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# **Stack Particulate Management Plan Annual Stack Particulate Report**

**Period: July 2019 – June 2020**

**Licensed site:** Adelaide Brighton Cement, Birkenhead Works  
**62 Elder Road, Birkenhead, SA 5015**

**EPA Licence number:** 1126

**Date of Submission:** 31 October 2020

**Version Number:** 1



Report Submitted by: Sustainability /Environmental Engineer

*I certify that to the best of my knowledge and ability all the information in this report is a true and accurate reflection of the regulatory monitoring performed.*

## Glossary

<b>Term</b>	<b>Definition</b>
$\mu\text{g}/\text{m}^3$	micrograms per cubic metre
$\text{mg}/\text{m}^3$	milligrams per cubic metre
m	metre
$\text{m}^3$	cubic metres
$\text{m}^3/\text{s}$	cubic metres per second
$\text{Nm}^3$	Gas volume in cubic metres at STP dry basis
<b>Abbreviations</b>	<b>Definition</b>
Air EPP	Environment Protection (Air Quality) Policy 2016
SA EPA	South Australian Environment Protection Authority
STP	Standard Temperature and Pressure (zero degrees Celsius and 101.3 kilo Pascals absolute)
TSP	Total Suspended Particulates
SPMP	Stack Particulate Management Plan

<p><b>Monitoring Objective</b></p>	<p>All stack particulate emissions events for the reporting period, where levels have exceeded the reporting thresholds:</p> <ul style="list-style-type: none"> <li>• 100mg/Nm<sup>3</sup> (1 hour averaging period) on Kiln Stack 4A</li> <li>• 60 mg/Nm<sup>3</sup> (1 hour averaging period) on Precalciner Stack 4B</li> </ul> <p>An annual report will be prepared and submitted by the last day of October of each year that provides an analysis of the 1-hour particulate reporting events including:</p> <ul style="list-style-type: none"> <li>• A table detailing the number and cause of reporting events for Kiln Stack 4A and Precalciner Stack 4B</li> <li>• A trend analysis of magnitude and duration of 1-hour notifications on a time series graph for each stack</li> <li>• A trend analysis of community complaints by type against 1-hour reporting events by cause on a time series graph for each stack</li> <li>• A table comparing the number of 1-hour reporting events by cause for the current and previous year</li> <li>• Identification of opportunities for improvement to decrease the frequency, duration and magnitude of 1-hour reporting events</li> </ul>
<p><b>Monitoring Plan</b></p>	<p>This monitoring report has been prepared in line with the objectives of the Stack Particulate Management Plan approved on 18 June 2018 by the South Australian EPA.</p> <p>The Plan is available on the ABC Birkenhead Community Website:  <a href="http://www.birkenheadcommunity.com.au">http://www.birkenheadcommunity.com.au</a></p>

## 4A Stack - Summary of 1-hr Reporting events for the period 1/10/2019 to 30/09/2020

The table below provides a summary of 1-hr reporting events

Date	Time start	Time finish	Duration (min)	Magnitude mg/Nm <sup>3</sup>	Cause	Immediate Actions Taken	Actions Taken to Prevent a Reoccurrence
13/08/2019	14:34	16:24	109	242	Erratic 4A and Bypass ESP performance	<p>The source/cause of this change in ESP performance was not obvious and plant operation was maintained to assist trouble shooting the process.</p> <p>The usual plant-operating conditions likely to cause a change in ESP performance were immediately checked including:</p> <ul style="list-style-type: none"> <li>• ESP fields and controls</li> <li>• Conditioning towers and water sprays</li> <li>• Flow rates and Temperatures</li> <li>• Temperatures and combustion process were <b>not</b> affected</li> </ul> <ul style="list-style-type: none"> <li>• raw materials checked including limestone (change in limestone heap occurred at the same time as the change in ESP performance)</li> <li>• Reduced RDF rate then stopped using RDF altogether and ESP and emissions returned to normal performance.</li> <li>• RDF supplier contacted and stockpiles inspected – nothing visibly different</li> <li>• Changed RDF stockpile and reintroduced with typical ESP and emission performance.</li> </ul>	<p>The plant has not previously experienced a deterioration in all ESP performances at the same time</p> <p>Samples of RDF and material from different parts of the process taken for independent laboratory analysis</p> <ul style="list-style-type: none"> <li>• Analysis of samples taken confirm that there were no unusual levels of organic materials/chemicals in the RDF</li> <li>• Test results for inorganic materials/chemicals confirm normal composition of RDF.</li> </ul> <p>There has not been a repeat occurrence of this issue since.</p> <p>RDF to be turned off if a similar situation arises in the future and investigated.</p>
29/08/2019	20:03	20:25	22	104.7	Excess build-up within the Bypass process	Checked and cleaned the Bypass system	Regular inspection and cleaning to minimise build-up
4/09/2019	0:03	0:30	27	110.4	Excess build-up within the Bypass process	Checked and cleaned the Bypass system	Regular inspection and cleaning to minimise build-up

## 4B Stack - Summary of 1-hr Reporting events for the period 1/10/2019 to 30/6/2020

The table below provides a summary of 1-hr reporting events

Date	Time start	Time finish	Duration (min)	Magnitude mg/Nm <sup>3</sup>	Cause	Immediate Actions Taken	Actions Taken to Prevent a Reoccurrence
13/08/2019	13:23	17:02	218	176.2	Erratic 4B ESP performance	<p>The source/cause of this change in ESP performance was not obvious and plant operation was maintained to assist trouble shooting the process.</p> <p>The usual plant-operating conditions likely to cause a change in ESP performance were immediately checked including:</p> <ul style="list-style-type: none"> <li>• ESP fields and controls</li> <li>• Conditioning towers and water sprays</li> <li>• Flow rates and Temperatures</li> <li>• Temperatures and combustion process were <b>not</b> affected</li> <li>• raw materials checked including limestone (change in limestone heap occurred at the same time as the change in ESP performance)</li> <li>• Reduced RDF rate then stopped using RDF altogether and ESP and emissions returned to normal performance.</li> <li>• RDF supplier contacted and stockpiles inspected – nothing visibly different</li> <li>• Changed RDF stockpile and reintroduced with typical ESP and emission performance.</li> </ul>	<p>The plant has not previously experienced a deterioration in all ESP Performances at the same time</p> <p>Samples of RDF and material from different parts of the process taken for independent laboratory analysis</p> <ul style="list-style-type: none"> <li>• Analysis of samples taken confirm that there were no unusual levels of organic materials/chemicals in the RDF</li> <li>• Currently test results of inorganic materials/chemicals confirm normal composition of RDF.</li> </ul> <p>There has not been a repeat occurrence of this issue since.</p> <p>RDF to be turned off if a similar situation arises in the future and investigated.</p>

Date	Time start	Time finish	Duration (min)	Magnitude mg/Nm3	Cause	Immediate Actions Taken	Actions Taken to Prevent a Reoccurrence
9/10/2019	19:10	19:10	1	77.8	4B Mill off for extended period for maintenance which resulted in higher than desirable temperatures into the electrostatic precipitator resulting in elevated emissions	Maximised conditioning tower cooling sprays and reduced process feed rates to reduce temperatures until 4B Mill could be restarted	Operate to Process control Standards
18/10/2019	10:02	10:03	1	66.6	4B Mill off for extended period which resulted in higher than desirable temperatures into the electrostatic precipitator resulting in elevated emissions	Restarted 4B mill to reduce emissions	Operate to Process control Standards
30/10/2019	16:26	16:50	24	62.6	VVF drive fault occurred on 4B Raw feed conveyor during 4B mill start up sequence, preventing 4B conditioning tower sprays to come on.	4B Mill shutdown. Drive fault on raw feed conveyor rectified	This issue has not occurred before Maintain existing maintenance and inspection program
7/06/2020	17:59	18:36	37	70.1	<p>The event occurred after the calciner tripped on high exit pressure.</p> <p>The increase in particulate emissions occurred as a result of increased flow required to safely perform fault finding and remove a metal pole, that was found lodged in the dust flap below 4B cyclone.</p>	The electrostatic precipitator fan damper was opened, reducing the pressure to enable the operators to fault find and safely remove a metal pole that was found lodged in the dust flap below 4B cyclone.	<p>The metal pole potentially was left in the preheater during the annual maintenance shutdown, eventually moving into a position to create the process issue.</p> <p>Reinforcement of checks associated with internal inspections before plant is returned to service will be carried out for the coming 2021 shut down.</p>

Date	Time start	Time finish	Duration (min)	Magnitude mg/Nm <sup>3</sup>	Cause	Immediate Actions Taken	Actions Taken to Prevent a Reoccurrence
18/06/2020	3:41	4:42	61	117.8	<p>The event occurred as a result of an electrical fault on 4B ESP field 3, which resulted in loss of that field, with resulting increase in particulate emission.</p> <p>The root cause of the problem was a failed cartridge fuse switch and associated cabling on the ESP switchboard.</p>	The Calciner was turned off to effect electrical repairs.	<p>Electrical switchboards are scanned, every year for hot spots which are indicative of early electrical failures.</p> <p>The last thermographic scan of this switchboard was in November 2019 which did not show any indication of a problem.</p> <p>Maintain existing inspection regime</p>

## Stacks 4A and 4B - Number and Cause of 1- hour Reporting Events - 1/10/2019 – 30/9/2020

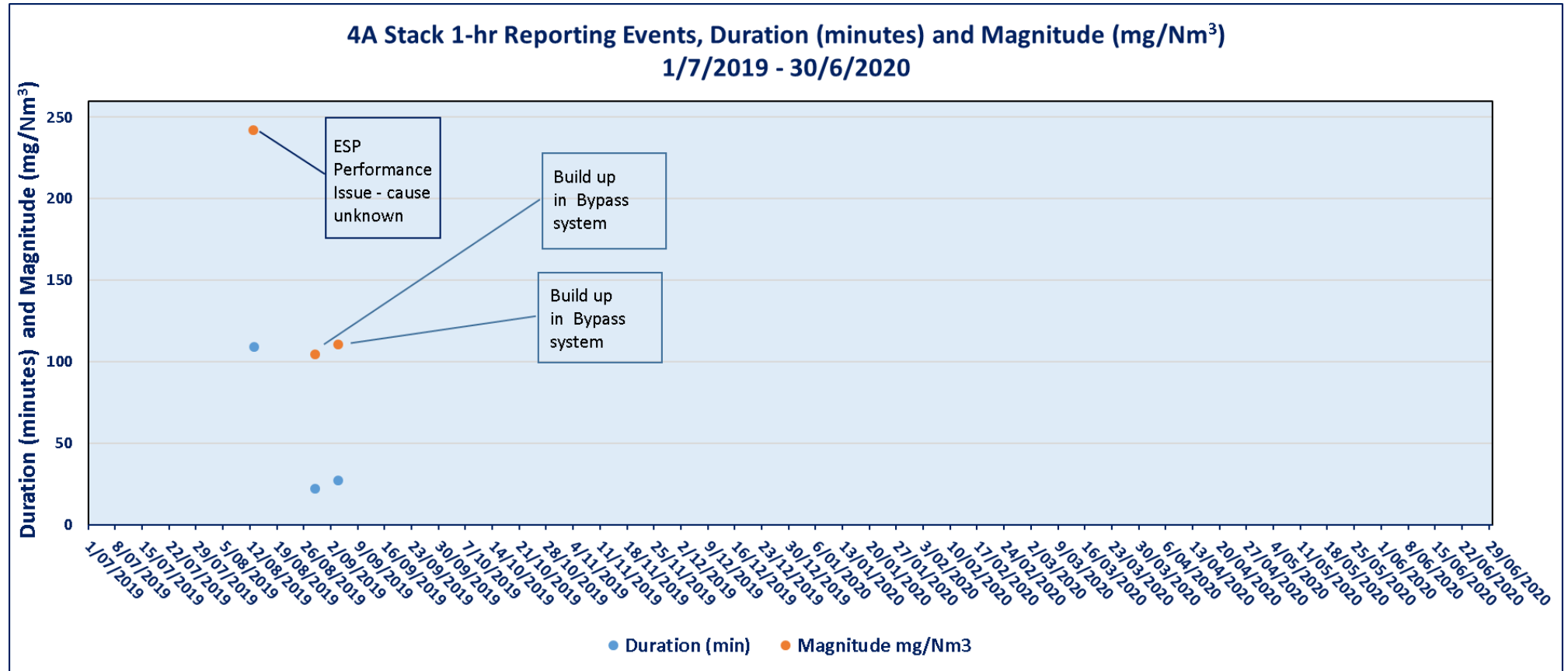
The number of reporting events by cause for each stack is summarised in the table below.

Stack	Cause of 1-hr Reporting Event	Number of 1-hr reporting events current year 1/7/2019 to 30/6/2020
4A	Excess build-up within the Bypass process	2
	Erratic ESP Performance - unknown cause	1
	<b>Total Number of Reporting Events</b>	<b>3</b>
4B	4B Mill off for extended period	2
	VVF drive fault occurred on 4B Raw feed conveyor during 4B mill start up sequence, preventing 4B conditioning tower sprays to come on.	1
	The event occurred after the calciner tripped on high exit pressure. The increase in particulate emissions occurred as a result of increased flow required to safely perform fault finding and remove a metal pole, that was found lodged in the dust flap below 4B cyclone.	1
	The event occurred as a result of an electrical fault on 4B ESP field 3, which resulted in loss of that field, with resulting increase in particulate emission.	1
	The root cause of the problem was a failed cartridge fuse switch and associated cabling on the ESP switchboard.	1
	Erratic ESP Performance - unknown cause	1
	<b>Total Number of Reporting Events</b>	<b>6</b>



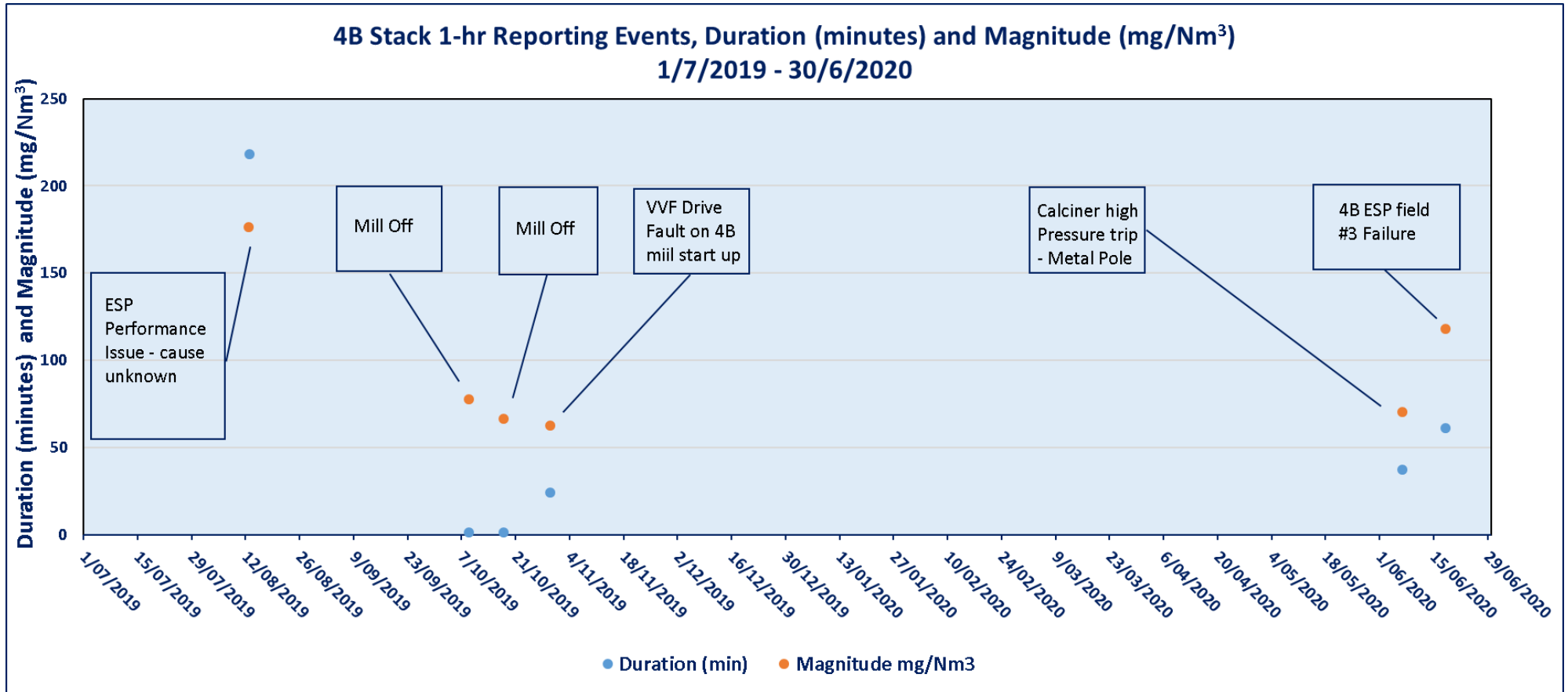
# Trend Analysis of magnitude and duration of 1-hr reporting events between 1/10/2019 to 30/9/2020

## 4A Stack:



There were 3, 1-hr Reporting events for the year.  
All the 1-hr Reporting events were process related.

## 4B Stack:



Most 1-hr reporting events have a different root cause.  
1-hr reporting events were both process and equipment related.

## Trend analysis of community complaints by type against 1-hr reporting events

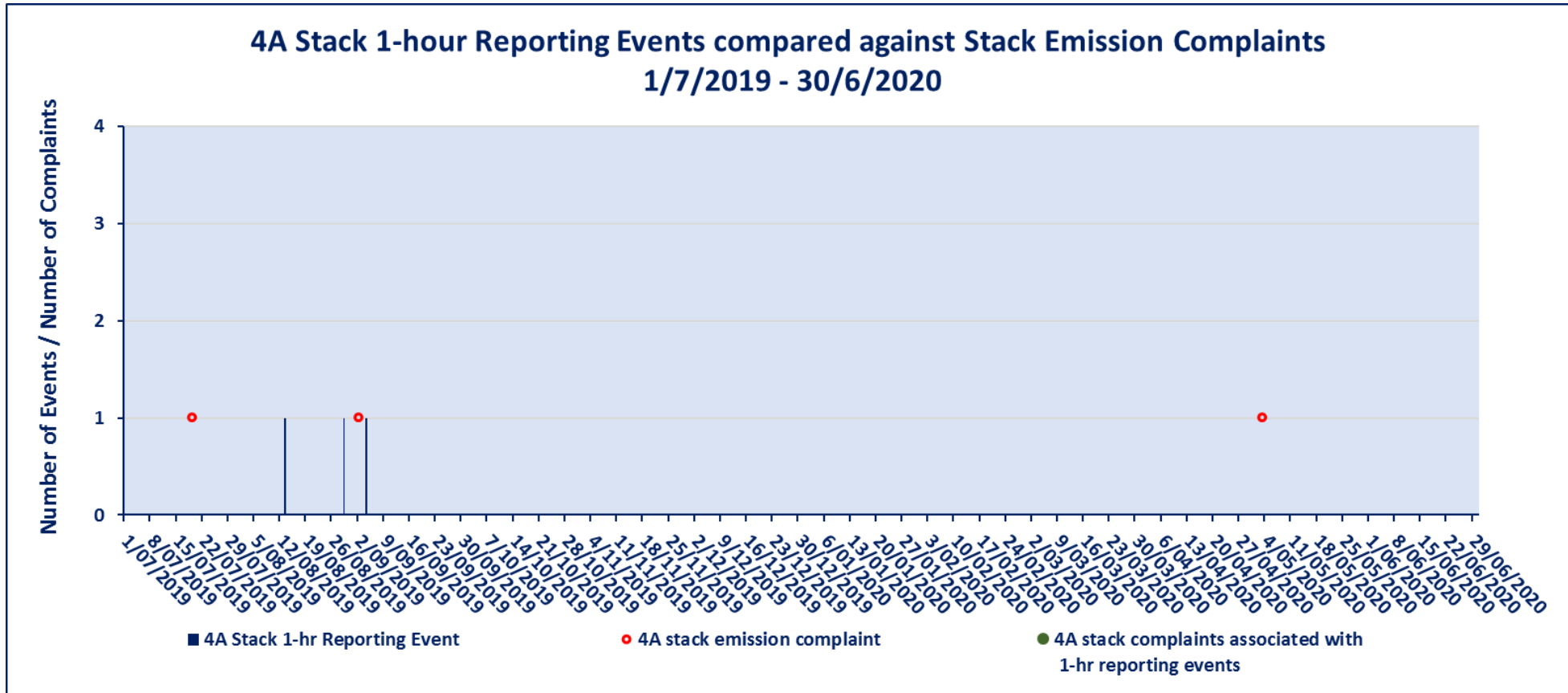
The table below captures community complaints by type and stack 1-hr reporting events for the period 1/7/2019 to 30/06/2020

Date	Time	4A Stack 1-hr Reporting Event	4B Stack 1-hr Reporting Event	4A stack emission complaint	4B stack emission complaint	4A stack complaints associated with 1-hr reporting	4B stack complaints associated with 1-hr reporting	Dust Complaint
19/07/2019	18:52			1	1			
13/08/2019	13:23		1					
13/08/2019	14:34	1						
29/08/2019	20:03	1						
2/09/2019	21:44			1				
4/09/2019	0:03	1						
27/09/2019	18:10							1
30/09/2019	18:15							1
30/09/2019	18:00							1
30/09/2019	18:31							1
30/09/2019	18:30							1
8/10/2019	16:30							1
9/10/2019	19:10		1					
11/10/2019	12:00							1
12/10/2019	11:11							1
18/10/2019	10:02		1					
23/10/2019	18:30							1
29/10/2019	19:30							1
30/10/2019	16:26		1					
1/11/2019	09:39							1
4/11/2019	15:00							1
10/11/2019	18:03							1
14/12/2019	05:30							1
16/12/2019	11:20							1
8/01/2020	13:00							1
19/02/2020	17:30							1
21/04/2020	15:40							1
3/05/2020	18:30			1				
5/06/2020	13:21							1
7/06/2020	17:59		1					
12/06/2020	13:30							1
18/06/2020	3:41		1					
29/06/2020	11:33							1
29/06/2020	11:30							1

Legend
Stack 1-hr reporting event
Stack emissions complaint
Dust complaint

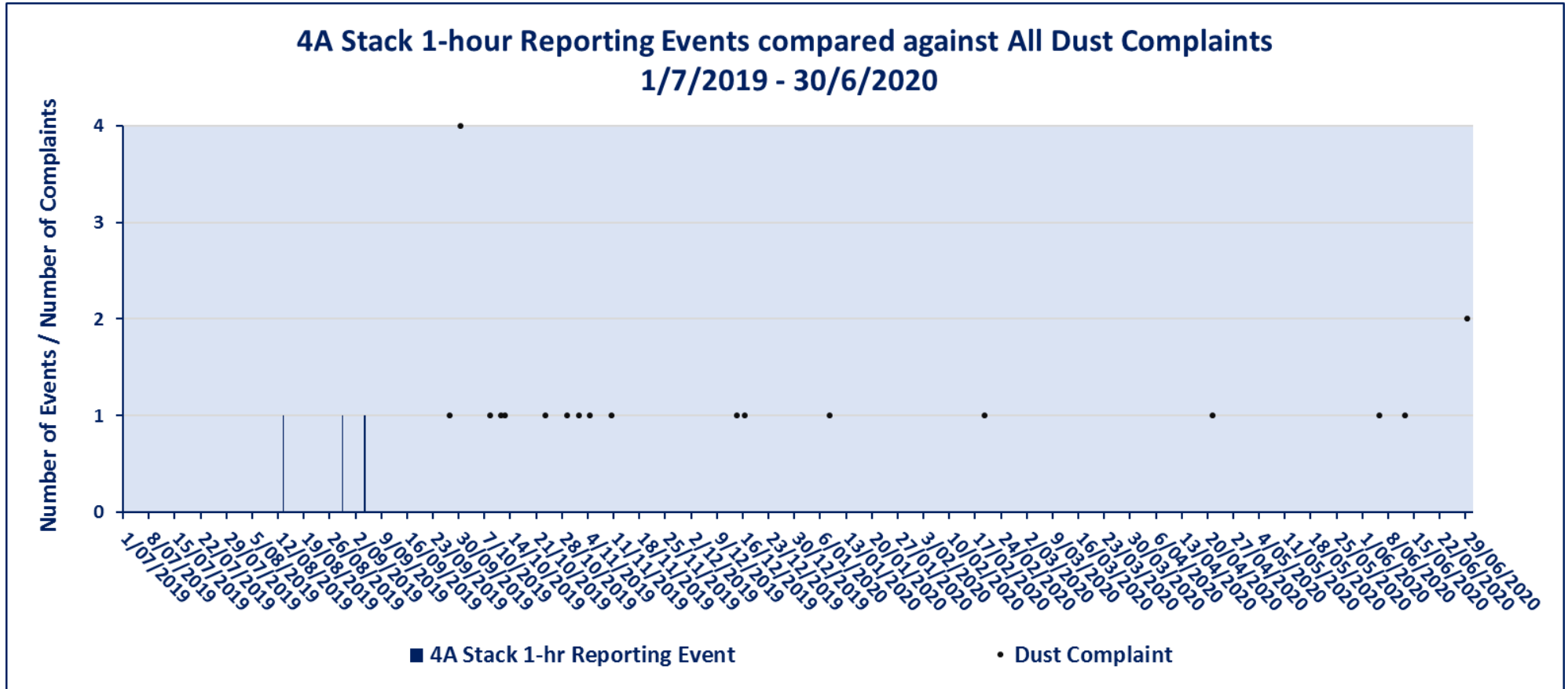
The above data is plotted on the following time series graphs for each stack.

## 4A Stack:



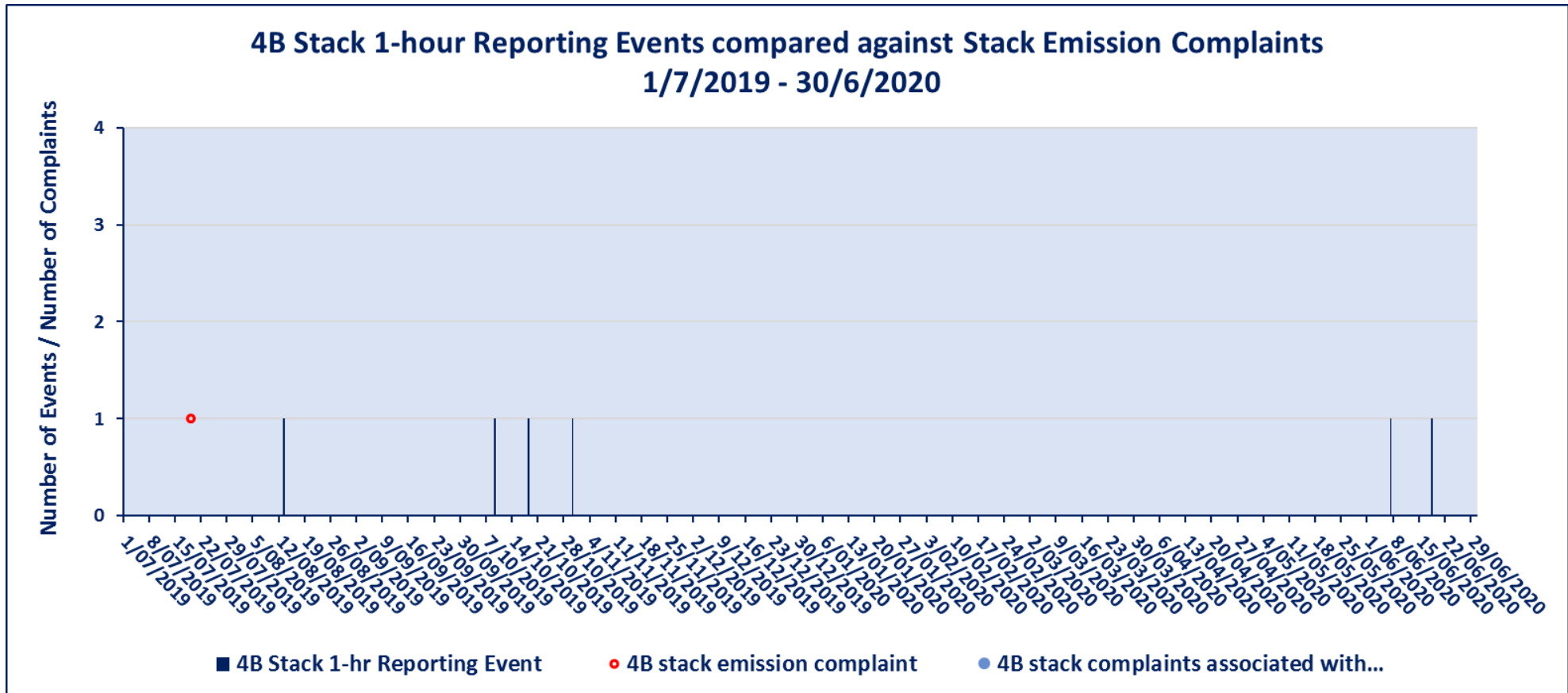
Stack emission complaints did not coincide with 4A stack 1-hr reporting events.

## 4A Stack:



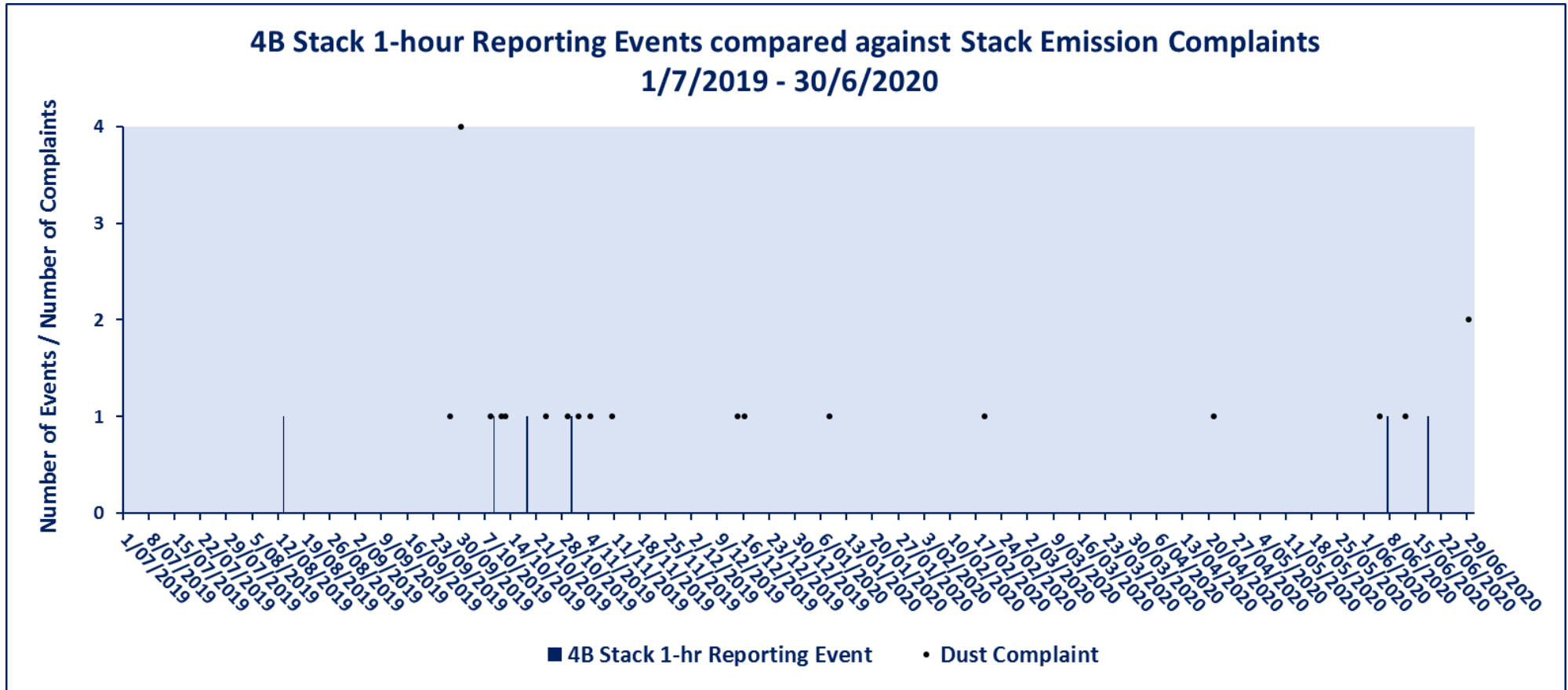
Dust complaints did not coincide with 4A stack 1-hr reporting events, indicating dust complaints are not related to stack emissions.

## 4B Stack:



Stack emission complaints did not coincide with 4B stack 1-hr reporting events.

## 4B Stack:



Dust complaints did not coincide with 4B stack 1-hr reporting events, indicating dust complaints are not related to stack emissions.

## Stacks 4A and 4B - Comparison of current and previous year 1-hr reporting events - by cause and number

The table below details the number and cause of 1-hr reporting events for both stacks, for the current and previous reporting year.

Stack	Cause of 1-hr Reporting Event	Type of 1-hr Reporting Event	Number of 1-hr reporting events previous year 1/7/2018 to 30/6/2019	Number of 1-hr reporting events current year 1/7/2019 to 30/6/2020
4A	Excess build-up within the Bypass process	Process related	1	2
	Erratic ESP Performance - unknown cause	Process related	0	1
	<b>Total Number of Reporting Events</b>		<b>1</b>	<b>3</b>
4B	4B Mill off for extended period	Process related	0	2
	Dislodged baffle plates at the entrance to the Electrostatic Precipitator were found to be the root cause	Equipment related	2	0
	4B Mill tripped (unforeseen sudden stop causing upset process conditions)	Process related	1	0
	Rare failure of a pump level protection sensor on the 4B conditioning tower header tank, tripping the pumps providing water to the conditioning tower sprays during a 4B mill stoppage	Equipment related	1	0
	Failure of the pump on the conditioning spray system to turn on, when the 4B Mill was turned off	Equipment related	1	0
	The 4B Electrostatic Precipitator (emission filtering equipment) efficiency was reduced as a result of water ingress from a cracked plastic casing on an electrical control unit.	Equipment related	1	0
	VVF drive fault occurred on 4B Raw feed conveyor during 4B mill start up sequence, preventing 4B conditioning tower sprays to come on.	Equipment related	0	1
	The event occurred after the calciner tripped on high exit pressure. The increase in particulate emissions occurred as a result of increased flow required to safely perform fault finding and remove a metal pole, that was found lodged in the dust flap below 4B cyclone.	Process related	0	1
	The event occurred as a result of an electrical fault on 4B ESP field 3, which resulted in loss of that field, with resulting increase in particulate emission. The root cause of the problem was a failed cartridge fuse switch and associated cabling on the ESP switchboard.	Equipment related	0	1
	Erratic ESP Performance - unknown cause	Process related	0	1
<b>Total Number of Reporting Events</b>			<b>6</b>	<b>6</b>

The data shows similar levels in 1-hr reporting events between the two reporting years



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## Identification of opportunities to reduce the frequency, duration and magnitude of 1-hr reporting events

Actions taken to prevent recurrence of 1-hr reporting events has been documented for each reporting each event. Equipment related failures are one off events and don't suggest an underlying condition that that requires any further action.

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### Stack Particulate Management Plan / TARP Review:

The Stack Particulate Management Plan (SPMP), approved on the 18 June 2018, incorporates the use of stack particulate emissions Trigger Action Reporting Plans (TARP's). The purpose of the stack TARP's is to enable early action to be taken to prevent or minimise the number of occasions where stack emissions reach the 1-hr reporting threshold. The plant initiates early action when particulate emissions reach the 10-minute trigger threshold.

The following table details the number of 10-minute triggers that were activated for each stack for the reporting period 1/7/2019 to 30/6/2020.

#### TARP trigger events for the period 1/7/2019 to 30/6/2020

Stack	Number of 10-minute trigger events	Number of 1-hr Reporting events
4A	17	3
4B	15	6

The data in the table shows the current 10-minute triggers are providing sufficient early warning needed to reduce the number of 1-hr reporting events.

The following table shows the 1-hr reporting events by type for the last three reporting years.

Stack	Cause of 1-hr Reporting Event	Type of 1-hr Reporting Event	Number of 1-hr reporting events previous year 1/11/2017 to 30/6/2018	Number of 1-hr reporting events previous year 1/7/2018 to 30/6/2019	Number of 1-hr reporting events current year 1/7/2019 to 30/6/2020
4A	Excess build-up within the Bypass process	Process related	5	1	2
	Ruptured airline hose to valve that controls water flow to the conditioning tower cooling spray system	Process related	1	0	0
	Erratic ESP Performance - unknown cause	Process related	0	0	1
	<b>Total Number of Reporting Events</b>		<b>6</b>	<b>1</b>	<b>3</b>
4B	4B Mill off for extended period	Process related	7	0	2
	Equipment failure of 4B Elevator drag chain transport system	Equipment related	1	0	0
	Dislodged baffle plates at the entrance to the Electrostatic Precipitator were found to be the root cause	Equipment related	0	2	0
	4B Mill tripped (unforeseen sudden stop causing upset process conditions)	Process related	0	1	0
	Rare failure of a pump level protection sensor on the 4B conditioning tower header tank, tripping the pumps providing water to the conditioning tower sprays during a 4B mill stoppage	Equipment related	0	1	0
	Failure of the pump on the conditioning spray system to turn on, when the 4B Mill was turned off	Equipment related	0	1	0
	The 4B Electrostatic Precipitator (emission filtering equipment) efficiency was reduced as a result of water ingress from a cracked plastic casing on an electrical control unit.	Equipment related	0	1	0
	VVF drive fault occurred on 4B Raw feed conveyor during 4B mill start up sequence, preventing 4B conditioning tower sprays to come on.	Equipment related	0	0	1
	The event occurred after the calciner tripped on high exit pressure. The increase in particulate emissions occurred as a result of increased flow required to safely perform fault finding and remove a metal pole, that was found lodged in the dust flap below 4B cyclone.	Process related	0	0	1
	The event occurred as a result of an electrical fault on 4B ESP field 3, which resulted in loss of that field, with resulting increase in particulate emission.  The root cause of the problem was a failed cartridge fuse switch and associated cabling on the ESP switchboard.	Equipment related	0	0	1
	Erratic ESP Performance - unknown cause	Process related	0	0	1
<b>Total Number of Reporting Events</b>		<b>8</b>	<b>6</b>	<b>6</b>	

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The data in the table above shows that the introduction of the stack TARP's in July 2018, have been effective in reducing the number of process related 1-hr reporting events. Equipment performance related events that result in a 1-hr reporting event, are often unique in nature and require the plant to remain operational long enough to be able to determine the root cause of the problem, so that corrective action can be taken. The current 10-minute triggers however do provide the plant with the early warning needed to start trouble shooting for equipment related issues.

The current Trigger Action Reporting Plans have been effective in improving operation response times to conditions that have the potential for stack emissions to reach 1-hr reporting levels.

There have been no identified improvements required in the existing TARP's.

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## **Summary:**

- The existing TARP's have been effective, in reducing the number of 1-hr reporting events.
  - Opportunities to reduce the frequency, number and magnitude of 1-hr reporting events have been identified and implemented.
  - It is recommended that the performance of the existing TARP's, continue to be monitored for further improvement over the next 12 months.
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