QUARTERLY AMBIENT AIR MONITORING PROGRAMME FOR BIRKENHEAD WORKS

COMPLIANCE DATE: 31/10/16 – Quarter 3, 2016
EPA Licence 1126

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

62 Elder Road, Birkenhead, SA 5015

Date of Submission: **31 October 2016**

Version Number: **1**

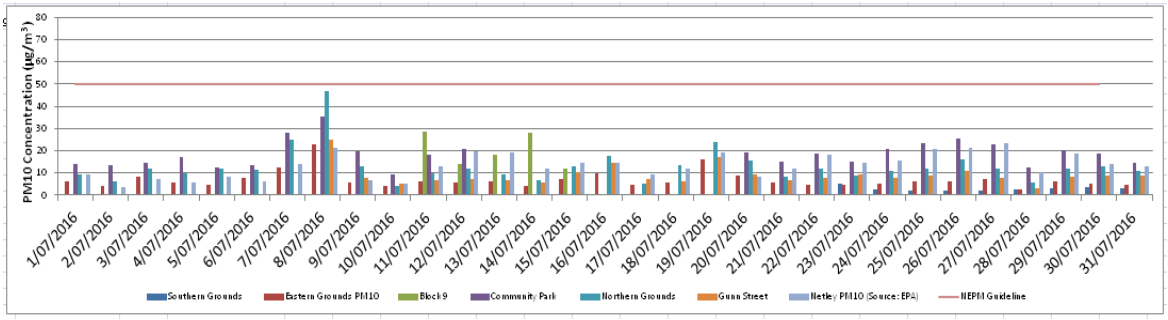
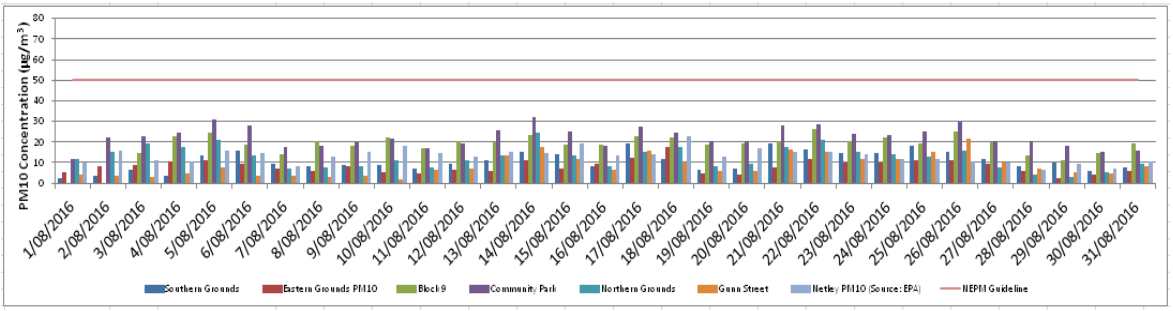
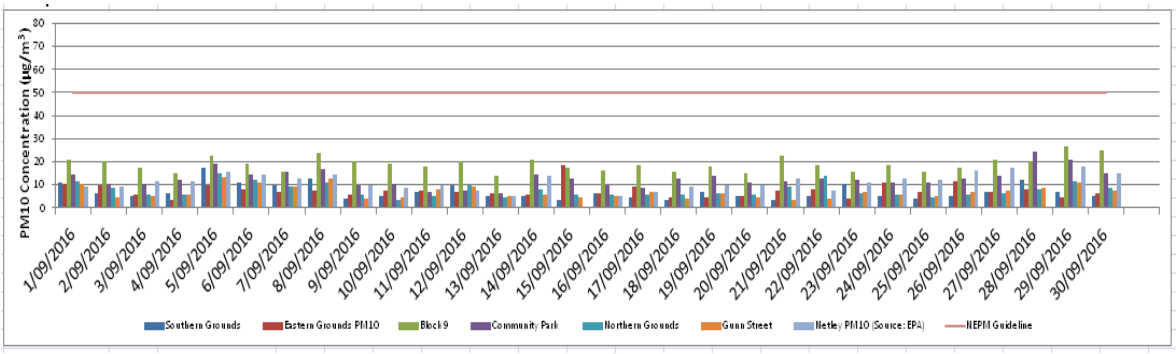
This document contains the Ambient Monitoring Programme in accordance with the EPA Licence 1126.

Monitoring Report Requirements

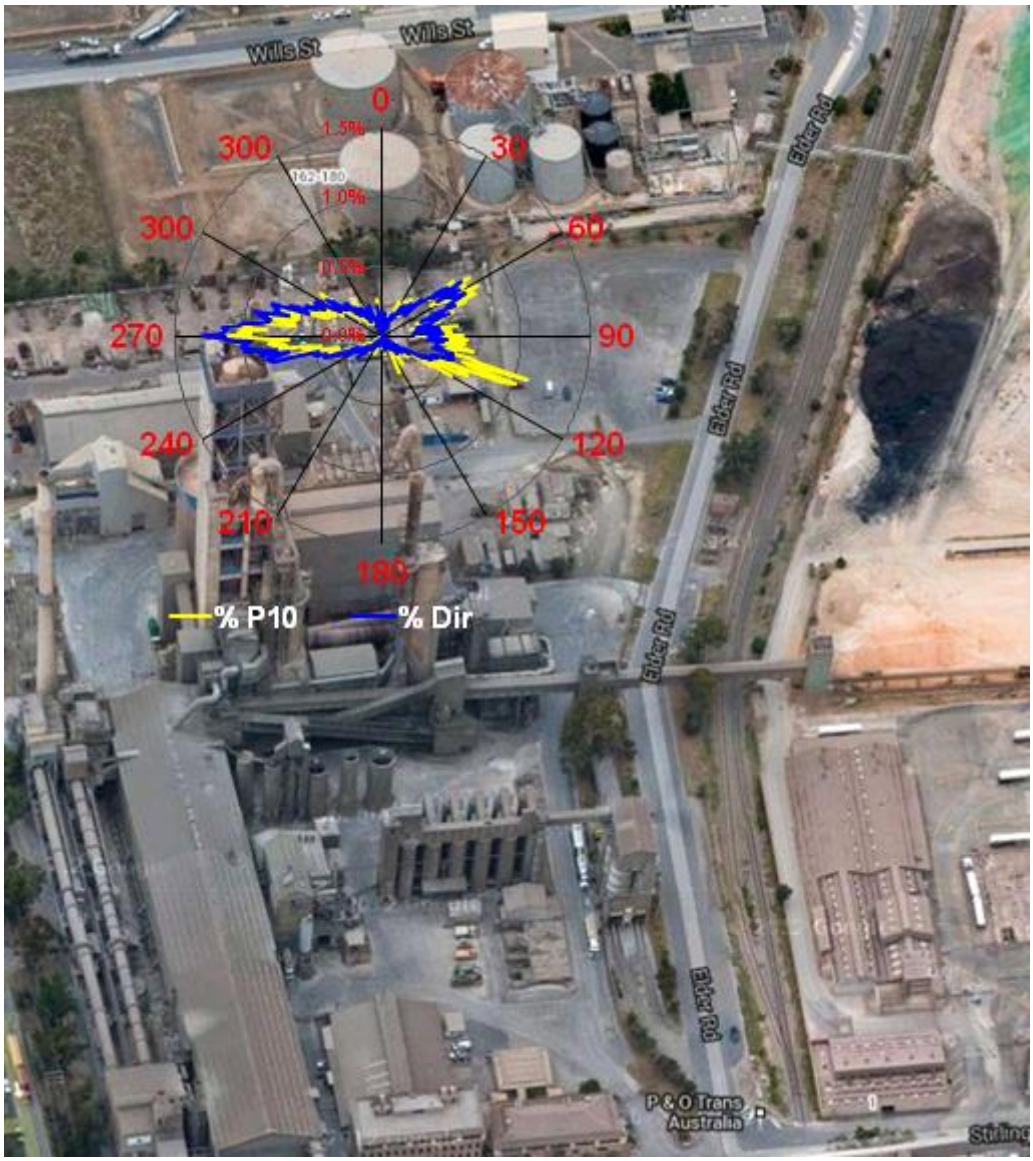
Monitoring Objective	To identify key sources of fugitive dust generated on the Birkenhead Site, by recording and analysing PM10 and reporting on actions taken to reduce fugitive dust sources.
Licence Requirements	***Section 4 (305-634)*** ***Ambient Particulate Level Monitoring and Reporting Plan*** The Licensee must: 1. Develop an ambient particulate monitoring and reporting plan to the satisfaction of the Authority that: 1.1. Will determine the sources of fugitive particulate emissions to identify opportunities for improvement; 1.2. Sets out how ambient TSP, PM10 and PM2.5 at STP will be monitored; and 1.3. Sets out the format of quarterly and annual reports 2. Submit the monitoring and reporting plan to the Authority for its assessment on or before the date indicated by the compliance date; 3. If the monitoring and reporting plan is not acceptable to the Authority, resubmit a revised version of the monitoring and reporting plan (incorporating any additions or alterations that are required by the Authority) within 30 days of being advised in writing by the Authority; 4. Implement the monitoring and reporting plan within 14 days of it being approved in writing by the Authority; 5. Prepare and submit quarterly reports to the Authority by the end of January, April, July and October each year; and 6. Prepare and submit an annual report to the Authority by the last day of October each year. NOTE 1: The Licensee should ensure that the ambient particulate monitoring and reporting plan has regard to input from the Adelaide Brighton Cement Community Liaison Group. NOTE 2: Guidance on the preparation of monitoring plans is provided in the EPA Guideline entitled 'Regulatory Monitoring and Testing: Monitoring Plan Requirements' dated 2006.
Background Information	• *Activity or process description and processing capacities, including prescribed activities conducted*

	○ Cement Works ○ Activities producing listed waste ○ Bulk shipping facility ○ Crushing, grinding or milling; rock, ores or minerals ○ Fuel burning; rate of heat release exceeding 5 MW • *Quantity and nature of emissions monitored* <u>Ambient Monitoring of Fugitive Dust on the Birkenhead Works Site</u> ○ Dust generated on site by the following: - All material movements on site - Stockpiles on site - Cleaning activities conducted on site - Truck and mobile equipment movements on site - All alternative fuels, raw materials and finished products on site - Conveyor systems on site - Storage facilities and fixed plant • *Description of the receiving environment (e.g. topography, location in a water protection area, proximity to a watercourse, etc)* ○ Plant is located adjacent to the Port River, Northern side of the Birkenhead Bridge ○ Plant is adjacent to a residential area
Sampling Locations, Frequency and Parameters	• *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). • *Sampling times and/or frequency* ○ Data is expressed as 10 minute and daily averages • *Parameters to be measured and analysed, including analytical method* ○ To investigate and aim to establish a baseline for ambient dust load for Birkenhead Works site and the surrounding area ○ To record spikes above the established baseline ○ To record all operational activities on site as per above list, re: dust generated on site (in Background Information Section of this table) ○ To analyse spikes and attempt to draw conclusions as to which

	operational activities are causal of dust generation ○ To examine the effects of wind directions and speeds ○ After further analysis and elimination of variables, aim to change systems, processes or activities on site to lessen the total dust impact ○ This would be a continually evolving analysis of the site and involve appropriate remedial action ○ This would also form an educational process of fugitive dust generation for our employees, contractors and adjacent community
Sampling and Testing Procedures	• *Sampling procedures including sampling methods and equipment, calibration procedures, filtering, decontamination and preservation techniques* ○ Six DustTrak DRX Units, which continuously measure PM2.5, PM10 and total PM. ○ The units are located at Gunn St, on the northern, southern and eastern grounds, Block 9 stockpiles and the Community Park. ○ These monitors are ***not compliance*** monitors.
Maintenance & Calibration	• *Maintenance & Calibration Procedures of Units* **Routine Internal Maintenance & Calibration** ○ Routine maintenance and inspection checks are typically carried out on a monthly basis. Depending on the results of the inspection, this may involve internal filter replacements, cleaning of inlet and sample tube, zeroing as well as general operation of the units. **External Maintenance & Calibration** ○ The units are sent to the certified suppliers for a full maintenance, calibration and compliance testing in line with manufacturer's recommendations on an annual basis. This may vary on the condition/performance of the monitor. ○ Calibration certificates are issued by the certified suppliers confirming the instrument accuracy against the relevant reference standards. • Maintenance and calibration records are kept onsite.
Information and Results – Key Findings	• *Data has been collected from ABC dust monitors (PM10), and from a neutral EPA dust monitor (Netley) for comparative purposes.* • *Graphs are constructed for dust monitor data, in each of the six locations, for each day* ○ Graphs showing both ABC and EPA (Netley) ambient particulate monitoring results are used for ***guidance*** purposes and to add further ***meaning*** by comparison. ○ Periods of dust levels exceeding 50 mg/Nm³ are examined in an attempt to see what site activities are causing these problems. It is hoped that by matching these activities up with dust levels, improvements can be made to counteract these problems. • **Key Graph Findings** ○ All monitors generally follow with one another and were comparable with the Netley control monitor and overall all six monitors indicate low PM10 levels. ○ There were no exceedances of the NEPM daily average air quality standard of 50 ug/m^3. ○ The Eastern Ground wind rose showed several spikes of PM10 coming from a southeastern direction during this period. These could be related to localised short term events.

Monthly PM10 Track Results (*Daily Averages*) Southern Grounds PM10 Eastern Grounds PM10 Block 9 PM10 Community Park PM10 Northern Grounds PM10 Gunn Street PM10 Netley PM10 (Source: EPA) NEPM Guideline	**July 2016**  All monitors displayed similar PM10 trends throughout the month with nothing exceeding the daily average of 50 ug/m^3. **August 2016**  All monitors displayed similar PM10 trends throughout the month with nothing exceeding the daily average of 50 ug/m^3. **September 2016**  All monitors displayed similar PM10 trends throughout the month with nothing exceeding the daily average of 50 ug/m^3.
Quarterly Wind/PM10 Graphs (Qualitative)	Quarterly wind & PM10 graphs were prepared for all dust track monitor sites based on ten minute wind data and PM10 readings. ***Please Note*****:** *Yellow plots show the percentage of PM10 whereas blue plots show the percentage of winds travelling from a specific direction. It is important to note that the percentages listed in these graphs are relative values and not absolute so they must not be compared quantitatively to other parameters.*

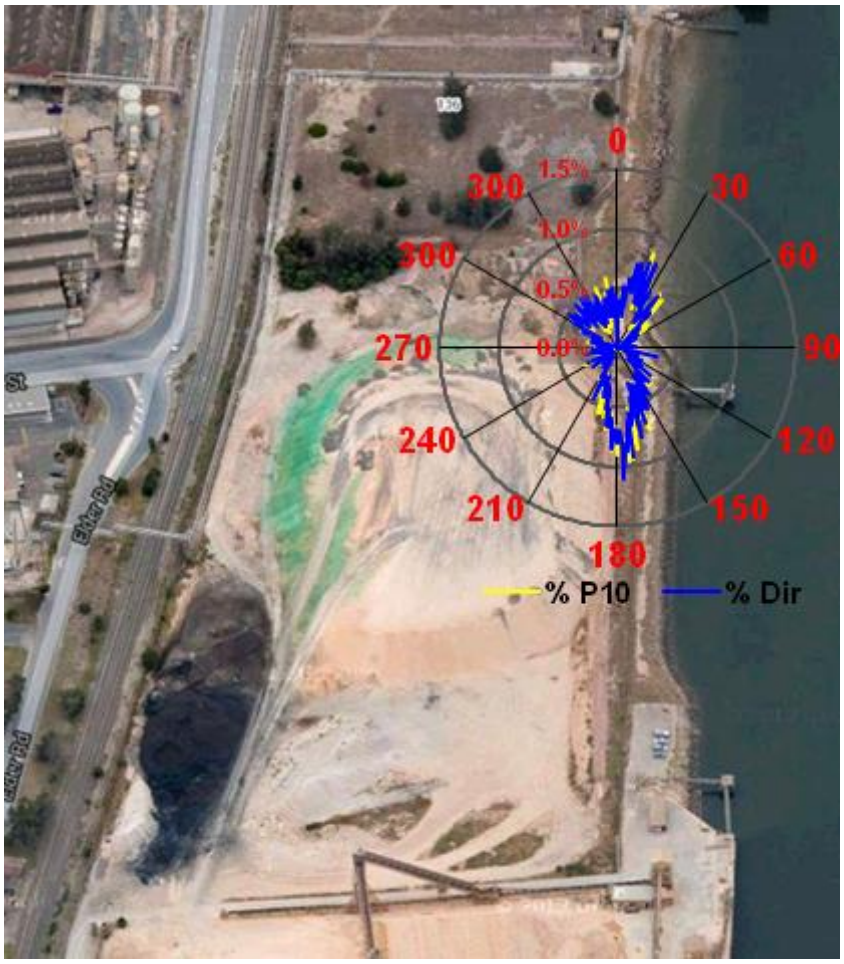
Northern Grounds Monitor



The wind-rose implies that dominant winds are westerly and easterly. Higher proportions of PM10 levels relative to wind directions appear to be coming from most notably the southeast. Possible sources could include stockpiles, truck and traffic movements. This process is managed by the constant application of water and a dust suppressant agent using a dedicated water cart.

Note: Limestone is pre wetted as it is transferred to Block 9, stockpiles are sealed and dust reducing polymers are applied to unsealed surfaces.

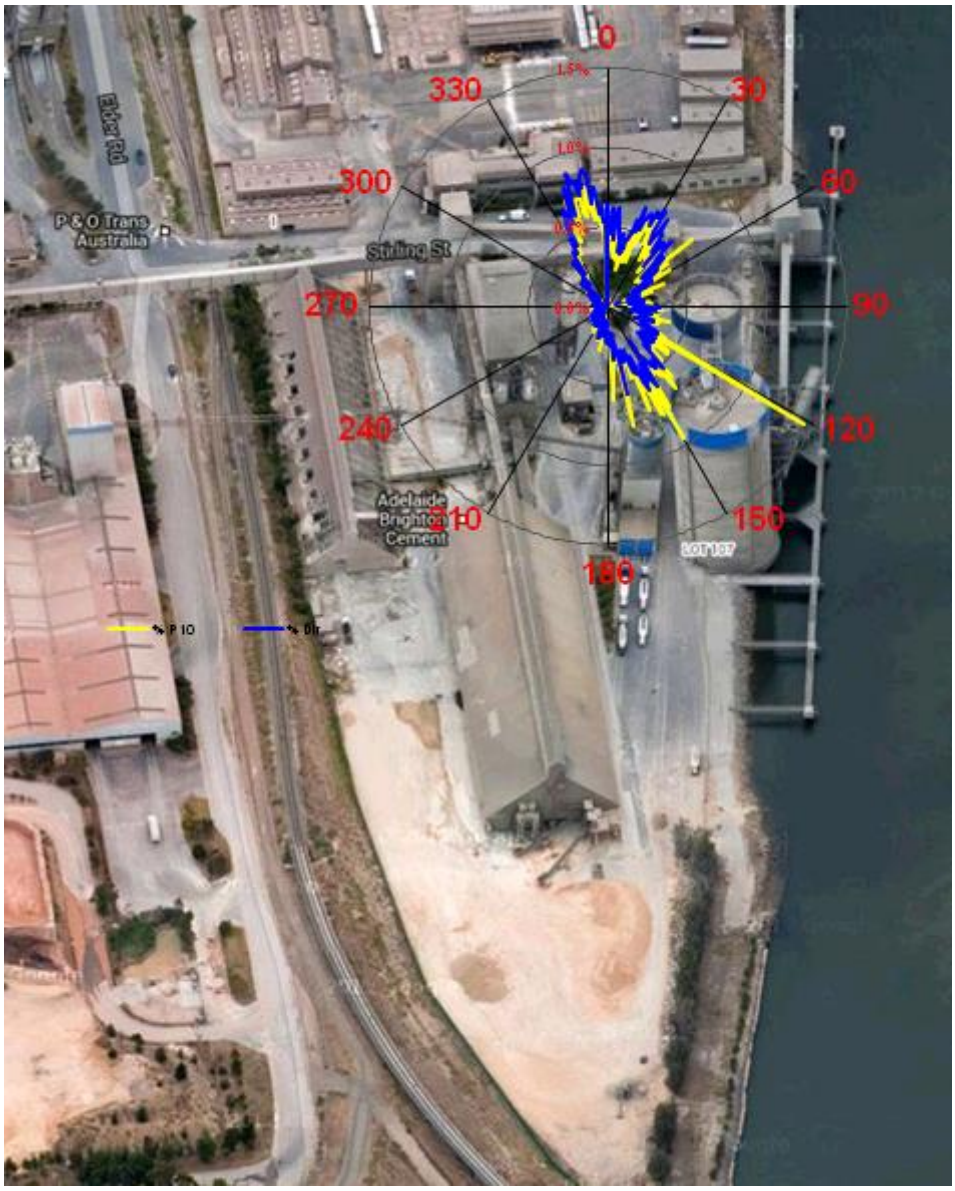
Block 9 Monitor



The wind rose implies winds are predominantely from the south and north.

The wind rose of PM10 suggests fugitive dust proportional to the wind direction, which implies dust levels are not influenced by local activities. Actions taken to minimise dust in this area, including: pre-wetting material at Block 9 before its transferred to main stockpile, regular addition of a dust suppressant sealant and sprays (both at Klein Point and Birkenhead), regular wetting with water and polymer sealing of unsealed surfaces.

Eastern Grounds Monitor



The wind rose implies that prevailing winds originated from a north and south. There appears to be a contribution of PM10 dust from a southeast direction and there are several spikes during this period. These could be related to localised short term events, including the contitinuous movement of cement tankers exiting the despatch loading facility on route to the adjacent truck wash.

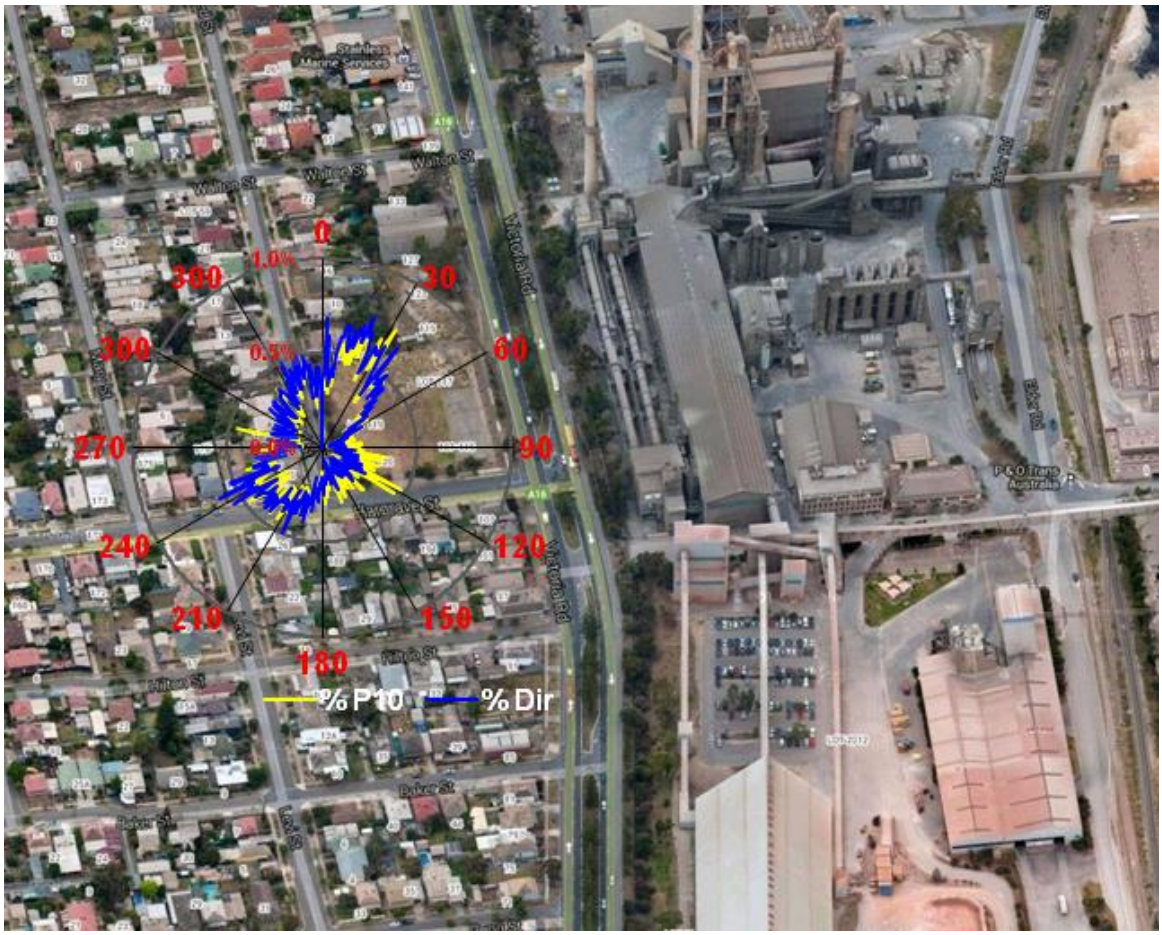
Southern Grounds Monitor

The wind rose of PM10 suggests fugitive dust proportional to the wind direction, which implies dust levels are not influenced by local activities.

Improvements in the area include: the installation of the canopy system covering the Materials Managment (MM) stockpile area and the foam suppression system on the loading hopper (both EIP projects).

Dominant winds were northerlies and southerlies.

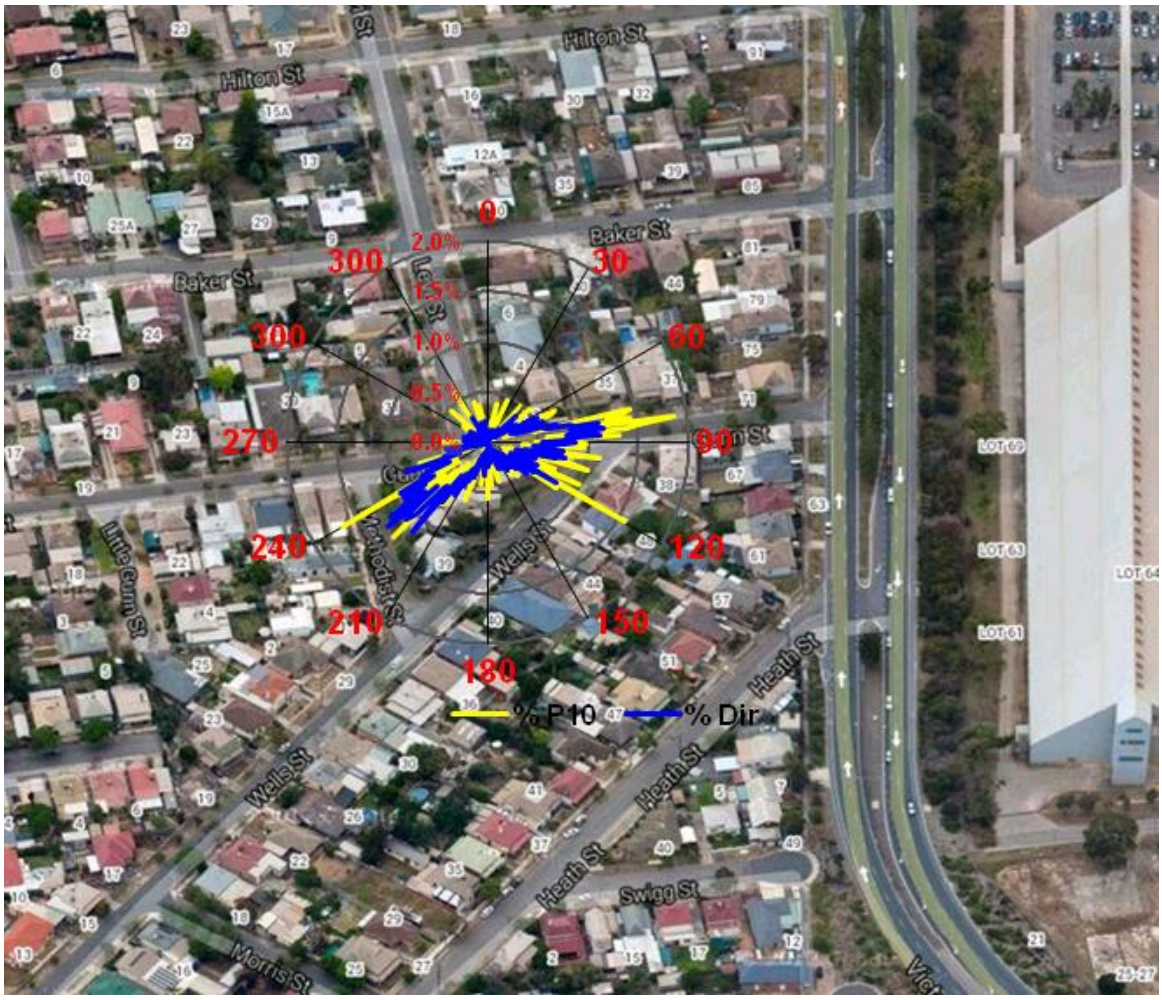
Community Park Monitor



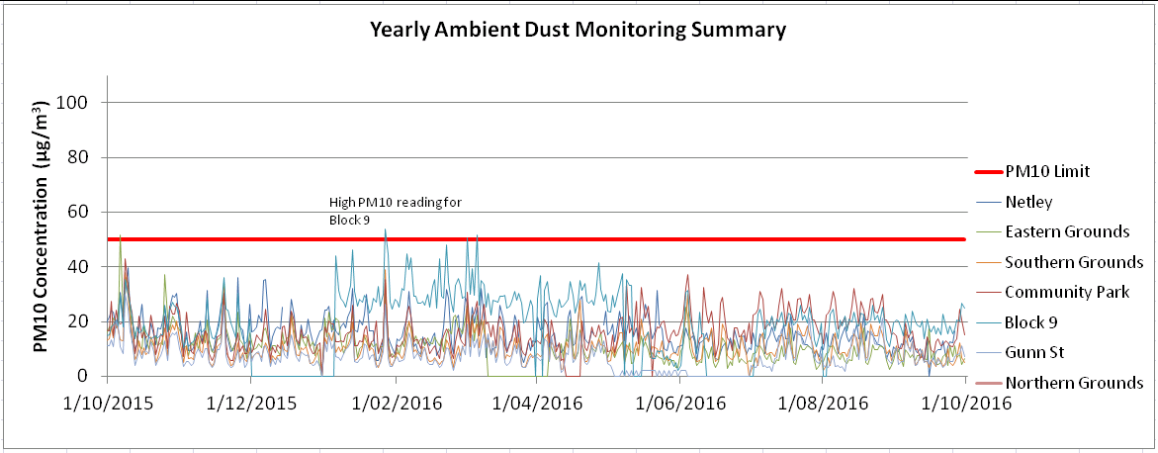
The wind rose implies winds prevailing from all directions but predominantly from the northeast and southeast. Higher proportions of PM10 levels in comparison to wind direction originate from an easterly direction.

Possible contributors may include activities around the limestone conveying system/activities, traffic movement at Victoria Road/Hargrave Street, council/construction works near Hargrave Street directly adjacent to the monitor.

Gunn Street Monitor



The wind rose implies prevailing winds were southwesterly and easterly. The PM10 trend on the diagram implies PM10 dust originating from predominantly an eastern direction with some coming from the north, south and south west. Considering the PM10 orginates from a number of directions, the loads could be related to localised events including traffic in the area. However, as shown earlier in the 24 hour average graphs, the average PM10 levels from this location are low.



Overall progress of ambient PM10 tracking was graphed to observe what happened to the plant over the past year.

From October 2015, PM10 levels from all site monitors are following a very consistent trend.

Actions, Improvements & Recommendations

- Hard surfaces are swept/maintained (road sweeper & water truck) daily inline with site scheduled Production Services maintenance program.
- Daily monitoring and dust control measures are used to manage dust spills on the site. Both the water truck and sweeper are used to clean and dampen grounds so that large moving trucks do not spread dust and make it airborne.
- Weekly site wide review and communication of all environmental incidents.
- Shift Supervisor's vigilantly managing all raw material and product movements to minimise dust impacts on the environment.
- The appointment of Raw Materials Supervisor. The primary purpose of this position is the effective management of all material movements, stockpile control, planning and transport management.
- Installation works of two cameras' at either end (north & south) of the main clinker Gantry (Victoria rd). The cameras monitor door status (open/closed) and dust emissions on a 24/7 on-line basis.
- The installation of an Annex at the northern end of the Gantry to fully enclose all trucks during loading was completed in the previous shutdown (April '13). The addition of the Annex will help to complete a seal to overcome the risk of dust loss to atmosphere due to pressurisation in the Gantry when the doors would normally be open. The Annex will also minimise dust loss to the atmosphere when trucks are entering\leaving and loading. Most importantly the Annex will reduce the amount of clinker dust escaping from the Northern Gantry end during loading activities by ensuring that all loading activities from this area are conducted with the door closed. Prior to the installation of the Annex the arrangement did not allow for loading of either semi trailer (20t) or quad-dog (30t) truck configuration with the north end gantry door closed. This practice caused significant amounts of dust to escape from the Gantry.
- Three new modern rapid raise doors have been installed to replace the existing large steel clinker shed sliding doors. These include:
    - Southern end of Birkenhead cement mill 1 clinker shed.
    - Southern ends of the main gantry (Victoria Rd).
    - Most recently (April 13) at the northern end of the main gantry (Victoria Rd) as part of the Annex installation.
    - The need to replace the doors stems from ongoing fugitive dust issues arising from the inability for the current doors to seal correctly, and the ability of the current doors to be closed automatically and quickly to minimise fugitive dust excursions.

- Installation of shade cloth over fence to east and southern fence line of cement mill 1 storage area.
- The Installation of rapid raise doors at the wharf bulk loading facility. This will ensure that all cement loading activities into bulk tankers are enclosed in a more reliable fashion, minimising fugitive dust from escaping.
- Dust suppression agent is applied to site stockpiles
- Drivers are regularly encouraged to move around more carefully to reduce the likelihood of dirt/dust becoming airborne, strictly adhering to site speed regulations.
- Cooler Bag-house Emissions Reduction Project. New baffles have been installed in the cooler bag-house to divert incoming air flow in order to reduce wear and tear of fabric filter bags. This has led to a substantial reduction in amount of broken bags during operation and overall emissions.
- Overhaul of the Bypass dust loading chute system (Birkenhead June 2012 major shutdown), resulting in significant dust emission reductions during the loading of Bypass dust and residual dust on the top of the tankers.
- The CM7 (cement mill 7) and associated unit operations was approved and work commenced in early 2012. An independent air quality study was carried out and the modelling shows significant improvements in ambient dust once the project is completed which has been noted through the Development Application process. *Projects include:*
    - Full commissioning of the new ship loader. Greatly improved clinker and cement dust loading achieving positive results. *Complete*
    - The open air raw material stockpiles (CM1 raw material) of limestone and gypsum behind the old clinker blend building will be relocated and undercover in the BrightonLite/Wallaroo shed adjacent to the proposed CM7. *Complete*
    - The above mentioned shed will also house the raw material feed system consisting of conveyors, feeder, dust collectors and storage bunds to transfer the materials from the shed to CM1 and CM7 buildings. *Complete*
    - 'Best Available Technology' was be used during development to make an improvement in air quality. This technology includes *several of the latest Luhr (equipment supplier) advanced technology dust collectors* located at; Conveyor transition points (CE1/CE1a & C1/C2), Clinker Bins (C2 & MF7b) conveyors, Gypsum & Limestone Bins conveyors (BF2 & MF7b), Primary Filter/Milling circuit, Dense Phase Pump surge bin and 16K silo. All bags within these dust collectors use the latest Luhr polyester needle-felt bags with a hydrophobic finish.
- Comprehensive overhaul of Cement Mill 7 dust collector and internal improvements on dust spiilage areas within the mill.
- E-Desktop/Ampla Environmental reporting and Management system has been upgraded. The system now allows for more effective and dynamic reporting of stack emission and ambient dust monitor data.
- Increased maintenance/vigilance on the plant dust collection systems.
- 3 sided x 3 metre concrete high bunker installed around 1,500t slag stockpile
- Installation of new Truck Wash adjacent Elder road/Old Bulk station – Dec 13
- Approximately 350 metres of shade cloth (fugitive dust barrier) installed on fencing around entire plant – 230 metres repaired/refurbished & 120 metres added (Despatch, Elder road, adjacent Wallaroo shed/cement mills)
- **Wetland Expansion (South east corner) -** Approximately 7500m^2 of waste land cleared (adjacent Schroder park), including bitumen road, fencing, concrete slabs, etc. Develop a substantially larger & more diverse wetland/ecosystem, which will create natural barriers and improve environment.
- Installation of foam mist spray system (EIP project) on the MM tipping loading hopper was installed and commissioned in late December 14
- **Fabric/Mesh canopies** were installed at the fringe MM system on top of the concrete bunker walls in March 2015. This will reduce the tendency for dust to become airborne when loading/unloading material as it acts as a wind break. This is an EIP project.
- **Standardisation of Ambient air monitoring network**
    - Four of the older generation ambient air monitors were replaced during

quarter 3, 2015 with current generation systems as used on Community Park and Block 9 area (2013).
        - The older generation models were Osiris monitors (Northern Grounds and corner of Gunn Street) and DustTrack 8520 (Southern and Eastern grounds).
    - The older generation monitors were over 10 years old and suffered from reliability and integrity issues
        - Several break downs resulted in periods of data loss throughout the years.
        - Two of the older DustTrak units also had no wind measuring capabilities and required extrapolating wind conditions to the other monitors.
    - All monitors are now the DustTrak TSI DRX model
    - A spare DustTrak TSI DRX unit was purchased to ensure full utilisation of the network during servicing, maintenance, breakdowns etc...
    - The new DustTrak TSI DRX monitors use current technology and consist of a dust analyser that can sample all of the required forms of reportable fugitive dust (PM2.5, PM10 and TSP). The system uses an ultrasonic wind sensor which is more precise and reliable than the anemometers used on the Osiris dust monitors. These anemometers also require virtually no maintenance as they have no moving parts.
    - The new monitors also include: greater collection efficiencies, NATA accreditation, calibration & support and show good correlation with compliance monitors.

- The Installation of rapid raise doors at the Wallaroo shed during quarter 3, 2015. This will ensure that all trucking activities and raw material movements are enclosed in a more reliable fashion, minimising fugitive dust from escaping the building.

- **Improvements for Quarter 4, 2015 include:**
    - Optimisation of Electrostatic Precipitator stack emission filtering equipment in November 2015 which resulted in a 20% improvement in stack baseline stack emissions.
    - Inspection and sealing of the western side of the Victoria Rd Clinker Storage Gantry.
    - Introduction of dust reducing polymer on all site unsealed surfaces.

- **Improvements for Quarter 1, 2016 include:**
    - Replacement of fabric filters bags with a new design and optimisation of the bag house.
    - Installation of blasters/internal air pulsating system throughout the pre heater tower. This is to reduce blockages that improves plant stability/operations and therefore reduces emissions.
    - Completion of slag bunker (first shipment February 2016). Bunker contains material and reduces fugitive dust. The bunker is also located adjacent to the slag dryer which has significantly reduced traffic movements. The entire area is hard surfaced which enables easy cleaning by the sweeper truck.
    - Mechanical inspection of Electrostatic Precipitators (ESP) and overseeing of maintenance work during the March 2016 shutdown by FLSmidth emissions specialist. The specialist provided valuable insight into the scope of work and possible areas for optimization.
    - In the first quarter of 2016, the sealing of the eves and cladding on western side (Victoria rd) of the Gantry using a crane was completed after an inspection. The Gantry is under negative pressure due to large dust collector and any sealing of openings helps to reduce fugitive dust escaping the building.
    - Twenty three new doors were replaced. The new doors are self closing and sealing, contain a rubber flange at bottom for high wear areas as required

(prevents damage when opening & closing), prevent alarms going off from load centres (dust ingress) and fugitive dust escaping buildings. Also, all major site doors are locked and controlled under a Shift Supervisor's master key.

- **Improvements for Quarter 2, 2016 include:**
  - Ongoing polymer application to unsealed surfaces and regular use of a water cart truck when reclaiming limestone.
  - Back-up power was installed on both Stack 4A and 4B emission monitors. Although site power failures are a rare and typically short event, this project will allow particulate levels to be measured during these periods.
  - In May 2016, new operating differential pressure controller technology was commissioned into the Cooler Bag filtering process. The primary intention of the technology is to optimise the overall life of the bags, which will subsequently increase the longer term performance of the Cooler Filter Bag process. A full analysis on the effectiveness of new bags and the Cooler Bag Filter performance will be provided once a longer term assessment has been conducted.
  - Installation of a large rapid raise door was installed on the southern side of the Wallaroo raw material storage shed. This type of door closes automatically and quickly to minimise fugitive dust excursions.

Figure 1 - Rapid Raise door - Wallaroo shed

- **Improvements for Quarter 3, 2016 include:**
  - Improvements to 4A Stack dust filtering equipment (ESP), resulting in a lower emissions baseline.
  - The replacement of an entire chamber in the cooler filter bag with 280 bags that feature a heavier weave and a reinforced cuff that initial trials have shown to greatly increase the lifespan of the bags and therefore the performance of the bag filter in reducing emissions.
  - Ongoing inspection, repair and sealing of main clinker storage Gantry located adjacent Victoria road
  - Greening/earth-care work was implemented along the western boundary of the main limestone stockpile area, along Elder road. The works included:
    - Planting of approximately 50 mature trees and 100 large scrubs
    - The installation of approximately 150 metres of green shade cloth on the fencing – wind break/fugitive dust suppressant