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ENVIRONMENT IMPROVEMENT PROGRAMME (EIP) QUARTERLY REPORT FOR BIRKENHEAD WORKS

COMPLIANCE DATE: 15/11/2023 – Quarter 3, 2023
EPA Licence 1126: Environment Improvement Programme (U-583)

Licensed site: Adelaide Brighton Cement, Birkenhead Works

62 Elder Road, Birkenhead, SA 5015

Date of Submission: 15 November 2023

Version Number: 1



Report Submitted by: Advisor Environment - C&L (SA/NSW/NT)

Purpose	The purpose of the Environmental Improvement Programme (EIP) is to reduce noise and fugitive particulate emissions from the site.
Background Information	<p>In order to reduce its environmental impact, Adelaide Brighton Cement Ltd, has developed an EIP that contains projects to reduce noise and fugitive particulate emissions. These projects were identified from the following inputs:</p> <ul style="list-style-type: none"> • Adelaide Brighton Cement Limited Report, August 2018, "Assessment of Options Report" • Katestone Environmental Report, August 2018 "Birkenhead Cement Plant – Options Assessment Report" • Katestone Environmental Report 2017 "Air Quality Assessment of the Birkenhead Cement Plant" • Vipac Engineers and Scientists Report, August 2018 "Environmental Noise Model Update" • Vipac Engineers and Scientists Report, February 2019 "Noise model update and Abatement Options" <p>Thirteen fugitive particulate and three noise improvement projects were identified and incorporated into an EPA approved EIP.</p> <p>EIP project implementation is tracked through the completion of 52 compliance actions over the life of the EIP.</p> <p>The EIP was approved by the EPA on 28 February 2019. The EIP has been revised in accordance with the EIP. The latest EIP - Revision 8 is available on the ABC Birkenhead Community Website: https://adelaidebrightoncommunity.com.au/</p>
Reporting Objective	<p>Quarterly EIP progress report providing:</p> <ul style="list-style-type: none"> • Details of steps taken to progress compliance actions • Details of proposed next steps to be taken
Quarterly Report	<p>EIP Project 17 - Evaluation Report Fugitive Dust Projects completed.</p> <p>Report attached in appendix A</p>
Appendix A	EIP - Evaluation Report Fugitive Dust Projects

Environment Improvement Programme

EPA Licence 1126

Evaluation Report

Fugitive Dust Projects

29/9/2023

Prepared by: C. Mackenzie Advisor Environment C&L (SA/NSW/NT)

Glossary

Term	Definition
$\mu\text{g}/\text{m}^3$	micrograms per cubic metre
μm	micrometre
m	metre
m^2	square metres
m^3	cubic metres
Nomenclature	Definition
TSP	Total suspended particulates
PM ₁₀	particulate matter with a diameter less than 10 micrometres
PM _{2.5}	particulate matter with a diameter less than 2.5 micrometres
Abbreviations	Definition
ABC	Adelaide Brighton Cement Ltd
Air EPP	Environment Protection (Air Quality) Policy 2016
CM1	Cement Mill 1
CM6	Cement Mill 6
CM6 CF6	Cement Mill 6 Clinker feed
CM6 Clinker Gantry	Cement Mill 6 Clinker storage shed
CS2 CR2 CR3	Group of conveyors used to transfer clinker from kiln to storage stockpiles
EET	Emission Estimation Technique
EIP	Environment Improvement Programme
EP Act	Environment Protection Act 1993
EPA	Environment Protection Authority
Geo fabric	An impermeable fabric sheet
MM	Fringe Materials Management System- (transfer of bulk fringe materials to the kiln)

Contents

1.0	Background	4
2.0	Assessment Of EIP Projects.....	4
3.0	APPENDIX A.....	19

Evaluation Report – Fugitive Dust Projects

1.0 Background

Adelaide Brighton Cement Ltd developed an EPA approved Environmental Improvement Programme (EIP) for the Birkenhead site operations in compliance with the sites Environmental Authorisation 1126 licence condition (U-925).

The current EPA approved EIP (document number 1126 Version 8, dated 29 May 2023), compliance action 52, requires that a report assessing and validating the reductions achieved through implementation of EIP particulate mitigative projects (EIP Project numbers, 1-9 and 13), by 30/09/2023. The assessment needs to include an evaluation of the whole of site air quality assessment in accordance with the Environment Protection (Air Quality) Policy 2016 and EPA guidance publication “Ambient Air Quality Assessment - 2016”. This report has been prepared in accordance with this requirement.

The Birkenhead EIP (document number 1126 Version 8, dated 29 May 2023), was informed by:

- Adelaide Brighton Cement Limited Report, August 2018, ‘Assessment of Options Report’
- Katestone Environmental Report, August 2018 “Birkenhead Cement Plant – Options Assessment Report”
- Katestone Environmental Report, 2017, “Air Quality Assessment of the Birkenhead Cement Plant”

2.0 Assessment Of EIP Projects

Where possible, the predicted reduction in particulate emissions at ABC’s Community Dog Park monitor location, were estimated for each of the EIP fugitive dust projects, using the Katestone, 2017, Air Quality Assessment of the Birkenhead Cement Plant, as a guide for assessing the effectiveness of the mitigation strategy.

A whole of site air quality assessment was undertaken by Katestone in 2023, which included the development of an updated emissions inventory and air dispersion modelling based on activity data from the 2022 calendar year which is documented in the Katestone Report, August 2023, “Birkenhead Cement Plant Air Emissions Inventory and Dispersion Modelling”, which has already been submitted to the EPA.

The 2022 whole of site air quality assessment considers current activity levels, with greater quantities of materials used and increased material handling, vehicular movements, vehicular travel distance on paved and unpaved roads, than those used in the 2017 air quality assessment. In addition, the 2017 assessment used average vehicle weights, whereas the 2022 assessment calculates emissions for laden and unladen heavy vehicles separately, which results in higher particulate emissions as the relationship between gross vehicular weight and particulate emissions is not linear, with heavier vehicles producing proportionally higher particulate emissions.



To address the requirements of compliance action 52, ABC engaged Katestone Environmental Pty Ltd (Katestone) to complete an assessment of air emissions reductions achieved at the Birkenhead Cement Plant, through the implementation of mitigative actions outlined in the EPA approved Environment Improvement Programme (EIP) for the Birkenhead site, which is presented in the Katestone Report, September 2023, “ABC Birkenhead Facility EIP Achievements Assessment” (Appendix A).

The Katestone EIP achievements assessment aims to address the relevant requirements of compliance action 52 by evaluating reductions in particulate dust emissions and impacts achieved through EIP actions implemented to date at the Birkenhead site (Facility), where quantifiable, using results from the updated emissions inventory and dispersion modelling presented in Katestone Report “Birkenhead Cement Plant Air Emissions Inventory and Dispersion Modelling”, August 2023.


ABC assessment of the outcomes and effectiveness of EIP Projects 1-9 and 13, is presented in Table 1: Summary of EIP Project Effectiveness, which provides the following information:

- EIP Project number, description, and implementation date
- Potential benefits and where quantifiable, the original estimated potential particulate mitigation based on Katestone 2017 air quality assessment.
- Project outcomes and evaluation of effectiveness where quantifiable, using the results from the Katestone 2022 air quality assessment.













Table 1: Summary of EIP Project Effectiveness

EIP Project Number	Category	Project Title	Project Description	Potential Benefits	Outcomes and Evaluation of Effectiveness
1	Fugitive Dust - Stockpile emission reduction	Relocate Bauxite Stockpile and cover with Geofabric.	Relocate Bauxite stockpile from shell block close to the Materials Management (MM) Pit area and cover inactive stockpile areas with Geofabric.	<p>Optimising the location of the raw material stockpile reduces vehicle movements and associated fugitive dust as the stockpile is closer to the entry point of the process. Covering inactive areas of the stockpile with Geofabric prevents wind erosion and fugitive dust from the surface of the stockpile.</p> <p>Independent air quality modelling and analysis indicates that relocating the Bauxite stockpile and covering inactive areas with Geofabric may reduce maximum 24-hr average concentrations of PM₁₀ at the Community Park by 0.2 µg/m³.</p>	<p>Stockpile relocated and chemical dust suppression applied and used until the stockpile can be covered with geofabric.</p>  <p>Dust suppression (green) applied to stockpile before covers added.</p> <p>ABC completed installation of the covers on the relocated Bauxite Stockpile at the Southern end of the plant on 13/02/2020.</p>  <p>Bauxite Stockpile with geofabric covers applied.</p> <p>Slow stockpile turnover enables most of the stockpile to be covered, and progressively rolled back to expose a new stockpile working surface.</p>
1	Fugitive	Relocate			

EIP Project Number	Category	Project Title	Project Description	Potential Benefits	Outcomes and Evaluation of Effectiveness
	Dust - Stockpile emission reduction	Bauxite Stockpile and cover with Geofabric	Relocate Bauxite stockpile from shell block close to the Materials Management (MM) Pit area and cover inactive stockpile areas with Geofabric.	<p>Optimising the location of the raw material stockpile reduces vehicle movements and associated fugitive dust as the stockpile is closer to the entry point of the process. Covering inactive areas of the stockpile with Geofabric prevents wind erosion and fugitive dust from the surface of the stockpile.</p> <p>Independent air quality modelling and analysis indicates that relocating the Bauxite stockpile and covering inactive areas with Geofabric may reduce maximum 24-hr average concentrations of PM₁₀ at the Community Park by 0.2 µg/m³.</p>	<p>ABC experienced significant safety issues with the application /removal of the geofabric material. Safety issues include:</p> <ul style="list-style-type: none"> • Need calm conditions for geofabric application/removal/adjustment to avoid personnel body injury from “whiplash” effects caused by wind lifting/pulling the geofabric. • Personnel working on stockpiles, uneven stockpile surfaces/slopes and threat of personal injury from slips /falls and engulfment by material. • Size/weight of the geofabric covers requires mobile equipment to deploy and creates a significant risk of injury to personnel from mobile equipment interaction. • Use of mobile equipment on narrow base stockpiles such as the (bauxite stockpile) is difficult and requires construction of benches which results in more material handling and significantly more dust emissions than from a static stockpile coated with polymer. <p>As a result of safety issues associated with their use, ABC will not continue to use geofabric covers for stockpiles.</p> <p>Relocated stockpile reduces emissions from double handling vehicle movements and associated fugitive dust as the stockpile is closer to the entry point of the process.</p> <p>ABC will continue to apply polymers to stockpile surfaces which are effective in reducing wind-blown particulate emissions from stockpiles.</p>

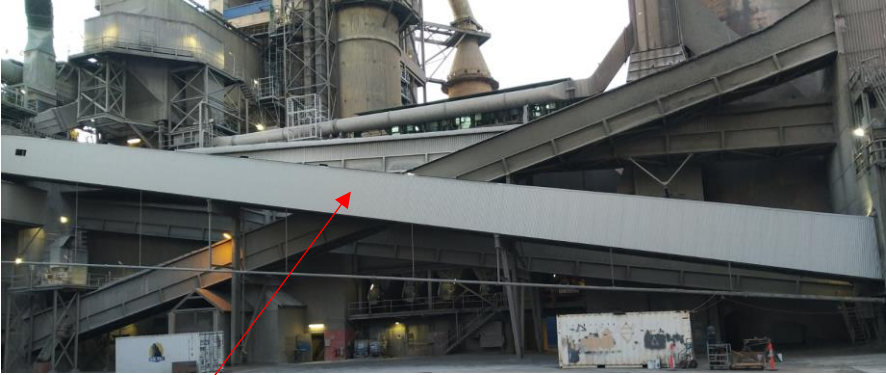
EIP Project Number	Category	Project Title	Project Description	Potential Benefits	Outcomes and Evaluation of Effectiveness
2	Fugitive Dust - Stockpile emission reduction	Wind curtain - Limestone stockpile	Install a portable 6m high by 50m length wind curtain at the working face of the stockpile - (shell block).	<p>A porous windbreak curtain can reduce wind speed minimising dust lift-off and transport.</p> <p>A portable wind curtain provides the flexibility to manage the changing dynamics of the stockpile size, providing an effective means of reducing dust emissions from materials handling activities at the working face of the stockpile.</p> <p>Independent air quality modelling and analysis indicates that a portable wind curtain located at the working face of the stockpile when used in conjunction with chemical polymers applied to stockpile sides and exposed surface areas, and use of stockpile covers applied to 11,500m² of inactive nonworking exposed surface areas of the limestone stockpile may reduce maximum 24-hr average concentrations of PM₁₀ at the Community Park by 2.3 µg/m³.</p>	<p>ABC completed installation of 5 portable wind fences on the 22/3/2021, before commencement of the limestone stockpile reclamation in early April 2021.</p> <ul style="list-style-type: none"> • 5 portable wind fences (6m high x10m length each) installed at the working face of the limestone stockpile. • A porous windbreak fence can reduce wind speed minimising dust lift-off and transport. • A portable wind fence provides flexibility to manage changing dynamics of the stockpile size, providing an effective means of reducing dust emissions from materials handling activities at the working face of the stockpile.  <p>The intent of the curtain is to reduce wind speed at the active working face of the stockpile, reducing dust emissions. As the limestone stockpile size increases there will also be times the fence is adjacent to the limestone stockpile, which will reduce emissions from the limestone stockpile.</p>


EIP Project Number	Category	Project Title	Project Description	Potential Benefits	Outcomes and Evaluation of Effectiveness
2	Fugitive Dust - Stockpile emission reduction	Wind curtain - Limestone stockpile	Install a portable 6m high by 50m length wind curtain at the working face of the stockpile - (shell block).	<p>A porous windbreak curtain can reduce wind speed minimising dust lift-off and transport.</p> <p>A portable wind curtain provides the flexibility to manage the changing dynamics of the stockpile size, providing an effective means of reducing dust emissions from materials handling activities at the working face of the stockpile.</p> <p>Independent air quality modelling and analysis indicates that a portable wind curtain located at the working face of the stockpile when used in conjunction with chemical polymers applied to stockpile sides and exposed surface areas, and use of stockpile covers applied to 11,500m² of inactive nonworking exposed surface areas of the limestone stockpile may reduce maximum 24-hr average concentrations of PM₁₀ at the Community Park by 2.3 µg/m³.</p>	<p>The potential benefits of this project included a wind curtain to reduce wind speed at the active working face of the stockpile, with inactive areas of the stockpile covered by geofabric to further minimise wind erosion of the stockpile (EIP Project 3).</p> <p>ABC will no longer use geofabric covers on this stockpile due to safety concerns and limited effective coverage time due to the nature of the stockpile build. ABC will however continue to apply polymers to stockpile surfaces which are effective in reducing wind-blown particulate emissions from stockpiles.</p> <p>Katestone have evaluated the range of realistic potential reductions achievable from the use of the wind curtain (in isolation of other controls), the range of which are covered by the following scenarios:</p> <ul style="list-style-type: none"> • Full 50 m length of the windbreak curtain adjacent to limestone stockpile, which provides a predicted maximum 24-hr average PM₁₀ concentration at ABC's Community Park monitor of 0.32 µg/m³. • Full 50 m length of the windbreak curtain adjacent to exposed unsealed surface area, which provides a predicted maximum 24-hr average PM₁₀ concentration at ABC's Community Park monitor of 0.07 µg/m³. <p>The wind curtain is effective in reducing dust emissions from materials handling activities at the working face of the stockpile.</p>


EIP Project Number	Category	Project Title	Project Description	Potential Benefits	Outcomes and Evaluation of Effectiveness									
3	Fugitive Dust - Stockpile emission reduction	Geofabric - Limestone stockpile	Geofabric cover is to be applied to 11,500m ² of inactive areas of limestone stockpiles on shell block.	<p>Covering inactive areas of the stockpile with Geofabric prevents wind erosion and fugitive dust from the surface of the stockpile.</p> <p>Independent air quality modelling and analysis indicates that covering 11,500m² of inactive stockpile surface with Geofabric may reduce maximum 24-hr average concentrations of PM₁₀ at the Community Park by 0.9 µg/m³.</p>	<p>ABC completed the installation of Geofabric on inactive surface areas of the limestone stockpile on 11/01/2021.</p> <p>At the time of preparing the EIP, ABC anticipated 11,500 m² of inactive surface area would be available by the 13/03/2020, to which a cover could be applied. Due to the dynamic nature of the stockpile build, this was not possible and variations to the project milestone was agreed with the EPA, allowing for progressive application of covers as the stockpile build enabled this to occur. Progress is summarised in the table below:</p> <table border="1" data-bbox="1258 552 2132 1362"> <thead> <tr> <th data-bbox="1258 552 1397 587">Date</th> <th data-bbox="1397 552 2132 587">Photos</th> </tr> </thead> <tbody> <tr> <td data-bbox="1258 587 1397 783">18/3/2020</td> <td data-bbox="1397 587 2132 783"> <p>Ariel view</p>  </td> </tr> <tr> <td data-bbox="1258 783 1397 1031">30/09/2020</td> <td data-bbox="1397 783 2132 1031"> <p>Top of stockpile</p>  </td> </tr> <tr> <td data-bbox="1258 1031 1397 1362" rowspan="2">11/01/2021</td> <td data-bbox="1397 1031 2132 1238"> <p>Ariel view</p>  </td> </tr> <tr> <td data-bbox="1397 1238 2132 1362"> <p>Port River Side</p>  </td> </tr> </tbody> </table>	Date	Photos	18/3/2020	<p>Ariel view</p> 	30/09/2020	<p>Top of stockpile</p> 	11/01/2021	<p>Ariel view</p> 	<p>Port River Side</p> 
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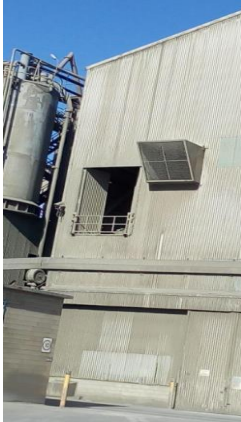


EIP Project Number	Category	Project Title	Project Description	Potential Benefits	Outcomes and Evaluation of Effectiveness
3	Fugitive Dust - Stockpile emission reduction	Geofabric - Limestone stockpile	Geofabric cover is to be applied to 11,500m ² of inactive areas of limestone stockpiles on shell block.	<p>Covering inactive areas of the stockpile with Geofabric prevents wind erosion and fugitive dust from the surface of the stockpile.</p> <p>Independent air quality modelling and analysis indicates that covering 11,500m² of inactive stockpile surface with Geofabric may reduce maximum 24-hr average concentrations of PM₁₀ at the Community Park by 0.9 µg/m³.</p>	<p>Limestone is transported by ship to the plant daily. The limestone stockpile is gradually built over 5 years to enable limestone to be available for the plant during a dry dock period required for mandatory ship recertification.</p> <p>The stockpile is built by progressively hauling limestone up constructed haul road ramps and placed on top of the stockpile to build height and length and reclaimed as needed from the stockpile base at ground level.</p> <p>Chemical dust suppression polymers are applied to stockpile surface areas (sides) and haul roads and working surfaces, to effectively reduce wind borne and wheel generated dust emissions.</p> <p>As the stockpile is dynamic, geofabric covers can only be applied to inactive non-working areas of the stockpile that have been completed, and due to the nature of the stockpile build, the effective coverage time is limited.</p> <p>ABC experienced significant safety issues with the application /removal of the geofabric material. Safety issues include:</p> <ul style="list-style-type: none"> • Need calm conditions for geofabric application/removal/ adjustment to avoid personnel body injury from “whiplash” effects caused by wind lifting/pulling the geofabric. • Personnel working on stockpiles, uneven stockpile surfaces/slopes and threat of personal injury from slips /falls and engulfment by material. • Size/weight of the geofabric covers requires mobile equipment to deploy and creates a significant risk of injury to personnel from mobile equipment interaction. <p>As a result of safety issues associated with their use, ABC will not continue to use geofabric covers for stockpiles.</p> <p>ABC will continue to apply polymers to stockpile surfaces, working surface areas and haul roads to effectively reduce wind borne and wheel generated dust emissions.</p>


EIP Project Number	Category	Project Title	Project Description	Potential Benefits	Outcomes and Evaluation of Effectiveness
4	Fugitive Dust - Transfer operation	MM Wheel wash system	Install a wheel wash at the exit of the MM receiving system	<p>Installing a wheel wash at the exit of the MM transfer system will reduce track out of material carried on the wheels of vehicles and the subsequent resuspension as dust.</p> <p>Independent air quality modelling and analysis indicates that installing a wheel wash system may reduce maximum 24hr average concentrations of PM₁₀ at the Community Park by 0.1 µg/m³.</p>	<p>Further investigations identified safety concerns with installation of a new wheel wash at the proposed location, due to the size/mass, breaking force and exit angle of the location. On-site traffic movement has been modified and double road trains, which used to deliver to site and could not fit the current wheel wash, are no longer used. Therefore, this EIP is no longer required.</p>




EIP Project Number	Category	Project Title	Project Description	Potential Benefits	Outcomes and Evaluation of Effectiveness
5	Fugitive Dust - Conveyors	CS2 CR2 CR3 wind shielding	Install wind shielding on outside of these conveyors	<p>Installing wind shielding on the weather-exposed side of the conveyors will reduce wind speed and minimise dust lift off.</p> <p>Reduction in off-site PM₁₀ dust concentration is not able to be quantified. It is expected this project will assist in reducing nuisance dust.</p>	<p>The roofing and cladding installation was completed on the 7/5/2021.</p> <p>The photograph below shows the completed project.</p>  <p data-bbox="1272 804 1581 860">CS2CR2CR3 conveyor</p> <p>The cladding provides effective wind shielding, reducing fugitive dust emissions.</p> <p>The reduction in PM₁₀ emissions is not able to be robustly quantifiable, as there is no effective way of measuring the change.</p>

EIP Project Number	Category	Project Title	Project Description	Potential Benefits	Outcomes and Evaluation of Effectiveness
6	Fugitive Dust - Storage/ processing buildings	CM6 CF6 Clinker Transfer Point Dust Collector	To install a dust collector on the CF6 clinker transfer point within the Cement Mill 6 (CM6) building.	<p>This project will reduce dust loadings within CM6 building and will lead to lower overall fugitive dust emissions from the building.</p> <p>Reduction in off-site PM₁₀ dust concentration is not able to be quantified. It is expected this project will assist in reducing nuisance dust.</p>	<p>Engineering analysis determined the existing dust collector is correctly sized, but dust capture at the transfer point needed improvement.</p> <p>ABC has completed the installation of the redesigned duct work to provide effective capture of dust at the transfer point. This work was completed on 24 June 2021</p>  <p>These improvements will reduce dust loadings within CM6 building and will lead to lower overall fugitive dust emissions from the building.</p> <p>The reduction in PM₁₀ emissions is not able to be robustly quantifiable, as there is no effective way of measuring the change.</p>

EIP Project Number	Category	Project Title	Project Description	Potential Benefits	Outcomes and Evaluation of Effectiveness
7	Fugitive Dust - Storage/ processing buildings	CM6 Clinker Gantry Entry Air Knives	Install a high-speed blower/air knife system on the clinker gantry vehicle entry door.	<p>Reduce fugitive dust emissions from the CM6 clinker gantry doors when vehicles pass through.</p> <p>This project will further improve emissions from the CM6 Clinker gantry stockpile, which already has significant dust control measures in place (fully enclosed with dust collection and rapid raise doors and entry annex).</p> <p>Reduction in off-site PM₁₀ dust concentration is not able to be quantified. It is expected this project will assist in reducing nuisance dust.</p>	<p>ABC completed the installation of the air knives, and the system was operational from the 10/8/2021. The photos below show the installed air knife duct work and one of the two identical air fans that have been installed.</p>  <p>This project improves fugitive dust emissions from the CM6 Clinker Gantry door when vehicles pass through.</p> <p>The reduction in PM₁₀ emissions is not able to be robustly quantifiable, as there is no effective way of measuring the change.</p>

EIP Project Number	Category	Project Title	Project Description	Potential Benefits	Outcomes and Evaluation of Effectiveness
8	Fugitive Dust - Dust Collectors	CM1 Dust Collector - redirect outlet	Change Cement Mill 1 (CM1) dust collector from a horizontal to vertical release with the release point above the height of the CM1 building	<p>A vertical outlet on the dust collector will improve the dispersion of and reduce the potential impact of emissions.</p> <p>Independent air quality modelling and analysis indicates that redirecting the CM1 to vertical release, may reduce maximum 24-hr average concentrations of PM₁₀ at the Community Park by 0.45 µg/m³.</p>	<p>Changes to the dust collector outlet were completed on 04/02/2020.</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p>Horizontal outlet</p> </div> <div style="text-align: center;">  <p>Vertical outlet</p> </div> <div style="text-align: center;">  <p>Vertical outlet through roof</p> </div> </div> <p>Katestone has assessed that redirecting the CM1 outlet is predicted to have reduced maximum 24-hour average concentrations of PM10 at Community Park by 0.26 µg/m³.</p>

EIP Project Number	Category	Project Title	Project Description	Potential Benefits	Outcomes and Evaluation of Effectiveness
9	Fugitive dust - Sealing exposed unsealed surfaces	Seal area - north of reclaimer shed	Seal 1200m ² of unsealed surface area on the northern side of the reclaimer shed with bitumen	<p>Paving exposed surface area with bitumen removes the erodible surface and eliminates the potential for dust generation.</p> <p>Independent air quality modelling and analysis indicates that sealing 1200 m² of exposed unsealed surface may reduce maximum 24-hr average concentrations of PM₁₀ at the Community Park by 0.3 µg/m³.</p>	<p>ABC completed the sealing of 1200m² of unsealed surfaces on the northern side of the reclaimer shed with bitumen on the 23/10/2019.</p> <p>The bituminised area is now being utilised to provide additional car parking spaces – see photograph below.</p>  <p>Paving exposed surface area with bitumen removes the erodible surface and eliminates the potential for dust generation.</p> <p>Katestone analysis indicates that sealing the exposed area north of the reclaimer shed is:</p> <ul style="list-style-type: none"> • Predicted to have reduced emissions of PM₁₀ by 51 kg/year • Predicted to have reduced the maximum 24-hour average contribution of this source to concentrations of PM₁₀ at the nearest residential receptor by 1.95 µg/m³.

EIP Project Number	Category	Project Title	Project Description	Potential Benefits	Outcomes and Evaluation of Effectiveness
13	Fugitive Dust - Storage/ processing buildings	CM6 Gantry Cladding	Upgrade/maintain the cladding on the CM6 Gantry building to ensure it remains well sealed.	<p>To ensure the building is able to maintain a high standard of dust control into the future. The existing building is old but has a number of dust control measures in place including the building itself, rapid raise doors and dust collection.</p> <p>The Reduction in off-site PM₁₀ dust concentration is not able to be quantified. It is expected this project will assist in reducing nuisance dust.</p>	<p>ABC completed sealing of the CM6 Gantry building on the 29/09/2022. Below are photographs showing some of the sections where cladding has been replaced.</p>    <p>Sealing the building reduces fugitive PM10 dust emissions.</p> <p>The reduction in PM₁₀ emissions is not able to be robustly quantifiable, as there is no effective way of measuring the change.</p>

3.0 APPENDIX A

ABC Birkenhead Facility EIP Achievements Assessment

Prepared for:

Adelaide Brighton Cement Ltd

September 2023

Final

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27 September 2023

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Contents

1.	Introduction	1
2.	Initial Screening of EIP Projects.....	2
3.	Emissions Reduction Assessment.....	4
	3.1 EIP Project 2 – Windbreak curtain	4
	3.2 EIP Project 8 – Redirection of CM1 dust collector outlet	4
	3.3 EIP Project 9 – Sealing area north of reclaimer shed	5
	3.4 Additional assessment – Sealing area south of clinker blend building.....	5

Glossary

Term	Definition
kg	kilograms
kg/year	kilograms per year
$\mu\text{g}/\text{m}^3$	micrograms per cubic metre
m	metres
m^2	square metres
m^3	cubic metres
Nomenclature	Definition
PM ₁₀	particulate matter with a diameter less than 10 micrometres
Abbreviation	Definition
ABC	Adelaide Brighton Cement
CF6	Cement Mill 6 Clinker feed
CM1	Cement Mill 1
CM6	Cement Mill 6
CS2, CR2, CR3	Group of conveyors used to transfer clinker from kiln to storage stockpiles
EIP	Environmental Improvement Programme
EP Act	<i>Environmental Protection Act 1994</i>
EPA	Environment Protection Authority
SA	South Australia
SA EPA	South Australian Environment Protection Authority
TAS	Tasmania

1. INTRODUCTION

Katestone Environmental Pty Ltd (Katestone) was commissioned by Adelaide Brighton Cement (ABC) to complete an assessment of air emissions reductions achieved at the Birkenhead Cement Plant (the Facility), through the implementation of mitigative actions outlined in the Facility's Environment Improvement Programme (EIP).

Environment improvement programmes are regulatory tools intended to outline demonstrable improvements to be undertaken by a licensee to enable them to meet the general environmental duty under section 54 of the *Environmental Protection Act 1993* (EP Act). ABC developed an EIP in compliance with license condition U-925, consisting of 17 projects designed to reduce noise and fugitive particulate emissions from the site. Katestone previously completed work for ABC that was utilised in the development of the EIP, namely:

- Katestone Report D16076-16, "Air Quality Assessment of the Birkenhead Cement Plant" (2017)
- Katestone Report D17053-14, "Birkenhead Cement Plant – Options Assessment Report" (2018)

Katestone has since developed an updated emissions inventory and undertaken air dispersion modelling for the Facility using activity data from the 2022 calendar year, presented in Katestone Report D22081-3, "Birkenhead Air Emissions Inventory and Dispersion Modelling" (2023).

Compliance action 52 under EIP project 17 requires ABC to submit a report by 30/09/2023 that assesses and validates the reductions achieved through the implementation of EIP projects 1-9 and 13, noting that projects 10-12 are not yet complete and will be assessed after completion (see Section 2). Compliance action 52 requires this evaluation to include:

"An evaluation of the whole of site air quality assessment in accordance with the Environment protection (Air Quality) Policy 2016 and EPA guidance publication "Ambient Air Quality Assessment - 2016".

This whole of site evaluation is essentially provided in Katestone Report D22081-3 (described above), which has already been submitted to SA EPA.

This assessment aims to address the relevant requirements of compliance action 52 by evaluating reductions in particulate dust emissions and impacts achieved through EIP actions implemented to date at the Facility, where quantifiable, using results from the updated emissions inventory and dispersion modelling presented in Katestone Report D22081-3 alongside Katestone's previous work.

2. INITIAL SCREENING OF EIP PROJECTS

Projects 1 through to 13 of the EIP pertain to actions relevant to air quality, designed to reduce particulate dust emissions from the Facility. Not all 13 projects are able to be evaluated in this assessment, for a variety of reasons. Table 1 presents an initial screening of all 13 EIP projects pertaining to air quality, with commentary on each detailing whether assessment of emissions reductions can or cannot be made.

Table 1 Initial screening of EIP projects at the Facility pertaining to air quality

EIP Project	Category	Project	Status	Included in assessment?	Comments
1	Fugitive dust – Stockpile emission reduction	Relocate bauxite stockpile and cover with Geofabric	Complete	✘	Geofabric no longer in use ¹
2	Fugitive dust – Stockpile emission reduction	Wind curtain - limestone stockpile	Complete	✓	Emissions reduction assessable
3	Fugitive dust – Stockpile emission reduction	Geofabric - limestone stockpile	Complete	✘	Geofabric no longer in use ²
4	Fugitive dust – transfer operation	MM Wheel wash system	Cancelled	✘	Project no longer required
5	Fugitive dust - conveyors	CS2, CR2, CR3 wind shielding	Complete	✘	Emissions reduction not robustly quantifiable
6	Fugitive dust – storage/processing buildings	CM6, CF6, Clinker transfer point dust collector	Complete	✘	Emissions reduction not robustly quantifiable
7	Fugitive dust – storage/processing buildings	CM6 clinker gantry entry air knives	Complete	✘	Emissions reduction not robustly quantifiable
8	Fugitive dust – dust collectors	CM1 dust collector – redirect outlet	Complete	✓	Emissions reduction assessable
9	Fugitive dust – sealing exposed unsealed surfaces	Seal area – north of reclaimer shed	Complete	✓	Emissions reduction assessable
10	Fugitive dust – sealing exposed unsealed surfaces	Seal area – north of kiln	Not Complete	✘	Sealing of the area north of the kiln is dependent on completion of a separate non EIP project which may not now be progressed. An alternative area south of 4A ESP is now proposed to be sealed instead by 31 December 2023
11	Fugitive dust – sealing exposed unsealed surfaces	Seal contractor compound (area far north of kiln)	Not Complete	✘	Sealing this area was dependent on completion of a separate project which may not now be progressed.

EIP Project	Category	Project	Status	Included in assessment?	Comments
					Refer to EIP Project number 10 for alternative proposed area to be sealed.
12	Fugitive dust – storage/processing buildings	CM6 cladding	Not Complete	x	Time frame for completion of this EIP is to be amended to 31 December 2023 as a shutdown of CM6 is required for implementation of this EIP.
13	Fugitive dust – storage/processing buildings	CM6 gantry cladding	Complete	x	Emissions reduction not robustly quantifiable

Table notes:

¹ Geofabric covers were applied as intended under EIP project 1, however, due to safety concerns relating to their application/removal (principally wind-related) they are not currently in use and ABC does not intend to resume their use. Chemical dust suppression is applied to the stockpile surfaces as a dust control measure.

² As the stockpile is dynamic, geofabric covers can only be applied to inactive non-working areas of the stockpile that have been completed, and due to the nature of the stockpile build, the effective coverage time is limited. The same safety concerns as described above also apply, thus the geofabric covers are not currently in use and ABC does not intend to resume their use. Chemical dust suppression and watering are applied to the stockpile surfaces as dust control measures.

3. EMISSIONS REDUCTION ASSESSMENT

This section details the assessments undertaken to determine reductions in dust emissions and subsequent reductions in PM₁₀ concentrations in the community due to the assessable EIP projects implemented at the Facility.

3.1 EIP Project 2 – Windbreak curtain

EIP Project 2 involved the installation of a portable wind curtain on the eastern side of the limestone stockpile at the 'Shell Block' area of the Facility. The porous mesh curtain is 6 m high and spans a length of 50 m. The purpose of the curtain is to act as a windbreak, slowing wind speed over the stockpile and thus minimising dust lift-off and transport.

The curtain was designed such that it would reduce wind speed at the active working face of the stockpile, whilst the inactive area of the stockpile would be covered by geofabric to further minimise wind erosion of the stockpile (EIP Project 3). However, Katestone understands that the geofabric covers are not used at the Facility due to safety issues. This has been accounted for in the assessment of dust emission reduction, with a 30% control factor for a wind break curtain applied only to areas behind the 50 m length of the curtain, and no further control factor applied. The assessment has considered the effect of this additional control under two potential scenarios; one where the full 50 m length of the windbreak curtain is adjacent to limestone stockpile and one where there is no stockpile behind the windbreak curtain, just an exposed unsealed surface. This provides a realistic range of potential reductions from the windbreak curtain.

The analysis indicates that when the full 50 m length of the windbreak curtain is adjacent to limestone stockpile, it is:

- predicted to reduce emissions of PM₁₀ by 101.4 kg/year
- predicted to reduce the maximum 24-hour average contribution of this source to concentrations of PM₁₀ at the Community Park monitor by 0.32 µg/m³.

If the area behind the windbreak curtain is entirely exposed unsealed surface, it is:

- predicted to reduce emissions of PM₁₀ by 16.8 kg/year
- predicted to reduce the maximum 24-hour average contribution of this source to concentrations of PM₁₀ at the Community Park monitor by 0.07 µg/m³.

3.2 EIP Project 8 – Redirection of CM1 dust collector outlet

Previously a horizontal release point, the Cement Mill 1 (CM1) dust collector has been reconfigured to have a vertical release above the height of the CM1 building as part of EIP Project 8. Vertical discharge increases the initial dispersion of pollutants, as atmospheric mixing will affect a greater proportion of the upward plume. This increased initial dispersion thus results in lower ground-level concentrations of pollutants.

The CM1 dust collector was modelled as having both a horizontal and vertical release, with results at the Community Park receptor compared between the two configurations to determine the reduction that EIP Project 8 will have resulted in.

The analysis indicates that redirecting the CM1 outlet is predicted to have reduced maximum 24-hour average concentrations of PM₁₀ at Community Park by 0.26 µg/m³.

3.3 EIP Project 9 – Sealing area north of reclaimer shed

EIP Project 9 comprised of paving 1,200 m² of unsealed surface area north of the reclaimer shed with bitumen. Sealing the exposed surface effectively eliminates the potential for dust generation from wind erosion, provided that the sealed surface is regularly cleaned and maintained appropriately.

Due to the distance and direction relative to the Community Park monitor, reductions in ground-level concentrations as a result of EIP Project 9 are very small there. Hence, impact reductions due to EIP Project 9 have been quantified at the nearest residences, which are ~60 m west of the source.

The exposed area north of the reclaimer shed has not been modelled as a source. Instead, results from a discrete receptor ~60 m west of a modelled exposed area source elsewhere within the Facility have been extracted and scaled by the size ratio between the modelled source and the 1,200 m² area north of the reclaimer shed.

The analysis indicates that sealing the exposed area north of the reclaimer shed is:

- Predicted to have reduced emissions of PM₁₀ by 51 kg/year
- Predicted to have reduced the maximum 24-hour average contribution of this source to concentrations of PM₁₀ at the nearest residential receptor by 1.95 µg/m³.

3.4 Additional assessment – Sealing area south of clinker blend building

An additional assessment has been undertaken for the area south of the clinker blend building, which was sealed in 2017 but is/was not a formal EIP Project. Figure 1 shows the area prior to and after sealing. The entire unsealed area south of the clinker blend building from the picture on the left was modelled as an exposed area in Katestone's D16076-16 report, while the smaller unsealed area from the picture on the right was modelled in Katestone's D22081-3 report.



Figure 1 Area south of clinker blend building before (left) and after (right) sealing

Results from Katestone's D22081-3 report were scaled up to the original exposed area, with the difference between the scaled-up emissions/impacts of the larger unsealed area and the modelled emissions/impacts of the smaller unsealed area taken to quantify the emissions reduction due to sealing part of the exposed area.

Due to the distance and direction relative to the Community Park monitor, reductions in ground-level concentrations as a result of sealing this area are very small there. Hence, impact reductions have been quantified using maximum concentrations within receptor zones used in the D22081-3 report.

The analysis indicates that sealing the exposed area south of the Clinker 13 building is:

- Predicted to have reduced emissions of PM₁₀ by 39.5 kg/year
- Predicted to have reduced the maximum 24-hour average contribution of this source to concentrations of PM₁₀ within a receptor zone by 0.53 µg/m³. However, this reduction occurs in the Port Adelaide receptor zone to the east, which does not actually contain sensitive receptors directly east of the Facility
- Predicted to have reduced the maximum 24-hour average contribution of this source to concentrations of PM₁₀ within a receptor zone to the west of the Facility by 0.16 µg/m³.