



*Adelaide Brighton Cement Ltd*

ABN 96 007 870 199

## ANNUAL DUST MANAGEMENT REPORT FOR BIRKENHEAD WORKS

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### 2018 Annual Report and TARP Review

**Compliance date: 15/02/19**

**EPA Licence 1126: Dust Management Plan (U-755)**

**Licensed site: Adelaide Brighton Cement, Birkenhead Works**

**62 Elder Road, Birkenhead, SA 5015**

**Date of Submission: 15 February 2019**

**Version Number: 1**



Report Submitted by: Environmental Engineer

Certified by: Compliance Manager

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

## 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
$\mu\text{m}$	micrometre
$^{\circ}\text{C}$	degrees Celsius
m	metre
$\text{m}^3$	cubic metre
$\text{m}^3/\text{s}$	cubic metres per second
<b>Nomenclature</b>	<b>Definition</b>
PM <sub>10</sub>	Particulate matter with a diameter less than 10 micrometres
PM <sub>2.5</sub>	Particulate matter with a diameter less than 2.5 micrometres
24 hour average	Calendar day (midnight to midnight)
<b>Abbreviations</b>	<b>Definition</b>
ABC	Adelaide Brighton Cement
Air EPP	South Australian Environment Protection (Air Quality) Policy 2016
DMP	Dust Management Plan
EPA	Environment Protection Authority
GLPMRP	Ground Level Particulate Monitoring and Reporting Plan
SPMP	Stack Particulate Management Plan
TARP	Trigger Action Response Plan

<b>Purpose</b>	The purpose of the Dust Management Plan (DMP) is to facilitate the ongoing implementation of dust control measures to minimise offsite dust from the Facility.
<b>Dust Management Plan</b>	<p>This report has been prepared in compliance with the Dust Management Plan, approved 21 June 2018, by SA EPA.</p> <p>The plan is available on the ABC Birkenhead Community website:  <a href="https://http://www.birkenheadcommunity.com.au">https:// http://www.birkenheadcommunity.com.au</a></p>
<b>Background Information</b>	<p>The DMP contains a Trigger Action Response Plan (TARP) to proactively manage fugitive dust emissions.</p> <p>The TARP uses three levels of trigger:</p> <ul style="list-style-type: none"> <li>• Low (watch and wait) – early warning to increase awareness of potential dust issues</li> <li>• Medium (investigate) – there may be a potential dust issue and investigate</li> <li>• High (escalate) – dust concentrations are higher than normal and action may be required</li> </ul> <p>Triggers and responses have been defined for :</p> <ul style="list-style-type: none"> <li>• Ambient dust monitoring from on-site monitors</li> <li>• Meteorological parameters (forecasts and observations (e.g. extended dry period with less than 1 mm of rain over 20 days))</li> <li>• Visual observations</li> </ul> <p>Trigger levels and responses are documented in the EPA Approved DMP.</p> <p>All monitoring data, triggers, associated responses and actions are captured in the Dust Management Dashboard and control system, for reporting and analysis.</p> <p>This is the first review of the DMP and is undertaken three months after commencement of the TARP on 3 October 2018, therefore the review is for the reporting period 3/10/2018 to 31/12/2018.</p>

**Reporting Objective**

To review the effectiveness of the Trigger Action Response Plan (TARP) contained within the approved Dust Management Plan (DMP) and includes;

- Review of all trigger values and frequency of occurrence
- A review of the effectiveness of all action and response strategies
- Correlation between triggers and measured onsite and offsite dust levels
- A review and analysis of community complaints with the exceedance of trigger values and 24 hour exceedance of PM<sub>10</sub> and PM<sub>2.5</sub> Air (EPP) criteria
- A review and analysis of data collected from licence conditions U-729 and U-749
- A trend analysis of data collected
- Opportunities for improvement in dust management
- Revision of trigger level values as a result of improvements made in dust controls and practices

**Particulate Monitor Locations**



Map showing sampling locations, major infrastructure, sensitive environmental receptors, and north arrow

Sampling locations are indicated by colour-coded dots on the above map.

**NB:** Four sampling points are located on the Birkenhead Works site; the other sampling points are in the community (corner of Gunn/Well streets and Community Park).

<p><b>TARP – Review</b></p>	<p>A review of the Trigger Action Response Plan data, for the reporting period, 3 October 2018 – 31 December 2018, has been undertaken by Katestone Environmental Pty Ltd. (Katestone), in accordance with the requirements of the Dust Management Plan. Katestone’s report is attached as an Appendix to this report.</p>
<p><b>Summary of findings from the TARP Review</b></p>	<p><b>Review of trigger values and frequency of occurrence</b></p> <p>The data analysis shows that there were 192 trigger alerts during the reporting period of 90 days, comprising of:</p> <ul style="list-style-type: none"> <li>• 112 low trigger alerts</li> <li>• 60 medium trigger alerts</li> <li>• 20 high trigger alerts</li> </ul> <p>The majority of the trigger alerts (85%) were raised from the dust monitors (Eastern Grounds, Northern Grounds, Southern Grounds and Block 9) with the remaining trigger alerts (15%) raised from the Meteorological forecast.</p> <p>In response to the 192 trigger alerts, ABC undertook 577 actions or approximately three actions per trigger alert. The details of the actions taken for each trigger alert are reported separately in the quarterly dust management reports for the reporting period.</p> <p><b>Review and analysis of data collected from licence conditions; Ground Level Particulate Monitoring and Reporting Plan (GLPMRP) - (U-729) and Stack Particulate Management Plan (SPMP) - (U-749)</b></p> <p>Ambient particulate monitoring data from the GLPMRP showed that there were no exceedances of the EPA criteria for the 24-hour average concentrations of PM<sub>10</sub> or the 24-hour average concentrations of PM<sub>2.5</sub> at the Community Park and Gunn St.</p> <p>Ambient particulate PM<sub>10</sub> (1-hour averages) monitoring data for the community monitors and stack particulate monitoring data (rolling 1-hr average) have been graphed on the same time series axis, along with high trigger alerts from onsite monitors so that comparisons can be made (refer Figure 1).</p> <p>Comparison of high trigger alerts against the ambient monitoring data for PM<sub>10</sub> (1-hour average) at the Community Park and Gunn St offsite monitoring sites during the reporting period shows that a high alert occurred during the highest offsite peak concentration mid November 2018. A number of other elevated 1-hour concentrations of PM<sub>10</sub> coincided with the high alerts.</p> <p>Comparison of the stack particulate emissions concentrations with the ambient monitoring data from the GLPMRP does not show any relationships.</p>

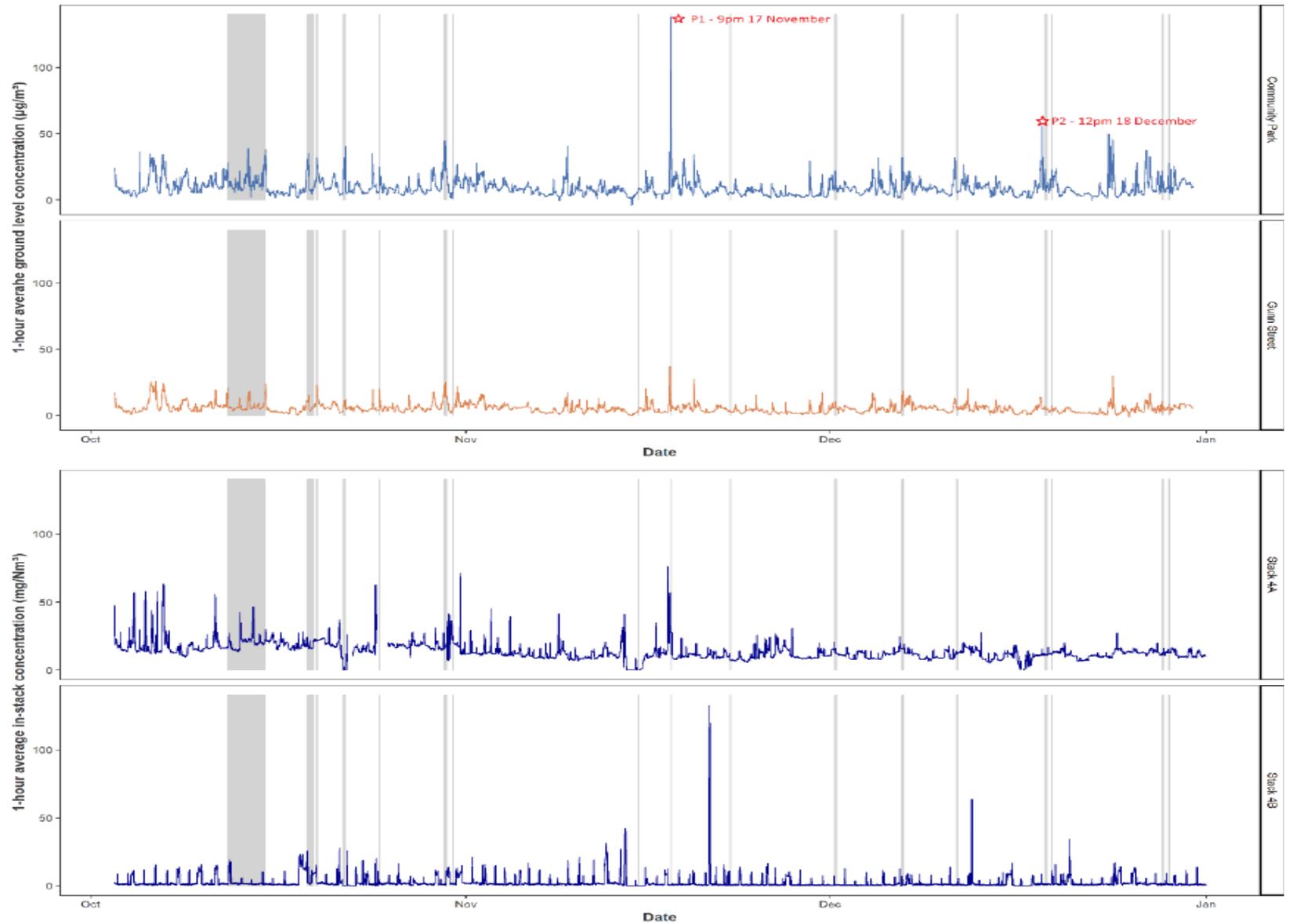


Figure 1: 1-hour average concentration of PM<sub>10</sub> (µg/m<sup>3</sup>) at offsite monitoring sites and rolling 1-hour average in-stack particulate matter concentrations (mg/m<sup>3</sup>) from Stacks 4A and 4B with periods of 'high' triggers marked in grey

The graph shows a high dust alert coincided with a 1-hour PM<sub>10</sub> concentration of 138 µg/m<sup>3</sup> and a 1-hour PM<sub>2.5</sub> concentration of 137 µg/m<sup>3</sup>, on the 21 November at 9pm (point P1 on Figure 1). The alert occurred on the Southern Grounds monitor only, with the wind blowing from a Southerly direction (i.e. parallel to the site with respect to the community monitor, rather than across the ABC site). Plant operators noted in their investigation that the alert coincided with the observation of smoke from the Port Adelaide Enfield Twilight Christmas Parade Fireworks, which were taking place on the Port River, directly to the south of the site.

The second highest 1-hour PM<sub>10</sub> concentration of 56 µg/m<sup>3</sup> and a 1-hour PM<sub>2.5</sub> concentration of 32 µg/m<sup>3</sup> for the reporting period occurred on the 18 December at 12 pm, (Point P2 on Figure 1). The wind was blowing towards the plant from the South West (i.e. towards the site).

**Review and analysis of community complaints with the exceedance of trigger values and 24 hour exceedance of PM<sub>10</sub> and PM<sub>2.5</sub> Air (EPP) criteria**

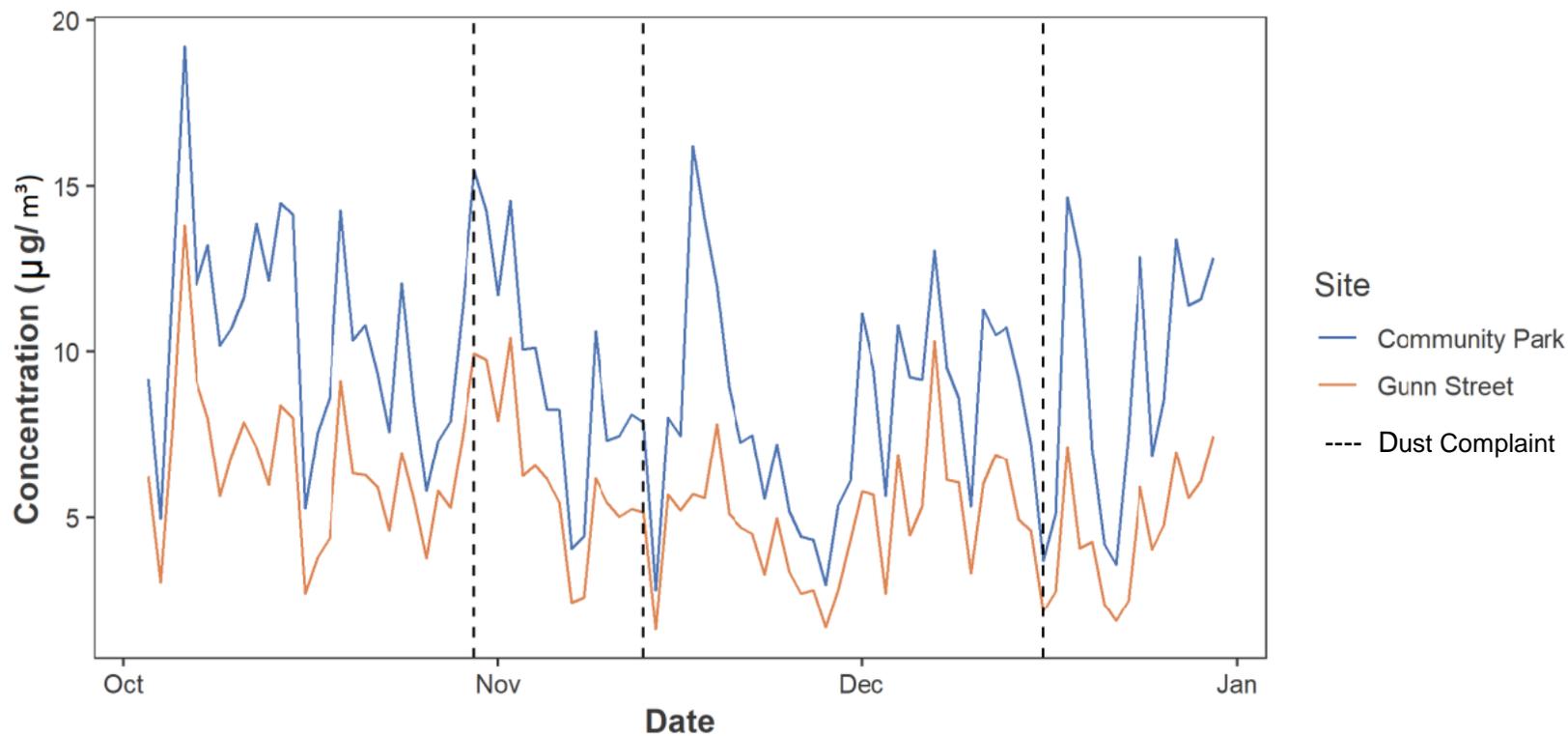
There were no exceedances of the EPA criteria for 24-hour average concentrations of PM<sub>10</sub> or 24-hour average concentrations of PM<sub>2.5</sub> at the Community Park and Gunn St.

There were four (4) complaints made during the reporting period in reference to dust as listed in the table below. It should be noted that two of the complaints were reported on the same day whilst only one complaint referred to a specific time period.

Reporting date	Impact date, if reported	Complaint description	Distance and direction from site
30 October 2018	Not reported	Resident brought car in for inspection	289 m - WNW
13 November 2018	Not reported	Resident brought car in for inspection	541 m - WSW
13 November 2018	12 November 2018	Dust on car - occurred overnight	383 m - W
17 December 2018	Not reported	General enquiry on dust	610 m - WNW

Graph 1: Dust Complaints vs Community PM<sub>10</sub> (24-hour average) Monitoring Data, shows the 24-hour average concentrations of PM<sub>10</sub> at the offsite monitors during the reporting period with the dust complaint reporting dates marked as vertical dashed lines.

Graph 1: Dust Complaints vs Community PM<sub>10</sub> (24-hour average) Monitoring Data



The graph shows that the 24-hour average concentrations of PM<sub>10</sub> were below the EPA criterion of 50 µg/m<sup>3</sup> both prior to, during and after each complaint and that the complaints did not follow periods of higher than normal ambient particulate concentrations.

<b>TARP Effectiveness</b>	<p>The above information demonstrates that the TARP is working effectively and there is no evidence that new triggers are required at this stage.</p> <p>However, historical monitoring data shows that the February / March period is when highest dust levels occur in the Birkenhead region. Therefore, the TARP effectiveness should be reviewed again with data during that period.</p>
<b>Opportunities For Improvement in Dust Management</b>	<p>ABC's "Assessment of Options Report" – August 2018 approved by the EPA on 16 August 2018 identifies further opportunities to reduce particulate emissions from the site. The recommended improvement options will be incorporated into Environment Improvement Programme (currently being developed), that will be approved by the EPA.</p>
<b>Dust Management Plan Effectiveness</b>	<p>The DMP has raised the awareness of operations personnel to monitored dust levels.</p> <p>This has been achieved through the implementation of the Dust Management Dashboard, which provides</p> <ul style="list-style-type: none"> <li>• improved visibility and employee understanding of ambient particulate monitoring data</li> <li>• improved responsiveness to monitored dust levels, driven by dust trigger alerts</li> </ul> <p>This has resulted in</p> <ul style="list-style-type: none"> <li>• pro-active action taken to minimise dust in response to high trigger alerts, including meteorological forecasts</li> <li>• more timely response to plant issues</li> </ul>
<b>Appendix</b>	<p>Katestone report "Trigger Action Response Plan Annual Review", February 2019</p>

# Trigger Action Response Plan Annual Review

Prepared for:

**Adelaide Brighton Cement Ltd**

**February 2019**

**Final**

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## Glossary

<b>Term</b>	<b>Definition</b>
$\mu\text{g}/\text{m}^3$	micrograms per cubic metre
$\mu\text{m}$	microns
$^{\circ}\text{C}$	degrees Celsius
km	kilometre
km/h	kilometre per hour
m	metre
m/s	metres per second
$\text{m}^2$	square metres
$\text{m}^3$	cubic metres
$\text{m}^3/\text{s}$	cubic metres per second
<b>Nomenclature</b>	<b>Definition</b>
$\text{PM}_{10}$	particulate matter with a diameter less than 10 micrometres
$\text{PM}_{2.5}$	particulate matter with a diameter less than 2.5 micrometres
<b>Abbreviations</b>	<b>Definition</b>
ABC	Adelaide Brighton Cement
EPA	Environmental Protection Authority South Australia
GLPMRP	Ground Level Particulate Monitoring and Reporting Plan
SPMP	Stack Particulate Management Plan
TARP	Trigger Action Response Plan

## EXECUTIVE SUMMARY

Katestone Environmental Pty Ltd (Katestone) was commissioned by Adelaide Brighton Cement Ltd (ABC) to complete a review of the Trigger Action Response Plan (TARP) data for the reporting period 3 October 2018 to 31 December 2018.

The TARP is implemented and managed at ABC's Birkenhead facility through a Dust Management Dashboard operated in the Birkenhead Control Room. This includes receiving alerts that are triggered by monitoring data or observations of visible dust, analysis of air quality monitoring data, logging responses/actions and closing alerts.

Analysis of the TARP data during the reporting period showed the following:

- A total of 192 alerts were triggered during the reporting period.
- All alerts were triggered by either ambient monitoring data or forecast meteorological conditions: including 112 low level triggers (58%), 60 medium level triggers (31%) and 21 high level triggers (10%).
- The sites that generated the most triggers were Eastern Grounds (68) and Northern Grounds (54) followed by Southern Grounds (32), Meteorology – forecast (28) and Block 9 (9).
- Alerts were not generated by meteorological observations or by observations of visible dust during the reporting period.
- A total of 577 actions were taken during the reporting period, including 124 actions against low triggers (21%), 258 actions against medium triggers (45%) and 195 actions against high triggers (35%).
- On average, three separate actions were performed for every trigger.
- The most actions were performed in response to an alert generated by a meteorological forecast, with approximately seven actions performed in response.

Ambient concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> are measured through the Dust Management Dashboard. Analysis of the Ground Level Particulate Monitoring Program data collected during the monitoring period showed the following:

- 24-hour average concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> were below their relevant EPA criteria at both offsite monitoring sites: Community Park and Gunn Street
- Whilst the EPA criteria do not apply at locations onsite, it is relevant to recognise that 24-hour average concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> were below the EPA criteria at the onsite monitoring stations.

The analysis demonstrates that the TARP is working effectively and there is no evidence to suggest that a revision to the triggers are required at this stage. However, it is noted from historical monitoring data (Katestone, 2017), that highest dust levels occur in the Birkenhead region during February and March. Therefore, effectiveness of the TARP should be reviewed again with the data during that period.

# 1. INTRODUCTION

Katestone Environmental Pty Ltd (Katestone) was commissioned by Adelaide Brighton Cement Ltd (ABC) to complete a review of the Trigger Action Response Plan (TARP) data collected for the period 3 October 2018 to 31 December 2018 (the reporting period).

The purpose of this report is to review and evaluate the effectiveness of the TARP and make any recommendations for improvement. The review has been prepared to satisfy the following annual reporting requirements in ABC's licence (Licence number 1126):

*"1.1.2e a methodology and framework for the provision of an annual report to the EPA which includes the following but is not limited to:*

- i a review of all the trigger values identified in sub paragraph 2(a) of this condition*
- ii a review of the effectiveness of all action and response strategies identified in sub paragraph 2(c) of this condition*
- iii a trend analysis of data collected*
- iv a review and analysis of community complaints recorded in condition 300-9 with the exceedance of trigger values reported under sub paragraph 2(d) of this condition; and*
- v opportunities for improvement in dust management"*

Accordingly, this report details the following:

- Description of ABC's TARP – Section 2
- Reporting Period Data Summary, including:
  - TARP data collected during the reporting period – Section 3.1
  - In addition, this report also includes an analysis of data collected by ABC's other environmental monitoring programs during the monitoring period, including:
    - Ground Level Particulate Monitoring and Reporting Plan (GLPMRP) - required under Licence Conditions U-729 – Section 3.2
    - Stack Particulate Management Plan (SPMP) - required under Licence Conditions U-749 – Section 3.3
- Review of the effectiveness of the TARP data collection during the reporting period – Section 4
- Analysis of community complaints and TARP data during the reporting period – Section 0
- Conclusion and recommendations for improvement – Section 6 and 7.

## 2. TRIGGER ACTION RESPONSE PLAN

The Trigger Action Response Plan (TARP) forms part of ABC's overall Dust Management Plan (DMP) at its Birkenhead Site. The DMP defines a range of triggers to assist ABC to meet its dust management obligations by identifying circumstances when:

- Ground-level concentrations at offsite receptors are likely to be elevated due to activities onsite
- Activities onsite are generating dust outside of the normal range.

Three levels of triggers are defined within the TARP:

1. Low trigger (Watch and wait). This is an early warning level put in place to increase awareness of potential dust issues before they arise.
2. Medium trigger (Investigate). A medium trigger indicates that there may be a potential dust issue and specific investigation is warranted.
3. High trigger (Escalate). A high trigger indicates that dust concentrations are outside of the normal range and that an action is warranted.

The TARP has been designed to provide as much warning as possible to allow proactive management of fugitive dust. Therefore, a trigger, particularly a low or medium trigger, does not indicate the presence of a dust impact.

The triggers and associated responses defined in ABC's DMP are reproduced in the following sections.

### 2.1 TARP for ambient dust monitoring

Certain responses are implemented when ABC's ambient dust monitoring network measures concentrations of PM<sub>10</sub> that exceed the trigger values presented in Table 1. The responses that are triggered are presented in Table 2.

**Table 1** Trigger values for 1-hour average concentrations of PM<sub>10</sub>

Parameter	Block 9	North Grounds	East Grounds	South Grounds
Location	Onsite	Onsite	Onsite	Onsite
Low	35	20	22	19
Medium	41	27	28	26
High	66	47	48	44

**Table 2 Actions and responses for ambient monitoring data triggers – onsite, 1-hour average**

Trigger Level	Action required	Responsibility
Low	<ul style="list-style-type: none"> <li>Alert relevant operators that dust levels are elevated therefore heightened awareness to sources of dust may be required.</li> </ul>	Shift supervisor
Medium	As for low, in addition: <ul style="list-style-type: none"> <li>Ensure all routine dust management practices have been implemented.</li> <li>Visual observations on site to check if there are any significant visible dust emissions in the region of the exceeding monitor.</li> </ul>	Shift supervisor
High	As for medium, in addition: <ul style="list-style-type: none"> <li>Ensure all routine dust management practices have been implemented. If not, correct this immediately.</li> <li>Slow activities or reschedule to more suitable meteorological conditions.</li> <li>If dust mitigation equipment is unavailable, or at fault, investigate temporary alternative management practices.</li> <li>Mobilise water cart or apply additional water sprays</li> </ul>	Shift supervisor

## 2.2 Trigger values for meteorological parameters

Certain responses are implemented when ABC’s meteorological monitoring indicates that meteorological parameters correspond to the trigger values presented in Table 3. The responses that are triggered are presented in Table 4.

**Table 3 Trigger values for meteorological parameters**

Trigger level	Trigger
Low	Forecast of high temperatures (30 °C) and north-easterly winds (0° – 90°)
Low	Forecast of strong winds (> 6 m/s as a 3-hour average) from the Facility towards receptor areas (wind direction between 0° and 180°)
Medium	Forecast of strong winds (> 7 m/s as a 3-hour average) from the Facility towards receptor areas (wind direction between 0° and 180°)
Medium	Extended dry period indicated by less than 1 mm of rain over a 20-day period
High	Forecast of strong winds (> 8 m/s as a 3-hour average) from the Facility towards receptor areas (wind direction between 0° and 180°)

**Table 4 Actions and responses for meteorological data triggers**

Trigger Level	Action required	Responsibility
Low	<ul style="list-style-type: none"> <li>Alert shift employees that dust potential is elevated.</li> <li>Pre-emptive watering of stockpiles before handling.</li> <li>Assess potential for shifting operations to more favourable conditions.</li> <li>Ensure water truck is on standby to apply water.</li> <li>Visual observations of site every 2 hours.</li> <li>Application of water.</li> </ul>	Shift supervisor
Medium	As for low, in addition: <ul style="list-style-type: none"> <li>Visual observations of major stockpiles.</li> <li>Additional watering if warranted.</li> </ul>	Shift supervisor
High	As for medium, in addition: <ul style="list-style-type: none"> <li>Minimise activity rate</li> <li>Apply water/suppressant immediately</li> </ul>	Shift supervisor

## 2.3 Trigger values for visual observations

Certain responses are triggered if visual observations of dust occur as detailed in Table 5. The responses that are triggered are presented in Table 6.

**Table 5 Trigger values for visual observations**

Trigger level	Trigger
Low	General build-up of deposited dust on non-worked areas at the Facility, e.g. carparks, alongside buildings etc.
Medium	Visible dust plume generated by Facility activity above normal/acceptable levels
High	Visible dust plume crossing the Facility boundary

**Table 6 Trigger Action Response Plan – Visual Observations**

Trigger Level	Action required	Responsibility
Low	<ul style="list-style-type: none"> <li>Inspect site to determine source of dust.</li> <li>Check whether routine (baseline) dust management practices have been applied to that source</li> </ul>	Shift supervisor
Medium	As for low, in addition: <ul style="list-style-type: none"> <li>Apply dust management.</li> <li>If relevant, apply water and/or chemical suppressant to source of dust.</li> <li>If dust mitigation equipment is unavailable, or at fault, investigate temporary alternative management practices.</li> <li>Repair any faulty dust mitigation equipment.</li> </ul>	Shift supervisor
High	As for medium, in addition: <ul style="list-style-type: none"> <li>Minimise activity rate</li> <li>Apply water/suppressant immediately</li> </ul>	Shift supervisor

## 2.4 TARP Implementation

The TARP is implemented and managed at ABC's Birkenhead facility through a Dust Management Dashboard operated in the Birkenhead Control Room. This includes analysis of monitoring data, logging responses/actions, closing alerts, and raising visual observation alerts.

Live, 1-minute average air quality monitoring data is collected from two offsite monitors (Community Park and Gunn Street) and four onsite monitors (Northern Grounds, Southern Grounds, Eastern Grounds and Block 9). The data are analysed hourly and compared with the site-specific trigger conditions (as detailed in the previous tables) to generate trigger alerts.

The Dust Management Dashboard also incorporates meteorological data (forecast and observational), which are updated at 3-hour intervals and analysed daily between 5am-6am and 5pm-6pm. Trigger alerts are generated if meteorological data (observations and forecast) satisfy the relevant trigger level criteria (as detailed in the previous tables).

Periodically, staff in the Birkenhead Control Room are notified of any new or escalated alerts.

### 3. DATA SUMMARY

#### 3.1 TARP

##### 3.1.1 Triggers

A summary of all the TARP triggers generated during the reporting period (3 October 2018 to 31 December 2018) are presented in Table 7 and Table 8. If a site generated a trigger over consecutive hours, this is recorded as a single trigger of the highest level during the period.

The TARP trigger data shows that during the reporting period:

- A total of 192 triggers were recorded during the reporting period, including 112 low level triggers (58%), 60 medium level triggers (31%) and 21 high level triggers (10%)
- The sites that generated the most triggers were Eastern Grounds (68) and Northern Grounds (54) followed by Southern Grounds (32), Meteorology – forecast (28) and Block 9 (9).
- Triggers were not generated by meteorological observations or onsite observations during the reporting period.

**Table 7** Number of TARP triggers during the reporting period at each site

Site	Trigger level			Total
	Low	Medium	High	
Southern Grounds	17	14	1	32
Eastern Grounds	33	25	10	68
Block 9	7	2	0	9
Northern Grounds	37	13	4	54
Meteorology - forecast	18	6	5	29
Meteorology - observations	0	0	0	0
Onsite visual observations	0	0	0	0
<b>Total</b>	<b>112</b>	<b>60</b>	<b>21</b>	<b>192</b>

**Table 8** Percentage of each TARP trigger at each site

Site	Trigger level			Total
	Low	Medium	High	
Southern Grounds	53%	44%	3%	17%
Eastern Grounds	49%	37%	15%	35%
Block 9	78%	22%	0%	5%
Northern Grounds	69%	24%	7%	28%
Meteorology - forecast	62%	21%	17%	15%
Meteorology - observations	0%	0%	0%	0%
Onsite visual observations	0%	0%	0%	0%
<b>Total</b>	<b>58%</b>	<b>31%</b>	<b>10%</b>	<b>100%</b>

### 3.1.2 Actions

A summary of the number of actions recorded at each site for each trigger level alert during the reporting period are shown in Table 9, Table 10 and Table 11. Actions includes but are not limited to: alerting operators, checking for dust emissions, checking dust controls are in place and working, implement temporary mitigation, reduce activity rates and reschedule activities.

Actions undertaken during the reporting period show the following:

- A total of 577 actions were taken during the reporting period, including 124 actions against low triggers (21%), 258 actions against medium triggers (45%) and 195 actions against high triggers (35%)
- Sites that generated the most actions were Meteorology forecast (215 actions or 37%), followed by Eastern Grounds (164 actions or 28%), Northern Grounds (115 actions or 20%), Southern Grounds (71 actions or 12%) and Block 9 (12 actions or 2%)
- On average, three separate actions were performed for every trigger (Table 11).
- The most actions were performed in response to an alert that was generated by a meteorological forecast, with approximately seven actions performed.

**Table 9 Number of TARP actions taken at each site during the reporting period**

Site	Actions			Total number of Actions
	Low trigger	Medium trigger	High trigger	
Southern Grounds	21	43	7	71
Eastern Grounds	39	79	46	164
Block 9	8	4	0	12
Northern Grounds	49	39	27	115
Meteorology forecast	141	30	44	215
<b>Total</b>	<b>124</b>	<b>258</b>	<b>195</b>	<b>577</b>

**Table 10 Percentage of actions taken at each site during the reporting period**

Site	Actions			Total number of Actions
	Low trigger	Medium trigger	High trigger	
Southern Grounds	30%	61%	10%	12%
Eastern Grounds	24%	48%	28%	28%
Block 9	67%	33%	0%	2%
Northern Grounds	43%	34%	23%	20%
Meteorology forecast	66%	14%	20%	37%
<b>Total</b>	<b>21%</b>	<b>45%</b>	<b>34%</b>	<b>100%</b>

**Table 11 Summary of TARP triggers and actions taken at each site during the reporting period**

Site	Triggers	Actions	Average Actions/Trigger
Southern Grounds	32	71	2.2
Eastern Grounds	68	164	2.4
Block 9	9	12	1.3
Northern Grounds	54	115	2.1
Meteorology forecast	29	215	7.4
<b>Total</b>	<b>192</b>	<b>577</b>	<b>3.0</b>

### 3.2 Ground Level Particulate Monitoring and Reporting Plan

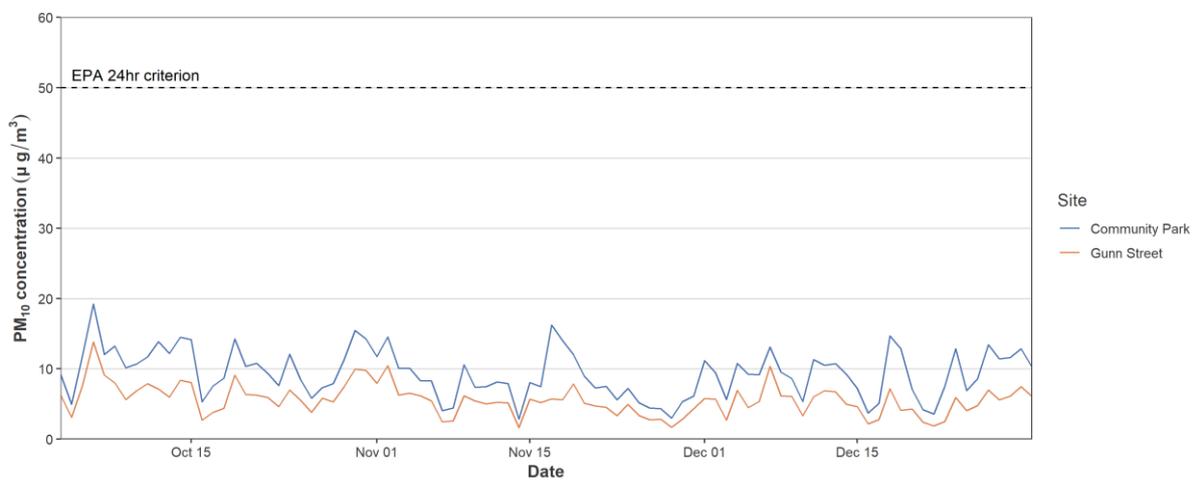
The PM<sub>10</sub> and PM<sub>2.5</sub> data collected during the reporting period in accordance with the GLPMRP are summarised in Table 12. The EPA 24-hour average criteria for PM<sub>10</sub> (50µg/m<sup>3</sup>) and PM<sub>2.5</sub> (25 µg/m<sup>3</sup>) are relevant to the offsite compliance sites at Community Park and Gunn Street.

Timeseries of 24-hour average PM<sub>10</sub> concentrations are presented for the offsite monitors in Figure 1 and Figure 2, and for the onsite monitors in Figure 3 and Figure 4. The GLPMRP data collected during the monitoring period showed the following:

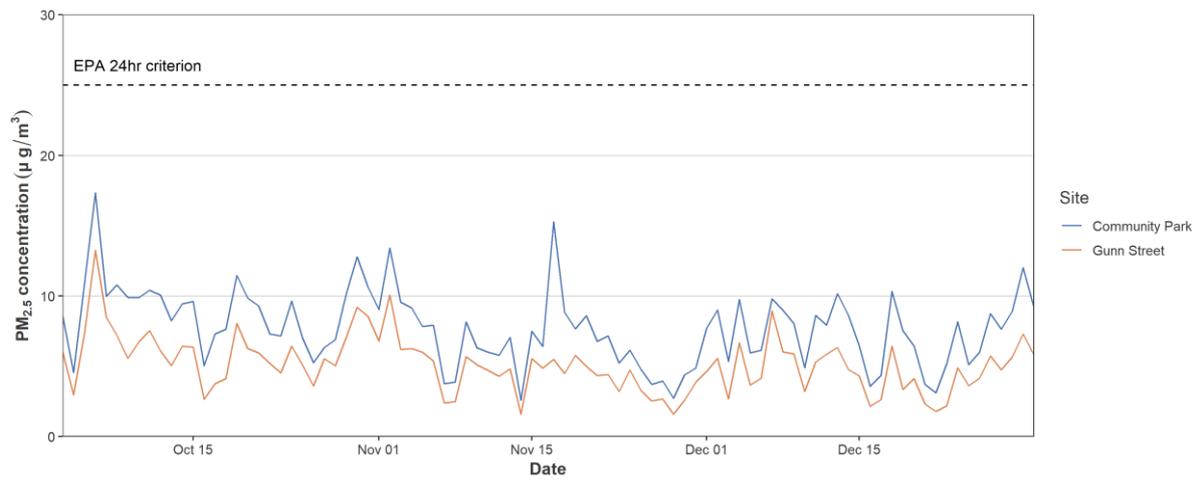
- Data capture during the reporting period was greater than 99% at all sites.
- 24-hour average concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> were below their relevant EPA criteria at both the Community Park or the Gunn Street monitoring sites during the reporting period (Figure 1 and Figure 2).
- The highest offsite 24-hour average concentration of PM<sub>10</sub> was 19 µg/m<sup>3</sup> (or 38% of the EPA criterion) and was recorded at Community Park.
- The highest offsite 24-hour average concentration of PM<sub>2.5</sub> was 17 µg/m<sup>3</sup> (or 68% of the EPA criterion) and was also recorded at Community Park.
- Whilst the EPA criteria do not apply at locations onsite, it is relevant to recognise that 24-hour average concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> were below the EPA criteria at the onsite monitoring stations.
- Highest onsite concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> were recorded at Eastern Grounds followed by Block 9, Southern Grounds and Northern Grounds.

**Table 12 Summary of GLPMRP data collected during the reporting period ( $\mu\text{g}/\text{m}^3$ )**

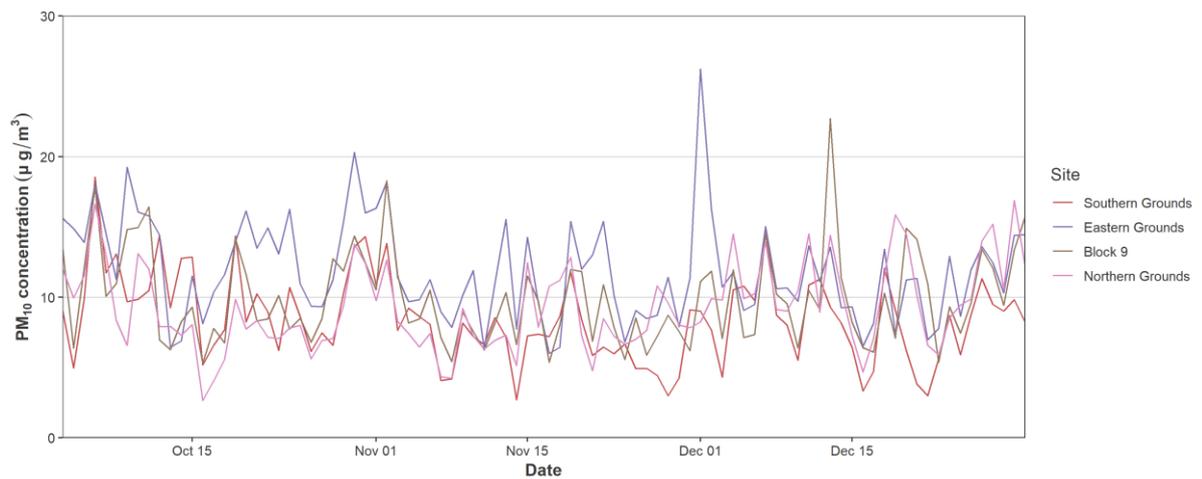
Location	Site	Avg period	Size	Min	Mean	95 <sup>th</sup> %ile	99 <sup>th</sup> %ile	Max	Data capture
Offsite	Community Park	1-hour	PM <sub>10</sub>	-4	9	22	34	138	100%
			PM <sub>2.5</sub>	-4	8	17	26	137	100%
		24-hour	PM <sub>10</sub>	3	9	15	17	19	100%
			PM <sub>2.5</sub>	3	8	12	15	17	100%
	Gunn Street	1-hour	PM <sub>10</sub>	-1	6	13	21	37	100%
			PM <sub>2.5</sub>	-1	5	12	19	37	100%
		24-hour	PM <sub>10</sub>	2	6	9	11	14	100%
			PM <sub>2.5</sub>	2	5	9	10	13	100%
Onsite	Southern Grounds	1-hour	PM <sub>10</sub>	1	8	19	30	79	100%
			PM <sub>2.5</sub>	1	7	16	25	78	100%
		24-hour	PM <sub>10</sub>	3	8	14	15	19	100%
			PM <sub>2.5</sub>	3	7	12	13	17	100%
	Eastern Grounds	1-hour	PM <sub>10</sub>	-2	12	24	42	140	100%
			PM <sub>2.5</sub>	-3	10	20	34	93	100%
		24-hour	PM <sub>10</sub>	6	12	17	21	26	100%
			PM <sub>2.5</sub>	5	10	15	17	17	100%
	Northern Grounds	1-hour	PM <sub>10</sub>	0	9	20	31	61	99%
			PM <sub>2.5</sub>	0	7	15	23	44	99%
		24-hour	PM <sub>10</sub>	3	9	15	17	17	100%
			PM <sub>2.5</sub>	2	7	11	13	14	100%
	Block 9	1-hour	PM <sub>10</sub>	1	10	22	33	84	100%
			PM <sub>2.5</sub>	-1	8	17	25	58	100%
		24-hour	PM <sub>10</sub>	5	10	15	19	23	100%
			PM <sub>2.5</sub>	4	8	13	16	17	100%



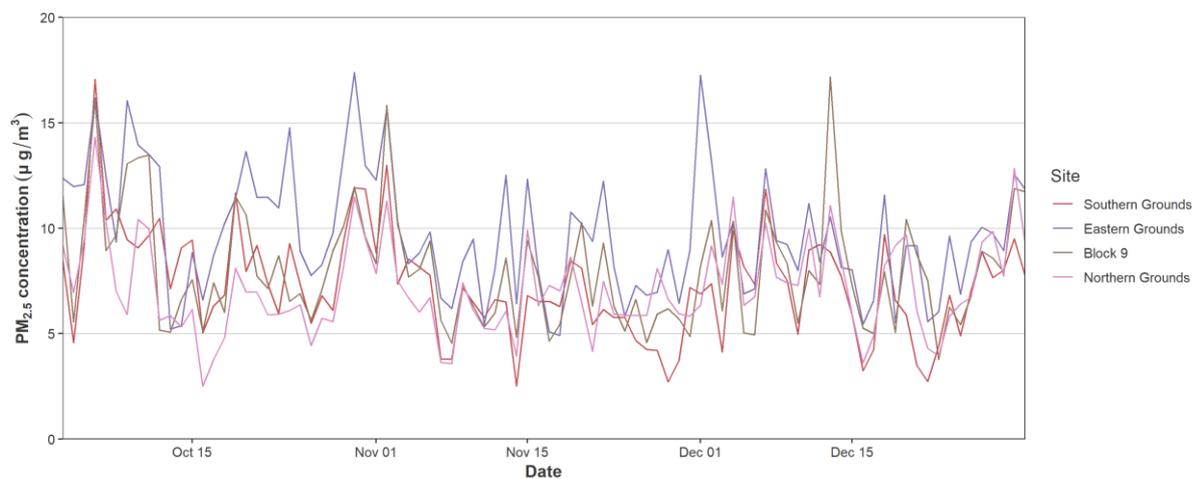
**Figure 1 24-hour average concentrations of PM<sub>10</sub> ( $\mu\text{g}/\text{m}^3$ ) measured at the offsite monitors during the reporting period**



**Figure 2** 24-hour average concentrations of PM<sub>2.5</sub> (µg/m<sup>3</sup>) measured at the offsite monitors during the reporting period



**Figure 3** 24-hour average concentrations of PM<sub>10</sub> (µg/m<sup>3</sup>) measured at the onsite monitors during the reporting period



**Figure 4** 24-hour average concentrations of PM<sub>2.5</sub> measured (µg/m<sup>3</sup>) at the onsite monitors during the reporting period

### 3.3 Stack Particulate Management Plan

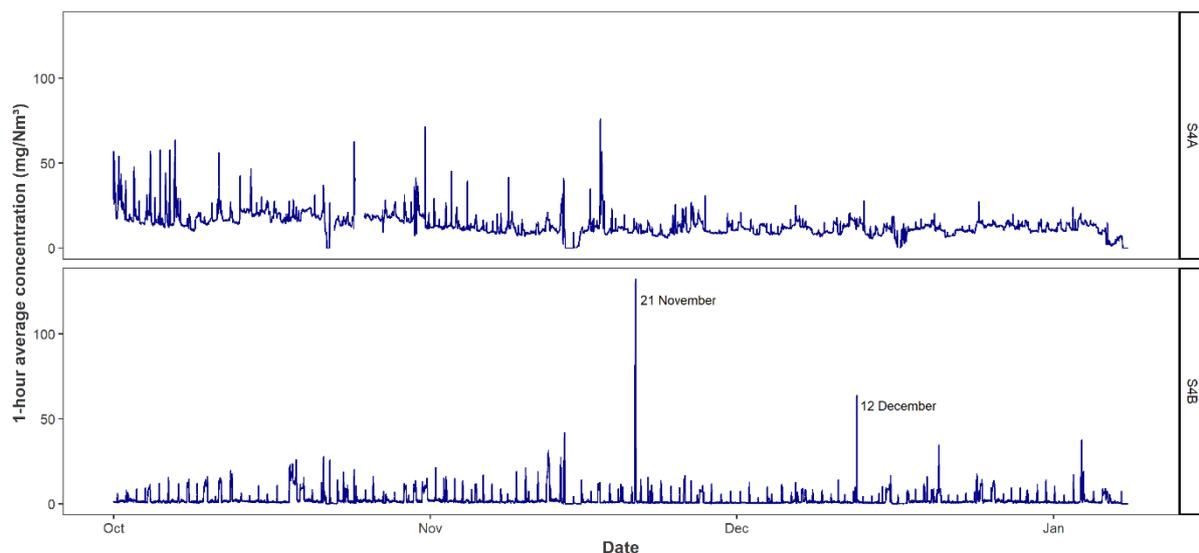
The data collected during the reporting period in accordance with the SPMP is summarised in Table 13. Timeseries of 1-hour and 24-hour rolling average in-stack concentrations are presented Figure 5 and Figure 6, respectively.

The SPMP data shows the following:

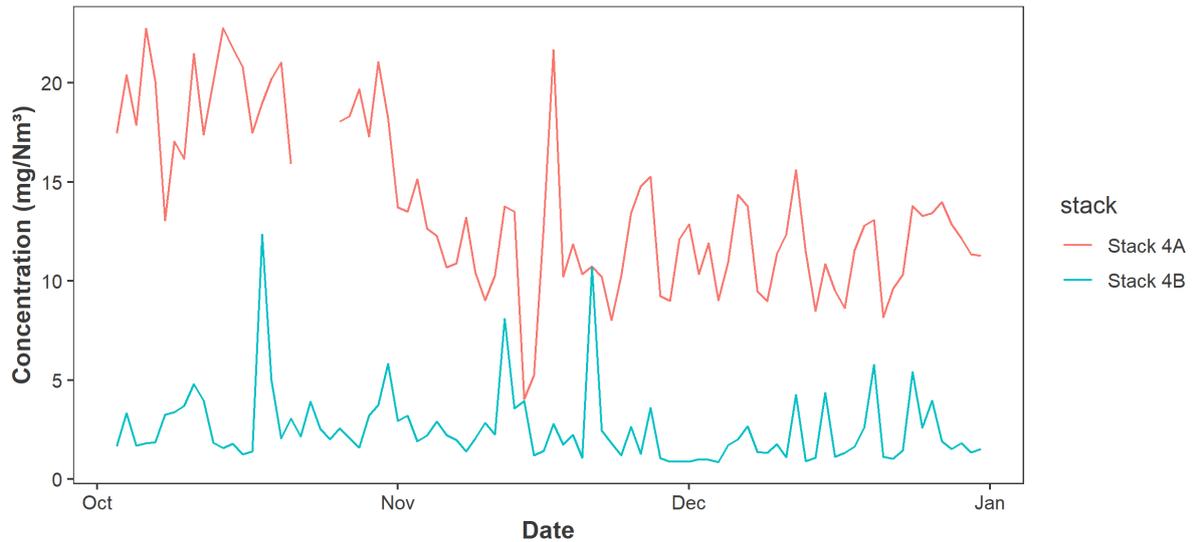
- Data capture during the reporting period was above 97% for Stack 4A and 100% for Stack 4B.
- The average particle concentration in Stack 4A (14 mg/Nm<sup>3</sup>) was higher than Stack 4B (3 mg/Nm<sup>3</sup>). The highest 1-hour average concentration of particles of 132 mg/Nm<sup>3</sup> was measured in Stack 4B.
- The 1-hour average and 24-hour average timeseries for Stack 4A showed a slight decreasing trend during the monitoring period.
- The 1-hour average and 24-hour average timeseries for Stack 4B showed a consistent trend during the monitoring period. The one exception to this was a spike on 21 November 2018 when the maximum 1-hour average particle concentration of 132 mg/Nm<sup>3</sup> occurred.
- Comparison of the stack particulate emissions concentrations with the GLPMRP data during the reporting period does not show any relationships.

**Table 13 Summary of SPMP data collected during the reporting period (mg/Nm<sup>3</sup>)**

Stack	Avg period	Min	Mean	95 <sup>th</sup> %ile	99 <sup>th</sup> %ile	Max	Data capture
4A	1-hour	0	14	23	38	76	98%
	24-hour	4	14	21	23	23	97%
4B	1-hour	0	3	11	18	132	100%
	24-hour	1	3	6	11	12	100%



**Figure 5 Rolling 1-hour average in-stack particulate matter concentrations (mg/m<sup>3</sup>) measured at Stacks 4A and 4B during the reporting period**

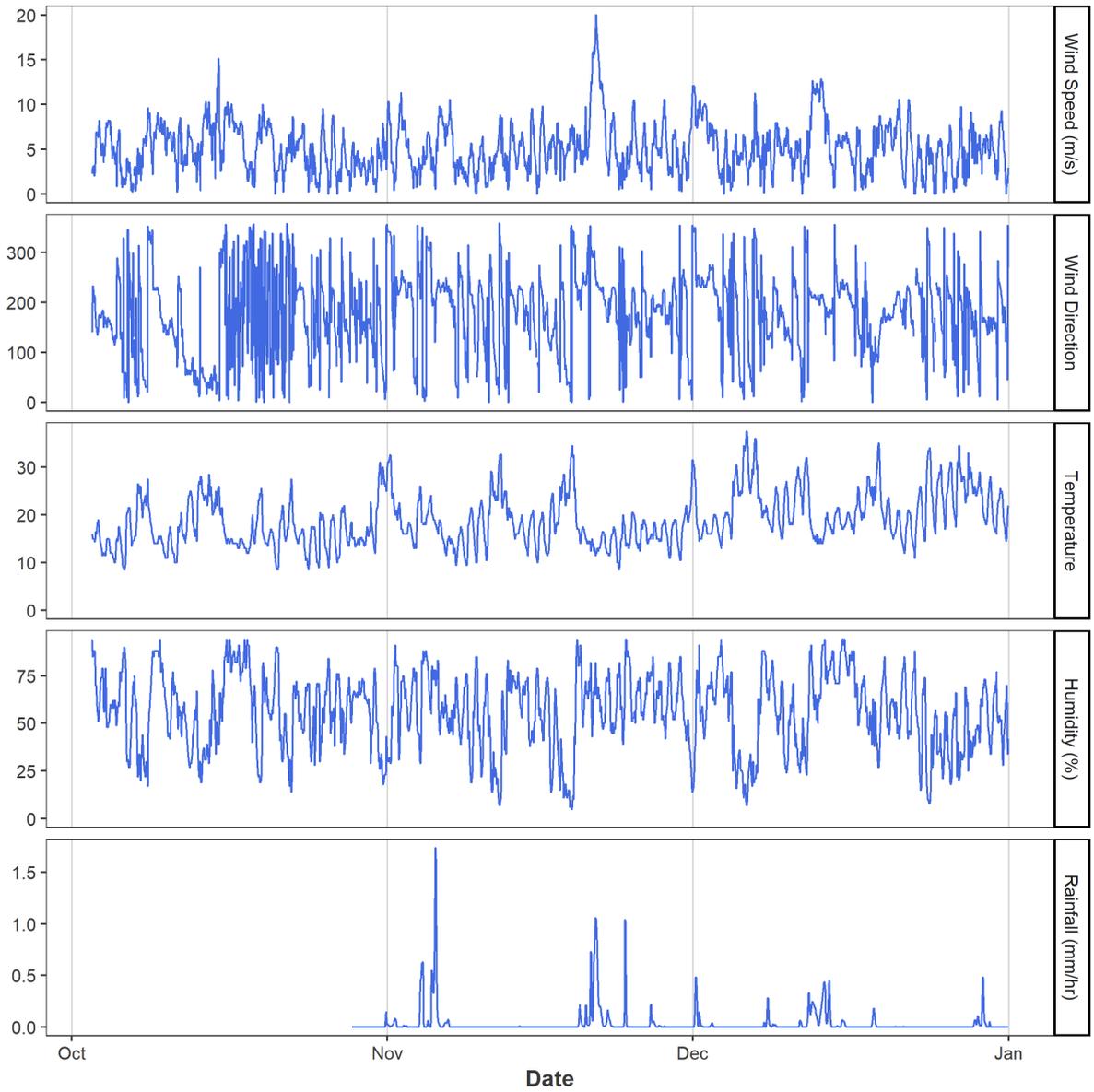


**Figure 6** 24-hour average in-stack particulate matter concentrations ( $\mu\text{g}/\text{m}^3$ ) measured at Stacks 4A and 4B during the reporting period

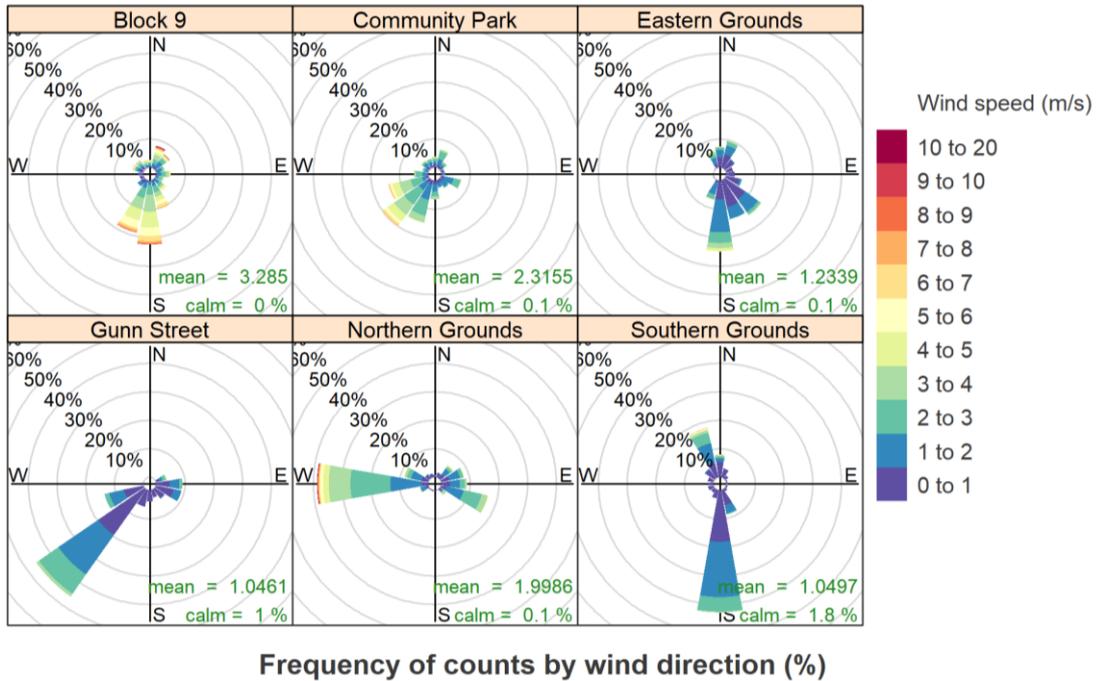
### 3.4 Meteorology

Forecast and observed meteorological data is provided by the Dark Sky data service. A timeseries of hourly average meteorological observations for the reporting period is presented in Figure 7. Note that automatic collection of rainfall did not begin until the end of October 2018. A review of this Dark Sky data service is currently planned to be undertaken in March 2019.

Meteorological data is also collected at each of the dust monitoring locations. The distribution of wind speed and wind direction measured at each monitor is presented in the wind roses in Figure 8.



**Figure 7 Meteorological observations for the ABC site during the reporting period**



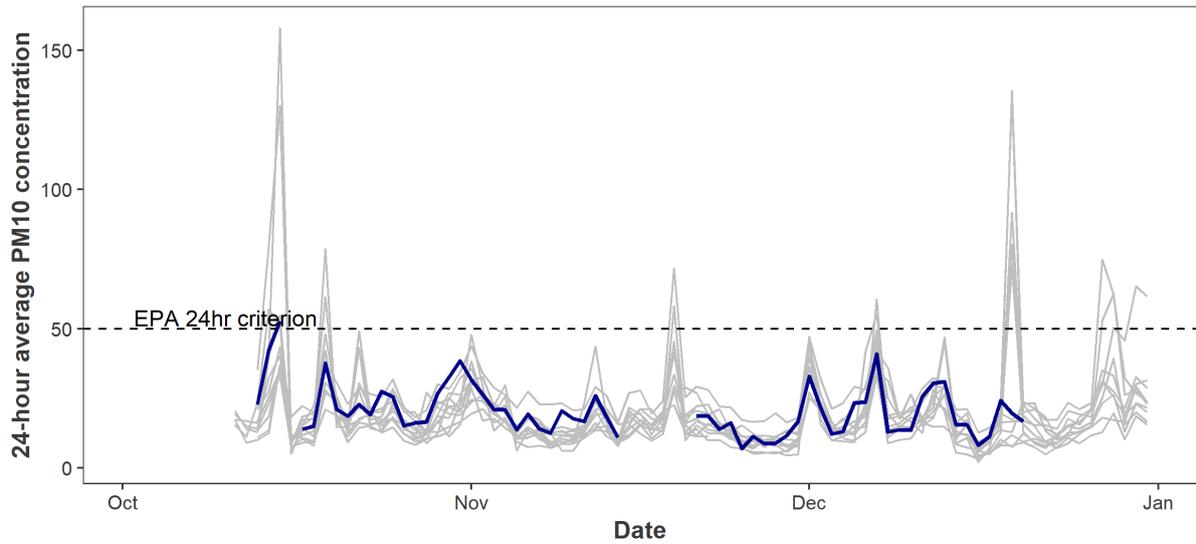
**Figure 8** Wind roses showing the distribution of wind speed and wind direction measured at the ABC dust monitors during the reporting period

### 3.5 EPA monitoring

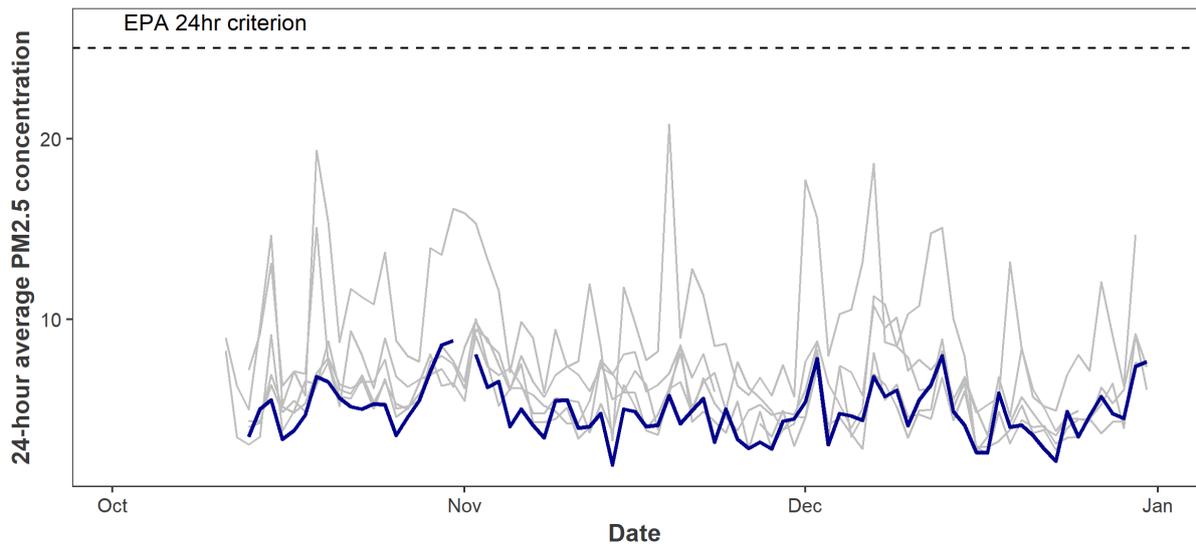
The closest EPA monitoring site to ABC's Birkenhead facility is Le Fevre 1. The 24-hour average concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> collected at Le Fevre 1 during the reporting period are shown in Figure 9 and Figure 10, respectively. Concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> measured at the other monitors within the EPA network are also shown in Figure 9 and Figure 10 (grey lines), to provide the context of regional dust levels.

The EPA monitoring data at Le Fevre 1 showed that 24-hour average concentrations of PM<sub>10</sub> were below the EPA criterion of 50 µg/m<sup>3</sup> on all but one occasion. The other EPA monitors also recorded elevated concentrations of PM<sub>10</sub> at this time (grey lines) indicating a regional event. It should be noted that the ABC offsite monitors (Community Park and Gunn St) did not show concentrations of PM<sub>10</sub> above the EPA criterion at the time the EPA monitoring data was elevated.

The EPA monitoring data at Le Fevre 1 showed that 24-hour average concentrations of PM<sub>2.5</sub> were below the EPA criterion of 25 µg/m<sup>3</sup> on all occasions as was the case for the ABC offsite monitors (Community Park and Gunn St).



**Figure 9** 24-hour average concentrations of PM<sub>10</sub> (µg/m<sup>3</sup>) recorded at Le Fevre 1 (blue) and other EPA monitoring sites (grey)



**Figure 10** 24-hour average concentrations of PM<sub>2.5</sub> (µg/m<sup>3</sup>) recorded at Le Fevre 1 (blue) and other EPA monitoring sites (grey)

## 4. TARP EFFECTIVENESS

The data analysis detailed in Section 3 shows that there were 192 trigger alerts during the reporting period of 90 days, comprising of:

- 112 low trigger alerts
- 60 medium trigger alerts
- 20 high trigger alerts.

The majority of the trigger alerts (85%) were raised from the dust monitors (Eastern Grounds, Northern Grounds, Southern Grounds and Block 9) with the remaining trigger alerts (15%) raised from the Meteorological forecast. In response to the 192 trigger alerts, ABC undertook 577 actions or approximately three actions per trigger alert.

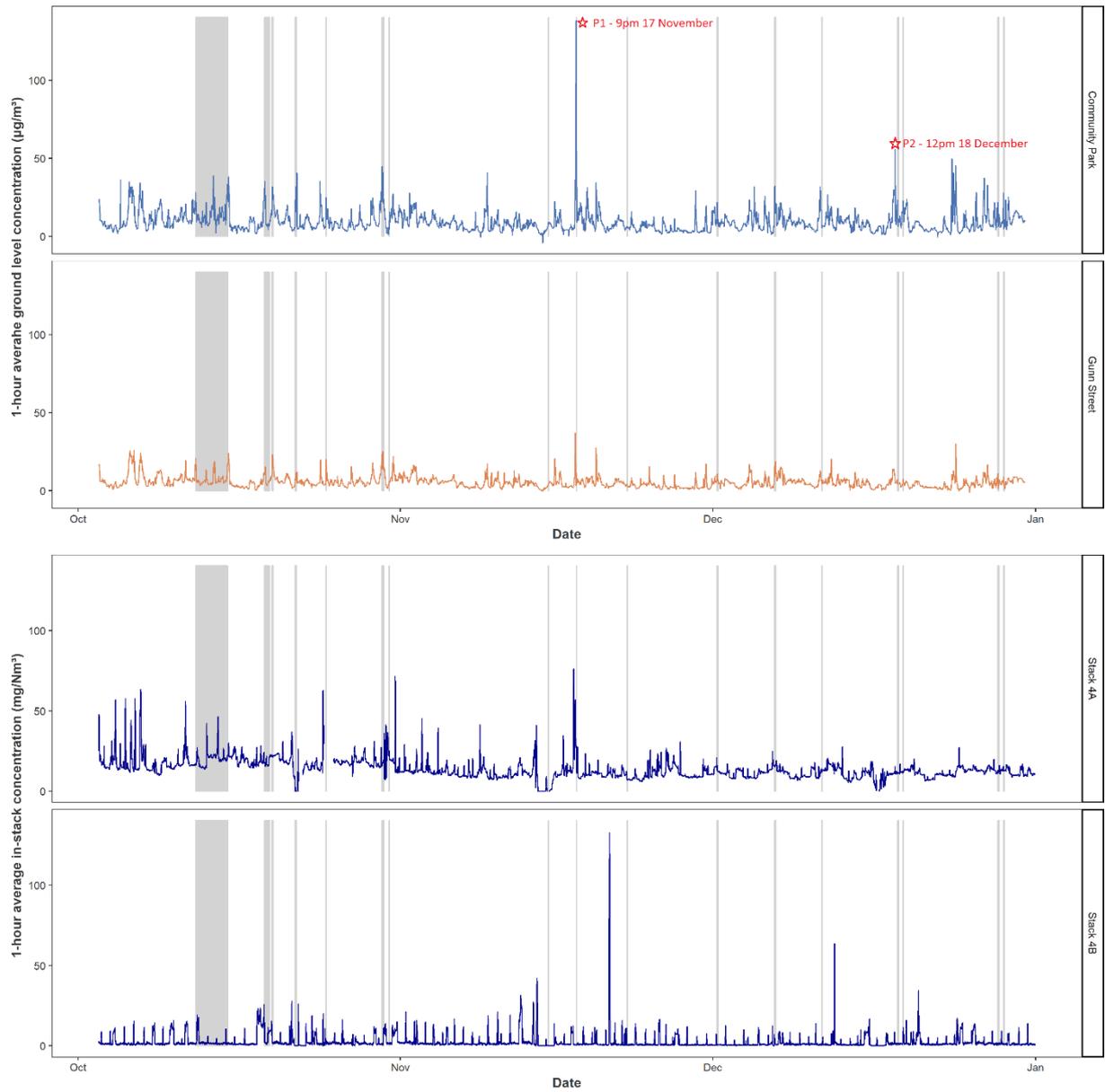
The GLPMRP data showed that during the reporting period there were no exceedances of the EPA criteria for 24-hour average concentrations of PM<sub>10</sub> or 24-hour average concentrations of PM<sub>2.5</sub> at the Community Park and Gunn St. Further to this, the onsite monitoring sites, whilst not required to demonstrate compliance with EPA criteria, also showed compliance.

Figure 11 provides the 1-hour average concentration of PM<sub>10</sub> at the Community Park and Gunn St offsite monitoring sites during the reporting period. High trigger alerts are identified with a grey vertical marker. The rolling 1-hour average in-stack concentrations of particulate matter (mg/m<sup>3</sup>) from Stacks 4A and 4B are also shown in Figure 11.

The figure shows the following:

- High alerts occurred during the highest and second highest offsite 1-hour average concentrations (as indicated by P1 and P2 on Figure 11, respectively)
- P1 occurred at 9pm on 17 November 2018, at this time the wind direction was 190° (southerly) and not blowing across the site to the Community Park monitor
- P2 occurred at 12pm on 12 December 2018, at this time the wind direction was 205° (south-southwesterly) and not blowing across the site to the Community Park monitor
- A number of other elevated 1-hour concentrations of PM<sub>10</sub> coincided with the high alerts.

The above information demonstrates that the TARP is working effectively and there is no evidence that new triggers are required at this stage. However, it is noted from historical monitoring data (Katestone, 2017) that the February/March period is when highest dust levels occur in the Birkenhead region. Therefore, the TARP effectiveness should be reviewed again with the data during that period.



**Figure 11** 1-hour average concentration of PM<sub>10</sub> (µg/m<sup>3</sup>) at offsite monitoring sites and rolling 1-hour average in-stack particulate matter concentrations (mg/m<sup>3</sup>) from Stacks 4A and 4B with periods of 'high' triggers marked in grey

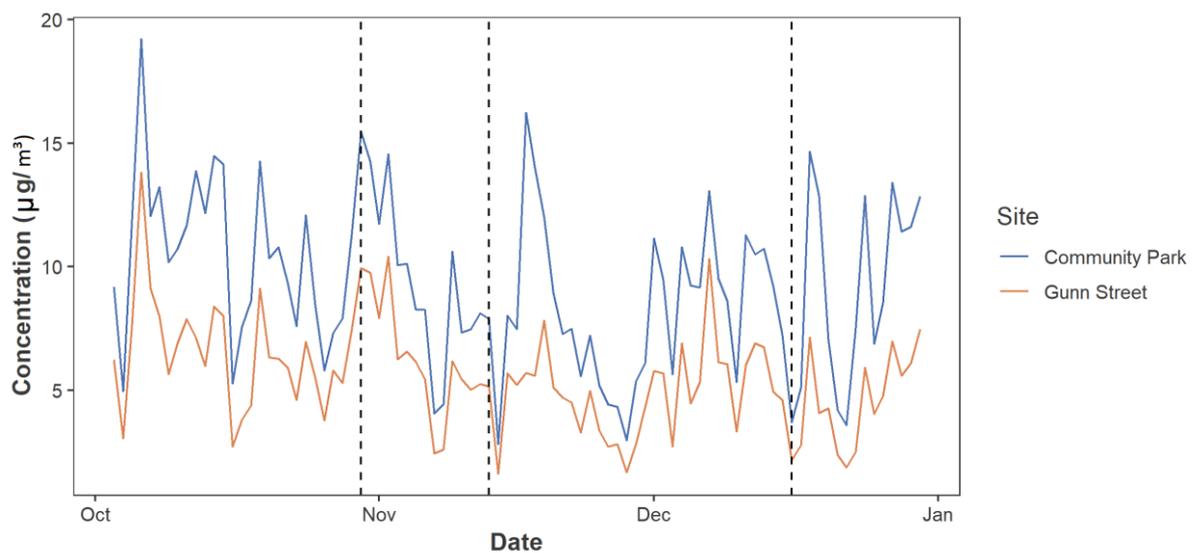
## 5. COMPLAINTS

There were four (4) complaints made during the reporting period in reference to dust as listed in Table 14. It should be noted that two of the complaints were reported on the same day whilst only one complaint referred to a specific time period.

**Table 14 Dust complaints made during the reporting period**

Reporting date	Impact date, if reported	Complaint description	Distance and direction from site
30 October 2018	Not reported	Resident brought car in for inspection	289 m - WNW
13 November 2018	Not reported	Resident brought car in for inspection	541 m - WSW
13 November 2018	12 November 2018	Dust on car - occurred overnight	383 m - W
17 December 2018	Not reported	General enquiry on dust	610 m - WNW

Figure 12 shows a timeseries of the 24-hour average concentrations of PM<sub>10</sub> at the offsite monitors during the reporting period with the dust complaint reporting dates marked as vertical dashed lines. The figure shows that the 24-hour average concentrations of PM<sub>10</sub> were below the EPA criterion both prior to, during and after each complaint and that complaints did not follow periods of higher than normal concentrations.



**Figure 12 Dust complaints reported (vertical dashed lines) and the corresponding 24-hour average concentration of PM<sub>10</sub> (µg/m<sup>3</sup>) at the offsite monitoring stations**

## 6. CONCLUSIONS

Katestone Environmental Pty Ltd (Katestone) was commissioned by Adelaide Brighton Cement Ltd (ABC) to complete a review of the Trigger Action Response Plan (TARP) data for the reporting period 3 October 2018 to 31 December 2018.

Analysis of the TARP data during the reporting period showed the following:

- A total of 192 alerts were triggered during the reporting period.
- All alerts were triggered by either ambient monitoring data or forecast meteorological conditions: including 112 low level triggers (58%), 60 medium level triggers (31%) and 21 high level triggers (10%).
- The sites that generated the most triggers were Eastern Grounds (68) and Northern Grounds (54) followed by Southern Grounds (32), Meteorology – forecast (28) and Block 9 (9).
- Alerts were not generated by meteorological observations or by observations of visible dust during the reporting period.
- A total of 577 actions were taken during the reporting period, including 124 actions against low triggers (21%), 258 actions against medium triggers (45%) and 195 actions against high triggers (35%).
- On average, three separate actions were performed for every trigger.
- The most actions were performed in response to an alert generated by a meteorological forecast, with approximately seven actions performed in response.

Ambient concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> are measured through the Dust Management Dashboard. Analysis of the Ground Level Particulate Monitoring Program data collected during the monitoring period showed the following:

- 24-hour average concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> were below their relevant EPA criteria at both offsite monitoring sites: Community Park and Gunn Street
- Whilst the EPA criteria do not apply at locations onsite, it is relevant to recognise that 24-hour average concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> were below the EPA criteria at the onsite monitoring stations.

## 7. RECOMMENDATIONS

It is recommended that the current trigger level values remain unchanged for the next reporting period. This is based on the finding of this report that the ambient concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> at offsite locations during the reporting period were below the 24-hour average EPA criteria.

It could be argued that the TARP trigger thresholds could be revised to be higher, with 192 trigger alerts issued and 577 actions taken and no offsite concentrations above the EPA 24-hour average criterion. However, historical data (Katestone, 2017) indicates that the summer months, February in particular, often lead to the highest levels of dust in the region. Therefore, it is recommended to maintain the current trigger levels for another quarter to evaluate them under these likely worst-case conditions.

## 8. REFERENCES

Katestone, 2017. *Air Quality Assessment of the Birkenhead Cement Plant*. Prepared for Adelaide Brighton Cement Limited by Katestone Environmental Pty Ltd. September, 2017.