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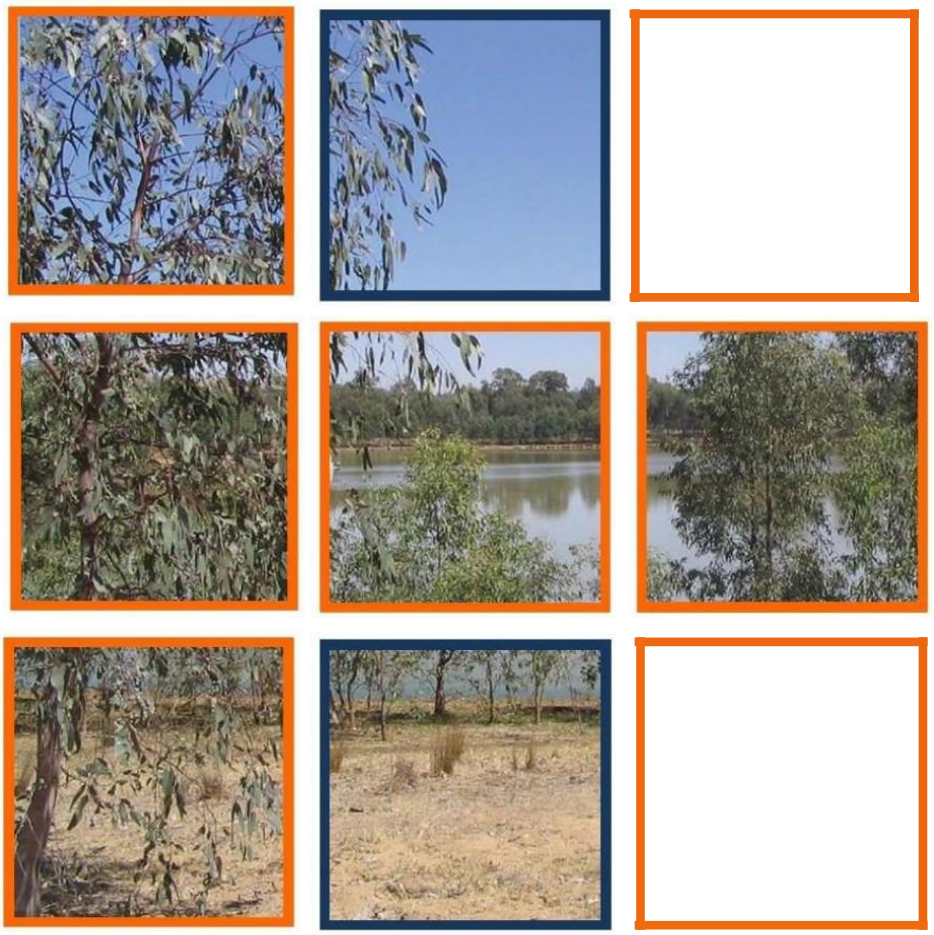
Wagga Wagga Quarry

AIR QUALITY MANAGEMENT PLAN



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1 INTRODUCTION

This Air Quality Management Plan (AQMP) has been prepared by Hanson Construction Materials Pty Ltd (Hanson) for the Wagga Wagga Quarry. The AQMP is largely based on a document prepared by PAE Holmes in May 2012. This AQMP is a second iteration of the document following review of the original AQMP and effectively updates the version prepared in May 2012. The facility is a sand and aggregate quarry located 5 km north-west of Wagga Wagga, on Roach Road (Lot 2 DP 610795 and part of Lot B DP 381991), NSW. Under the Project Approval for Development Application 07_0069 – *Wagga Wagga Quarry Extension Project*, Hanson is required to compile an Air Quality Management Plan for submission to the Director-General (now Secretary).

The AQMP seeks to summarise dust generating activities, current dust management practices and provide recommendations for further reducing the impact of dust on nearby sensitive receptors. All recommendations have been made in accordance with the requirements of Project Approval 07_0069.

The report provides guidance on the siting of air quality monitoring and meteorological instrumentation in accordance with the approved methodology. Aspects of air quality management are covered with regards to complaints handling, performance indicators, training, roles and responsibilities and a recommended revision procedure.

The AQMP provides a working document for day-to-day management of the site which will assist with ensuring the operation complies with approval requirements. An annual review of this document is necessary to ensure that air quality management at the site remains effective throughout changing operations.

This management plan was informed by a site visit undertaken on 20 April 2012 by Greer Laing of PAEHolmes. While on site the quarry operations and current dust management were discussed with Site Manager Rod Thompson.

1.1 Objectives of the Management Plan

The management plan requirements have been outlined in Schedule 5 of the Project Approval. An outline of these requirements and the section of the management plan that addresses these requirements can be found in **Table 1**.

Table 1: Management Plan Requirements

Management Plan Requirement	Section of this Report
Detailed Baseline Data	**2.3**
A description of relevant statutory requirements	**1.2**
A description of relevant limits or performance measures/criteria	**5.2**
A description of the specific performance indicators that are proposed to be used to judge the performance or guide the implementation of the project or any management measures	**5**
A description of measures that would be implemented to comply with the relevant statutory requirements, limits, or performance criteria/measures	**5**
A program to monitor and report on the impacts and environmental performance of the project	**4**
A program to monitor and report on the effectiveness of any management measures	**5.2**
A contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible	**3.2**
A program to investigate and implement ways to improve the environmental performance of the project over time	**5.5**
A protocol for managing and reporting any incidents, complaints, non-compliance with the conditions of this approval and statutory requirements and exceedances of the impact assessment criteria and/or performance criteria	**5.1**
A protocol for periodic review of the plan	**5.5**

Specifically the AQMP must address two points as outlined in Schedule 3 of the Project Approval; shown in **Table 2**.

Table 2: Air Quality Management Plan Requirements

Air Quality Management Plan Requirement	Section of this Report
Describe the measures that would be implemented to ensure compliance with the relevant conditions of this approval, including consideration of a real-time air quality management system that employs both reactive and proactive mitigation measures.	**4.5**
Include an air quality monitoring program that uses a combination of high volume samplers and dust deposition gauges to evaluate the performance of the project, and includes a protocol for determining exceedances with the relevant conditions of this approval.	**4**

1.2 Applicable Legislation and Criteria

This management plan complies with the following legislation:

- Protection of the Environment Operations (Clean Air) Regulation 2010.
- Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (**OEH, 2007**).

The operation of the quarry must comply with conditions of air quality impact assessment criteria (Condition 5 of Schedule 3 of the project approval), operating hours (Condition 2 of Schedule 3 of the project approval) and air quality management (Conditions 6 and 7 of Schedule 3 of the project approval). All reasonable and feasible avoidance and mitigation measures must be employed so that particulate matter emissions generated by the project do not cause an exceedance of the criteria shown in **Table 3, Table 4** and **Table 5**.

Table 3: Long Term Criteria for Particulate Matter

Pollutant	Averaging Period	[d] Criteria
Total Solid Particulates (TSP)	Annual	[a] 90 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	[a] 30 µg/m^3

Table 4: Short Term Criterion for Particulate Matter

Pollutant	Averaging Period	[d] Criterion
Particulate matter < 10 µm (PM_{10})	24 Hour	A 50 µg/m^3

Table 5: Long Term Criteria for Deposited Dust

Pollutant	Averaging Period	Maximum Project Contribution	Maximum Total Deposited Dust Level
[c] Deposited Dust	Annual	[b] 2/g/m2/month	[a] 4 g/m^2/month

Notes to **Table 3**, **Table 4** and **Table 5**.

[a] Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources);

[b] Incremental impact (i.e. incremental increase in concentrations due to the project on its own);

[c] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method;

[d] Excludes any extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents, illegal activities or any other activity agreed by the Director-General in consultation with OEH.

1.3 Project Overview

The site is located on a floodplain bordering the Murrumbidgee River and private land. The total area of the site is 200ha, 120ha of which is floodplain, 29 ha encompasses the extraction area and 1.5ha is occupied by the plant and stockpile area. Access to the site is from Roach Road and McNickle Road off the Sturt Highway.

The quarry is approved to transport 150,000tpa of product from the site. The operational life of the quarry is expected to be in excess of 30 years. The quarry will be developed into a series of cells.

There is little topsoil on the site, however all useful soil material will be stockpiled for rehabilitation works. The soil depth is typically less than 0.5m thick and abruptly passes into sand and gravel. Overburden will be placed back into exhausted cells for final rehabilitation. Overburden depth is approximately 4m followed by fine-grained sand and gravel to a depth of 20m.

Material is extracted from the reserves using a 40t excavator. Raw material is transported to the crushing plant via two dump trucks each with a 35t capacity. Aggregate stockpiles normally contain approximately 20,000t of aggregate for retail distribution.

The material goes into a feed bin and is sent over a wash screen. This screen separates out the oversized material and sends it to a crusher. All the material is then sent over another screen that again separates out oversized material and returns it in a closed loop to the crusher. Material not oversized then goes to a third screen that sizes and separates the material in various grades. Material is then put into stockpiles via a front-end loader. The existing plant covers an area of approximately 200 m x 200m and the highest component is the screen and bin structure.

The material is sold by loading into trucks via a front-end loader and quantified using a weighbridge. All processed material is hauled from the site, via a sealed access road (Roach Road) connecting to the Sturt Highway. Haul trucks are typically truck and dog configurations carrying 33t payloads. The haul routes are either east or west along the Sturt highway.

Progressive reclamation of the quarried areas will be carried out by completing earthworks and covering the reclaimed area with topsoil and vegetation. The project seeks to recreate indigenous

vegetation areas similar to those on the surrounding land. The excavated areas will naturally fill with water to create a series of dams.

2 AIR QUALITY IMPACTS

2.1 Identified Contributors to Dust Emissions

A site inspection was undertaken to evaluate dust generating activities associated with current operations. The following activities have been identified as key areas for potential dust generation:

- Wheel generated dust from movement of vehicles on unsealed roads within the site.
- Movement of machinery at the processing plant (front end loaders, excavators and dump trucks).
- Scraping of overburden.
- Crushing and screening of aggregate.
- Materials handling and conveying.
- Emplacement of materials within the site.
- Wind erosion of stockpiles/exposed areas.

It is therefore these principal activities where dust management measures should be directed.

2.2 Closest Sensitive Receptors

The locations of the closest sensitive receptors are identified in **Table 6**. The locations of these receptors relative to the site are shown in **Figure 1**. Kullaroo represents Kullaroo 1 in the Air Quality Assessment (**Heggies, 2009**) because Kullaroo 2 has since been demolished.

Table 6: Closest Sensitive Receptors to the Project Site

Residence ID	Distance to Site Boundary	Distance to Processing Plant	East (m)	North (m)
Kullaroo	0.2	1.7	527572	6117801
Sweetwater	0.2	1.4	528569	6117275
Riverglen	0.7	1.2	529831	6116625
Globine	0.5	1.0	527908	6115201
Pomigalarna	0.4	1.5	526301	6116493

The project site comprises of two mining lease areas, the old extraction area located to the north-north-west of the processing plant and the new extraction area located to north-north-east of the processing plant (**Figure 1**).

Figure 1: Map of Site and Nearest Sensitive Receptors

2.3 Air Quality Impact Assessment

An Air Quality Impact Assessment was undertaken for the extension of the quarry and involved air dispersion modelling of dust impacts at the site (**Heggies, 2009**). The results of predictions made by AUSPLUME atmospheric dispersion modelling for this assessment are summarised in **Table 7**, **Table 8** and **Table 9**. These values represent worst-case modelled results using meteorology data sourced from TAPM and the Wagga Wagga Airport AMO, located approximately 15 km to the south-east of the Project Site.

Table 7: Background and Predicted Incremental Dust Deposition at Nearest Non-Project Related Residence (Heggies, 2009)

Receptor	Background	Increment	Background+ Increment	Project Goal
Kullaroo	1.8	0.1	1.9	4
Sweetwater	1.8	0.7	2.5	4
Riverglen	1.8	1.7	3.5	4
Globine	1.8	0.6	2.4	4
Pomigalarna	1.8	0.2	2.0	4

Table 8: Maximum Predicted (Background + Increment) 24-Hour PM_{10} Concentration ($\mu g/m^3$) (Heggies, 2009)

Receptor	Background (Date)	Increment	Background + Increment	Project Goal
Kullaroo	48.7 (27/04/05)	0.0	48.7	50
Sweetwater	48.7 (27/04/05)	1.0	49.7	50
Riverglen	48.7 (27/04/05)	0.8	49.5	50
Globine	48.7 (27/04/05)	0.1	48.8	50
Pomigalarna	48.7 (27/04/05)	0.1	48.8	50

Table 9: Predicted Annual Average (Background + Increment) PM_{10} Concentration ($\mu g/m^3$) (Heggies, 2009)

Receptor	Background (Date)	Increment	Background + Increment	Project Goal
Kullaroo	23.9	0.8	24.7	30
Sweetwater	23.9	1.2	25.1	30
Riverglen	23.9	1.2	25.1	30
Globine	23.9	0.9	24.8	30
Pomigalarna	23.9	0.8	24.7	30

These modelling results indicate that annual average dust deposition, annual average PM_{10} concentrations and 24-hour average PM_{10} concentrations associated with the Project were predicted to satisfy the project air quality goals, provided specific operation controls are adhered to.

3 DUST CONTROL PRACTICES

3.1 Current Dust Control Practices

Identification of a dust incident event will be triggered by evidence of unacceptable visible fugitive emissions on the site or a dust complaint from adjacent neighbours.

Upon identification of a dust incident, one or more of the following corrective actions will be implemented by the Site Manager. Identification of any significant sources of emissions by visual inspections will be undertaken and if required, activities and processes will be modified. If requested, air quality monitoring should be conducted at the complainant's property.

Specific dust management practices, that address the potential sources identified in **Section 2.1** are summarised below.

3.1.1 Hauling

- When dusty conditions are identified by the Site Manager the water cart is sent out to water the haul roads. The frequency of watering is determined by the availability of staff to operate the water cart.

- Speed restrictions between the public road and site office are applied at 20 km/h.
- Loads are required to be covered when haul trucks exit the site.
- The new haul road (currently under construction) minimises the distance travelled by taking the most direct route from the new extraction area to the processing plant.
- The public road is sealed from the site entrance resulting in less wheel-generated emission from product haul trucks on public roads.
- Speed limit on the public road is restricted to 80 km/h.

3.1.2 Extraction

- The machinery used to scrape overburden also has the facility to haul and dump the material, thereby lessening the handling of the material and resulting in fewer emissions.
- Due to the location of the quarry operation, the sand and aggregate is being extracted from below the water table therefore the moisture content of the product is high.

3.1.3 Processing

- Bins in the processing plant have three sided enclosures.
- Two of the four screens onsite have water piping that can be used to dampen the material during the screening process.
- Transfer of sand from the processing plant to the stockpile is delivered using a pipe that mixes the sand with water, therefore no emissions are produced during this process.

3.1.4 Wind Erosion

- The planting of the wildlife park adjacent to the operation acts as a windbreak near the stockpiles and other exposed areas.
- Overburden stockpiles are seeded during the course of the operation to reduce wind erosion.
- Flood levees have been rehabilitated with grasses and other rehabilitation areas have been planted with native vegetation.

3.2 Additional Dust Control Practices

Practical mitigation measures and best management practices must be implemented to prevent or mitigate impacts on the air quality within the local area. A summary of all current and additional dust controls for the site can be found in **Table 10**.

Other factors that must be taken into consideration are that the availability of staff onsite to maintain dust control throughout operations. It must be ensured that the watering cart is the correct specification for the plant, because it is noted that watering has only limited impact on the roads. A sign will be installed at the entrance to the quarry to ensure that loads are covered when exiting the facility.

Table 10: Additional Dust Management Practices

Action	Timing	Performance Indicator	Responsibility for Implementation
Ensure regular watering of unsealed roads, exposed surfaces and stockpiles in times of adverse dust conditions	Throughout operations	No complaints from nearby sensitive receptors	Site Manager
Employee induction to ensure awareness of dust management measures	Throughout operations	Records of employee induction processes.	Site Manager
Watering of material to be crushed and screened	In the event that visible dust is seen by the crusher/screen operator or Site Manager beyond the weigh bridge	No visible dust is seen by the crusher/screen operator or Site Manager beyond the weigh bridge	Crusher Operator / Site Manager
Evaluation of the practicability and effectiveness of chemical dust suppressants on unsealed roads and effectiveness of chemical dust suppressants on unsealed roads and exposed surfaces	First six months of expansion	Use of chemical dust suppressants evaluated for effectiveness and economic viability	Site Manager
Stockpiles will be directly sprayed with water to suppress dust generation	During adverse wind conditions	No complaints from nearby sensitive receptors	Site Manager
Identify the contributing source of dust emissions by visual inspection and review of site wind speed / direction data	Throughout operations	No complaints from nearby sensitive receptors	Site Manager
Modify and cease operations in times of adverse conditions likely to contribute high dust levels	Determine daily conditions from forecast provided by BoM forecast from Wagga Wagga AMO or onsite meteorological station	No complaints from nearby sensitive receptors	Site Manager
Instigate appropriate dust mitigation measures during crushing / screening (e.g. use of water suppression / foam suppression / bag filtration / varying or ceasing operations)	Throughout operations	No complaints from nearby sensitive receptors	Site Manager
Plant and equipment movements will be restricted to designated routes and standing areas	Throughout operations	No complaints from nearby sensitive receptors	Site Manager
Vehicle speeds will be controlled between the public road and site office (20 km/h) and public feeder roads (55 km/h) to minimise dust generation	Throughout operations	No complaints from nearby sensitive receptors	Drivers / Site Manager
All trucks entering or leaving the site with loads shall have loads covered	Throughout operations	No incidents of uncovered loads reported	Site Manager
Material spilled or tracked onto public roads to be removed as soon as identified	Immediately upon identification	No material spilled / tracked onto the public road network	Site Manager
Inspect air quality monitoring data and determine whether levels exceed a 'trigger' level, after which modification of the identified activities is actioned	Quarterly	No exceedances of the air quality criteria summarised in **Section 1.2**	Site Manager

4 AIR QUALITY MONITORING

Ambient air quality monitoring will be conducted to evaluate compliance with the project air quality goals established in **Section 1.2**. All air quality monitoring will be conducted in accordance with the following Australian Standards:

- NSW OEH Approved methods for the sampling and analysis of air pollutants in NSW (**NSW DEC 2005**).
- Australia/New Zealand Standard AS2922-1987: Methods for Sampling and Analysis of Ambient Air, Part1 – Guide to Siting Air Monitoring Equipment.

4.1 Dust Deposition Monitoring

Four dust deposition gauges have been maintained at the site since 2001 to determine dust deposition levels at the site. Dust deposition gauges (DDGs) are operated in accordance with:

- NSW OEH Approved methods for the sampling and analysis of air pollutants in NSW (**NSW DEC 2005**).
- Australia/New Zealand Standard: Methods for sampling and analysis of ambient air - Determination of particulate matter - Deposited matter - Gravimetric method.

Monitoring for dust deposition is conducted at four sites across the operation at a frequency of one-month continuous basis. Current locations of each dust deposition gauge (DDG) are illustrated in **Figure 2**.

Figure 2: Site Map and Existing Dust Deposition Gauges

The annual average dust deposition was calculated using the laboratory analysis reports undertaken by the NATA accredited laboratory at Charles Sturt University (**Table 11**).

Table 11: Annual Average Insoluble Solids Dust Deposition from four sites

	DDG1	DDG2	DDG3	DDG4
2009	5.0	3.9	4.1	4.8
2010	2.3	1.4	6.8	1.4
2011[a]	1.3	0.7	3.2	1.6

[a] Not a full year (only measured February, March and September)

Given their proximity to both the processing plant and current extractive operations, these monitoring locations are not deemed representative of dust impacts at the closest sensitive receptors, but provide an indication of the level of dust emanating from the Site. Due to access considerations, the monitoring network will remain onsite.

4.2 High Volume Air Sampling

In accordance with approval condition 7(c), the air quality program must include a combination of high volume samplers (HVAS) and dust deposition gauges to evaluate the performance of the project and include a protocol for determining exceedances.

HVAS units will be operated in accordance with:

- NSW OEH Approved methods for the sampling and analysis of air pollutants in NSW (**NSW DEC 2005**).
- Australia/New Zealand Standard: Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM_{10} high volume sampler with size-selective inlet - Gravimetric method.

One high volume air sampler would be sufficient to provide continuous monitoring at the site. Monitoring will be conducted on a one-day-in-six run cycle for a continuous sample period of 24 hours. Filter papers will be returned to a NATA accredited laboratory for analysis, following exposure. Additional analysis may be required as part of compliance evaluation when elevated levels are recorded.

Taking all approved siting methodology into consideration and the need for the instrument to be sited onsite, the optimum siting of the HVAS is included in the proposed monitoring network in **Figure 4**.

Following the first three months of monitoring, the results and any evident trends will be reviewed by Hanson with a view to establishing if this monitoring is providing useful information for management of potential air quality impacts. HVAS monitoring will be continued until sufficient data has been collected and approval to modify the monitoring program is provided by DPE.

The above relates to the sampling of PM_{10} using a HVAS. It is acknowledged that Condition 5 of Schedule 3 of the project approval additionally requires evaluation of a Total Suspended Particulate (TSP) annual criterion (90µg/m^3, annual average).

The typical percentage of PM_{10} in a semi-rural environment (i.e. one where the airshed is not dominated by particulate from motor vehicles) lies in the range of 40-50%. With this in mind, compliance with the annual PM_{10} criterion (30 µg/m^3) should therefore be seen to satisfying the annual TSP criterion. HVAS monitoring of PM_{10} will thus be used as a surrogate for evaluating compliance with the TSP criterion (i.e. if the annual PM_{10} criterion is satisfied, it is assumed that the TSP criterion will also be achieved).

4.3 Meteorological Monitoring

A suitable meteorological station within the vicinity of the site is required under the Statement of Commitments for the project (Section 1.6.2 of Appendix 3 of the Project Approval). The meteorological station will be operated in accordance with:

- Australian Standard AS 3580.14-2011 *Methods for sampling and analysis of ambient air - Meteorological monitoring for ambient air quality monitoring applications*.

Currently an on-site weather station is sited above the old site office but it is not maintained. The old site office was affected by recent flooding, so all office work is conducted within a temporary office building adjacent to the old site office.

Plans to rebuild a site office would include a 3 meter base to elevate the office from any further flooding impacts. Placing a weather station within the vicinity of the site office (but at a sufficient separation distance as specified within AS 3580.14-2011) would provide an optimum location for a weather stations, the location is marked in **Figure 3**.

Figure 3: Site Map and Meteorological Station Location

4.4 Future Monitoring Locations

The current DDG locations are considered to be influenced by onsite activities, as is evidenced by the high deposition rates observed to date (refer **Table 11**). Specifically DDG1 is located next to the product stockpiles, DDG2 is located next to the haul road while DDG3 is located in

the old extraction rehabilitation zone. These locations are not deemed representative of dust levels at the nearest residences.

The monitoring network is required to remain onsite due to access requirements for maintenance. The proposed sites are deemed by Hanson to be free of the influence of the buildings, trees, steep slopes and roadways (i.e. are generally compliant with the requirements of AS2922-1987). Secondary considerations will need to be made to site the instruments in locations thatare secure to maintain the integrity of the data.

The existing locations for dust gauges and the proposed locations for the HVAS will provide an indication of dust levels produced from extraction activities which may be used to infer compliance at the nearest residential receptors.

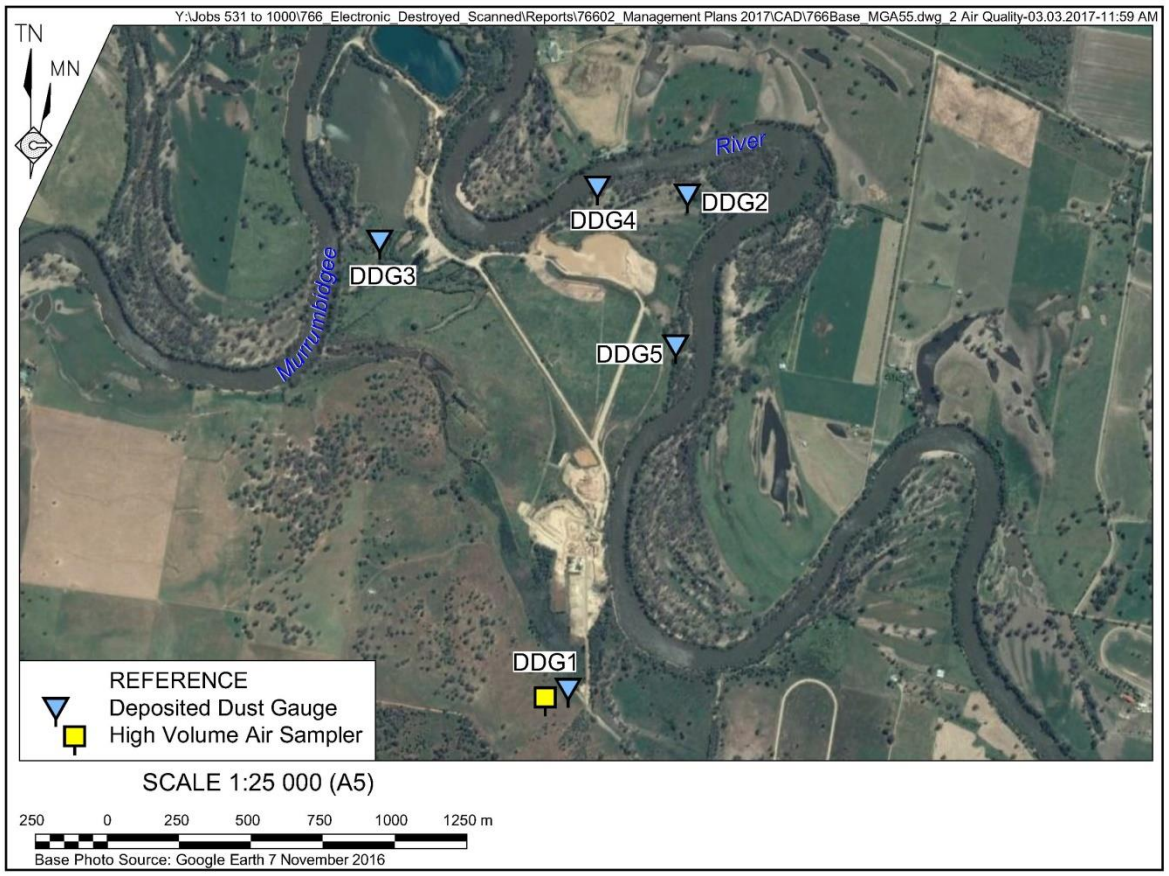

Figure 4: Site Map and proposed dust deposition gauge (DDG) location

4.5 Real-Time Air Quality Management

Based on complaints to date and the scale of the operations, this have been evaluated and discounted. Predictive techniques can be implemented in the form of a meteorology data inspection. In this case a forecast from the nearby BoM station at Wagga Wagga Airport AMO would be subscribed to and inspected at the start of each day. On days where the conditions are likely to create adverse dust impacts, operators will be briefed on methods to reduce their dust contributions.

5 DUST MANAGEMENT

5.1 Dust Incident and Complaints Handling

Any dust incidents or complaints will be recorded and fully investigated to find root causes and corrective actions implemented where necessary. Additionally the following measures will be undertaken during complaint and incident investigation:

- Review of management practices will be undertaken to systemically identify and implement options to modify site practices, to ensure effective control of dust-generating activities so as to achieve the air quality goals stated in this plan.
- All complaints will be documented by the Site Manager on the complaints register, along with the corrective action undertaken.
- Additional air quality monitoring may be conducted at a complainants request at their property, and at an appropriate frequency.
- There will be an annual review of the extent of monitoring conducted.

5.2 Performance Indicators

In addition to the Air Quality Goals stated in this plan, the effectiveness of the Air Quality Management and Monitoring Plan will be reviewed against the following performance indicators:

- Any dust incidents reported internally and effectively managed.
- No dust complaints from nearby sensitive receptors.

5.3 Training and Awareness

The Site Manager will be responsible for ensuring that environmental training and awareness programs are provided to all staff. Specific attention will be made to incident management and reporting, use of plant and equipment, dust control, and complaints management during the induction period.

Briefings should be held between staff and contractors to assist in minimising any on-site and off-site environmental issues. The Site Manager shall maintain a record on site of environmental training undertaken for all employees, detailing the type and purpose of the training.

5.4 Roles and Responsibilities

The Site Manager will be responsible for implementation and maintenance of this Air Quality Management Plan by all personnel working on the site.

5.5 Revision Procedure

This AQMP will be reviewed annually to ensure that the management practices reflect the measured emissions and the operation.

A review should also occur when there are significant changes made to the operation. If at the stage of review it is found that PM_{10} monitoring results are consistently and substantially below the assessment criteria, consideration may be taken to decommission the HVAS.

The review will include an assessment of the effectiveness of the established dust controls and their performance against the AQMP objectives. Any amendments to the Plan will be undertaken in consultation with the appropriate regulatory authorities.

6 REFERENCES

AS 2922-1987 *Ambient Air - Guide for the Siting of Sampling Units*.

AS 3580.14-2011 *Methods for sampling and analysis of ambient air - Meteorological monitoring for ambient air quality monitoring applications*

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