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August 2020

Dust Fallout Monitoring Results Report

Site

Samancor Chrome - Middelburg Ferrochrome (MFC)
Hendrina Road, Middelburg, Mpumalanga Province

PREPARED FOR:

Samancor Chrome - Middelburg Ferrochrome (MFC)
Hendrina Road, Middelburg, Mpumalanga Province

PREPARED BY:

CJ Janse van Vuuren
For and on Behalf of EnviroNgaka (Pty) Ltd.

Reporting Year (12 Month) Period:

September-19
to
August-20

Update / Report Date:	**28-Sep-20**
Reference:	**ENVN_ASD-DFO_Samancor Chrome_MFC_AEL Report-Aug2020**
Method:	**Refer: Appendix A - Method**

Summary: Samancor Chrome, Middelburg Ferrochrome (MFC), Dust Fallout Monitoring for August 2020

EnviroNgaka was contracted to take over an established dust fallout monitoring network at the Site of Works from March 2020. 4 Dust Fallout buckets are deployed monthly at the site. 4 locations are classified as ''off-site Residential and Non-residential'' locations, and 0 locations are classified as ''on-site''. The off-site locations are classified as follows:

Residential areas: 0 locations;
Non-residential areas: 4 locations;

4 of the single stand buckets deployed on 13 August 2020 and collected on 14 September 2020 (exposed for 32 days) were sent for analysis for the August 2020 sampling campaign.

The horizontal dust flux measurements are done at locations MFC-4-D and MFC-5-D and used for % distribution estimates only.

1. Year Dust Fallout assessment of Off Site (Residential and Non-residential) Locations:

- The 4 locations classified as Residential and Non-residential are assessed for the period September 2019 up to and including August 2020 in Table 1 below.

Table 1: Year (12-Month) DFO Results : Off-Site Residential & Non-residential Locations:

Bucket Locations	Assessment of Dustfall Rates (D) against the National Dust Control Regulation and SANS1929 as a guideline		
	D > Acceptable rate; More than 2 times /year (NDCR)	D > Acceptable rate; No Sequential months (NDCR)	D > 2400; (Guideline per SANS1929)
Non-residential: MFC-3	Comply	Comply	Comply
Non-residential: MFC-4	Comply	Comply	Comply
Non-residential: MFC-5	Comply	Comply	Comply
Non-residential: MFC-7	Comply	Comply	Comply

2. Rolling Annual Average DFO rate of Locations (refer page 7):

- The rolling annual average data suggests that relative to the preceding month:

Non-residential locations: For the 4 Non-residential locations:

- None of the locations show a decrease in DFO rates;

- 4 locations show an increase in DFO rates. They are the following:
  MFC-3, MFC-4, MFC-5 and MFC-7

3. Other Comments & Comments with regards to the potential wind generated dust (refer page 9):

- The sample locations maintained or increased in DFO levels for Aug2020.
- Elevated dust fallout rates could be influenced by high wind speed incidents, the transport/handling of loose material and/or point source emissions.
- The on-site meteorological data were used for the interpretation of the data.
- Based on the Aug2020 meteorological data, it is expected that there were more occurrences of high wind speeds, when compared to that of the preceding month (174 vs 116).
- These high wind speed incidents originated mainly from the NW, N and W directions, impacting on the SE, S and E respectively.
- Location MFC-7 was added from May2020 onwards.
- All sampled Non-Residential locations fell within acceptable DFO levels during Aug2020.
- Directional buckets indicate contributions for MFC-4-D, North (18%), East (15%), South (19%) and West (48%) and at MFC-5-D, North (27%), East (34%), South (20%) and West (19%) during Aug2020.
- MFC-7-D was not exchanged for Aug2020.

Dust Fallout Monitoring Results Report

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Dust Fallout / Dustfall Rate Monitoring - Regulations and Guidelines

Average dust fallout / dustfall rates are monitored on a monthly basis based on the American Society for Testing and Materials Standard Test Method (ASTM) for Collection and Measurement of Dustfall (Settleable Particulate Matter) (ASTM D1739: 1970 or amended per 1998 (2010)) method, detailed in Appendix A.

This report will contain results of monthly dustfall rates (including results for the 11 previous sampling campaigns) determined at specific locations on and around the site. The results are assessed for compliance against the National Dust Control Regulation (GN827, 01Nov2013) and guidelines as contained in the South African National Standards (SANS 1929), where applicable.

a) Evaluation criteria for dustfall rates

Dustfall / dust fallout (dust deposition) rates shall be expressed in units of mg/m²/day over a 30 day averaging period and assessed as referred below:

Four-band scale evaluation criteria for dustfall rates:

Band number	Band description label	Dustfall rate, *D* (mg/m²/day, 30 day average)	Comment
1	**Residential**	***D* < 600**	**Per Table 1 of National Dust Control Regulation (GN827)**
2	**Non-residential**	**600 < *D* < 1 200**	**Per Table 1 of National Dust Control Regulation (GN827)**
3	Action	1 200 < *D* < 2 400	Guideline per SANS1929: Requires investigation and remediation if two sequential months lie in this band, or more than three occur in a year.
4	Alert	2 400 < *D*	Guideline per SANS1929: Immediate action and remediation required following the first incidence of the dustfall rate being exceeded. Incident report to be submitted to the relevant authority.

b) Target, action and alert thresholds

Target, action and alert thresholds for ambient dust deposition are provided below.

Target, action and alert thresholds for dust deposition

Level	Dustfall rate, *D* (mg/m²/day, 30 day average)	Averaging period	Comment
Target	300	Annual	Guideline per SANS1929
Residential	**D < 600**	**30 days**	**Per Table 1 of National Dust Control Regulation (GN827): Two within any year, no two sequential months.**
Non-residential	**D < 1200**	**30 days**	**Per Table 1 of National Dust Control Regulation (GN827): Two within any year, no two sequential months.**
Alert threshold	2 400	30 days	Guideline per SANS1929: No exceedences. First incidence of dustfall rate being exceeded requires remediation and compulsory report to the relevant authorities.

c) Residential versus Non-Residential Areas:

The National Dust Control Regulation defines that area classification should be done per the local town planning scheme, i.e. if an area is not classified as residential per the local town planning scheme, the area should be classified as non-residential.

In this report and assessment, for the purpose of assessing more conservatively, where a bucket is located in an area which is/might be classified as non-residential per the local town planning scheme, but people reside in the area, the area will be considered to be "Residential".

Dust Fallout Monitoring: Overview

a. Introduction

EnviroNgaka was contracted to take over an established dust fallout monitoring network at the Site of Works from March 2020. The buckets are located On Site and at areas surrounding the Site of Works (interpreted as "Off Site"). A list of the buckets can be found in Section 3.3-4 of this report. There are three single stand locations and two multi-directional stands used for % distribution estimates only.

Dust fallout rates are monitored over a 30-day period in accordance with the requirements of the National Dust Control Regulation, GN 827, 01 November 2013 and SANS1929 per ASTM D1739 (A more detailed description of the methodology can be referred to in "Appendix A - Method" of this report).

This report provides the dustfall / dust fallout (DFO) monitoring results over a rolling 12-month period, with interpretation thereof in terms of meteorological conditions and other matters as far as possible.

All locations nearest to the fence line and not located near a source are assessed as Off-Site and interpreted against "Non-residential" guidelines, except for those located in a Residential area which are classified as Residential. Locations within an operational area or directly adjacent to it are deemed "On-Site" for internal dust control purposes and not assessed against the NDCR, but against SANS1929 as a benchmark.

b. Comments on 12-Month DFO Results : Residential & Non-Residential Locations:

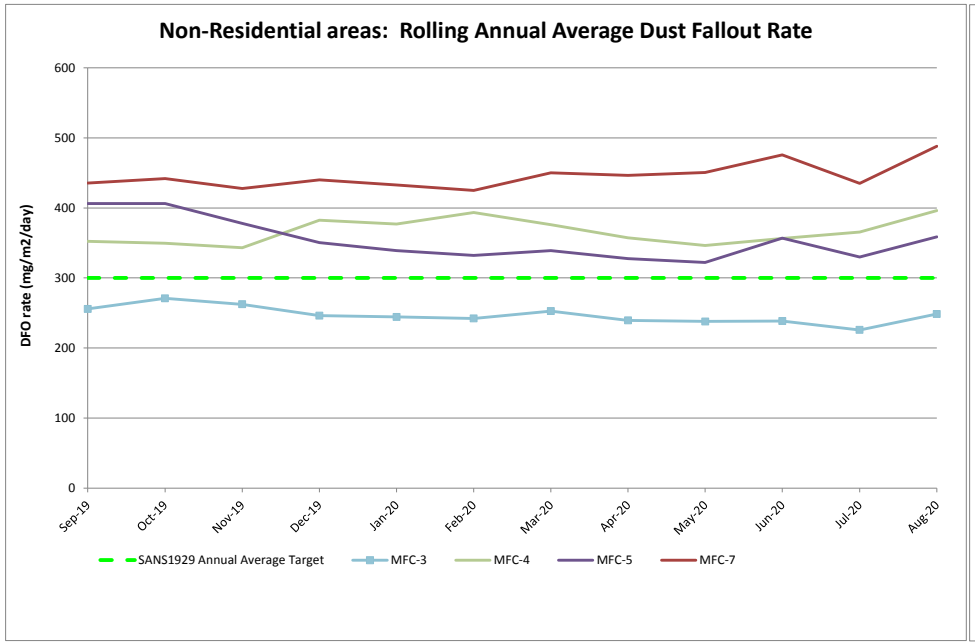
Dust Bucket Location	Assessment of Dustfall Rates (D) against the National Dust Control Regulation and SANS1929 as a guideline (mg/m²/day, 30day average in accordance with ASTM D1739)				Approximate Bearing		Distance from Site Center (km)
	D > Acceptable rate; More than 2 times /year (NDCR)	D > Acceptable rate; No Sequential months (NDCR)	D > 2400; (Guideline per SANS1929)	Comments			
Non-residential: MFC-3	Comply	Comply	Comply	**Aug 2020 up from Jul 2020. The annual average DFO rate of 249 mg/m²/day is below the SANS1929 target level of 300 mg/m²/day.**	S	181.6	1.550
Non-residential: MFC-4	Comply	Comply	Comply	**Aug 2020 down from Jul 2020. The annual average DFO rate of 396 mg/m²/day is currently higher than the SANS1929 target level of 300 mg/m²/day.**	SW	217.6	0.760
Non-residential: MFC-5	Comply	Comply	Comply	**Aug 2020 up from Jul 2020. The annual average DFO rate of 359 mg/m²/day is currently higher than the SANS1929 target level of 300 mg/m²/day.**	W	277.7	0.830
Non-residential: MFC-7	Comply	Comply	Comply	**Aug 2020 up from Jul 2020. The annual average DFO rate of 488 mg/m²/day is currently higher than the SANS1929 target level of 300 mg/m²/day.**	NW	318.3	1.280

d. General Comments - Specific to: **August-20**

d.1 4 of the buckets deployed on 13 August 2020 and collected on 14 September 2020 (exposed for 32 days) were sent for analysis for the August 2020 sampling campaign.

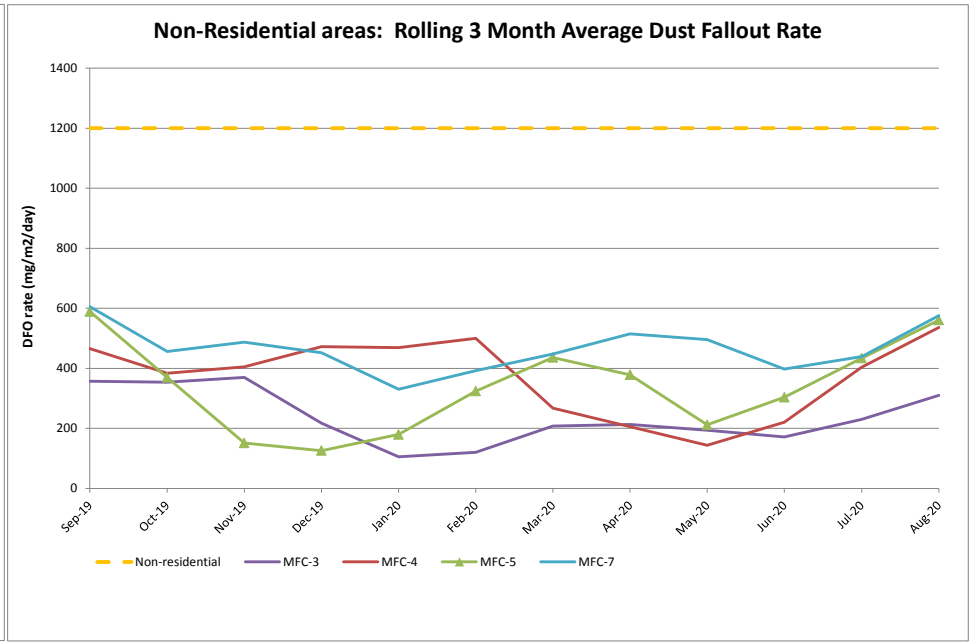
Rolling Annual Average Graphs: Dust Fallout Rates

The graphs below provide the rolling annual average Dust Fallout Rate for some key sensitive receptors.



Rolling 3 Month Average Graphs: Dust Fallout Rates

The graphs below provide the rolling 3 month average Dust Fallout Rate for some key sensitive receptors.



Sampling Locations: Dust Fallout

Site

Samancor Chrome - Middelburg Ferrochrome (MFC)

Middelburg, Mpumalanga Province

Key	Direction /Code	Description	Coordinates		Bucket Positioning interpretation Relative to Site		Purpose / Reason
					On Site	"Off Site"	
MFC-3	S	South of Site	25° 49' 2.719'' S	29° 29' 29.479'' E	X		NDCR (GN827, 01Nov2013)
MFC-4	SW	South West of Site	25° 48' 32.18'' S	29° 29' 14.341'' E	X		NDCR (GN827, 01Nov2013)
MFC-5	W	West of Site	25° 48' 9.112'' S	29° 29' 1.439'' E	X		NDCR (GN827, 01Nov2013)
MFC-7	NW	North West of Site	25° 47' 41.561'' S	29° 29' 0.179'' E	X		NDCR (GN827, 01Nov2013)

Meteorological Data: Potential for Wind Generated Dust (from MFC-On Site meteorological data)

- **The information in the table below summarizes the windrose data:**

Period	Sep-19	Ref	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Aug-20	Wind direction	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
		Potential Impact direction	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE

WINDROSE: Wind Direction Indication - Time Distribution

Month	Sampling Period	Date / Unit	% of Period	% of Period	% of Period	% of Period	% of Period	% of Period	% of Period	% of Period	% of Period	% of Period	% of Period	% of Period	% of Period	% of Period	% of Period	% of Period
1	11/09/19 to 11/10/19	Sep-19	13	3	18	7	15	9	5	3	4	2	1	1	4	5	6	5
2	11/10/19 to 11/11/19	Oct-19	20	5	18	8	12	7	2	3	3	2	1	2	6	2	4	7
3	11/11/19 to 9/12/19	Nov-19	14	3	34	7	3	0	3	0	0	0	3	21	7	3	0	0
4	9/12/19 to 6/01/20	Dec-19	23	4	10	5	17	6	4	1	1	2	1	2	6	6	5	5
5	6/01/20 to 21/01/20	Jan-20	16	4	6	5	21	11	4	3	4	1	1	1	3	8	6	7
6	21/02/20 to 19/03/20	Feb-20	15	4	8	7	21	16	3	2	4	1	2	1	2	4	3	5
7	19/03/20 to 16/04/20	Mar-20	11	3	7	5	16	8	5	4	9	4	4	3	8	6	4	3
8	16/04/20 to 15/05/20	Apr-20	17	4	6	5	16	11	4	2	5	4	3	3	7	6	3	4
9	15/05/20 to 15/06/20	May-20	3	3	4	5	7	15	14	6	7	6	5	3	5	6	8	5
10	15/06/20 to 14/07/20	Jun-20	3	3	4	6	7	18	11	5	5	6	5	3	5	4	8	5
11	14/07/20 to 13/08/20	Jul-20	4	3	5	5	10	17	14	6	5	5	3	3	3	5	7	4
12	13/08/20 to 14/09/20	Aug-20	11	6	5	5	10	12	9	3	4	3	3	2	2	3	9	13

- **The following information provides an indication of the number of times when the wind reached high speeds, which can potentially lead to incidents of wind generated dust transported away from the source.**
- **The Number of Potential Incidents for wind generated dust are based on hourly average mean wind speeds in excess of 5.4m/s as a rule of thumb with a daily rainfall rate of less than 2.54mm {refer US EPA & NSW guidelines}.**

Period from:	Sep-19	Potential Impact direction	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
to:	Aug-20	Potential Buckets																
Month	Sampling Period	Date / Unit	Number of Potential Incidents		Number of Potential Incidents		Number of Potential Incidents		Number of Potential Incidents		Number of Potential Incidents		Number of Potential Incidents		Number of Potential Incidents		Number of Potential Incidents	
1	11/09/19 to 11/10/19	Sep-19	2		0		9		6		1		25		41		7	
2	11/10/19 to 11/11/19	Oct-19	9		1		9		9		23		10		64		3	
3	11/11/19 to 9/12/19	Nov-19	0		0		0		0		2		3		0		0	
4	9/12/19 to 6/01/20	Dec-19	0		0		5		0		1		7		26		2	
5	6/01/20 to 21/01/20	Jan-20	0		0		12		6		2		3		45		2	
6	21/02/20 to 19/03/20	Feb-20	0		1		0		0		0		13		87		5	
7	19/03/20 to 16/04/20	Mar-20	6		0		0		0		0		14		13		0	
8	16/04/20 to 15/05/20	Apr-20	3		0		3		0		2		1		27		0	
9	15/05/20 to 15/06/20	May-20	17		6		30		26		0		0		2		0	
10	15/06/20 to 14/07/20	Jun-20	9		38		28		43		5		13		49		1	
11	14/07/20 to 13/08/20	Jul-20	6		4		23		45		2		4		28		4	
12	13/08/20 to 14/09/20	Aug-20	8		11		25		83		25		2		17		3	

Average DFO rate in Off-Site Samples in the Specified Direction

Month	Sampling Period	Date / Unit	DFO Rate (0.01 x mg/m²/day)		DFO Rate (0.01 x mg/m²/day)		DFO Rate (0.01 x mg/m²/day)		DFO Rate (0.01 x mg/m²/day)		DFO Rate (0.01 x mg/m²/day)		DFO Rate (0.01 x mg/m²/day)		DFO Rate (0.01 x mg/m²/day)		DFO Rate (0.01 x mg/m²/day)	
1	11/09/19 to 11/10/19	Sep-19	6.673		N/A		N/A		N/A		5.250		N/A		6.120		6.673	
2	11/10/19 to 11/11/19	Oct-19	4.926		N/A		N/A		N/A		4.070		N/A		3.210		4.926	
3	11/11/19 to 9/12/19	Nov-19	2.267		N/A		N/A		N/A		1.780		N/A		2.170		3.024	
4	9/12/19 to 6/01/20	Dec-19	3.305		N/A		N/A		N/A		0.680		N/A		4.560		5.600	
5	6/01/20 to 21/01/20	Jan-20	2.080		N/A		N/A		N/A		0.710		N/A		2.995		1.290	
6	21/02/20 to 19/03/20	Feb-20	5.365		N/A		N/A		N/A		2.230		N/A		4.810		4.880	
7	19/03/20 to 16/04/20	Mar-20	7.246		N/A		N/A		N/A		3.281		N/A		1.128		7.246	
8	16/04/20 to 15/05/20	Apr-20	2.512		N/A		N/A		N/A		0.887		N/A		1.498		3.308	
9	15/05/20 to 15/06/20	May-20	3.414		N/A		N/A		N/A		1.634		N/A		2.210		4.308	
10	15/06/20 to 14/07/20	Jun-20	4.594		N/A		N/A		N/A		2.621		N/A		4.151		4.318	
11	14/07/20 to 13/08/20	Jul-20	5.093		N/A		N/A		N/A		2.660		N/A		6.215		4.546	
12	13/08/20 to 14/09/20	Aug-20	7.364		N/A		N/A		N/A		4.021		N/A		6.080		8.418	

w/w% Mass percentage of element in dust sampled - excluding contribution from copper sulphate
NT Not Tested
RA Results Awaited
#N/A / --- Not sampled yet

COMMENTS: The data tabled in the abovementioned tables are presented in monthly graphs on the following pages. The following comments are made on the data.

Sep-19	Refer historic reports
Oct-19	Refer historic reports
Nov-19	Refer historic reports
Dec-19	Refer historic reports
Jan-20	Refer historic reports
Feb-20	Refer historic reports
Mar-20	The sample locations maintained in DFO levels for Mar2020. Elevated dust fallout rates could be influenced by high wind speed incidents, the transport/handling of loose material and/or point source emissions. The meteorological data for SAWS Witbank were used for the interpretation of the data. Once the specific site data has been prepared and processed, it will be used for data interpretation. Based on the Mar2020 meteorological data, it is expected that there were similar occurrences of high wind speeds, than compared to that of the preceding month, with 36 hours high wind speed incidents foreseen to occur during Mar2020. These high wind speed incidents originated mainly from the NE and E directions, impacting on the SW and W respectively. All sampled Non-Residential locations fell within acceptable DFO levels during Mar2020. MFC-5 was not recovered and presumed stolen. Directional locations MFC-4-D and MFC-5-D indicate higher contributions, East during Mar2020.
Apr-20	The sample locations maintained in DFO levels for Apr2020. Elevated dust fallout rates could be influenced by high wind speed incidents, the transport/handling of loose material and/or point source emissions. The meteorological data for SAWS Witbank were used for the interpretation of the data. Once the specific site data has been prepared and processed, it will be used for data interpretation. Based on the Apr2020 meteorological data, it is expected that there were similar occurrences of high wind speeds, when compared to that of the preceding month. These high wind speed incidents originated mainly from the E and S directions, impacting on the W and N respectively. All sampled Non-Residential locations fell within acceptable DFO levels during Apr2020. Directional locations MFC-4-D indicate higher contributions, West(79%), with MFC-5-D contributing to all directions during Apr2020.
May-20	The sample locations maintained in DFO levels for May2020. Elevated dust fallout rates could be influenced by high wind speed incidents, the transport/handling of loose material and/or point source emissions. The on-site meteorological data were used for the interpretation of the data. Based on the May2020 meteorological data, it is expected that there were more occurrences of high wind speeds, when compared to that of the preceding month. These high wind speed incidents originated mainly from the W and NW directions, impacting on the E and SE respectively. Location MFC-7 was added from May2020 onwards. All sampled Non-Residential locations fell within acceptable DFO levels during May2020. Directional buckets indicate even contributions for MFC-4-D, North (24%), East (26%), South (25%) and West (24%) and at MFC-5-D, North (25%), East (23%), South (26%) and West (26%) during May2020. MFC-7-D was not exchanged for May2020.
Jun-20	The sample locations maintained or increased in DFO levels for Jun2020. Elevated dust fallout rates could be influenced by high wind speed incidents, the transport/handling of loose material and/or point source emissions. The on-site meteorological data were used for the interpretation of the data. Based on the Jun2020 meteorological data, it is expected that there were more occurrences of high wind speeds, when compared to that of the preceding month (186 vs 81). These high wind speed incidents originated mainly from the E, NW and SW directions, impacting on the W, SE and NE respectively. Location MFC-7 was added from May2020 onwards. All sampled Non-Residential locations fell within acceptable DFO levels during Jun2020. Directional buckets indicate contributions for MFC-4-D, North (16%), East (20%), South (23%) and West (41%) and at MFC-5-D, North (18%), East (33%), South (26%) and West (23%) during Jun2020. MFC-7-D was not exchanged for Jun2020.
Jul-20	The sample locations maintained or increased in DFO levels for Jul2020. Elevated dust fallout rates could be influenced by high wind speed incidents, the transport/handling of loose material and/or point source emissions. The on-site meteorological data were used for the interpretation of the data. Based on the Jul2020 meteorological data, it is expected that there were less occurrences of high wind speeds, when compared to that of the preceding month (116 vs 186). These high wind speed incidents originated mainly from the NW, E and W directions, impacting on the SE, W and E respectively. Location MFC-7 was added from May2020 onwards. All sampled Non-Residential locations fell within acceptable DFO levels during Jul2020. Directional buckets indicate contributions for MFC-4-D, North (16%), East (17%), South (24%) and West (43%) and at MFC-5-D, North (17%), East (36%), South (26%) and West (20%) during Jul2020. MFC-7-D was not exchanged for Jul2020.
Aug-20	The sample locations maintained or increased in DFO levels for Aug2020. Elevated dust fallout rates could be influenced by high wind speed incidents, the transport/handling of loose material and/or point source emissions. The on-site meteorological data were used for the interpretation of the data. Based on the Aug2020 meteorological data, it is expected that there were more occurrences of high wind speeds, when compared to that of the preceding month (174 vs 116). These high wind speed incidents originated mainly from the NW, N and W directions, impacting on the SE, S and E respectively. Location MFC-7 was added from May2020 onwards. All sampled Non-Residential locations fell within acceptable DFO levels during Aug2020. Directional buckets indicate contributions for MFC-4-D, North (18%), East (15%), South (19%) and West (48%) and at MFC-5-D, North (27%), East (34%), South (20%) and West (19%) during Aug2020. MFC-7-D was not exchanged for Aug2020.

September-19

October-19

November-19

December-19

January-20

February-20

March-20

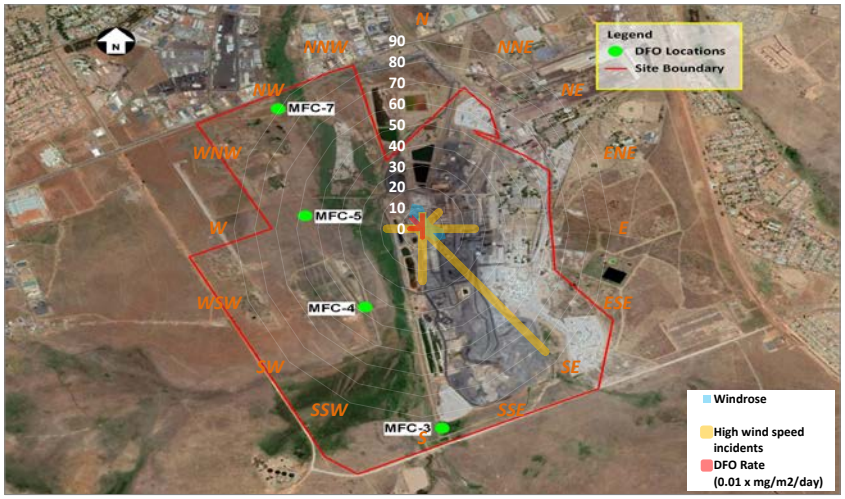
April-20

May-20

June-20

July-20

August-20



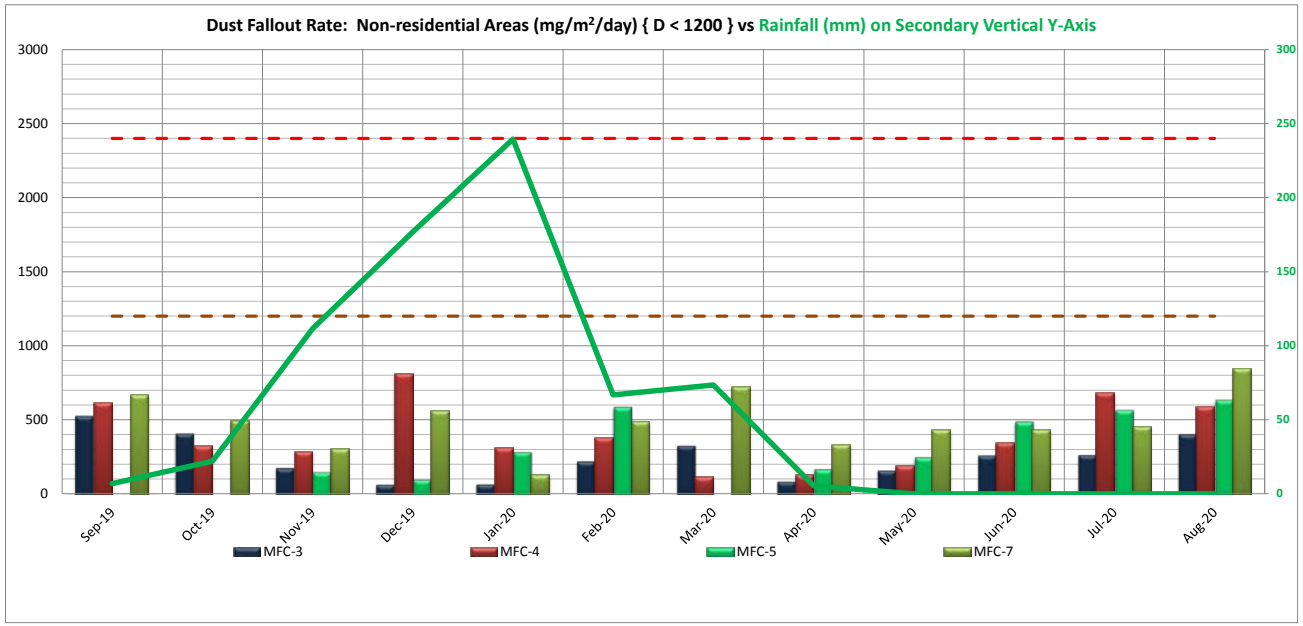
Non-residential

Period fro	Sep-19	Reference Number	1	2	7	12
to:	Aug-20	Sensitive Area:	MFC-3	MFC-4	MFC-5	MFC-7
		Area Classification	Non-residential	Non-residential	Non-residential	Non-residential
		Approximate Bearing (degrees from N clockwis	181.63	217.63	277.67	318.3

National Dust Control Regulation (NDCR), Table 1: Acceptable dustfall rate:	1200	1200	1200	1200
Annual Average (against SANS1929 Target: 300mg/m^2/day, No NDCR limit):	249	396	359	488
Minimum during past 12 months:	68	113	101	129
Maximum during past 12 months:	525	811	631	842
NDCR, Regulation: D > Acceptable dustfall rate: Max of 2 times /year:	Comply	Comply	Comply	Comply
NDCR, Regulation: D > Acceptable dustfall rate: No Sequential Months:	Comply	Comply	Comply	Comply
SANS1929 Guideline: D > 2400; Immediate Action Req.:	Comply	Comply	Comply	Comply

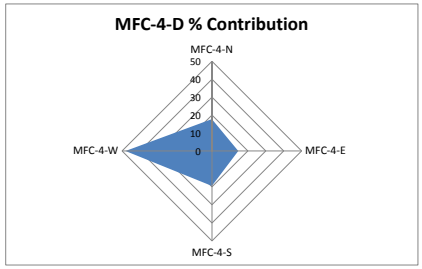
Month	Sampling Period	Date / Unit	Dustfall Rate mg.m^{-2}.day^{-1}	Dustfall Rate mg.m^{-2}.day^{-1}	Dustfall Rate mg.m^{-2}.day^{-1}	Dustfall Rate mg.m^{-2}.day^{-1}
1	11/09/19 to 11/10/19	Sep-19	525	612	NT	667
2	11/10/19 to 11/11/19	Oct-19	407	321	NT	493
3	11/11/19 to 9/12/19	Nov-19	178	283	151	302
4	9/12/19 to 6/01/20	Dec-19	68	811	101	560
5	6/01/20 to 21/01/20	Jan-20	71	312	287	129
6	21/02/20 to 19/03/20	Feb-20	223	377	585	488
7	19/03/20 to 16/04/20	Mar-20	328	113	NT	725
8	16/04/20 to 15/05/20	Apr-20	89	128	172	331
9	15/05/20 to 15/06/20	May-20	163	190	252	431
10	15/06/20 to 14/07/20	Jun-20	262	343	487	432
11	14/07/20 to 13/08/20	Jul-20	266	679	564	455
12	13/08/20 to 14/09/20	Aug-20	402	585	631	842

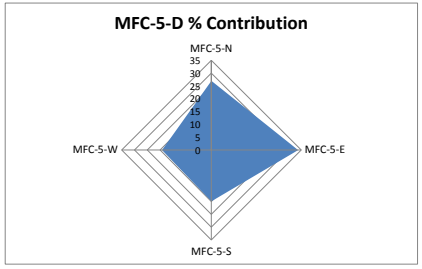
w/w% Mass percentage of element in dust sampled - excluding contribution from copper sulphate
NT Not Tested
RA Results Awaited
#N/A / --- Not sampled / analysed yet


Dust Fallout Rate: Non-residential Areas (mg/m²/day) { D < 1200 } vs Rainfall (mm) on Secondary Vertical Y-Axis
3000
2500
2000
1500
1000
500
0
300
250
200
150
100
50
0
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20
Feb-20
Mar-20
Apr-20
May-20
Jun-20
Jul-20
Aug-20
MFC-3
MFC-4
MFC-5
MFC-7

Directional locations % distribution graphs:

Directional buckets indicate contributions for MFC-4-D, North (18%), East (15%), South (19%) and West (48%) and at MFC-5-D, North (27%), East (34%), South (20%) and West (19%) during Aug2020. MFC-7-D was not exchanged for Aug2020.



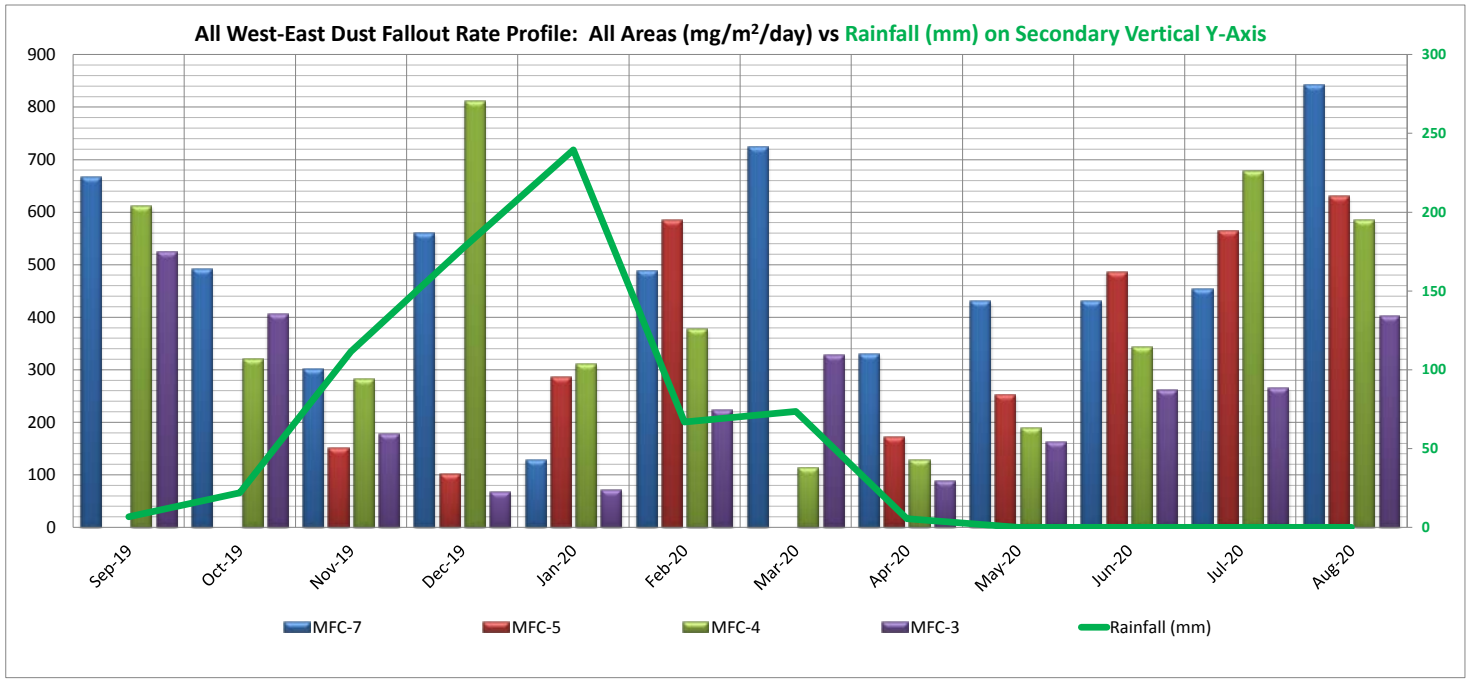


Period from	Sep-19	Reference Number	12	7	2	1
to:	Aug-20	Sensitive Area:	MFC-7	MFC-5	MFC-4	MFC-3
		Area Classification	Non-residential	Non-residential	Non-residential	Non-residential
		Approximate Bearing (degrees from N clockwise)	318.3	277.67	217.63	181.63

National Dust Control Regulation (NDCR), Table 1: Acceptable dustfall rate:	1200	1200	1200	1200
Annual Average (against SANS1929 Target: 300mg/m^2/day, No NDCR limit):	488	359	396	249
Minimum during past 12 months:	129	101	113	68
Maximum during past 12 months:	842	631	811	525
NDCR, Regulation: D > Acceptable dustfall rate: Max of 2 times /year:	Comply	Comply	Comply	Comply
NDCR, Regulation: D > Acceptable dustfall rate: No Sequential Months:	Comply	Comply	Comply	Comply
SANS1929 Guideline: D > 2400; Immediate Action Req.:	Comply	Comply	Comply	Comply
	Dustfall Rate	Dustfall Rate	Dustfall Rate	Dustfall Rate

Month	Sampling Period	Date / Unit	mg.m^{-2}.day^{-1}	mg.m^{-2}.day^{-1}	mg.m^{-2}.day^{-1}	mg.m^{-2}.day^{-1}
1	11/09/19 to 11/10/19	Sep-19	667	NT	612	525
2	11/10/19 to 11/11/19	Oct-19	493	NT	321	407
3	11/11/19 to 9/12/19	Nov-19	302	151	283	178
4	9/12/19 to 6/01/20	Dec-19	560	101	811	68
5	6/01/20 to 21/01/20	Jan-20	129	287	312	71
6	21/02/20 to 19/03/20	Feb-20	488	585	377	223
7	19/03/20 to 16/04/20	Mar-20	725	NT	113	328
8	16/04/20 to 15/05/20	Apr-20	331	172	128	89
9	15/05/20 to 15/06/20	May-20	431	252	190	163
10	15/06/20 to 14/07/20	Jun-20	432	487	343	262
11	14/07/20 to 13/08/20	Jul-20	455	564	679	266
12	13/08/20 to 14/09/20	Aug-20	842	631	585	402

w/w% Mass percentage of element in dust sampled - excluding contribution from copper sulphate
NT Not Tested
RA Results Awaited
#N/A / --- Not sampled / analysed yet


All West-East Dust Fallout Rate Profile: All Areas (mg/m²/day) vs Rainfall (mm) on Secondary Vertical Y-Axis
900
800
700
600
500
400
300
200
100
0
300
250
200
150
100
50
0
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20
Feb-20
Mar-20
Apr-20
May-20
Jun-20
Jul-20
Aug-20
MFC-7
MFC-5
MFC-4
MFC-3
Rainfall (mm)

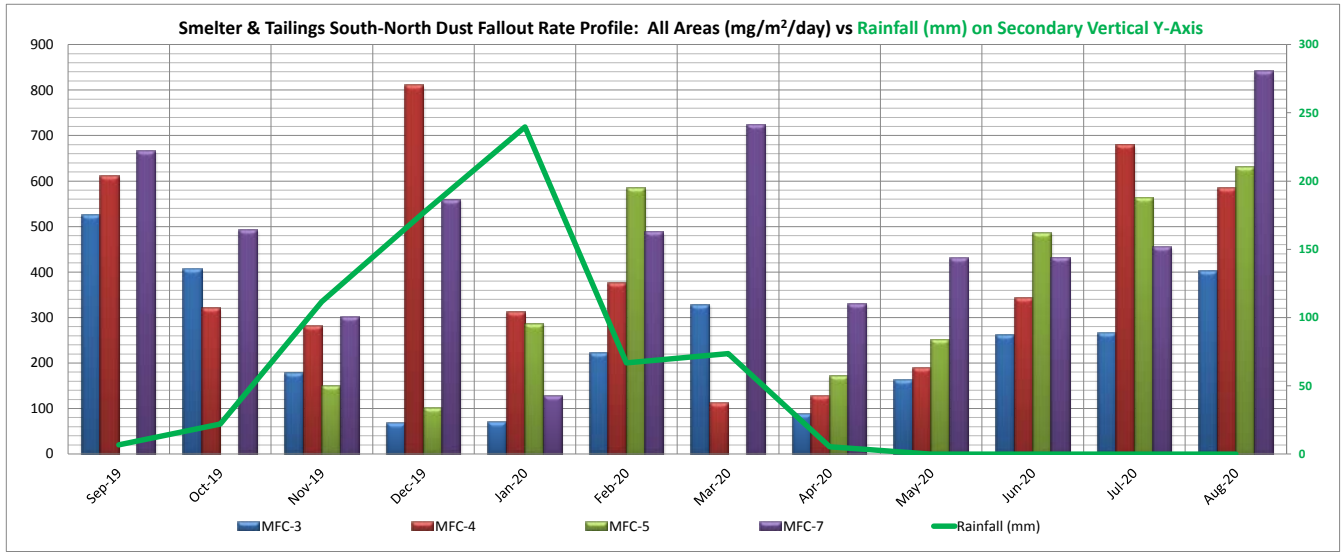
Selected S-N Profile

Period fro	Sep-19	Reference Number	1	2	7	12
to:	Aug-20	Sensitive Area:	MFC-3	MFC-4	MFC-5	MFC-7
		Area Classification	Non-residential	Non-residential	Non-residential	Non-residential
		Approximate Bearing (degrees from N clockwise)	181.63	217.63	277.67	318.3

National Dust Control Regulation (NDCR), Table 1: Acceptable dustfall rate:	1200	1200	1200	1200
Annual Average (against SANS1929 Target: 300mg/m^2/day, No NDCR limit):	249	396	359	488
Minimum during past 12 months:	68	113	101	129
Maximum during past 12 months:	525	811	631	842
NDCR, Regulation: D > Acceptable dustfall rate: Max of 2 times /year:	Comply	Comply	Comply	Comply
NDCR, Regulation: D > Acceptable dustfall rate: No Sequential Months:	Comply	Comply	Comply	Comply
SANS1929 Guideline: D > 2400; Immediate Action Req.:	Comply	Comply	Comply	Comply
	Dustfall Rate	Dustfall Rate	Dustfall Rate	Dustfall Rate

Month	Sampling Period	Date / Unit	mg.m^{-2}.day^{-1}	mg.m^{-2}.day^{-1}	mg.m^{-2}.day^{-1}	mg.m^{-2}.day^{-1}
1	11/09/19 to 11/10/19	Sep-19	525	612	NT	667
2	11/10/19 to 11/11/19	Oct-19	407	321	NT	493
3	11/11/19 to 9/12/19	Nov-19	178	283	151	302
4	9/12/19 to 6/01/20	Dec-19	68	811	101	560
5	6/01/20 to 21/01/20	Jan-20	71	312	287	129
6	21/02/20 to 19/03/20	Feb-20	223	377	585	488
7	19/03/20 to 16/04/20	Mar-20	328	113	NT	725
8	16/04/20 to 15/05/20	Apr-20	89	128	172	331
9	15/05/20 to 15/06/20	May-20	163	190	252	431
10	15/06/20 to 14/07/20	Jun-20	262	343	487	432
11	14/07/20 to 13/08/20	Jul-20	266	679	564	455
12	13/08/20 to 14/09/20	Aug-20	402	585	631	842

w/w% Mass percentage of element in dust sampled - excluding contribution from copper sulphate
NT Not Tested
RA Results Awaited
#N/A / --- Not sampled / analysed yet

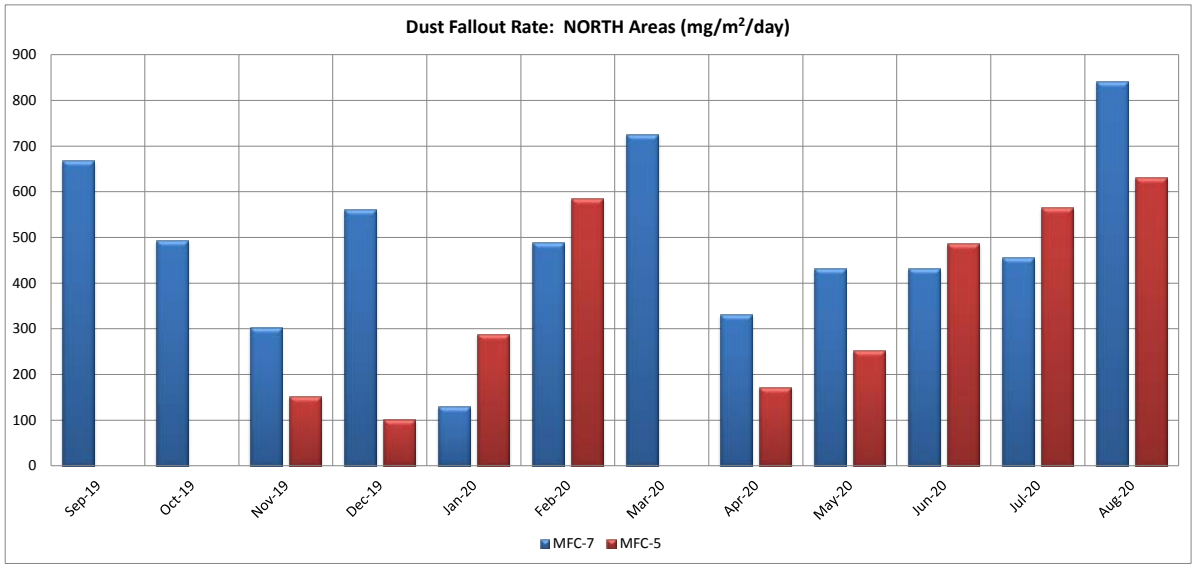

Smelter & Tailings South-North Dust Fallout Rate Profile: All Areas (mg/m²/day) vs Rainfall (mm) on Secondary Vertical Y-Axis
900
800
700
600
500
400
300
200
100
0
300
250
200
150
100
50
0
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20
Feb-20
Mar-20
Apr-20
May-20
Jun-20
Jul-20
Aug-20
MFC-3
MFC-4
MFC-5
MFC-7
Rainfall (mm)

Period from:	Sep-19	Reference Number	12	7
to:	Aug-20	Sensitive Area:	MFC-7	MFC-5
		Area Classification	Non-residential	Non-residential
	Approximate Bearing	(degrees from N clock	318.3	277.67

National Dust Control Regulation (NDCR), Table 1: Acceptable dustfall rate:	1200	1200
Annual Average (against SANS1929 Target: 300mg/m^2/day, No NDCR limit):	488	359
Minimum during past 12 months:	129	101
Maximum during past 12 months:	842	631
NDCR, Regulation: D > Acceptable dustfall rate: Max of 2 times /year:	Comply	Comply
NDCR, Regulation: D > Acceptable dustfall rate: No Sequential Months:	Comply	Comply
SANS1929 Guideline: D > 2400; Immediate Action Req.:	Comply	Comply
	Dustfall Rate	Dustfall Rate

Month	Sampling Period	Date / Unit	mg.m^{-2}.day^{-1}	mg.m^{-2}.day^{-1}
1	11/09/19 to 11/10/19	Sep-19	667	NT
2	11/10/19 to 11/11/19	Oct-19	493	NT
3	11/11/19 to 9/12/19	Nov-19	302	151
4	9/12/19 to 6/01/20	Dec-19	560	101
5	6/01/20 to 21/01/20	Jan-20	129	287
6	21/02/20 to 19/03/20	Feb-20	488	585
7	19/03/20 to 16/04/20	Mar-20	725	NT
8	16/04/20 to 15/05/20	Apr-20	331	172
9	15/05/20 to 15/06/20	May-20	431	252
10	15/06/20 to 14/07/20	Jun-20	432	487
11	14/07/20 to 13/08/20	Jul-20	455	564
12	13/08/20 to 14/09/20	Aug-20	842	631

w/w% Mass percentage of element in dust sampled - excluding contribution from copper sulphate
NT Not Tested
RA Results Awaited
#N/A / --- Not sampled / analysed yet



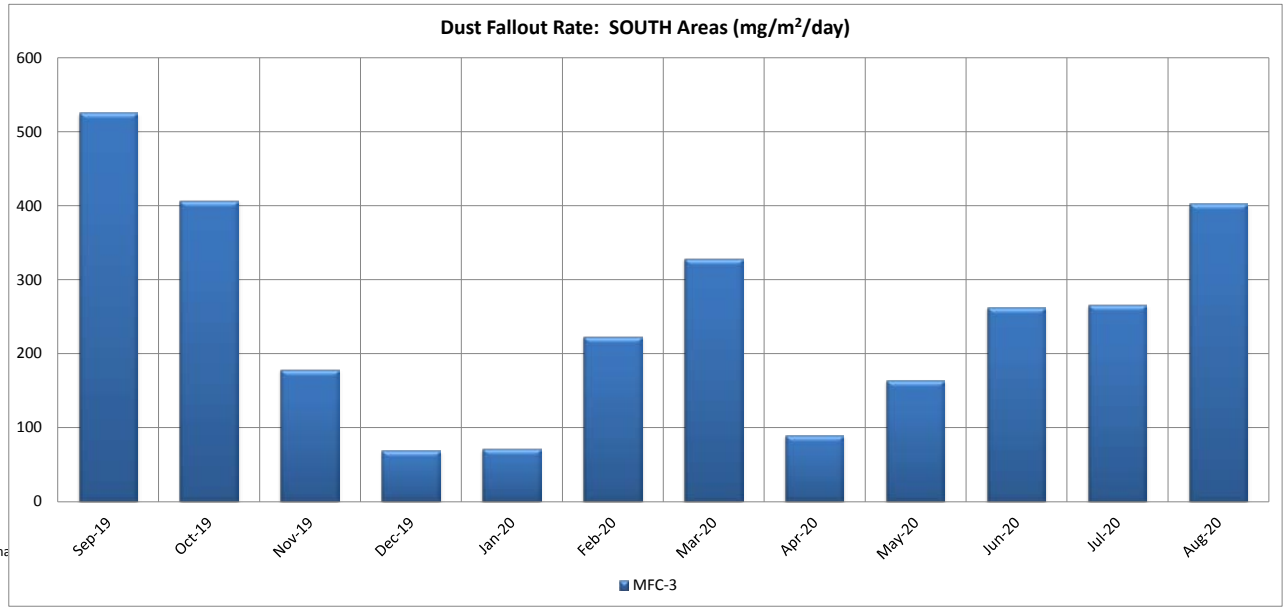
Period from	Sep-19	Reference Number	1
to:	Aug-20	Sensitive Area:	MFC-3
		Area Classification	Non-residential

Approximate Bearing (degrees from N clockwise) 181.63

National Dust Control Regulation (NDCR), Table 1: Acceptable dustfall rate:	1200
Annual Average (against SANS1929 Target: 300mg/m^2/day, No NDCR limit):	249
Minimum during past 12 months:	68
Maximum during past 12 months:	525
NDCR, Regulation: D > Acceptable dustfall rate: Max of 2 times /year:	Comply
NDCR, Regulation: D > Acceptable dustfall rate: No Sequential Months:	Comply
SANS1929 Guideline: D > 2400; Immediate Action Req.:	Comply

Month	Sampling Period	Date / Unit	Dustfall Rate mg.m^{-2}.day^{-1}
1	11/09/19 to 11/10/19	Sep-19	525
2	11/10/19 to 11/11/19	Oct-19	407
3	11/11/19 to 9/12/19	Nov-19	178
4	9/12/19 to 6/01/20	Dec-19	68
5	6/01/20 to 21/01/20	Jan-20	71
6	21/02/20 to 19/03/20	Feb-20	223
7	19/03/20 to 16/04/20	Mar-20	328
8	16/04/20 to 15/05/20	Apr-20	89
9	15/05/20 to 15/06/20	May-20	163
10	15/06/20 to 14/07/20	Jun-20	262
11	14/07/20 to 13/08/20	Jul-20	266
12	13/08/20 to 14/09/20	Aug-20	402

w/w% Mass percentage of element in dust sampled - excluding contribution from copper sulpha
NT Not Tested
RA Results Awaited
#N/A / --- Not sampled / analysed yet

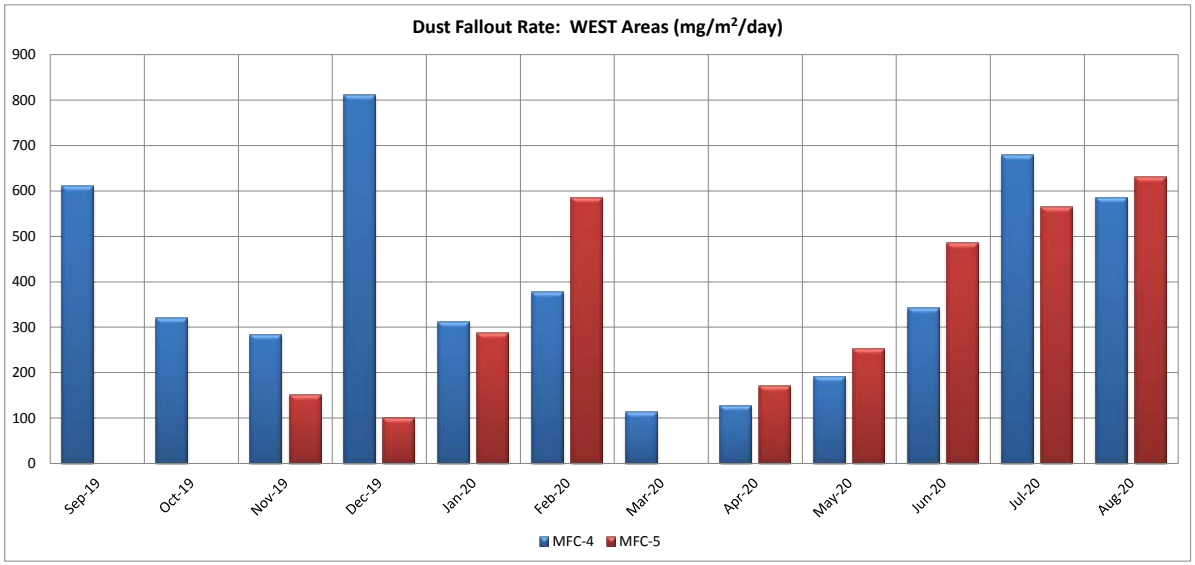


Period from:	Sep-19	Reference Number	2	7
to:	Aug-20	Sensitive Area:	MFC-4	MFC-5
		Area Classification	Non-residential	Non-residential
	Approximate Bearing	(degrees from N clockwise	217.63	277.67

National Dust Control Regulation (NDCR), Table 1: Acceptable dustfall rate:	1200	1200
Annual Average (against SANS1929 Target: 300mg/m²/day, No NDCR limit):	396	359
Minimum during past 12 months:	113	101
Maximum during past 12 months:	811	631
NDCR, Regulation: D > Acceptable dustfall rate: Max of 2 times /year:	Comply	Comply
NDCR, Regulation: D > Acceptable dustfall rate: No Sequential Months:	Comply	Comply
SANS1929 Guideline: D > 2400; Immediate Action Req.:	Comply	Comply
	Dustfall Rate	Dustfall Rate

Month	Sampling Period	Date / Unit	mg.m^{-2}.day^{-1}	mg.m^{-2}.day^{-1}
1	11/09/19 to 11/10/19	Sep-19	612	NT
2	11/10/19 to 11/11/19	Oct-19	321	NT
3	11/11/19 to 9/12/19	Nov-19	283	151
4	9/12/19 to 6/01/20	Dec-19	811	101
5	6/01/20 to 21/01/20	Jan-20	312	287
6	21/02/20 to 19/03/20	Feb-20	377	585
7	19/03/20 to 16/04/20	Mar-20	113	NT
8	16/04/20 to 15/05/20	Apr-20	128	172
9	15/05/20 to 15/06/20	May-20	190	252
10	15/06/20 to 14/07/20	Jun-20	343	487
11	14/07/20 to 13/08/20	Jul-20	679	564
12	13/08/20 to 14/09/20	Aug-20	585	631

w/w% Mass percentage of element in dust sampled - excluding contribution from copper sulphate
NT Not Tested
RA Results Awaited
#N/A / --- Not sampled / analysed yet

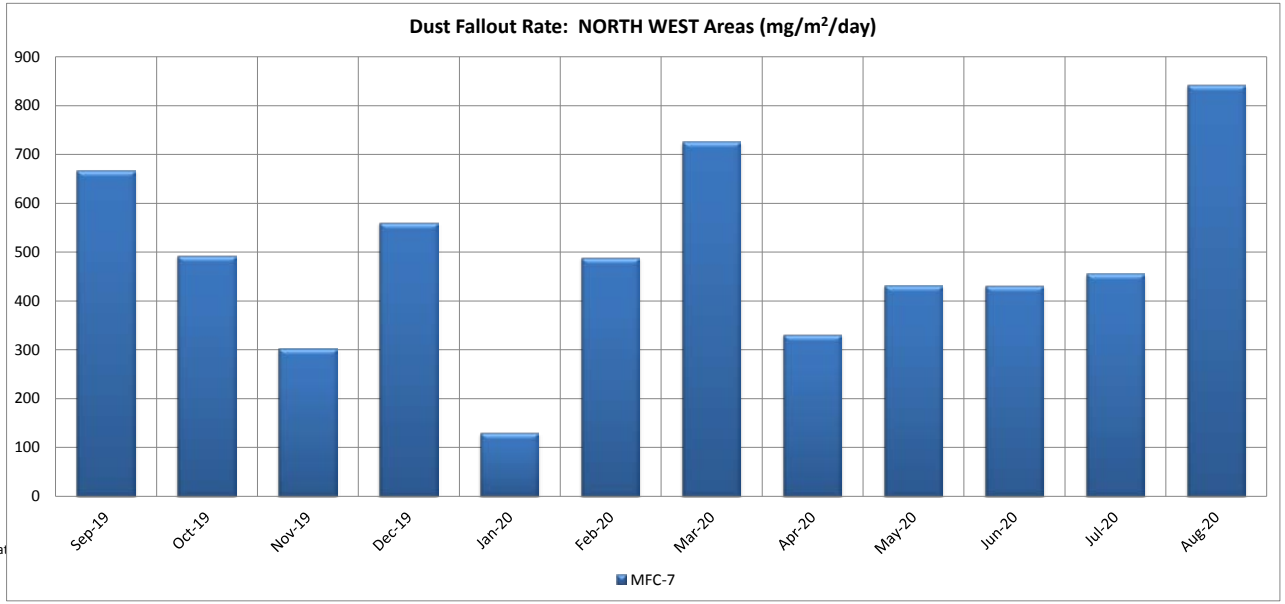


Period from	Sep-19	Reference Number	12
to:	Aug-20	Sensitive Area:	MFC-7
		Area Classification	Non-residential
	Approximate Bearing	(degrees from N clockwise	318.3

National Dust Control Regulation (NDCR), Table 1: Acceptable dustfall rate:	1200
Annual Average (against SANS1929 Target: 300mg/m^2/day, No NDCR limit):	488
Minimum during past 12 months:	129
Maximum during past 12 months:	842
NDCR, Regulation: D > Acceptable dustfall rate: Max of 2 times /year:	Comply
NDCR, Regulation: D > Acceptable dustfall rate: No Sequential Months:	Comply
SANS1929 Guideline: D > 2400; Immediate Action Req.:	Comply

Month	Sampling Period	Date / Unit	Dustfall Rate mg.m^{-2}.day^{-1}
1	11/09/19 to 11/10/19	Sep-19	667
2	11/10/19 to 11/11/19	Oct-19	493
3	11/11/19 to 9/12/19	Nov-19	302
4	9/12/19 to 6/01/20	Dec-19	560
5	6/01/20 to 21/01/20	Jan-20	129
6	21/02/20 to 19/03/20	Feb-20	488
7	19/03/20 to 16/04/20	Mar-20	725
8	16/04/20 to 15/05/20	Apr-20	331
9	15/05/20 to 15/06/20	May-20	431
10	15/06/20 to 14/07/20	Jun-20	432
11	14/07/20 to 13/08/20	Jul-20	455
12	13/08/20 to 14/09/20	Aug-20	842

w/w% Mass percentage of element in dust sampled - excluding contribution from copper sulphat
NT Not Tested
RA Results Awaited
#N/A / --- Not sampled / analysed yet



Reference Number		**1**	**2**	**7**	**12**
Sensitive Area:		**MFC-3**	**MFC-4**	**MFC-5**	**MFC-7**
Area Classification		**Non-residential**	**Non-residential**	**Non-residential**	**Non-residential**
Guideline		**1200**	**1200**	**1200**	**1200**
	Average / Total	**237.93**	**365.71**	**381.14**	**456.28**
	Minimum	**68.00**	**112.85**	**101.00**	**129.00**
	Maximum	**525.00**	**811.00**	**808.00**	**942.83**
	D > NDCR	NDCR: max 2 times in a year	NDCR: max 2 times in a year	NDCR: max 2 times in a year	NDCR: max 2 times in a year
	D > NDCR	NDCR: no sequential mnths	NDCR: no sequential mnths	NDCR: no sequential mnths	NDCR: no sequential mnths
	D > 2400	SANS1929: immediate action	SANS1929: immediate action	SANS1929: immediate action	SANS1929: immediate action
Month	Sampling Period	Date / Unit	**Dustfall Rate** mg.m^{-2}.day^{-1}	**Dustfall Rate** mg.m^{-2}.day^{-1}	**Dustfall Rate** mg.m^{-2}.day^{-1}	**Dustfall Rate** mg.m^{-2}.day^{-1}
	11/09/19 to 11/10/19	Sep-19	525	612	NT	667
	11/10/19 to 11/11/19	Oct-19	407	321	NT	493
	11/11/19 to 9/12/19	Nov-19	178	283	151	302
	9/12/19 to 6/01/20	Dec-19	68	811	101	560
	6/01/20 to 21/01/20	Jan-20	71	312	287	129
	21/02/20 to 19/03/20	Feb-20	223	377	585	488
1	19/03/20 to 16/04/20	Mar-20	328	113	NT	725
2	16/04/20 to 15/05/20	Apr-20	89	128	172	331
3	15/05/20 to 15/06/20	May-20	163	190	252	431
4	15/06/20 to 14/07/20	Jun-20	262	343	487	432
5	14/07/20 to 13/08/20	Jul-20	266	679	564	455
6	13/08/20 to 14/09/20	Aug-20	402	585	631	842

EnviroNgaka measures, analyses and reports the dust fallout (DFO) monitoring results through a SANAS accredited laboratory. The dust fallout sampling is conducted in accordance with the requirements as stipulated in the National Dust Control Regulations (GN827, 01Nov2013) and SANS1929 per the reference method ASTM D1739.

Windblown settleable dust (fallout) is monitored in accordance with the American Society of Testing and Materials standard method for collection and analysis of dust deposition (ASTM D1739). This method employs a simple device – a cylindrical 5ℓ container (bucket) placed inside a frame on top of a pole. The method is as follows:

Containers / Buckets:
De-ionised water is used in the preparation of the buckets;
The water is treated with a known quantity of inorganic biocide before being poured in the buckets. The inorganic biocide assists in preventing algal growth in the buckets;
The buckets and lids that are to be used for the sampling, are thoroughly cleaned using a detergent solution. The buckets and lids are then rinsed with reagent and deionised water, and stored in a controlled environment;
Each bucket is labelled with an identification number before use;
The buckets are filled with a known quantity of de-ionised water, pre-treated with the inorganic biocide, and sealed in a controlled environment;
The bucket is then transported to the Site of Works in crates, where each bucket is opened at its predetermined location and deployed on a DFO stand;
The date, time and identification number for each bucket is recorded when they are deployed;

DFO stand:
DFO stands are deployed on-site and/or off-site at in accordance with SANS1929;
The DFO stand comprises a frame (bucket holder) connected to a pole;
The frame has a ring that is raised to the rim of the bucket, with the diameter of the ring three times that of the bucket. The ring is a mounting place for an aerodynamic wind shield which is fitted to the frame;
The aerodynamic wind shield is cone shaped, with the top of the shield having a diameter of three times the diameter of the bucket (to fit on the outside of the ring), and the bottom section having a diameter of twice the diameter of the bucket. The shield has a height of half that of the bucket;
The frame is connected to a pole;
With the frame attached and the bucket in place, the top of the bucket should be at a height of 2m (±0.1m) from the ground;
Multi-Directional Dust Flux:
Dust flux gauges have a collection device positioned in vertical plane to intercept dust as it travels parallel to the ground;
The BS directional dust gauge has four slotted sampling tubes with collection posts set at right angles to each other;
The results of the multi-directional dust flux samplers are expressed in units of mg/m^2/day, which is the flux rate, not the deposition rate, and so the results are not comparable with those of a deposition sampler;

In March 2020 when EnviroNgaka was appointed to conduct the DFO monitoring for Samancor Chrome, Middelburg Ferrochrome operations, it was identified by EnviroNgaka that the equipment complies to relevant standards, and will advise client on a continuous basis, if any equipment does not comply to the requirements as stipulated in the reference method ASTM D1739.

Duration of exposure:
The buckets are exposed for 30 days (±2 days) before being exchanged with newly prepared buckets;
No attempt is made on-site to remove the collected material from the buckets;
Exposed buckets are removed from the stand, sealed and sent to a SANAS accredited laboratory for analyses;
The date, time and identification number for each bucket is recorded when they are collected;

Laboratory analysis:
The sealed buckets are received at the laboratory, and each given a unique identification number (for internal use);
The laboratory determines the masses of water-soluble and –insoluble components of the material collected;

Reporting:
The results are received from the laboratory, and reported as milligrams per square meter per day (mg/m^2/day), averaged over the number of days the samples were exposed, for each location;
The results are evaluated against the SANS1929 Four-band scale for dust deposition;
The results are evaluated against the National Dust Control Regulations (GN827, 01Nov2013) and SANS1929 (where relevant);
Compliance is assessed and reported for the dustfall rates against Acceptable dust fall rates as published in the last mentioned National Dust Control Regulations.