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PREPARED BY:	Ed Cocchiarella		Aug. 19, 2020
REVIEWED BY:	Shelley Cox	Digitally signed by IO955255 DN: cn=IO955255 Date: 2020.08.20 08:38:15 -04'00'	
APPROVED BY:	Darren Toner	foo7274 2020.08.20 08:41:41 -04'00'	

ISSUE/REVISION INDEX

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Issue Codes: RC = Released for Execution, RD = Released for Design, RF = Released for Fabrication, RI = Released for Information, RP = Released for Purchase, RPA = Released for Permit Application, RQ = Released for Quotation, RR = Released for Review and Comments.

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1.0 PURPOSE & SCOPE

1.1 Purpose

The purpose of this Air Quality and Dust Management Plan (the Plan, AQDMP) is to establish a framework to control and monitor mining, demolition and construction processes that may impact local air quality. These measures are necessary to ensure the project's compliance obligation are met and to protect the local community and natural environment.

1.2 Objectives

The environmental objectives of the AQDMP include:

- Apply Best Management Practices (BMPs) to control fugitive dust from construction activities;
- Maintain emissions of particulate matter (PM) in air emissions within the applicable standards;
- Maintain concentrations of particulate matter (PM) and trace metals, particularly Nickel (Ni), in ambient air off-property and at sensitive receptors either on or off-property, within applicable standards;

1.3 Scope

The AQDMP is established to address mining construction activities that may have a significant impact upon the local air quality. The sources of air emissions are identified along with their measures for control during mining, demolition and construction activities on the site.
The Plan requirements apply to all project site personnel whose work may cause dust or other emissions to air. Requirements are consistent with *Air Emissions Management* (PGS-003278).
The AQDMP identifies activities to monitor the air emissions and abatement performance of the project, as well as monitoring for environmental quality, consistent with the objectives of the project.
The scope of the AQDMP includes the following demolition and construction activities that may emit pollutants to air:

- Particulate emissions (dust) from the, construction and site preparation operations (including ground excavation: cut, fill and haulage);
- Fugitive dust emissions from material handling including vehicle loading and unloading of debris;
- Fugitive dust emissions from the demolition of buildings, equipment and existing infrastructure;

- Fugitive dust emissions from open material storage piles and unpaved road vehicular traffic, and from track-out of dust and dirt onto paved roads by construction vehicles;
- Exhaust emissions from vehicles and construction equipment.

Noise and vibration issues are addressed in a separate management plan titled *Noise and Vibration Management Plan.*

2.0 ROLES AND RESPONSIBILITIES

Specific responsibilities for the identified roles are provided below. For projects being constructed on or in conjunction with an existing Vale operating site the responsibilities of the host site and project roles are provided as well.

2.1 Project Team

Ensure **all conditions in** regulatory permits related to environment are met.

Inspect and audit environmental activities for compliance to regulatory requirements and the AQDMP.

Coordinate regular host operations and project activities to allow for the efficient completion of the project and minimize overall air emissions from the site, if required.

Appoint an Environmental Representative from the Project Team (usually an HSE Advisor competent in environmental issues).

2.2 Vale or Project Security

Monitor and enforce site speed limits, as required.

2.3 Host Operations Environment Group

Ensure all environmental permits for the operating site and the project are obtained and update the project team of any amendments or changes.

Provide wind and weather advisories and access to off-site camera monitoring, if available, (e.g. Sudbury Emission Reduction Program (ERP) can provides network data to projects) to supplement the Contractors' program for dust control.

Maintain any existing ambient air monitoring network for particulates and metals and augment as required for the project's duration.

Refer and coordinate any environmental complaints pertaining to Project construction activities to the project team for investigation.

Communicate with the public and regulators through pre-existing forums, as required.

Provide environmental training materials and programs to the project for use in developing Project-specific training.

Collect information and submit reports on the investigation of air exceedances potentially caused by project construction and demolition activities.

Collect information for the classification of environmental incidents, and internal communication processes.

2.4 Project Construction Management

Implement the AQDMP and ensure compliance with all applicable regulations, guidelines and project commitments through planning, training, supervising, monitoring, inspection and reporting activities.

Oversee Contractors to ensure compliance with the requirements of the AQDMP.

Investigate and report on all incidents of non-compliance with the AQDMP and/or regulation; specify corrective actions and ensure their timely completion.

Complete environmental reporting to the Project team and the host site's Environmental group, as required.
Where directed by the project team, require additional dust control measures to Contractors scope of work, such as road cleaning, tire cleaning, binder application, etc.

Develop procedures and forms to facilitate compliance with the AQDMP.

2.5 Project Environment Lead

Advise Construction Management on the requirements of the AQDMP including managing compliance, reporting on performance, arranging to inspect and audit the Plan and propose improvements.

Regularly review and update the AQDMP and related site-specific procedures and plans as required.

Review and approve method statements for air quality and dust control elements prior to work starting.

Monitor construction activities and air quality/dust control performance to ensure that control measures are effective and comply with the AQDMP.

Through the Environmental Representative, provide advice and liaise with the construction team to identify and mitigate environmental risks related to air quality and dust, and to ensure appropriate controls are implemented.

Develop and arrange for delivery of environmental training on air quality and dust for workers, as required.

Work with the NAPG HSER Manager and the project team to coordinate environmental performance reporting on air quality and dust, and ambient particulate monitoring.

Liaise with Vale's Corporate Affairs Officer as required regarding air quality and dust. Ensure appropriate investigation and responses are completed for all public complaints about construction activities, utilizing communications protocols in the NAPG Environmental Plan.

Manage the environmental audit, inspection and monitoring program for dust and review the reports.

2.6 Environmental Representative

Deliver environmental training to project personnel on site-specific AQDMP requirements.

Support Construction Management, in conjunction with Vale, in the event of an environmental incident relative to air quality and dust.

Ensure coordination of environmental mitigation and monitoring procedures and data.

2.6 Environment Representative continued:

Ensure regular visual monitoring at sensitive locations (such as adjacent to neighbouring residences or near demolition/construction sites) is completed when dusty construction activities are undertaken.

Update work method statements for air quality and dust aspects, as required through the PMRA process.

Complete routine performance reports.

2.7 Contractors

Appoint an Environmental liaison to coordinate with the project as needed to ensure ongoing adherence to the Plan.

Assist the project team to coordinate on-site activities to minimize impact to the host Vale operation, if required.

Implement the requirements of the AQDMP relative to the work undertaken (e.g., tarping loads, following speed limits, applying dust suppressant, etc.)

Respond to all dusting events that may be identified, including curtailing activities if required.

Follow Vale procedures established for spill reporting for air quality or dusting events.

Where requested by Vale, participate in complaint investigation process and implement recommended corrective actions.

2.8 All Workers

Follow all requirements of the AQDMP and guidance from the project team Environmental Representative on matters related to air quality and dust management.

Immediately inform supervisor or designate of any issue of non-compliance with this AQDMP and/or regulation.

3.0 DEFINITIONS

Best Management Practice (BMP): are methods that have been determined to be the most effective and practical **means** of preventing or reducing sources of pollution, including air emissions.

Greenhouse Gas (GHG): Gaseous emissions that have the potential to contribute to global warming such as Carbon Dioxide and Methane.

Opacity: Visible particulate emissions that obstruct the passage of light.
Oxides of Nitrogen (NO_X): The sum of nitrogen dioxide (NO_2) and nitric oxide (NO) which are combustion products that exist in equilibrium in the atmosphere and contribute to smog.

Total Particulate Matter (TPM): Particles, either solid or liquid, that can be suspended in air; generally smaller than 44 µm in diameter.

PM10, Inhalable particulate matter; smaller than 10 µm in diameter.

PM2.5, Respirable particulate matter; smaller than 2.5 µm in diameter.

Polycyclic Aromatic Hydrocarbons (PAHs): A class of complex organic compounds that form from incomplete combustion and are known to be carcinogenic.

Sensitive Receptor: a location either on or off Vale property where the impact of air emissions is of greater concern, e.g., a school, hospital, day care or an ecologically protected area.

4.0 COMPLIANCE OBLIGATIONS

The compliance obligations associated with Project activities are detailed in the *Project Permitting Plan*. The following are the primary regulations that govern air quality depending on the jurisdiction of the project:

Federal:

- Canada Wide Standards for Particulate Matter (PM).

Ontario:

- Ontario Environmental Protection Act, RSO 1990, Ch. E.19; and
- Ontario Regulation 419/05: Air Pollution – Local Air Quality, as amended.

Manitoba:

- The Environment Act, C.C.S.M. c. E125;
- Manitoba uses an environmental assessment process and reference air standards from other jurisdictions to set limits for new projects.

Newfoundland & Labrador:

- Environmental Protection Act, SNL2002 Ch. E-14.2
- Air Pollution Control Regulations, NLR 39/04;
- Newfoundland & Labrador uses an environmental assessment process to set limits for new projects.

Municipalities:

- Various municipalities may establish by-laws or best practices for construction sites or unpaved yards that prescribe dust control measures.

The air contaminants that may be regulated for a NAPG project include:

- Total Particulate Matter, PM10, PM2.5, Opacity;
- Metals, including, Nickel, Copper, Lead, Chromium;
- Combustion products from smelting, furnaces or power generation, including, Sulphur Dioxide, Oxides of Nitrogen, Carbon Monoxide;
- Greenhouse Gas Emissions: Carbon Dioxide, Methane;
- Trace toxic compounds: Polycyclic Aromatic Hydrocarbons (PAHs).

5.0 REQUIREMENTS

5.1 General

The demolition and construction activities could potentially generate high volumes of dust and particulates in the air affecting the natural environment. Dusts found at mining and smelting sites should be assumed to contain nickel and other metals. If uncontrolled, air quality standards in nearby communities may be exceeded, the potential for worker exposure is increased and visibility may be affected. The AQDMP focuses on the abatement and control of particulates and dust generated in these phases.

Contractors that bid on work for activities that have the high potential for dust generation, including demolition, substantial earth-moving, and high traffic volume on unpaved roads, are required to submit detailed work plans that indicate dust mitigating practices and procedures appropriate for metal-bearing dust. The duty of care required is much higher for metal-bearing dust in comparison to nuisance dust. Contractors must use Best Management Practices during dry or windy conditions especially if the wind is blowing towards sensitive areas. These practices include:

- Reschedule/postpone high dusting activities during unfavourable environmental conditions (e.g. trucking or demolition) as agreed with project team. Contractors must stop work due to safety or environmental conditions (e.g. excessively dusty conditions) when extreme weather is forecast;

- Stop work and modify activities if the dust levels from construction are excessive in density or magnitude. Obtain project team approval to continue work with modifications.

- Locate dust generating activities (accumulation, loading, unloading, storage, cutting, grinding) away from high traffic areas and site boundaries, especially adjacent to residential areas as per site layout plans for construction;

- Designate “clean” and “dirty” areas and restrict activities within each, as well as utilizing dust suppressants where appropriate. Clean vehicle wheels and tailgates as they cross from dirty areas to clean areas as required, to prevent tracking of dust and mud;

- Store sand, gravel and other aggregates so that they are protected from the wind (e.g. in hoppers or bunkers), and keep conveyor belts and hoppers covered or enclosed unless the material transferred does not generate visible emissions;

- Immediately clean up or dampen spilled material that can generate dust (e.g. cement) to minimize dust emissions generated by the wind or vehicle traffic;
- Wet down dust generating materials prior to handling, e.g. loading wetted material into a haulage truck, if required;
- Manage and reduce open areas and pile shape as per site layout plans for construction;
- Practice controlled open burning only at sites where the practice is allowed for wood disposal and only when weather is favourable;
- Utilize a mobile truck wash system (if required/requested);
- Utilize where appropriate, large sized aggregate as a sacrificial base to avoid truck driving through mud;
- Utilize wind barriers when specified to achieve wind speed reduction;
- Adhere to road speed limits established by Vale;
- Construct unpaved roads as per standard approved methods (provide for appropriate crowning, slope and drainage).
- For projects on an operating site, coordinate paved road cleaning and unpaved road dust suppression with the existing program for operations.
- Project personnel may carry out visual inspection at pre-established sensitive locations or during construction activities on a regular basis. Locations and frequency are developed cooperatively between the project team and the host site Environment Department. Compliance with AQDMP requirements will be based on observed visible emissions.

5.2 Mobile Equipment

Mobile equipment powered by gasoline, diesel or propane must be:

- Operated in accordance with manufacturer's instructions;
- Immediately repaired if exhaust is abnormally smoky; and

- Equipped with appropriate emission controls such as catalytic converters.

5.3 Access Roads and Traffic Lanes

- The project team will assess the condition of unpaved roads and order appropriate applications of topping materials, water, surface binding, stabilizers or other dust suppressants to minimize erosion and the generation of fugitive dust.

- Wet unpaved roads using mobile water trucks or use Vale approved binder and chemical stabilizers. The frequency of application depends upon assessment and observed/expected conditions of dryness, amount of traffic and signs of fugitive dust emissions. Note that the use of oil as a dust suppressant is prohibited;

- The project team shall approve all access routes and communicate them to contractors before the start of work.

- Contractors shall ensure only suitable and approved methods of dust control are used as needed. If no water is available, suitable alternatives may include wood chips, salts and calcium or magnesium chloride-based brine. Notify the project team for approval of the alternative dust control agents.

- If an operating site is required by permit to maintain and implement a Best Management Practices Plan for the Control of Fugitive Dust Emissions (e.g. Sudbury operations), then Contractors must comply with the Plan requirements as well.

- Existing paved roads must be kept clear of dust and debris utilizing approved methods. Routine vacuum sweeping of paved roads is used to minimize the potential for fugitive dust emissions. Clean paved haul roads on an agreed pre-planned basis and on an as-needed basis based on inspections, observations and traffic plans. Cleaning may include water flushing and mechanical/vacuum sweeping; no dry mechanical sweeping without vacuum collection.

5.4 Vehicle Fleet

- All fleet (owned or leased) vehicles will be maintained regularly to optimize performance.

- Contractors shall cover all bulk loads on vehicles transporting granular materials to and from the site;

- Contractors shall securely cover bins of off-road heavy trucks and haul trucks with tarps during the transport of bulk granular materials to minimize dust emissions, where possible.

- All contractors shall ensure that engines operate in compliance with manufacturers' emission standards; Engines must be tuned properly, emission control systems maintained in good operating condition.

- On-site vehicles are restricted to the posted speed limit, to minimize fugitive dust emissions from unpaved roads surfaces and unpaved site areas. Vale security personnel monitor compliance with site speed limits.

5.5 Earth-moving Activities

- Dust/mud track out control stations to remove mud and dirt from tires and undercarriages must be established at locations where vehicles exit construction areas onto paved roadways. Contractor shall propose the type and method to be used and obtain approval from the project team.

- Wheels of all trucks and heavy equipment in contact with natural soils (arable soil, clay, silt, etc) should be checked for cleanliness and cleaned if required, prior to leaving the site using the track out control stations.

- Contractors shall use slope stabilizers such as fabric filters, plastic sheeting or wind fencing to reduce the amount of soil that may become airborne dust during earth moving activities.

- Contractors shall cover stockpiles and disturbed soils with non-toxic soil binders such as watering and non-toxic surfactants. Tarps or temporary coverings may also be used for stockpiles of fine materials.

- Material handling equipment or processes such as boring machines, crushing machines, conveyor elevators, aggregate screening, etc., must be equipped with fugitive dust abatement systems, such as tarps, water sprays or enclosures on equipment, piles or excavation area.

6.0 LEARNING AND COMPETENCE

6.1 Training

The project shall include awareness of dust control, including that site dust may have elevated metal content, in the Site Orientation training. All workers must take the site orientation training.

During the RFQ and PMRA processes a high potential for track-out or dust generation may be identified. Contractors who are selected for this work may require more detailed training on dust control measures to effectively control dust.

7.0 INSPECTION, MONITORING AND REPORTING

7.1 Inspection

The project team shall carry out regular inspections of their construction areas to verify that housekeeping or supporting controls are effective. These inspections consider the site environmental standards as the minimum standards that should be achieved, with necessary actions to be recorded and raised at weekly progress meetings, or earlier as required. Projects may create a site-specific Environmental Inspection Form, including AQDMP control elements, to record findings.

Vale environmental personnel from the host site may be invited to attend the inspections and completed inspection reports may be forwarded to the host site upon request. Unless addressed by a straightforward stop and correct action, non-conformities must be added to the Environmental Corrective Action Register. For any non-conformance identified, Vale participates in the development of the proposed correction action.

The Environment Lead may review dust control inspection records to ensure the adequacy of the program. Issues identified are investigated as needed and discussed with the host site Environment Department to ensure compliance requirements are met.

7.2 Vale Air Quality Monitoring Program

The host Vale site or the project itself, must maintain a local Ambient Air Quality monitoring program if required to comply with permit conditions. For example, in Sudbury the Ambient Air Quality monitoring program is designed to measure environmental performance off-property against applicable standards, guidelines and compliance with regulatory requirements. If required, additional ambient air monitoring may be imposed due to project construction.

The host site Environmental Department or the project Environmental Lead reviews all ambient air monitoring data. If elevated values are observed, the project shall investigate potential causes and take appropriate corrective actions if necessary.

Air quality monitoring results must be reported to appropriate authorities made available to the public, if required by permits, in accordance with communications requirements of the NAPG Environmental Plan.

Where there is an operating Vale site it may be difficult to differentiate the dust contribution from project activities, the existing background sources and normal ongoing operations. **There may be an approximate 2 month lag between the air network sample collection and analysis/results being received by Vale.** Alternative methods to assess dust control may be required to identify problems more readily.
Site video cameras may be an effective alternative to identify large visible emission plumes emitted by construction or demolition activities. In Sudbury such cameras are operated by the Vale Emission Reduction Program (ERP) group and may be available to projects to determine immediate impacts. A project may also choose to install cameras to observe visible emissions.

In addition, the project team may inspect activities with an appropriately trained Visible Emissions Observer who can assess plume density through quantitative opacity observations and monitor road silt levels.

7.3 Auditing Program

The annual audit program described in the NAPG Environmental plan must include conformity with the AQDMP and compliance with regulatory requirements.

7.4 Management of Non-Conformities

The project Environmental Representative assesses the environmental performance based upon the information received from Construction Management, Vale, the contractors and his or her own inspection and audits of the construction works. Issues and non-conformities are reported and discussed at weekly Construction Meetings, or on an as-needed basis.

If non-conformity with the AQDMP or non-compliance with regulations is observed, the project shall follow the Process to Manage Non-Conformities in the NAPG Environment Plan.

Environmental occurrences will be assessed using Vale's standard for classification and reported according to the Communications instructions in the NAPG Environment Plan.

8.0 COMMUNICATION AND REPORTING

Communications of issues relative to air quality and dust are coordinated through the project Environmental Representative and the Construction Manager at least at weekly construction meetings, or on an as-needed basis.

Only Vale communicates directly with the public through a Corporate Affairs representative. This process is described in the NAPG Environmental Plan.

9.0 REFERENCE

Sudbury Operations, Best Management Practices Plan for the Control of Fugitive Dust Emissions.

NAPG Environmental Plan, NAPG- ENV-SPI-0001

NAPG Waste Management Plan, NAPG-ENV-SPI-0002

Air Emissions Management (PGS-003278).

Canada Wide Standards (CWS) for Particulate Matter (PM) and Ozone, Canadian Council of Ministers of the Environment, 2000.

Ontario Environmental Protection Act, RSO 1990, Ch. E. 19.

Ontario's Ambient Air Quality Criteria, Standards Development Branch, Ministry of Ontario, April 2012.

Ontario Regulation 419/05: Air Pollution – Local Air Quality, Ontario Ministry of the Environment, Conservation and Parks, 2011.

Manitoba, The Environment Act, C.C.S.M. c. E125

Newfoundland and Labrador, Environmental Protection Act, SNL2002 Ch. E-14.2

Newfoundland and Labrador, Air Pollution Control Regulations, NLR 39/04;

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