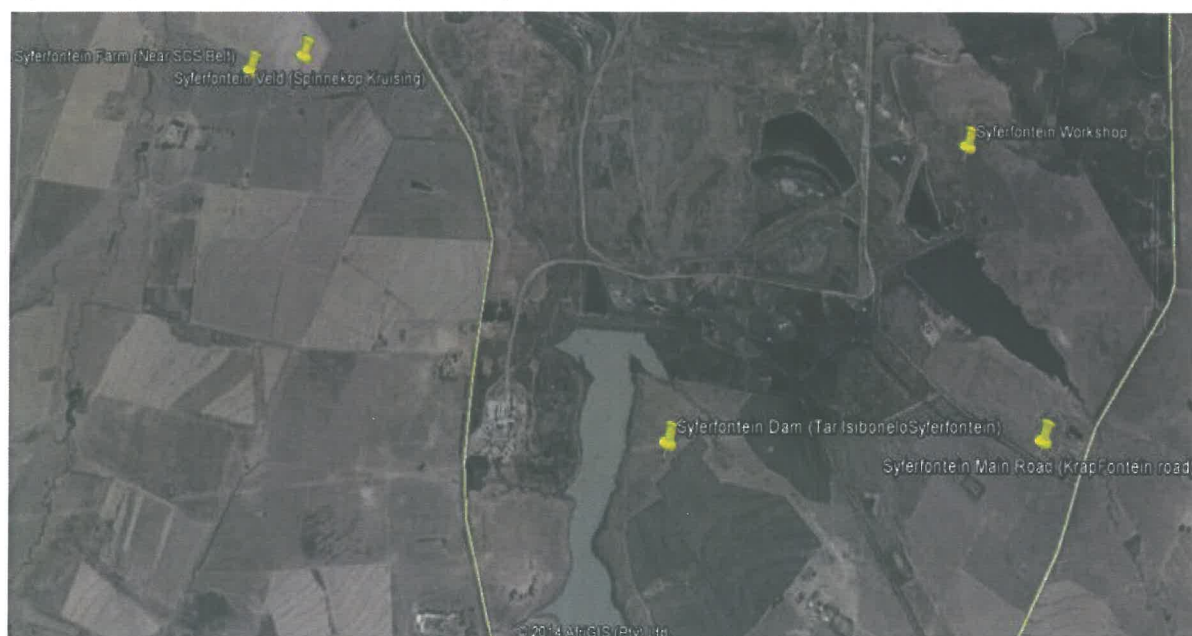




Figure 7: Map illustrating the monitoring sites at Shondoni.



Figure 8: Map illustrating the monitoring sites at Syferfontein.





## 5 OPERATIONAL ASPECTS

Data availability for the Sasol Secunda monitoring network during the monitoring period in review was 99%. There was No Data recorded at Impumelelo East in November as the sample was contaminated by a dead bird. The exposure period complied with the standard sampling exposure period of  $30 \pm 3$  days.

**Table 5: Sampling dates and comments for Sasol Secunda monitoring network for the period January to December 2015**

Sample month	Start and end date	Exposure duration (days)	Sample Recovery
Jan 2015	5/6 Jan – 5/6 Feb 2015	31	100%
Feb 2015	5/6 Feb – 5/6 Mar 2015	28	100%
March 2015	5/6 Mar – 1/2 April 2015	27	100%
April 2015	1/2 April – 4/5 May 2015	33	100%
May 2015	4/5 May – 5 June 2015	31/32	100%
June 2015	5 June 2013 – 2/3 July 2015	27/28	100%
July 2015	2/3 July – 4/5 Aug 2015*	33	100%
Aug 2015	4/5 Aug – 3/4 Sep 2015	30	100%
Sep 2015	3/4 Sep – 5/6 Oct 2015	32	100%
Oct 2015	5/6 Oct – 4/5 Nov 2015	29/30	100%
Nov 2015	4/5 Nov – 3/4 Dec 2015**	29/30	97%
Dec 2015	3/4 Dec – 5/6 Jan 2015	33	100%

**Comment:** \* Game Park and Halvepan Dam were terminated on the 4<sup>th</sup> of August 2015.

\*\* Impumelelo East recorded no data due to a contaminated sample (dead bird).

## 6 DUSTFALL RESULTS

Dust fall rates observed at each of the 39 single buckets for the period January to December 2015, are presented in Tables 6 - 9. Temporal variations in dust fall rates are illustrated and described in Section 6.2. Dust fall rates are presented and discussed graphically on a site-by-site basis in Section 6.3.

SGS requires a data recovery of 75% or higher in order to assess compliance to the National Dust Control Regulations, 2013. Results exceeding the RESIDENTIAL target of 600 mg/m<sup>2</sup>/day are indicated in **bold black** font and the NON-RESIDENTIAL target of 1200 mg/m<sup>2</sup>/day are indicated in **bold red** font. Please note that compliance with respect to the National Dust Control Regulations is provisional as the site classifications in terms of these regulations will need to be confirmed by the client by considering the town planning of the area of operation.

Time-plots represent a useful means of comparing trends in monthly dustfall levels. Each figure presents the monthly averaged dustfall levels per monitoring site over period January to December 2015, compared with the average results of data for the previous annual period. An increase or decrease of > 200 mg/m<sup>2</sup>/day is considered to be significant.

Temporal and spatial variations in dustfall rates are illustrated and described at the end of this section, as is the classification of the overall dustfall rates for the period under review. Dustfall rates recorded since the initiation of monitoring in are given in Appendix 1.

Table 6: Dust fall rates for Sasol Secunda single-bucket sites from January to December 2015 (mg/dm<sup>2</sup> over a 30-day averaging period).

Sample Month	Thubelisha North	Thubelisha South	Thubelisha West	Thubelisha East	Game Park	Halvepan Dam	Resm 3	Langverwacht	Resm 9	Pump Station
Jan 2015	40	7	21	17	18	79	38	49	25	12
Feb 2015	19	10	13	15	19	33	29	32	22	13
Mar 2015	35	18	20	24	15	74	21	34	43	44
April 2015	11	14	12	17	18	48	21	15	16	56
May 2015	59	60	16	10	18	132	6	38	28	62
June 2015	29	6	20	25	19	49	27	41	46	34
July 2015	43	54	42	22	34	27	53	29	56	69
Aug 2015	62	105	48	24	DEC	DEC	56	62	33	125
Sep 2015	46	32	42	38	DEC	DEC	26	49	36	39
Oct 2015	83	53	126	47	DEC	DEC	97	137	38	108
Nov 2015	142	148	159	112	DEC	DEC	159	163	181	368
Dec 2015	76	37	51	38	DEC	DEC	60	158	66	83
Annual Average	54	45	47	32	20	63	49	67	49	84

Comment: DEC – decommissioned (Game Park and Halvepan Dam were decommissioned in August 2015)

Specific Test Conditions	Samples stored at room temperature prior to analysis. Filters weighed at constant mass
Deviations From Method	None.
Measurement Uncertainty	± 5%

Table 7: Dust fall rates for Sasol Secunda Single bucket sites from January to December 2015 (mg/m<sup>2</sup>/day over a 30 day averaging period)

Sample Month	SCS	Twistdraai Mine	Twistdraai Export	Twistdraai Export 2	Twistdraai Export 3	Twistdraai Export 4	Syferfontein Veld	Syferfontein Workshop	Syferfontein Farm	Syferfontein main road
Jan 2015	41	18	49	99	37	98	24	139	20	18
Feb 2015	26	14	25	42	20	24	7	103	17	22
Mar 2015	42	23	59	25	61	72	35	289	30	25
April 2015	44	18	54	36	15	38	50	104	39	15
May 2015	68	69	136	95	32	34	88	114	69	79
June 2015	47	31	61	31	99	26	13	234	42	19
July 2015	42	39	110	103	65	51	79	417	221	49
Aug 2015	186	92	175	301	73	91	103	297	124	40
Sep 2015	76	30	121	52	54	80	71	317	113	70
Oct 2015	95	40	224	132	81	104	159	980	348	192
Nov 2015	172	39	302	171	198	99	114	638	138	93
Dec 2015	81	69	237	161	50	65	91	432	148	28
Annual Average	77	40	129	104	65	65	70	339	109	54

Specific Test Conditions	Samples stored at room temperature prior to analysis.
Deviations From Method	Filters weighed at constant mass
Measurement Uncertainty	None.
	± 5%

Table 8: Dust fall rates for Sasol Secunda Single bucket sites from January to December 2015 (mg/m<sup>2</sup>/day over a thirty day averaging period)

Sample Month	Syferfontein Dam	Impumulelo West	Impumulelo South	Impumulelo East	Impumulelo North	Impumulelo Conveyor	Shondoni North	Shondoni East	Shondoni South	Shondoni West
Jan 2015	15	31	184	15	16	4	35	50	23	43
Feb 2015	11	21	50	4	6	28	10	36	72	35
Mar 2015	18	19	92	29	86	20	50	134	32	66
April 2015	19	5	152	27	18	20	84	213	23	105
May 2015	34	52	56	73	22	23	44	95	99	125
June 2015	28	23	41	17	32	16	32	104	41	42
July 2015	37	52	40	19	50	26	50	148	126	84
Aug 2015	58	60	45	35	101	29	35	125	121	158
Sep 2015	45	35	13	23	160	26	74	240	68	139
Oct 2015	62	142	63	73	524	89	70	258	294	156
Nov 2015	50	45	41	ND	675	36	119	340	510	319
Dec 2015	69	79	62	29	229	44	51	83	184	95
<b>Annual Average</b>	<b>37</b>	<b>47</b>	<b>70</b>	<b>29</b>	<b>160</b>	<b>30</b>	<b>54</b>	<b>152</b>	<b>133</b>	<b>114</b>

Comments: ND: No data

Specific Test Conditions	Samples stored at room temperature prior to analysis. Filters weighed at constant mass
Deviations From Method	None.
Measurement Uncertainty	± 5%



Table 9: Dust fall rates for Sasol Secunda Single bucket sites from January to December 2015 (mg/m<sup>2</sup>/day over a thirty day averaging period)

Sample Month	Nitro Dam Wall	Nitro Export Entrance	Nitro Cellphone Tower	Nitro Explosives Entrance	Fine Ash West	Fine Ash West 1	Fine Ash West 2	Coal Separation East	Coal Separation West
Jan 2015									
Feb 2015									
Mar 2015									
April 2015	18	87	26	53					
May 2015	2	85	61	110					
June 2015	35	33	26	49					
July 2015	36	194	32	44					
Aug 2015	46	108	86	112					
Sep 2015	43	131	28	63	80	117	203	71	87
Oct 2015	26	90	63	111	48	203	324	105	63
Nov 2015	58	335	110	135	102	226	781	229	217
Dec 2015	100	70	156	124	51	128	114	87	138
Annual Average	40	126	65	89	71	169	355	123	126

Specific Test Conditions	Samples stored at room temperature prior to analysis. Filters weighed at constant mass
Deviations From Method	None.
Measurement Uncertainty	± 5%



## 6.1 Review of dustfall rates on a site by site basis

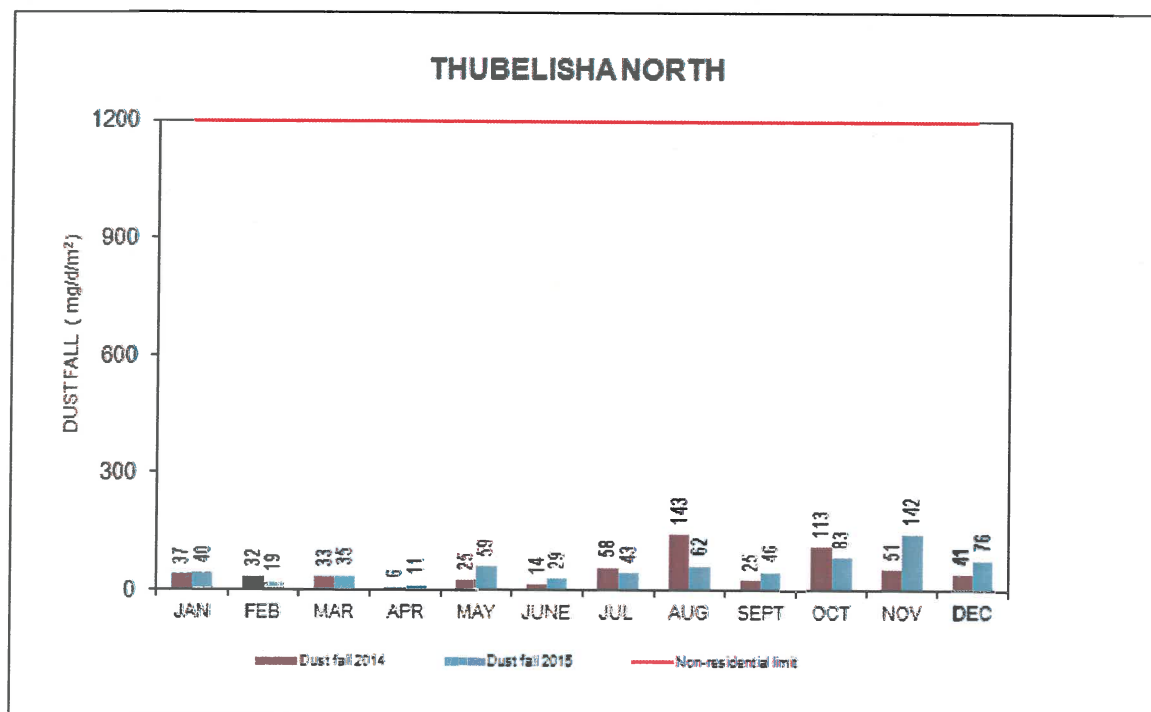
### 6.1.1 Site 1 – Thubelisha North

This site was commissioned in April 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the months recorded dust fall rates below the NON-RESIDENTIAL threshold limit. The month of November 2015 recorded the highest dust fall rate at 142 mg/m<sup>2</sup>/day while the month of April 2015 recorded the lowest dust fall rate at 11 mg/m<sup>2</sup>/day.

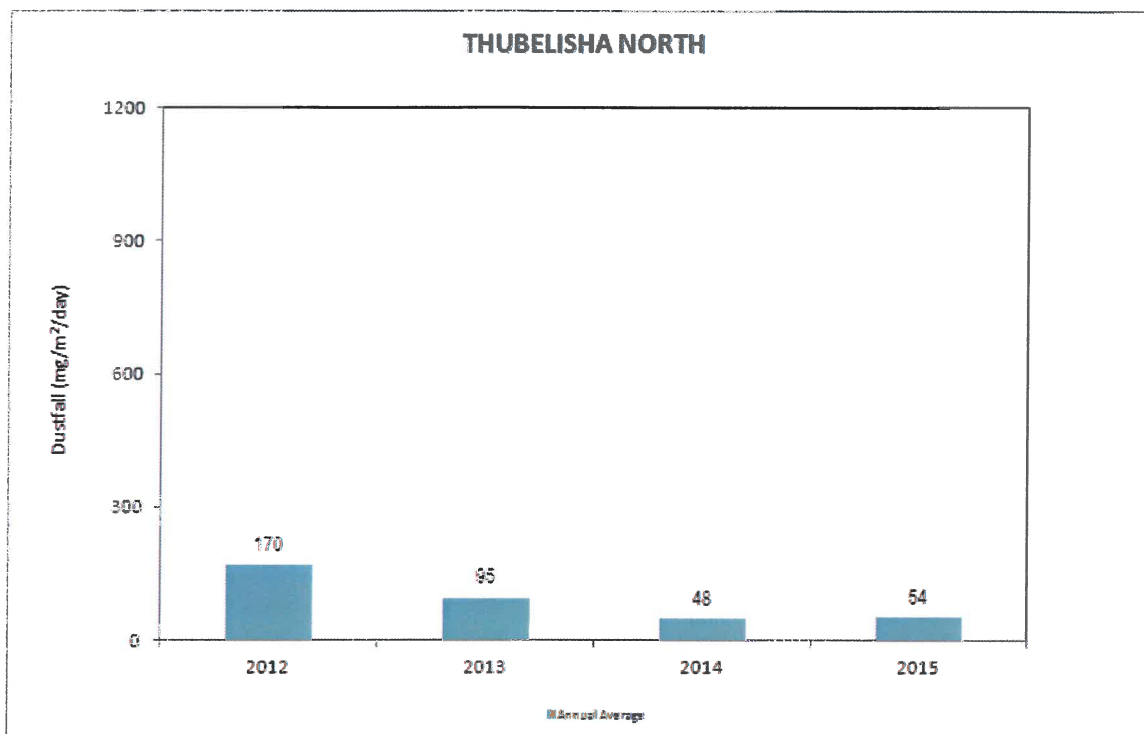
The results for 2014 are included to show the trend in dust fallout from the previous year. All the 2015 months experienced dust fallout equivalent to the 2014 results.

Figure 9: Dustfall rates recorded for Site 1 (Thubelisha North) from January - December 2015.



Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2012 at 170 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2014 at 48 mg/m<sup>2</sup>/day.

Figure 10: Annually averaged dust fallout at Site 1 (Thubelisha North) from 2012 to 2015



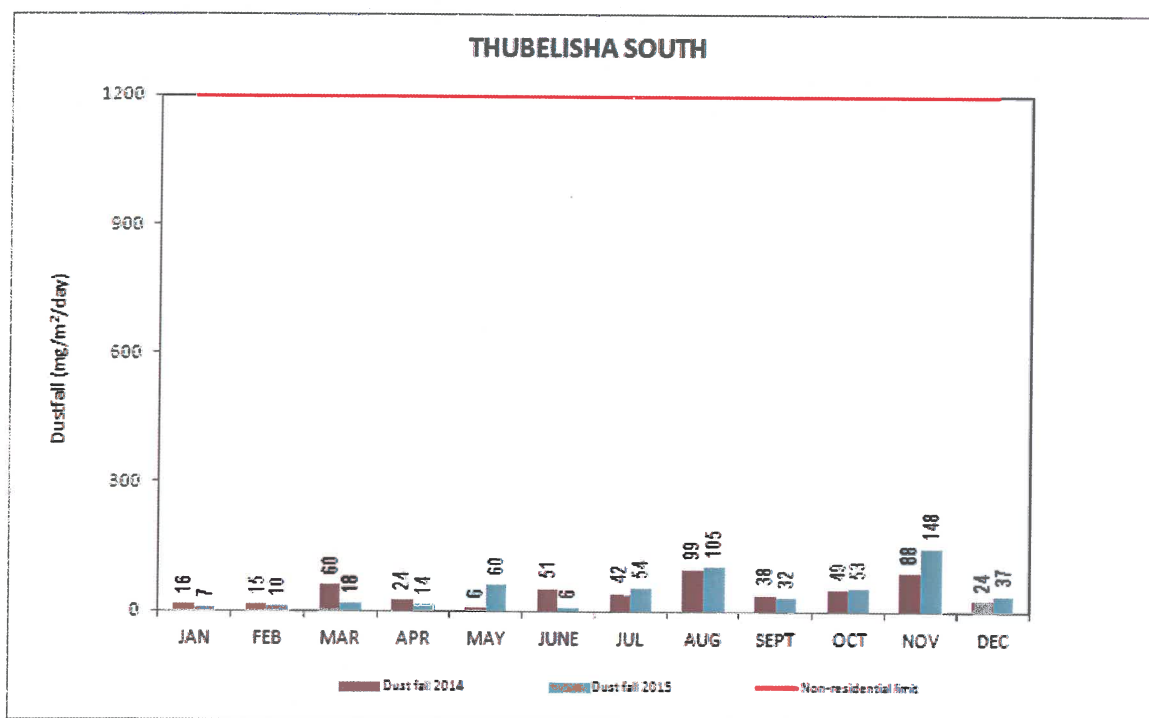
### 6.1.2 Site 2 – Thubelisha South

This site was commissioned in April 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the months recorded dust fall rates below the NON-RESIDENTIAL threshold limit. The month of November 2015 recorded the highest dust fall rate at 148 mg/m<sup>2</sup>/day while the month of January 2015 recorded the lowest dust fall rate at 7 mg/m<sup>2</sup>/day.

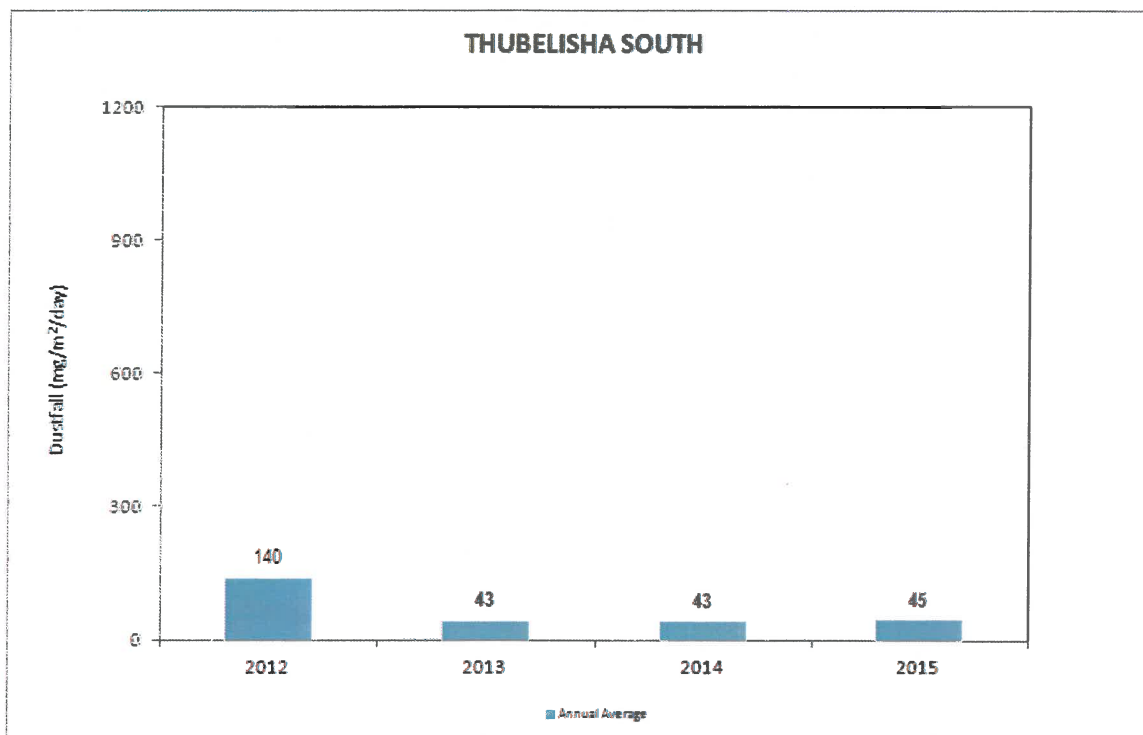
The results for 2014 are included to show the trend in dust fallout from the previous year. All the 2015 months experienced dust fallout equivalent to the 2014 results.

Figure 11: Dustfall rates recorded for Site 2 (Thubelisha South) during January - December 2015.



Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2012 at 140 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the years 2013 and 2014 at 43 mg/m<sup>2</sup>/day.

Figure 12: Annually averaged dust fallout at Site 2 (Thubelisha South) from 2012 to 2015



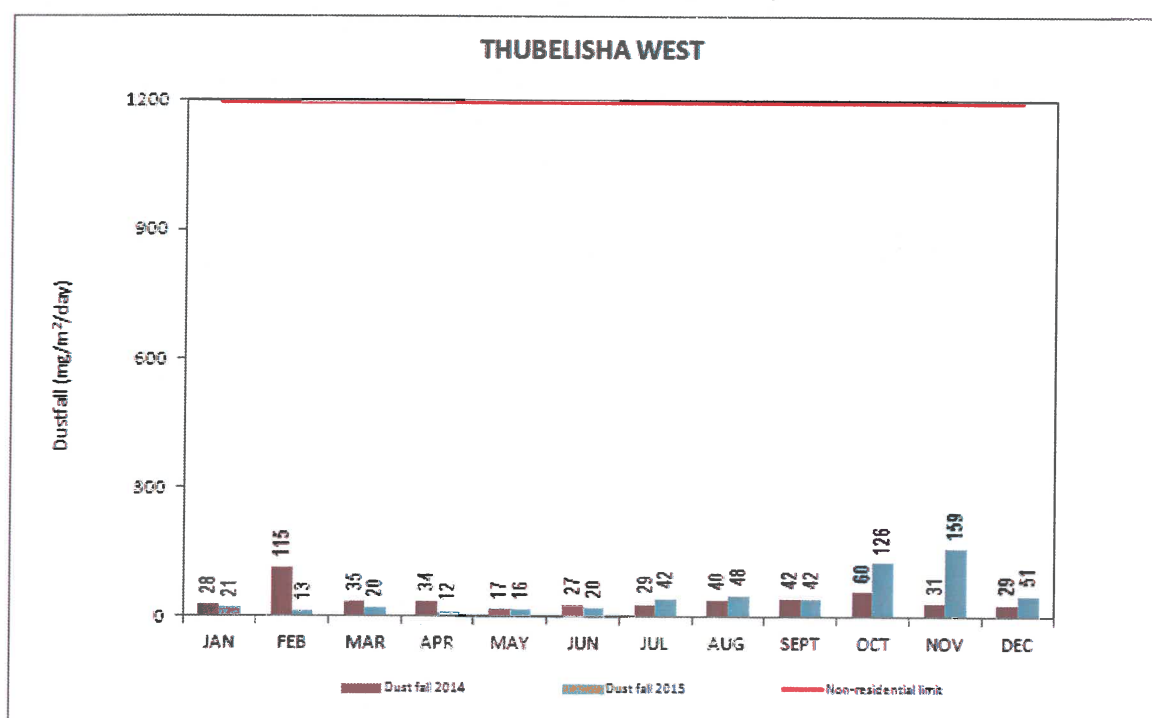
### 6.1.3 Site 3 – Thubelisha West

This site was commissioned in April 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. The month of November 2015 recorded the highest dust fall rate at 159 mg/m<sup>2</sup>/day while April 2015 recorded the lowest dust fall rate at 12 mg/m<sup>2</sup>/day.

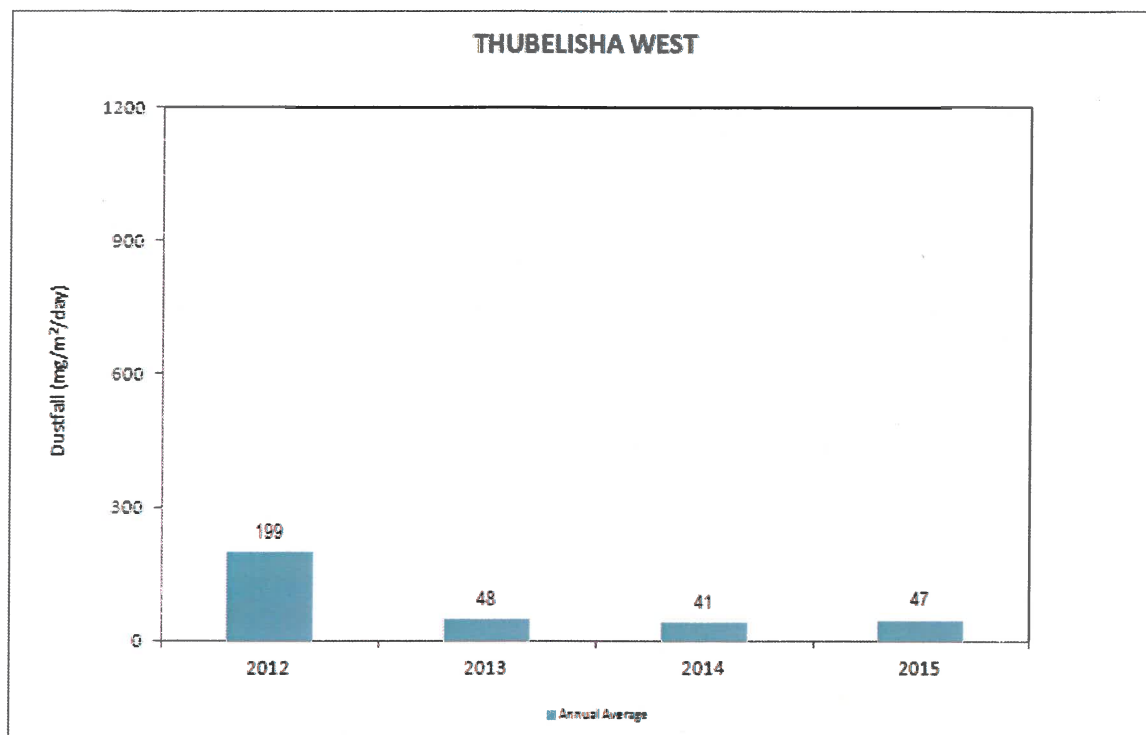
The results for 2014 are included to show the trend in dust fallout from the previous year. All the 2015 months experienced dust fallout equivalent to the 2014 results.

Figure 13: Dustfall rates recorded for Site 3 (Thubelisha West) during January to December 2015.



Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2012 at 199 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2014 at 41 mg/m<sup>2</sup>/day.

Figure 14: Annually averaged dust fallout at Site 3 (Thubelisha West) from 2012 to 2015





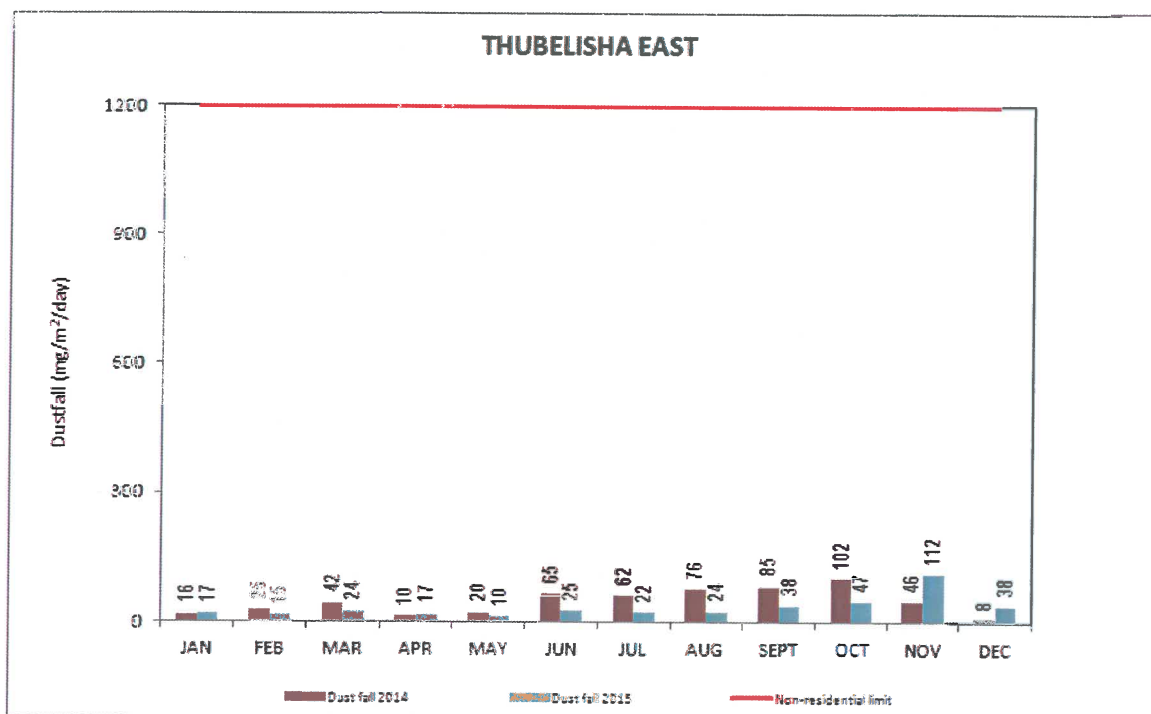
### 6.1.4 Site 04 – Thubelisha East

This site was commissioned in April 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. The month of November 2015 recorded the highest dust fall rate at 112 mg/m<sup>2</sup>/day. The lowest dust fallout was recorded during May 2015 at 10 mg/m<sup>2</sup>/day.

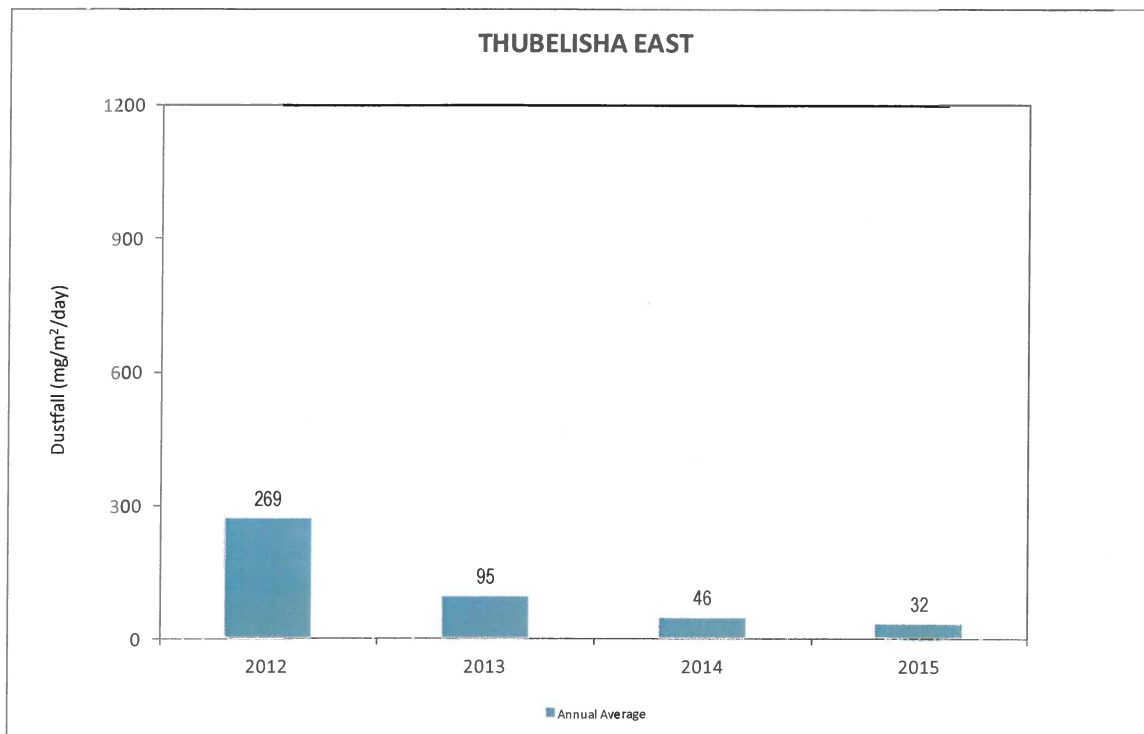
The results for 2014 are included to show the trend in dust fallout from the previous year. All the 2015 months experienced dust fallout equivalent to the 2014 results.

Figure 15: Dust fall rates recorded for Site 4 (Thubelisha East) during January to December 2015.



Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2012 at 269 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2015 at 32 mg/m<sup>2</sup>/day.

Figure 16: Annually averaged dust fallout at Site 4 (Thubelisha East) from 2012 to 2015



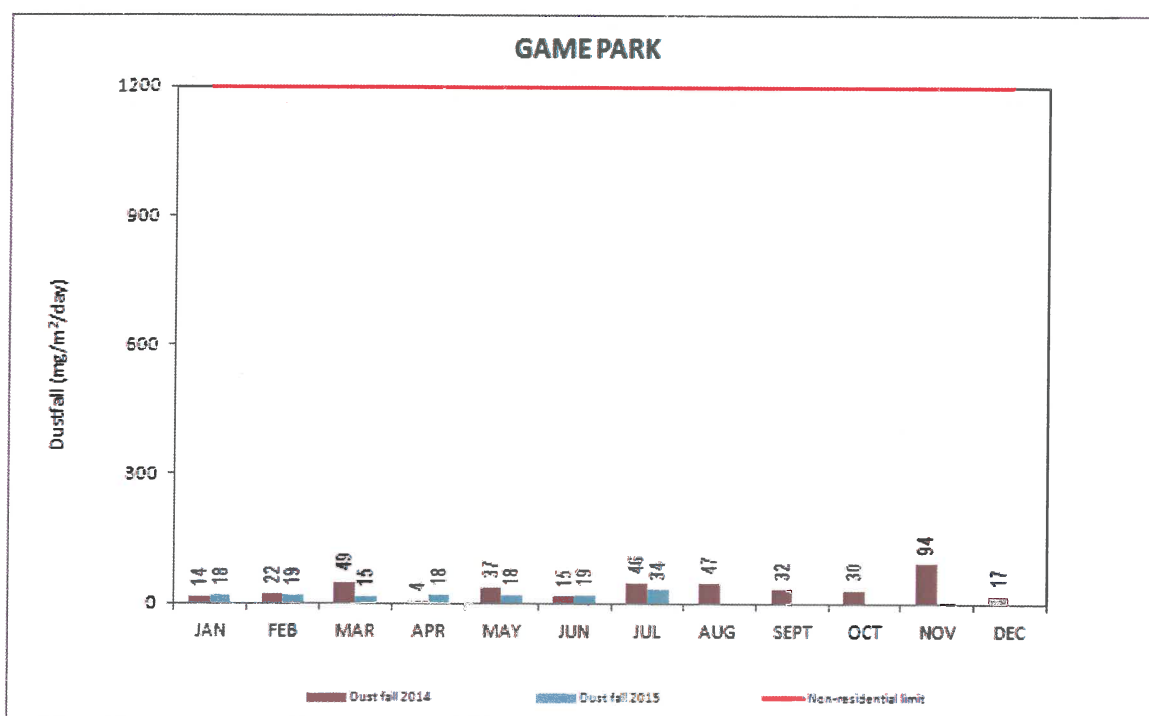
### 6.1.5 Site 05 – Game Park

This site was commissioned in April 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. The month of July 2015 recorded the highest dust fall rate at 34 mg/m<sup>2</sup>/day while March 2015 recorded the lowest dust fall rate at 15 mg/m<sup>2</sup>/day. The site was decommissioned on the 4<sup>th</sup> of August 2015.

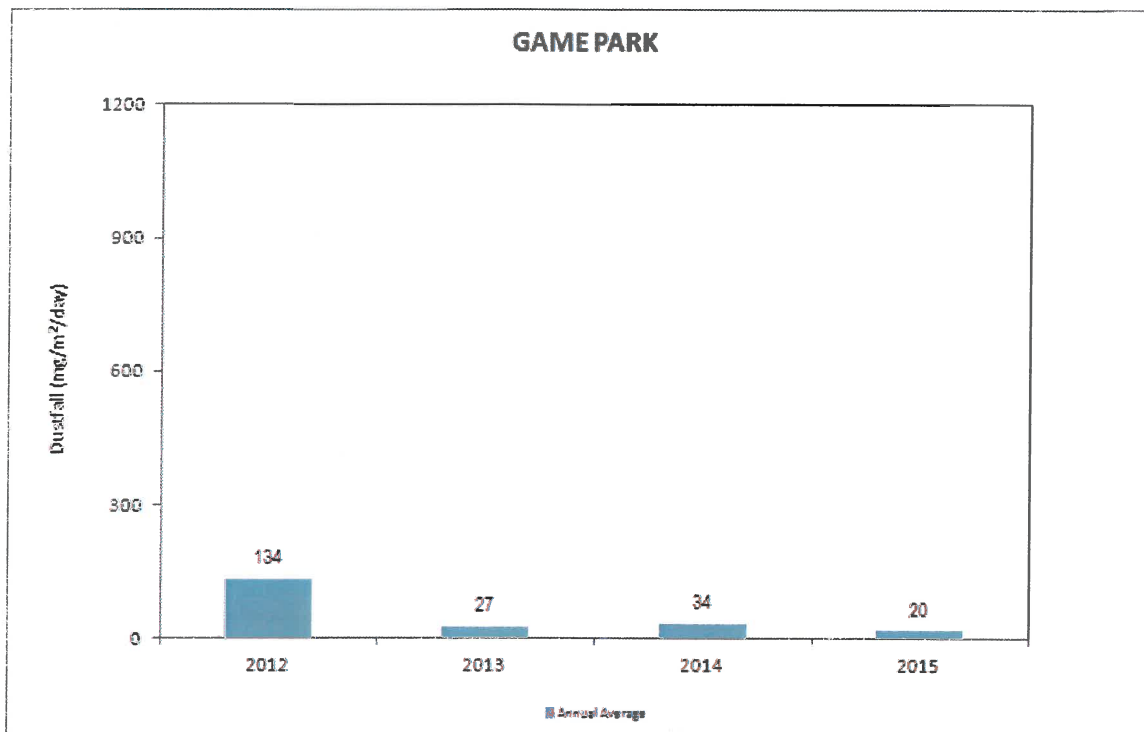
The results for 2014 are included to show the trend in dust fallout from the previous year. All the 2015 months experienced dust fallout equivalent to the 2014 results.

Figure 17: Dustfall rates recorded for Site 5 (Game Park) for January to December 2015.



Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2012 at 134 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2015 at 20 mg/m<sup>2</sup>/day.

Figure 18: Annually averaged dust fallout at Site 5 (Game Park) from 2012 to 2015



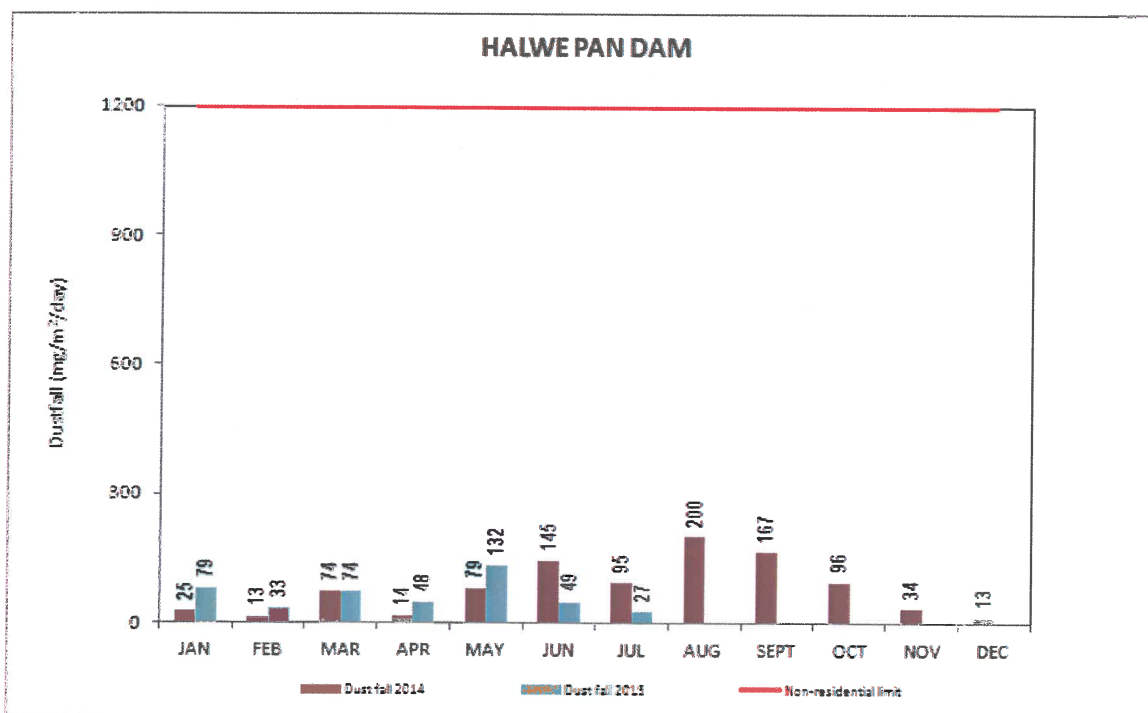
### 6.1.6 Site 6 – Halwepan Dam

This site was commissioned in April 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. The month of May 2015 recorded the highest dust fall rate at 132 mg/m<sup>2</sup>/day while July 2015 recorded the lowest dust at 27 mg/m<sup>2</sup>/day. The site was decommissioned on 4<sup>th</sup> of August 2015.

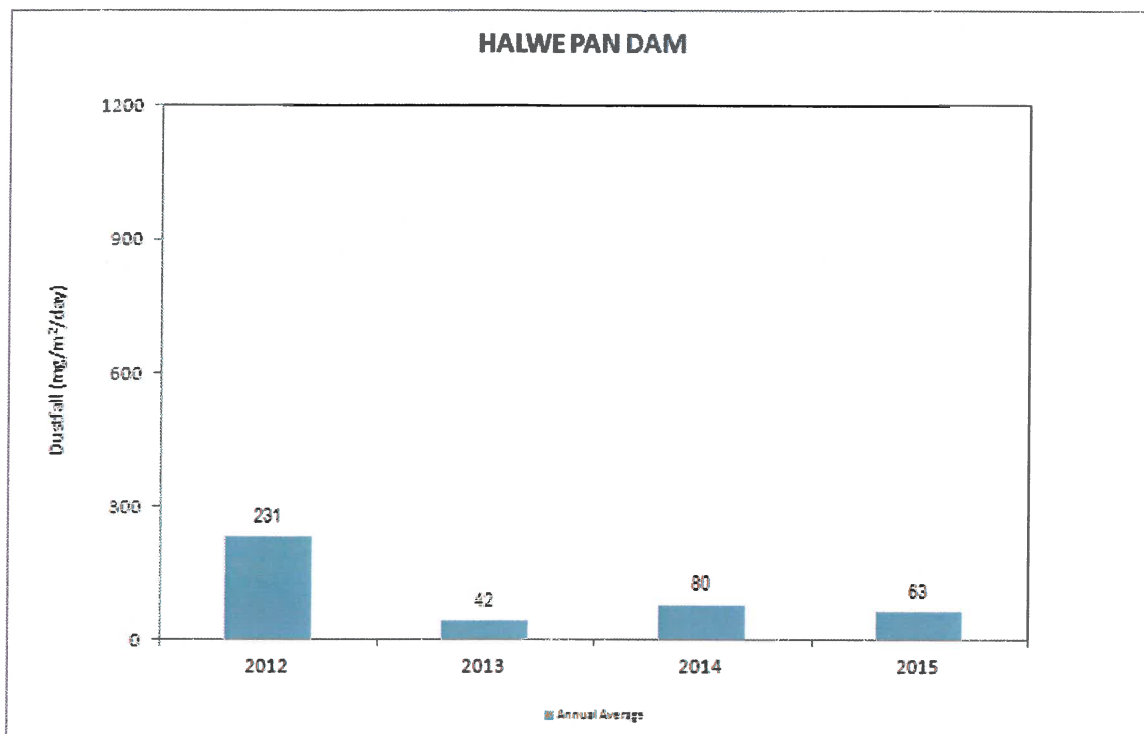
The results for 2014 are included to show the trend in dust fallout from the previous year. All the 2015 months experienced dust fallout equivalent to the 2014 results.

Figure 19: Dust fall rates recorded for Site 6 (Halwepan Dam) for January to December 2015.



Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2012 at 231 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2013 at 42 mg/m<sup>2</sup>/day.

Figure 20: Annually averaged dust fallout at Site 6 (Halwepan Dam) from 2012 to 2015





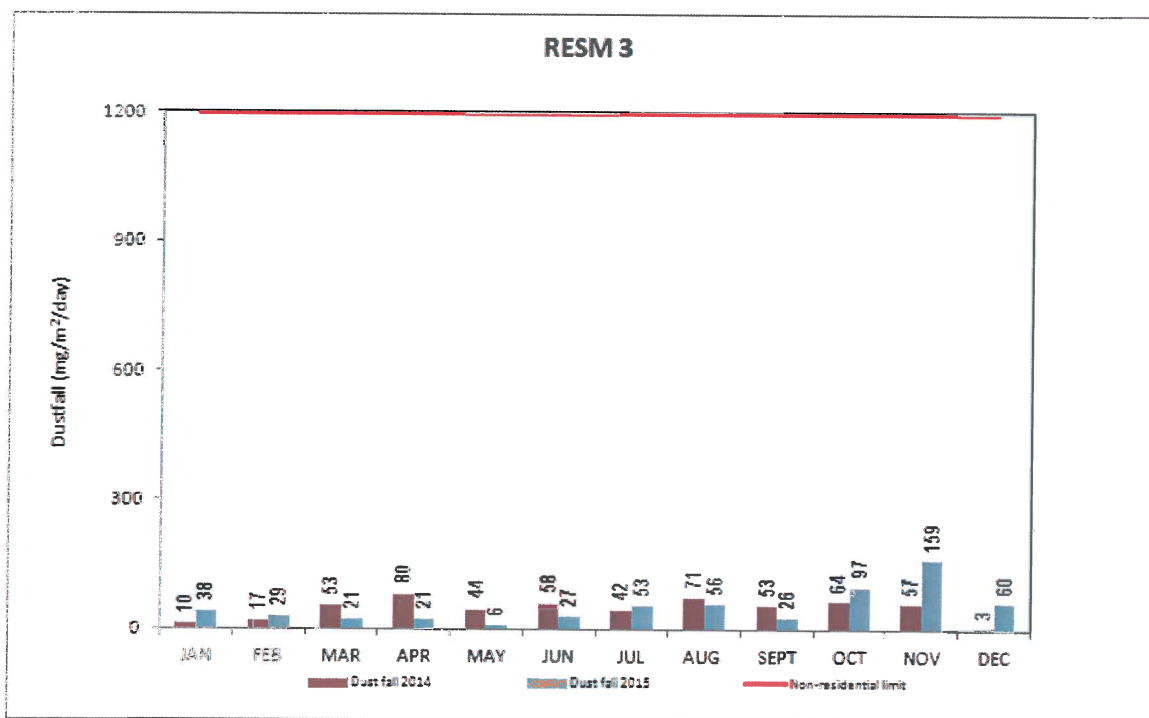
### 6.1.7 Site 7 – Resm 3

This site was commissioned in April 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. The highest dust fallout of 159 mg/m<sup>2</sup>/day was recorded during the month of November 2015. May 2015 recorded the lowest dust fall rate at 6 mg/m<sup>2</sup>/day.

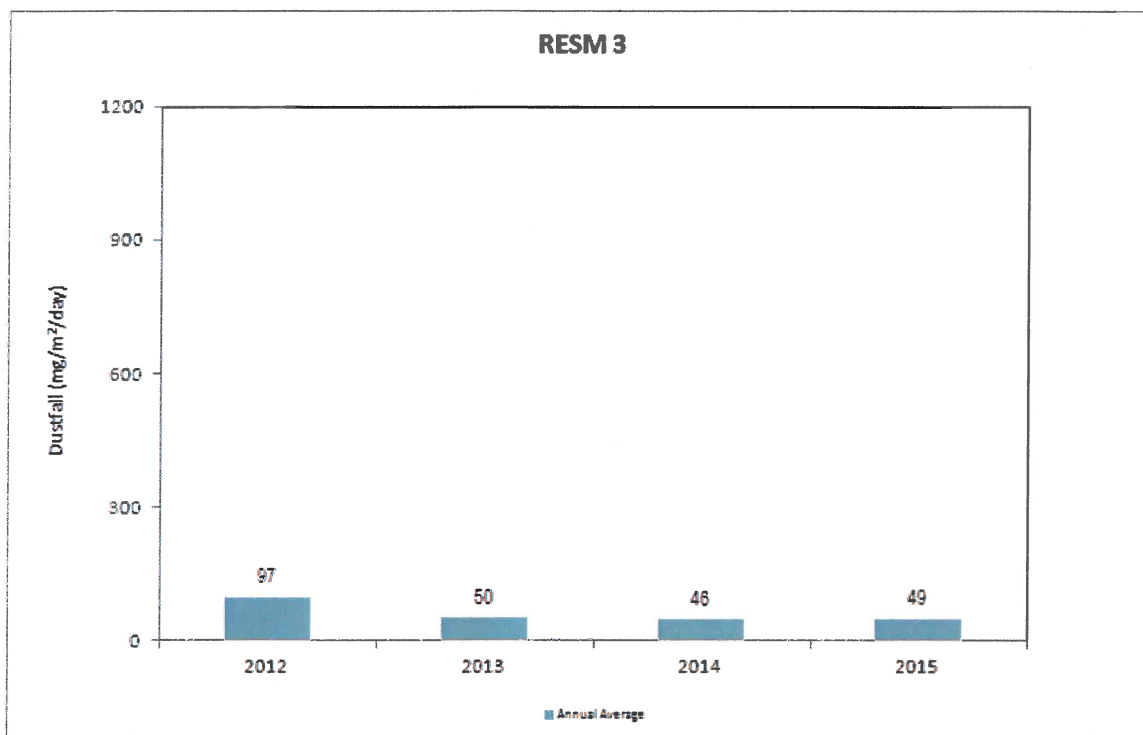
The results for 2014 are included to show the trend in dust fallout from the previous year. All the 2015 months experienced dust fallout equivalent to the 2014 results.

Figure 21: Dust fall rates recorded for Site 7 (Resm 3) for January to December 2015.



Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2012 at 97 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2014 at 46 mg/m<sup>2</sup>/day.

Figure 22: Annually averaged dust fallout at Site 7 (Resm 3) from 2012 to 2015



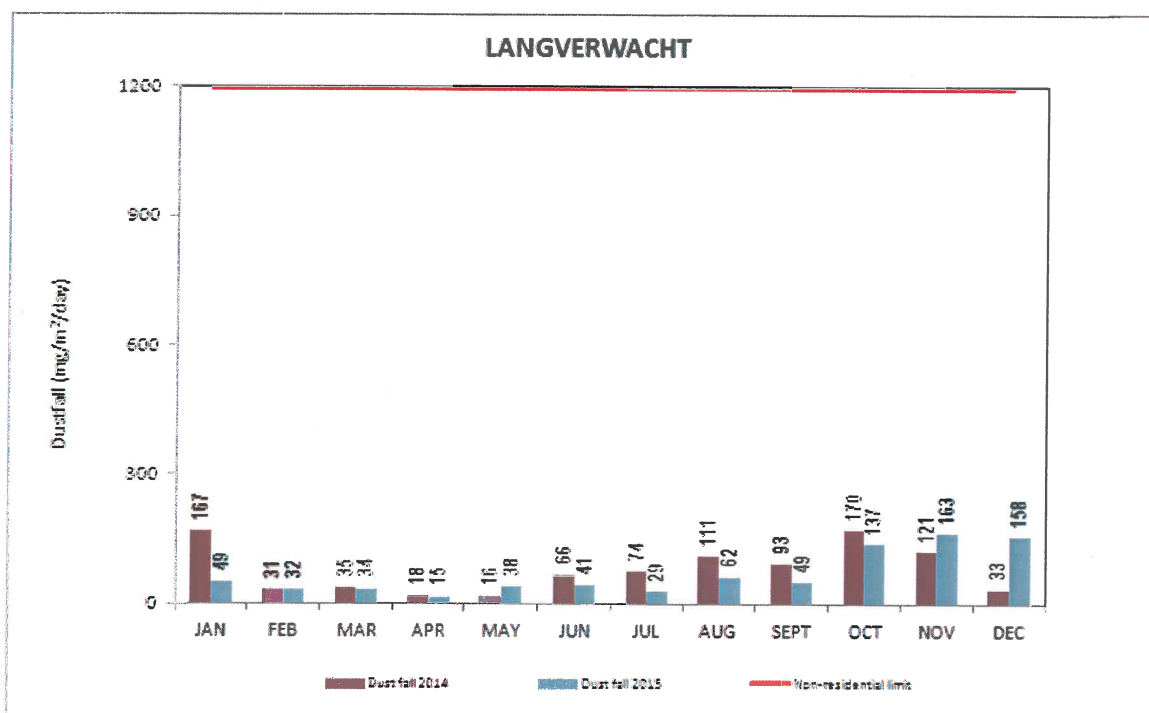
### 6.1.8 Site 8 - Langverwacht

This site was commissioned in April 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. The month of November 2015 recorded the highest dust fall rate at 163 mg/m<sup>2</sup>/day while April 2015 recorded the lowest dust fall rate at 15 mg/m<sup>2</sup>/day.

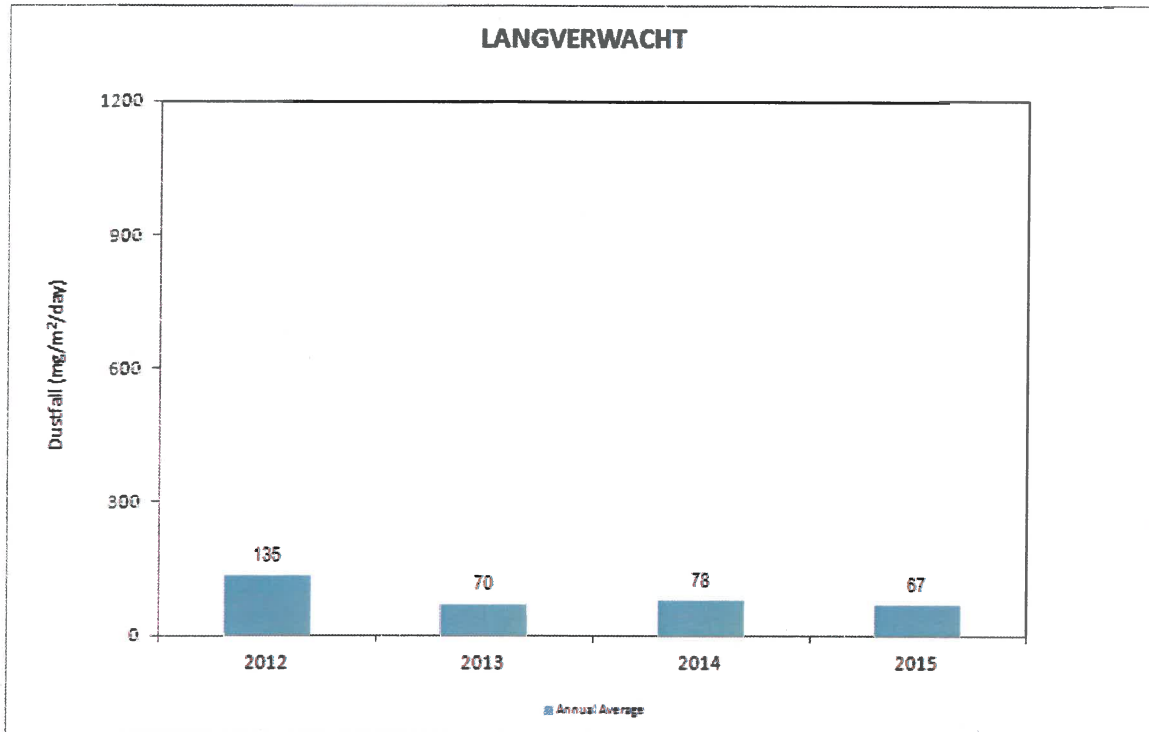
The results for 2014 are included to show the trend in dust fallout from the previous year. All the 2015 months experienced dust fallout equivalent to the 2014 results.

Figure 23: Dust fall rates recorded for Site 8 (Langverwacht) for January to December 2015.



Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2012 at 135 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2015 at 67 mg/m<sup>2</sup>/day.

Figure 24: Annually averaged dust fallout at Site 8 (Langverwacht) from 2012 to 2015



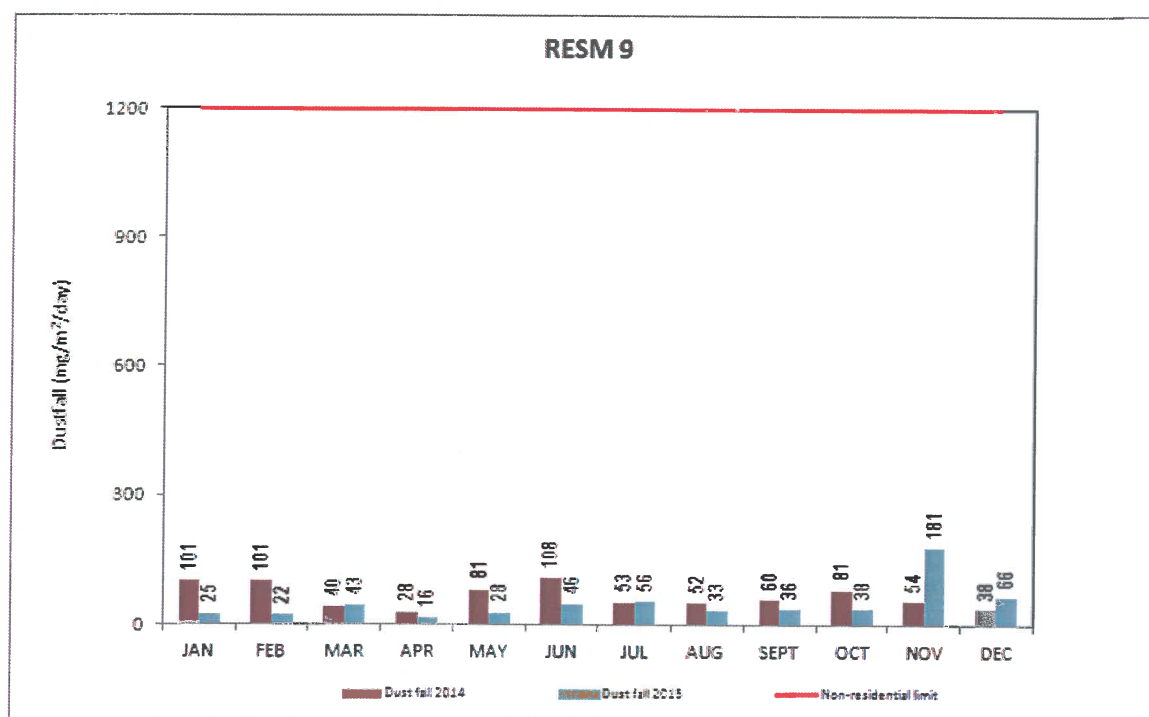
### 6.1.9 Site 9 – Resm 9

This site was commissioned in April 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. The month of November 2015 recorded the highest dust fall rate at 181 mg/m<sup>2</sup>/day while April 2015 recorded the lowest dust fall rate at 16 mg/m<sup>2</sup>/day.

The results for 2014 are included to show the trend in dust fallout from the previous year. All the 2015 months experienced dust fallout equivalent to the 2014 results.

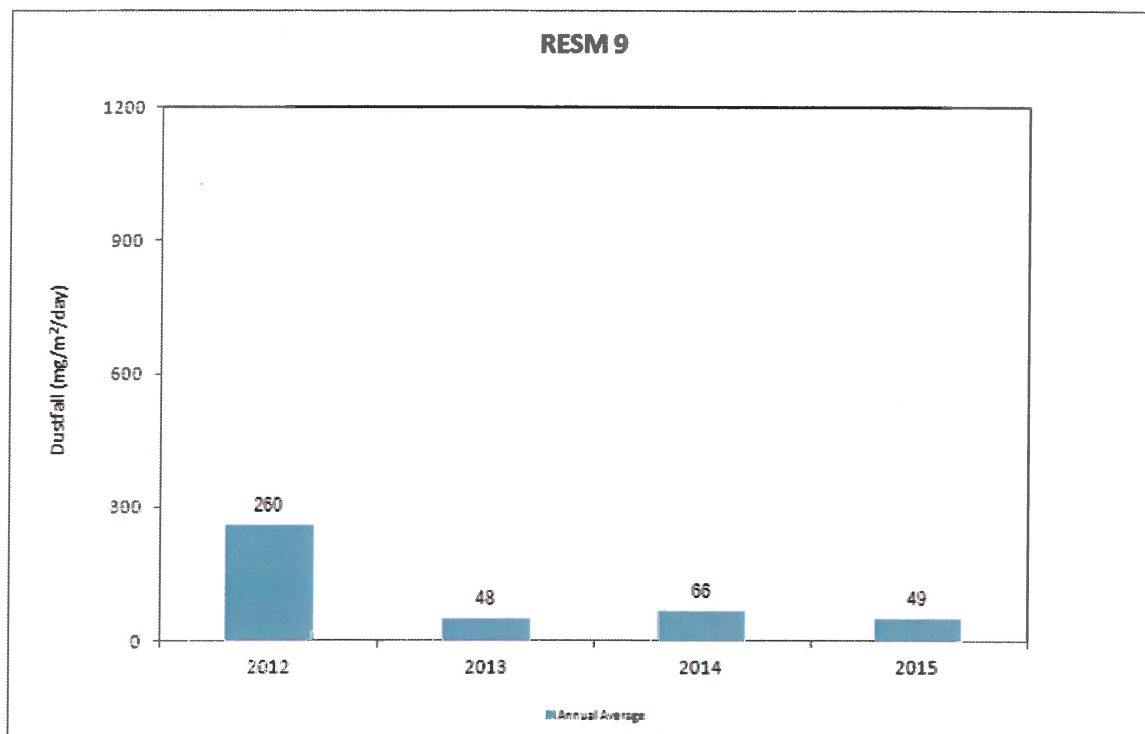
Figure 25: Dust fall rates recorded for Site 9 (Resm 9) for January to December 2015.





Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2012 at 260 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2013 at 48 mg/m<sup>2</sup>/day.

Figure 26: Annually averaged dust fallout at Site 9 (Resm 9) from 2012 to 2015



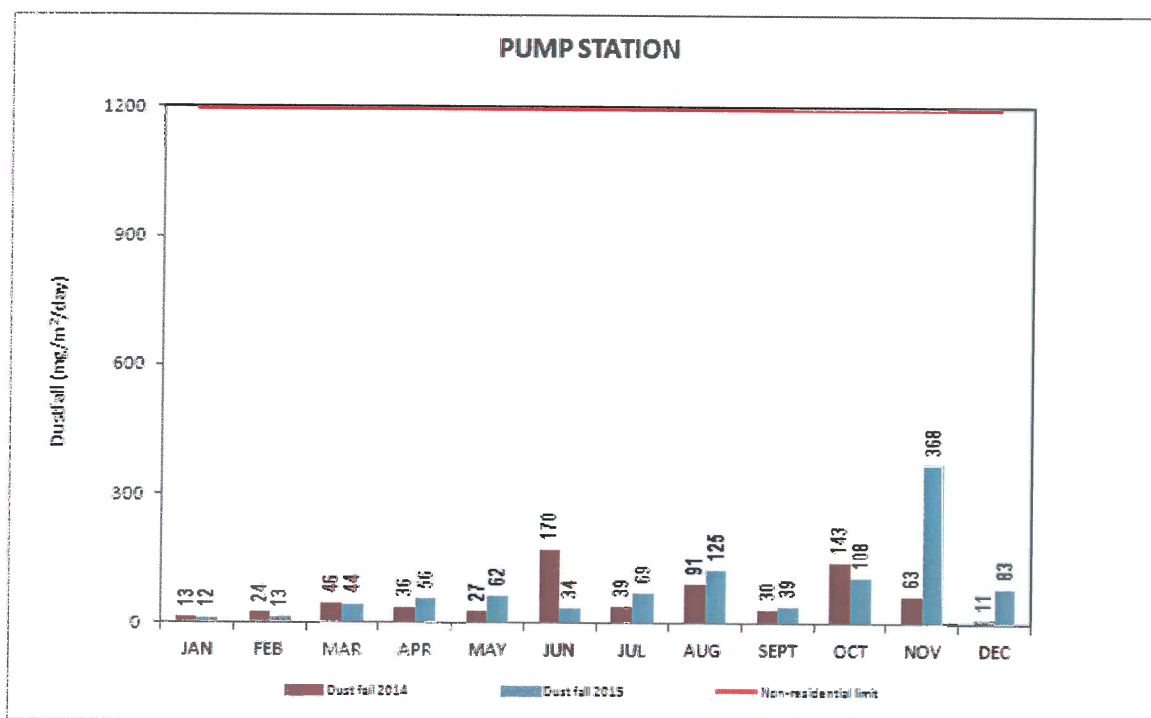
### 6.1.10 Site 10 – Pump Station

This site was commissioned in April 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. The month of November 2015 recorded the highest dust fall rate at 368 mg/m<sup>2</sup>/day while January 2015 recorded the lowest dust fall rate at 12 mg/m<sup>2</sup>/day.

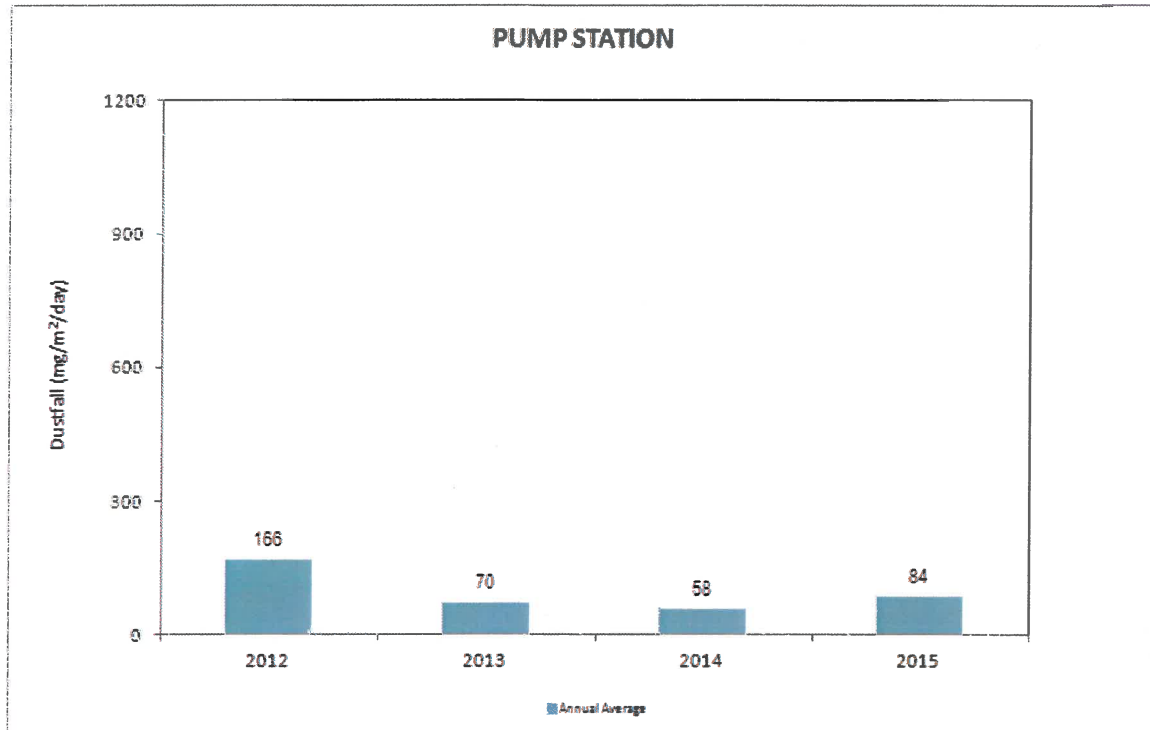
November 2015 recorded a significant increase in dust fallout compared to the 2014 results. All the remaining months recorded dust fallout equivalent to the 2014 results.

Figure 27: Dust fall rates recorded for Site 10 (Pump Station) for January to December 2015.



Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2012 at 166 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2014 at 58 mg/m<sup>2</sup>/day.

Figure 28: Annually averaged dust fallout at Site 10 (Pump Station) from 2012 to 2015



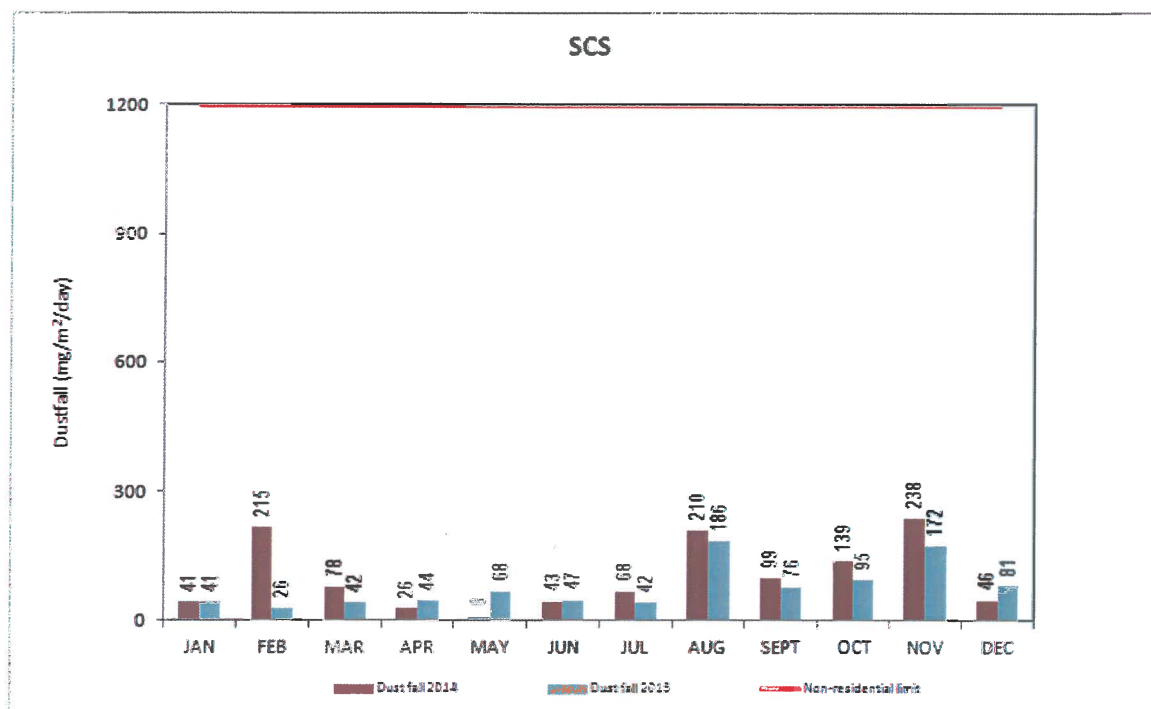
### 6.1.11 Site 11 - SCS

This site was commissioned in April 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015 all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. The month of August 2015 recorded the highest dust fall rate at 186 mg/m<sup>2</sup>/day while February 2015 recorded the lowest dust fall rate at 26 mg/m<sup>2</sup>/day.

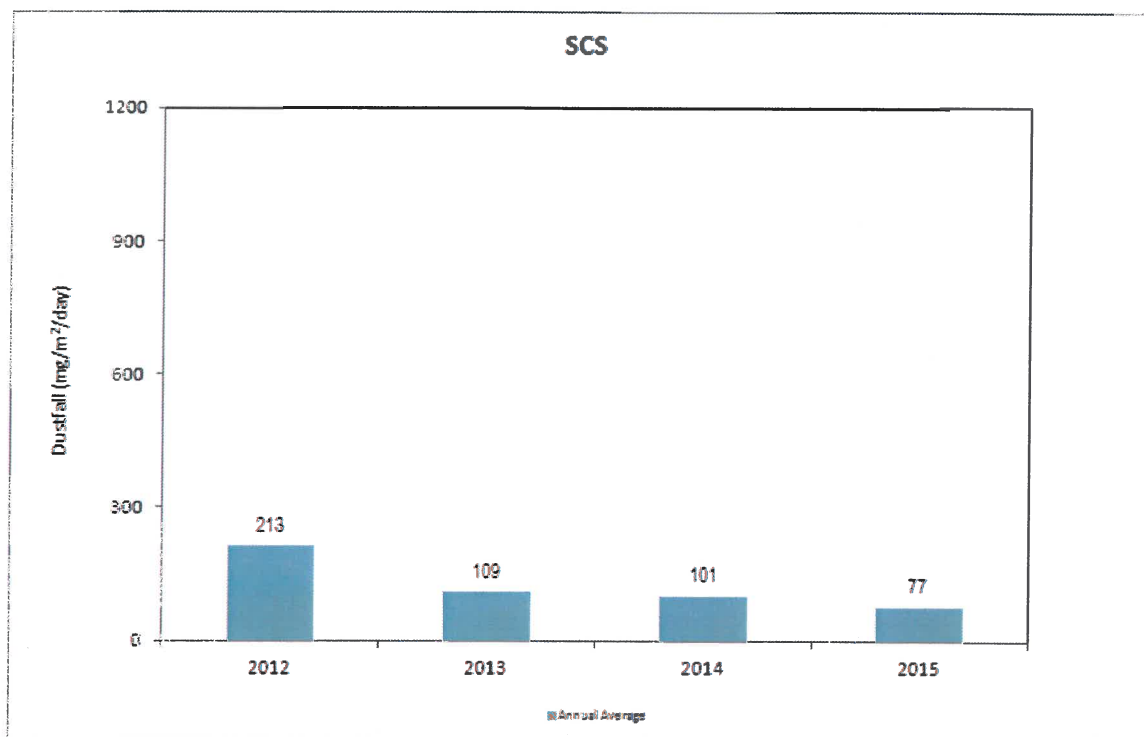
The results for 2014 are included to show the trend in dust fallout from the previous year. All the 2015 months experienced dust fallout equivalent to the 2014 results.

Figure 29: Dust fall rates recorded for Site 11 (SCS) for January to December 2015.



Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2012 at 213 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2015 at 77 mg/m<sup>2</sup>/day.

Figure 30: Annually averaged dust fallout at Site 11 (SCS) from 2012 to 2015





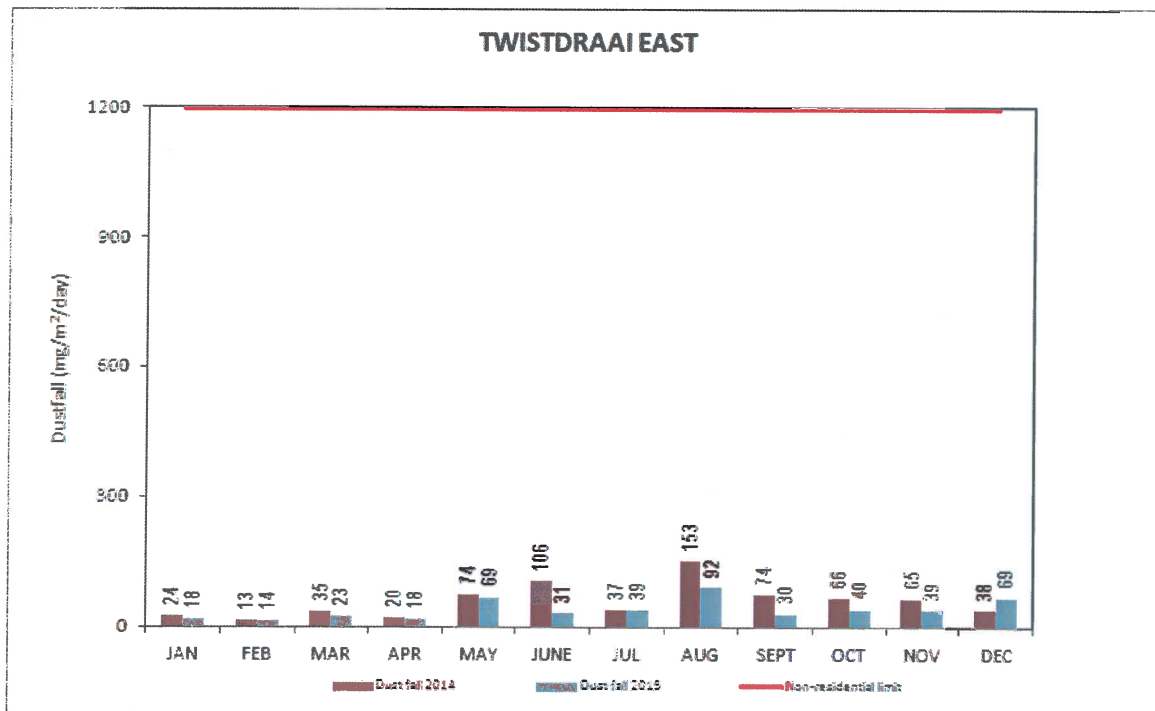
### 6.1.12 Site 12 – Twistdraai East

This site was commissioned in April 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. The month of August 2015 recorded the highest dust fall rate at 92 mg/m<sup>2</sup>/day while the month of February 2015 recorded the lowest dust fall rate at 14 mg/m<sup>2</sup>/day.

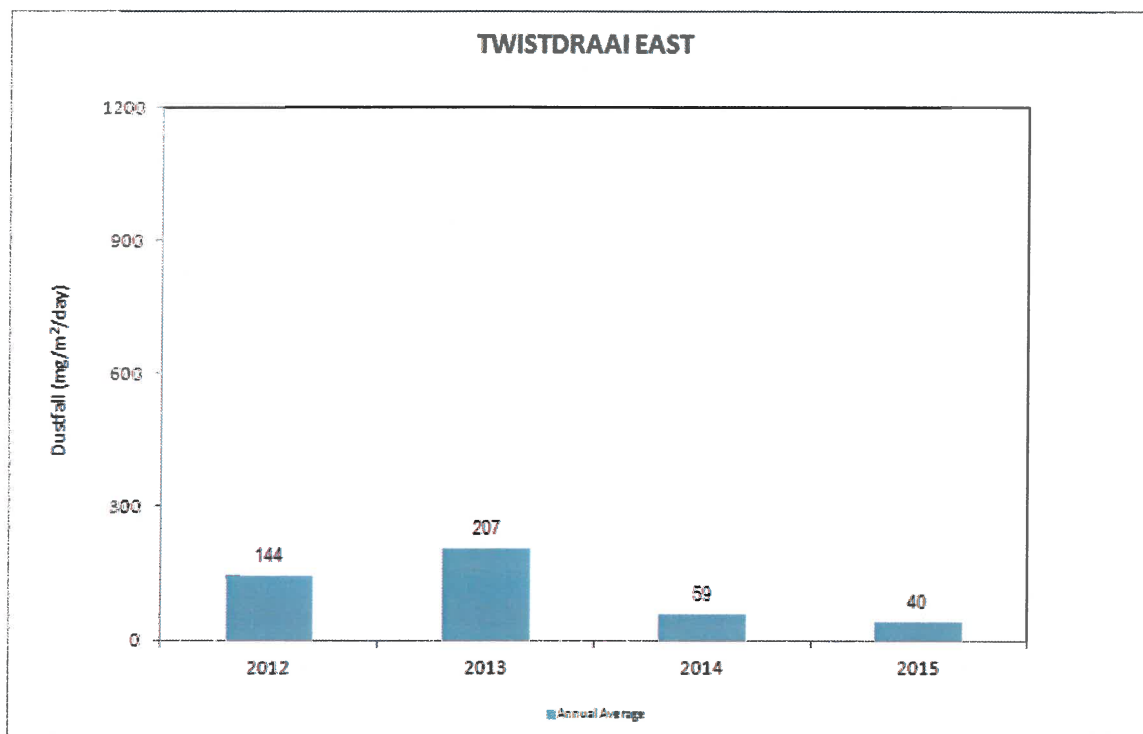
The results for 2014 are included to show the trend in dust fallout from the previous year. All the 2015 months experienced dust fallout equivalent to the 2014 results.

Figure 31: Dust fall rates recorded for Site 12 (Twistdraai Mine) for January to December 2015.



Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2013 at 207 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2015 at 40 mg/m<sup>2</sup>/day.

Figure 32: Annually averaged dust fallout at Site 12 (Twistdraai East Mine) from 2012 to 2015



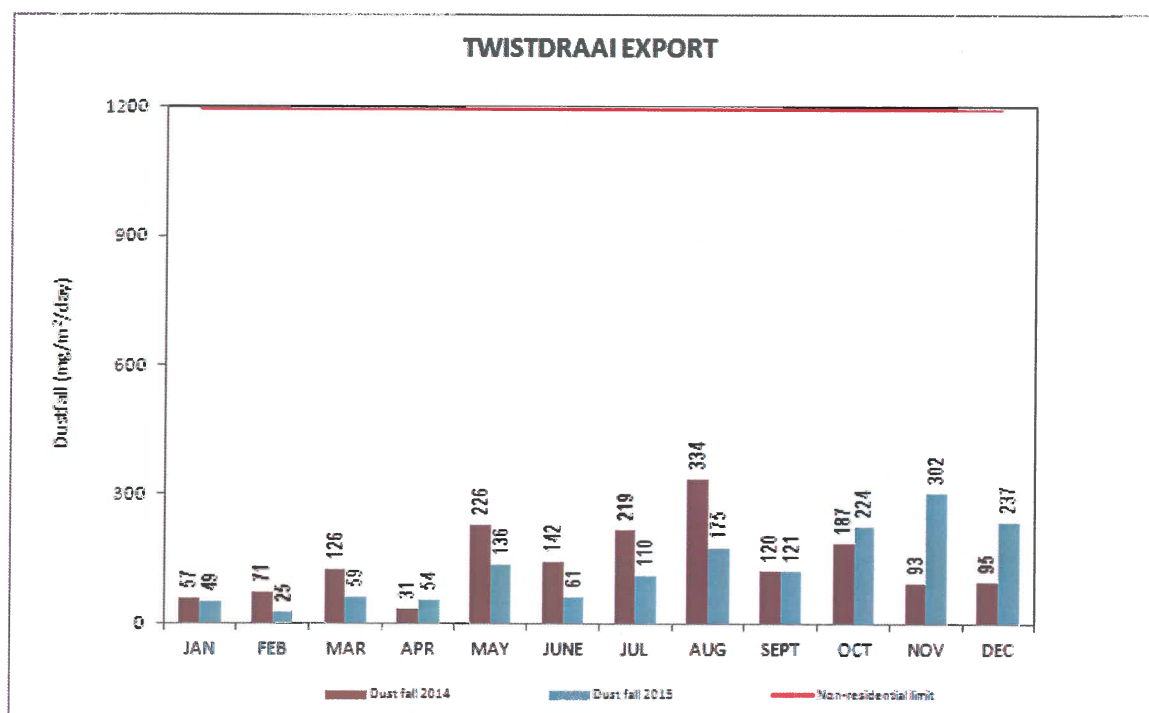
### 6.1.13 Site 13 – Twistdraai Export

This site was commissioned in April 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. The month of November 2015 recorded the highest dust fall rate at 302 mg/m<sup>2</sup>/day while the month of February 2015 recorded the lowest dust fall rate at 25 mg/m<sup>2</sup>/day.

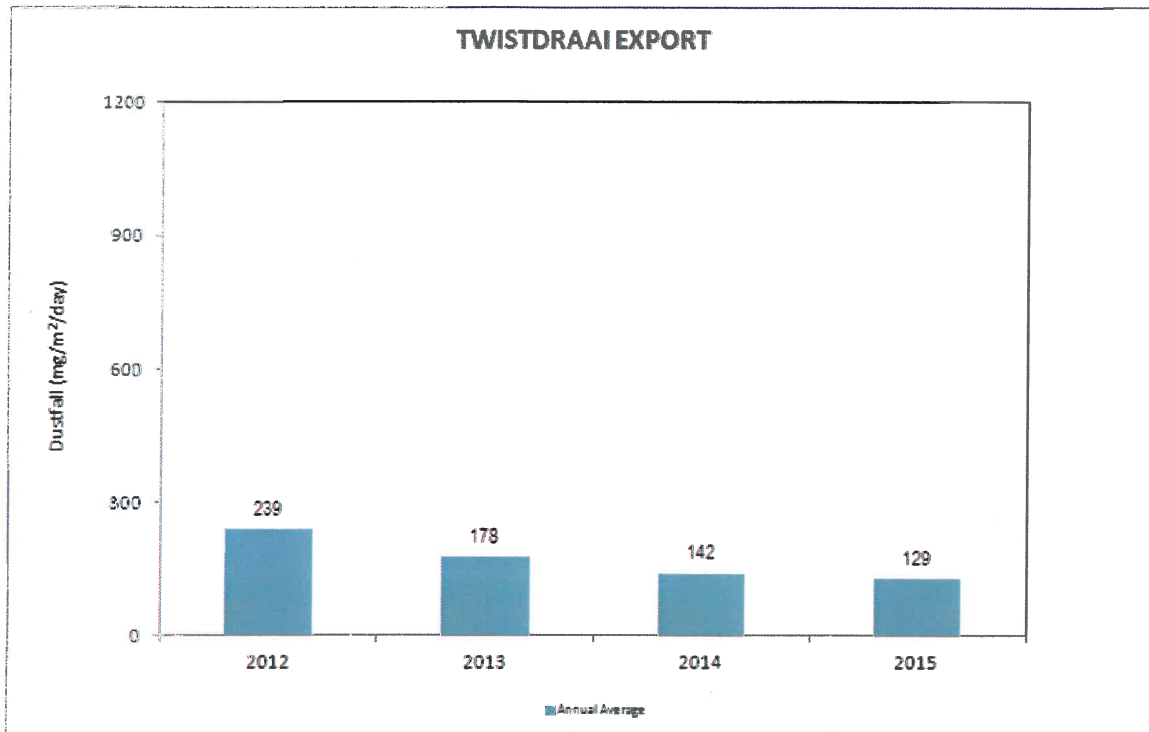
November 2015 recorded a significant increase in dust fallout compared to the 2014 results. All the remaining months recorded dust fallout equivalent to the 2014 results.

Figure 33: Dust fall rates recorded for Site 13 (Twistdraai Export) for January to December 2015.



Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2012 at 239 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2015 at 129 mg/m<sup>2</sup>/day.

Figure 34: Annually averaged dust fallout at Site 13 (Twistdraai Export) from 2012 to 2015



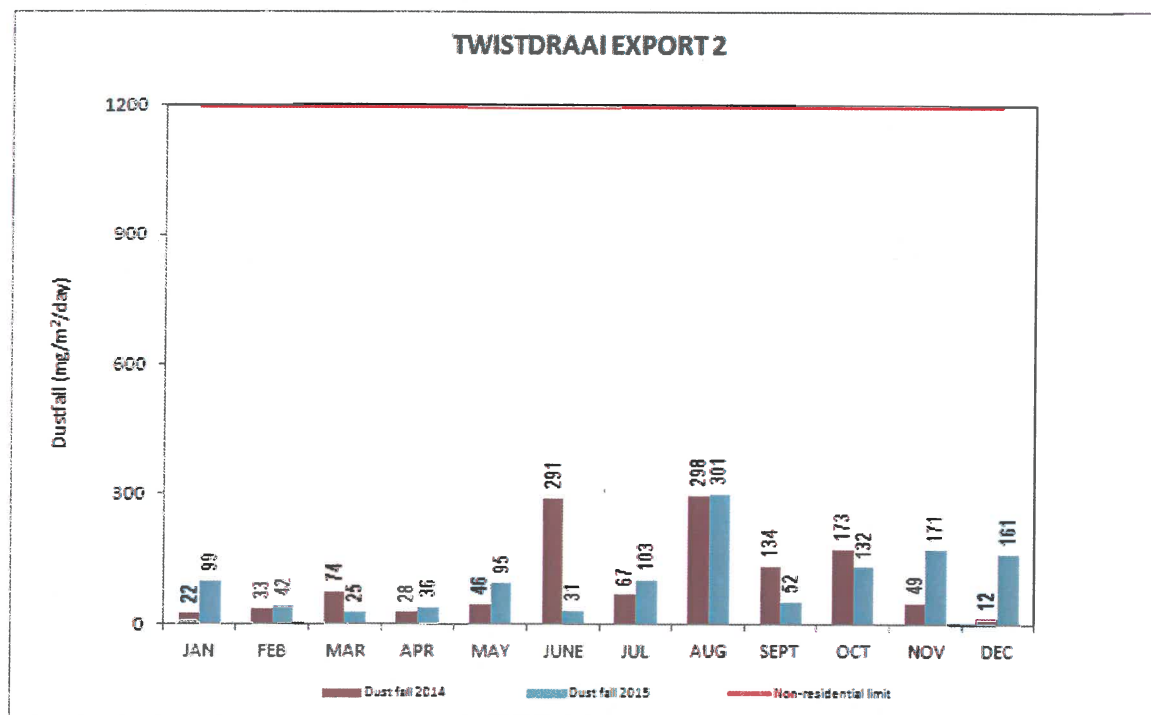
### 6.1.14 Site 14 – Twistdraai Export 2

This site was commissioned in October 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. August 2015 recorded the highest dust fallout at 301 mg/m<sup>2</sup>/day. March 2015 recorded the lowest dust fall rate at 25 mg/m<sup>2</sup>/day.

June 2015 recorded a significant decrease in dust fallout compared to the 2014 results. All the remaining months recorded dust fallout equivalent to the 2014 results.

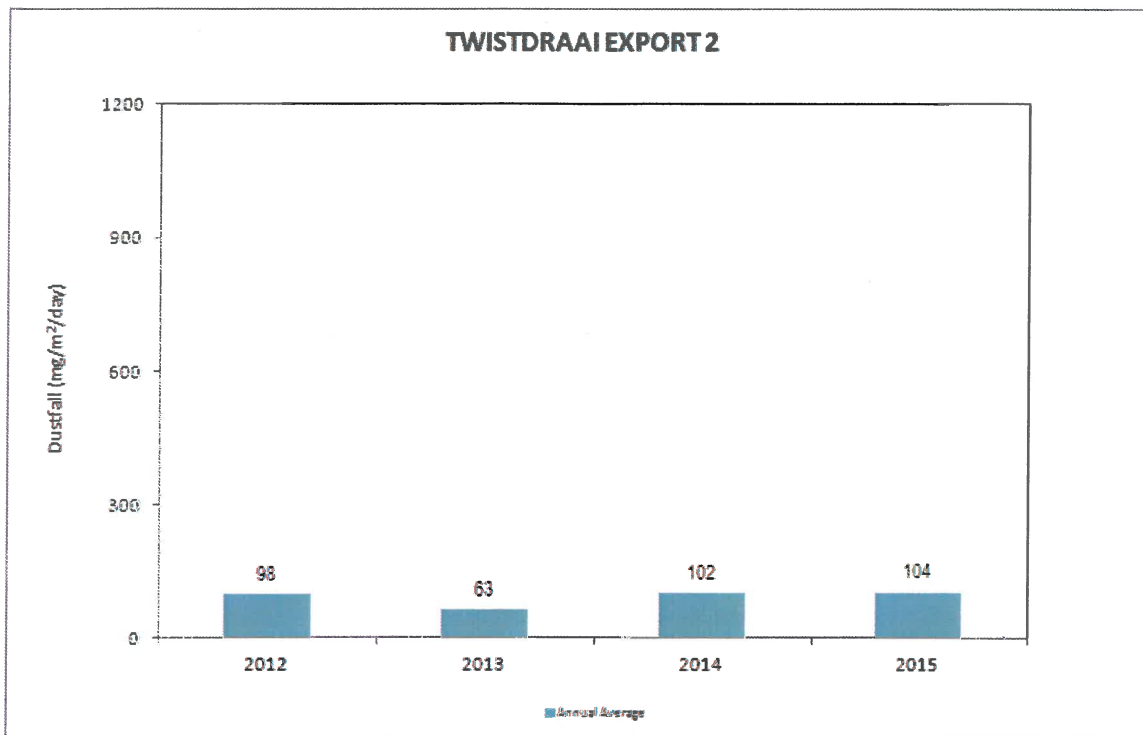
Figure 35: Dust fall rates recorded for Site 14 (Twistdraai Export 2) for January to December 2015.





Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2015 at 104 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2013 at 63 mg/m<sup>2</sup>/day.

Figure 36: Annually averaged dust fallout at Site 14 (Twistdraai Export 2) from 2012 to 2015



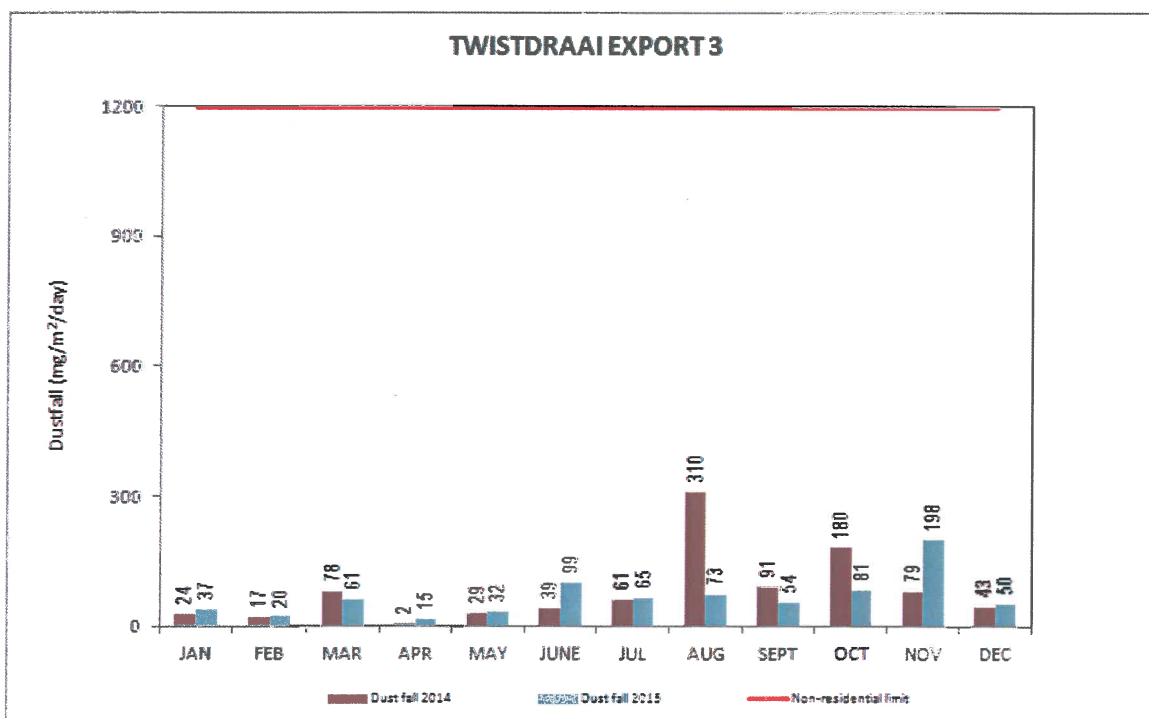
### 6.1.15 Site 15 – Twistdraai Export 3

This site was commissioned in October 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. The month of November 2015 recorded the highest dust fall rate at 198 mg/m<sup>2</sup>/day while the month of April 2015 recorded the lowest dust fall rate at 15 mg/m<sup>2</sup>/day.

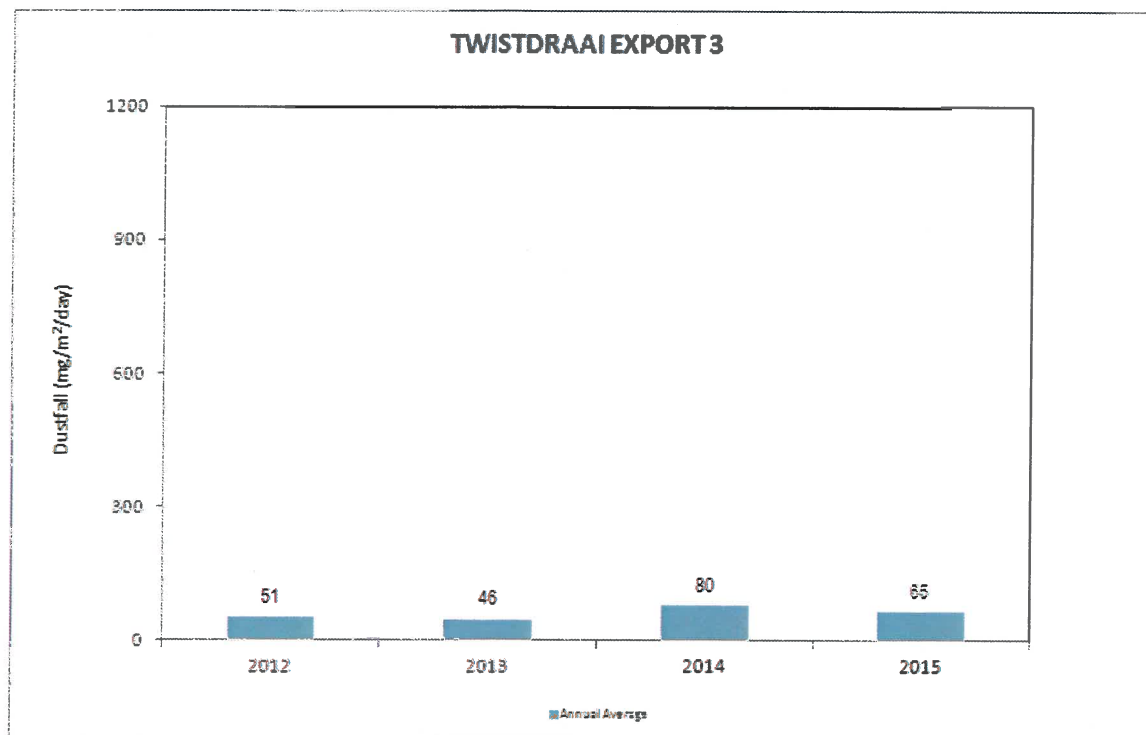
August 2015 recorded a significant decrease in dust fallout compared to the 2014 results. All the remaining months recorded dust fallout equivalent to the 2014 results.

Figure 37: Dust fall rates recorded for Site 15 (Twistdraai Export 3) for January to December 2015.



Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2014 at 80 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2013 at 46 mg/m<sup>2</sup>/day.

Figure 38: Annually averaged dust fallout at Site 15 (Twistdraai Export 3) from 2012 to 2015



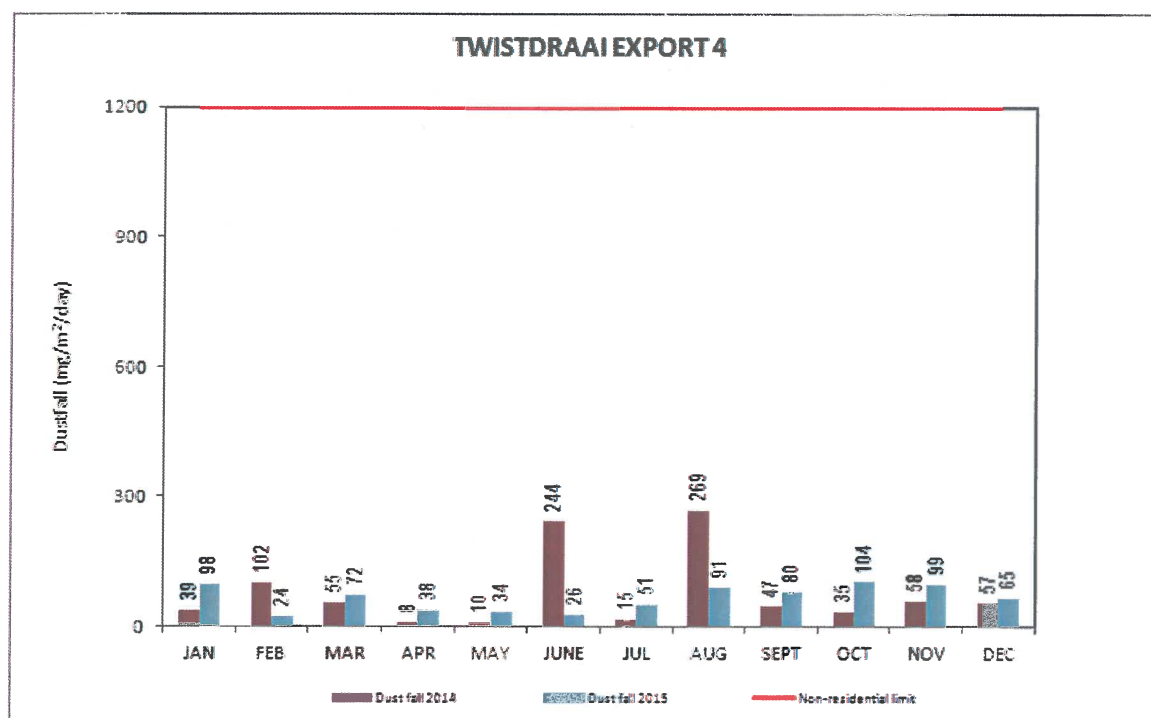
### 6.1.16 Site 16 – Twistdraai Export 4

This site was commissioned in October 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. The highest dust fall rate was recorded in October 2015 at 104 mg/m<sup>2</sup>/day. February 2015 recorded the lowest dust fallout at 24 mg/m<sup>2</sup>/day.

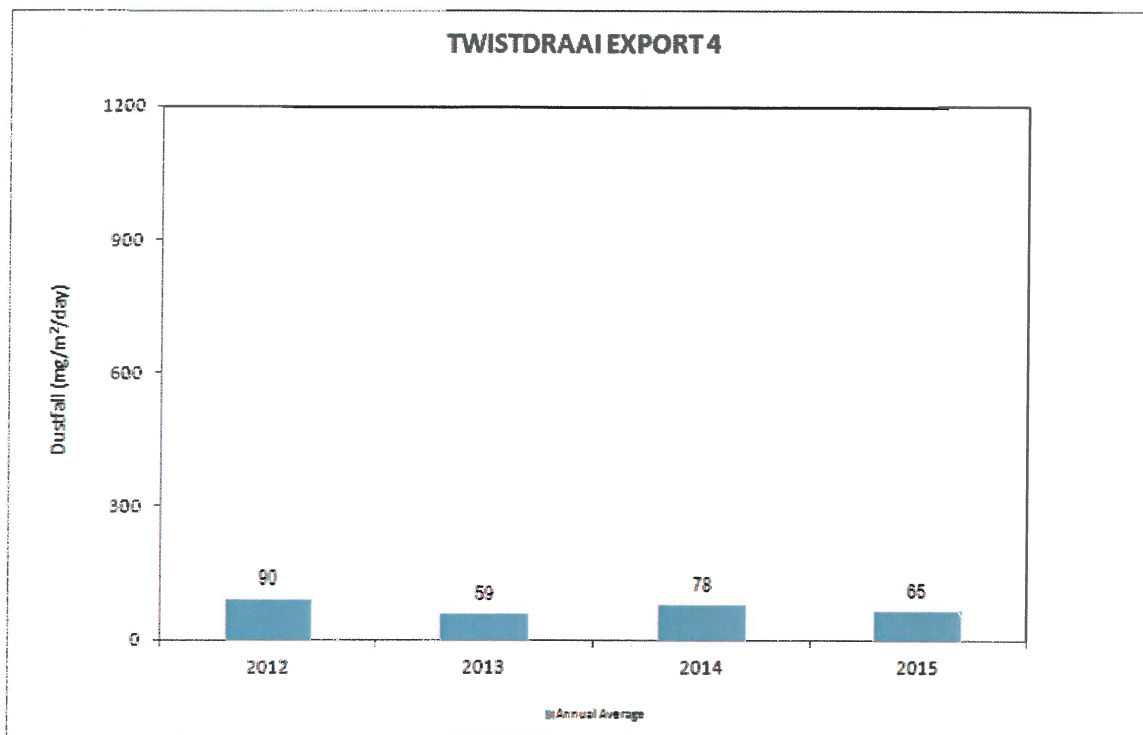
June 2015 recorded a significant decrease in dust fallout compared to the 2014 result. All the remaining months recorded dust fallout equivalent to the 2014 results.

Figure 39: Dust fall rates recorded for Site 16 (Twistdraai Export 4) for January to December 2015.



Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2012 at 90 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2013 at 59 mg/m<sup>2</sup>/day.

Figure 40: Annually averaged dust fallout at Site 16 (Twistdraai Export 4) from 2012 to 2015



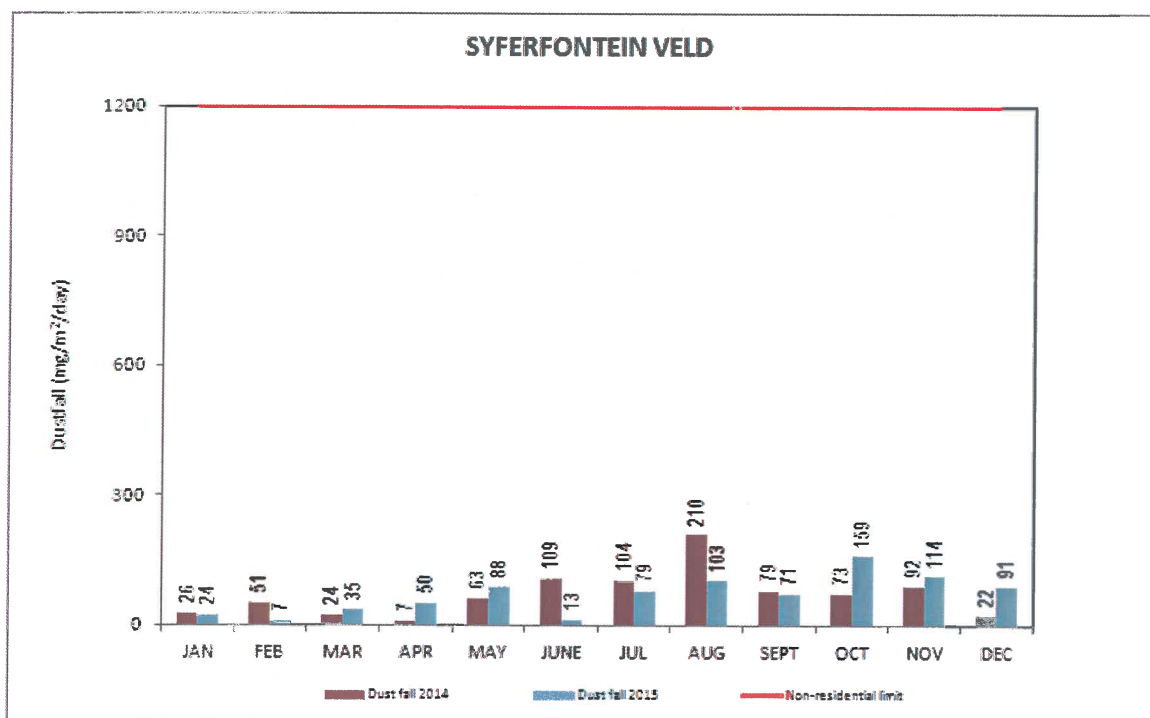
### 6.1.17 Site 17 – Syferfontein Veld

This site was commissioned in May 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. October 2015 recorded the highest dust fallout at 159 mg/m<sup>2</sup>/day. The month of February 2015 recorded the lowest dust fallout at 7 mg/m<sup>2</sup>/day.

The results for 2014 are included to show the trend in dust fallout from the previous year. All the 2015 months experienced dust fallout equivalent to the 2014 results.

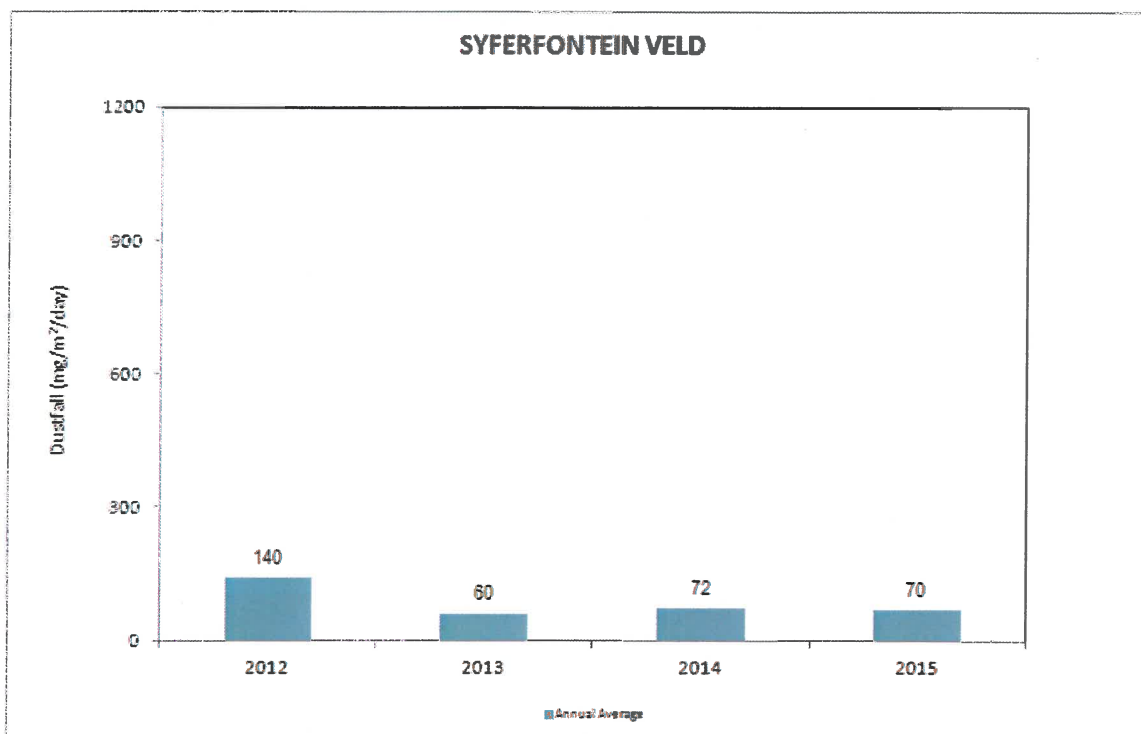
Figure 41: Dust fall rates recorded for Site 17 (Syferfontein Veld) for January to December 2015.





Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2012 at 140 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2013 at 60 mg/m<sup>2</sup>/day.

Figure 42: Annually averaged dust fallout at Site 17 (Syferfontein Veld) from 2012 to 2015



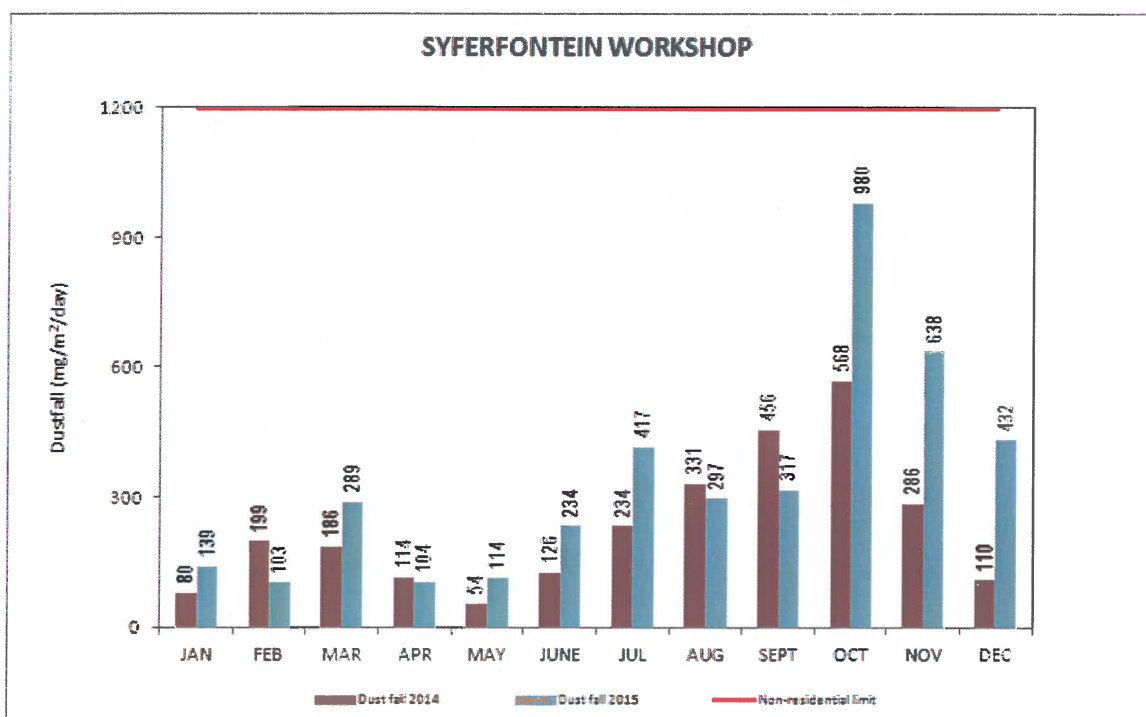
### 6.1.18 Site 18 – Syferfontein Workshop

This site was commissioned in May 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. The month of October 2015 recorded the highest dust fall rate at 980 mg/m<sup>2</sup>/day, while February 2015 recorded the lowest dust fallout at 103 mg/m<sup>2</sup>/day.

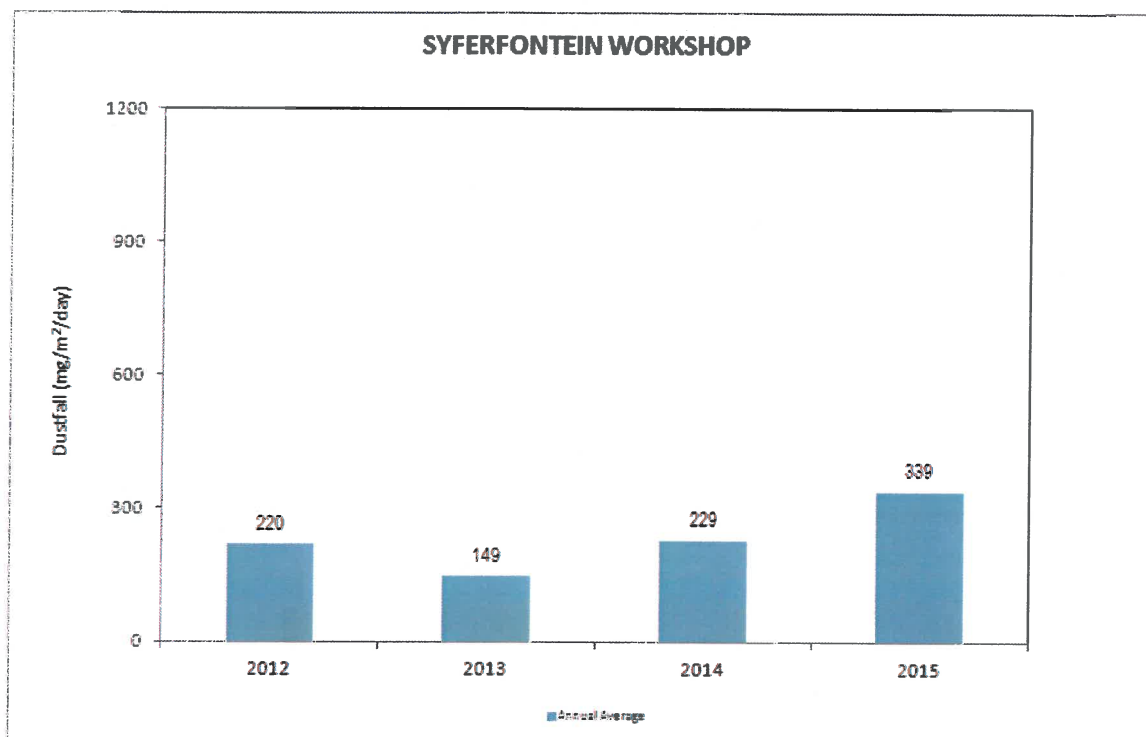
October, November and December 2015 recorded significant increase in dust fallout compared to the 2014 results. All the remaining months recorded dust fallout equivalent to the 2014 results.

Figure 43: Dust fall rates recorded for Site 18 (Syferfontein Workshop) for January to December 2015.



Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2015 at 339 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2013 at 149 mg/m<sup>2</sup>/day.

Figure 44: Annually averaged dust fallout at Site 18 (Syferfontein Workshop) from 2012 to 2015



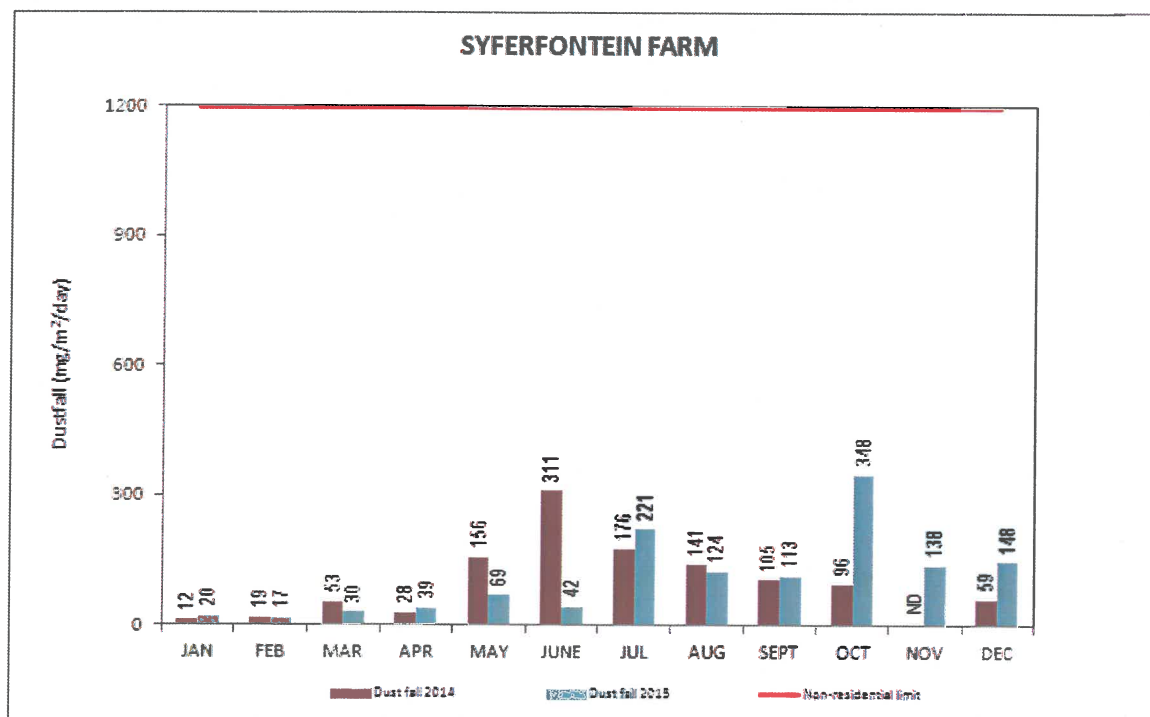
### 6.1.19 Site 19 – Syferfontein Farm

This site was commissioned in May 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. The month of October 2015 recorded the highest dust fall rate at 348 mg/m<sup>2</sup>/day, while February 2015 recorded the lowest dust fallout at 17 mg/m<sup>2</sup>/day.

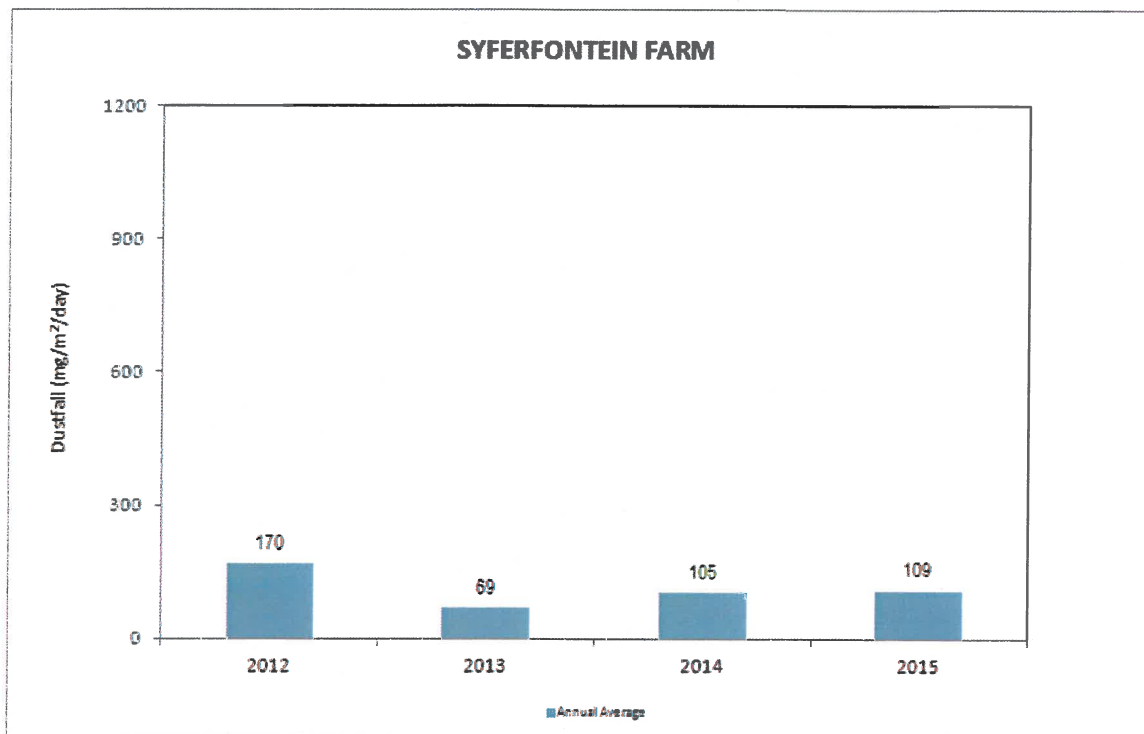
June 2015 recorded a significant decrease in dust fallout compared to the 2014 results. October 2015 recorded a significant increase in dust fallout compared to the 2014 results. All the remaining months recorded dust fallout equivalent to the 2014 results.

Figure 45: Dust fall rates recorded for Site 19 (Syferfontein Farm) for January to December 2015.



Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2012 at 170 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2013 at 69 mg/m<sup>2</sup>/day.

Figure 46: Annually averaged dust fallout at Site 19 (Syferfontein Farm) from 2012 to 2015



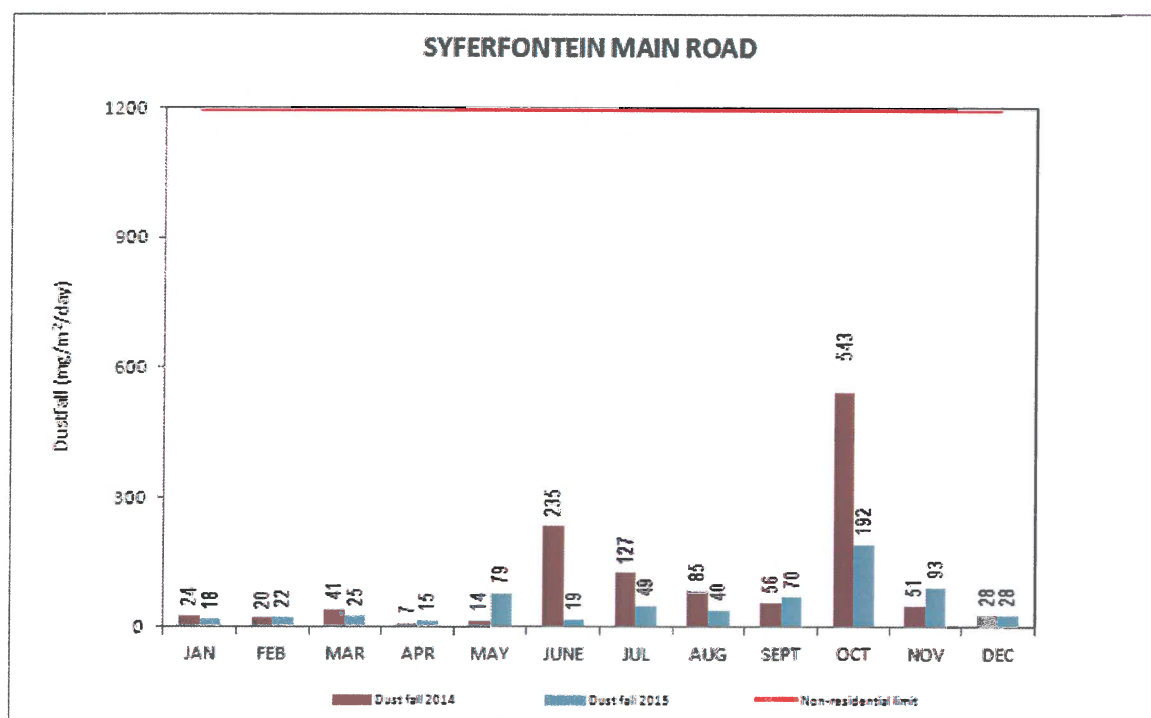
### 6.1.20 Site 20 – Syferfontein Main Road

This site was commissioned in May 2012 and is classified as a Non-residential site.

During the monitoring period of January to December 2015, all the monitoring months recorded dust fallout below the NON-RESIDENTIAL threshold limit. The month of October 2015 recorded the highest dust fall rate at 192 mg/m<sup>2</sup>/day, while April 2015 recorded the lowest dust fallout at 15 mg/m<sup>2</sup>/day.

June and October 2015 recorded significant decrease in dust fallout compared to the 2014 results. All the remaining months recorded dust fallout equivalent to the 2014 results.

Figure 47: Dust fall rates recorded for Site 20 (Syferfontein Main Road) for January to December 2015.





Annually averaged dust fallout from when monitoring began is shown below. The highest annually averaged dust fallout was recorded in 2012 at 113 mg/m<sup>2</sup>/day, while the lowest dust fall average was recorded in the year 2013 at 41 mg/m<sup>2</sup>/day.

Figure 48: Annually averaged dust fallout at Site 20 (Syferfontein Main Road) from 2012 to 2015

