



## KEMESS UNDERGROUND PROJECT


### **Fugitive Dust Management Plan**

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# Fugitive Dust Management Plan

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## GLOSSARY AND ABBREVIATIONS

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

<b>Air Quality Standards</b>	Objectives for maximum concentrations of air contaminants in the atmosphere developed to ensure long-term protection of public health and the environment.
<b>Ambient Air Quality</b>	The outdoor air quality at a particular site
<b>FDMP</b>	Fugitive Dust Management Plan
<b>AuRico</b>	AuRico Metals Inc.
<b>BC</b>	British Columbia
<b>BC MOE</b>	British Columbia Ministry of Environment
<b>CAAQS</b>	Canadian Ambient Air Quality Standards
<b>CCME</b>	Canadian Council of Ministers of the Environment
<b>CEAA</b>	Canadian Environmental Assessment Agency
<b>CEPA</b>	<i>Canadian Environmental Protection Act, 1999</i>
<b>CO<sub>2e</sub></b>	Carbon Dioxide Equivalent
<b>COPC</b>	Contaminant of Potential Concern
<b>CWS</b>	Canada-Wide Standards
<b>EAC</b>	Environmental Assessment Certificate (#M17-01)
<b>EAO</b>	BC Environmental Assessment Office
<b>ECCC</b>	Environment & Climate Change Canada
<b>EMA</b>	British Columbia <i>Environmental Management Act</i>
<b>EMC</b>	Environmental Management Committee
<b>EMP</b>	Environmental Management Plan
<b>EMPR</b>	BC Ministry of Energy, Mines and Petroleum Resources
<b>EMS</b>	Environmental Management System
<b>ENV</b>	BC Ministry of Environment and Climate Change Strategy
<b>FLNRO</b>	BC Ministry of Forests, Lands, Natural Resource Operations & Rural Development

<b>Fugitive Dust</b>	Particulate matter, often sand or mineral dust, released to the atmosphere by mechanical disruption of soil or by wind scouring
<b>IEM</b>	Independent Environmental Monitor
<b>kW</b>	Kilowatt
<b>KLV</b>	Kemess Lake Valley
<b>KS</b>	Kemess South
<b>KUG</b>	Kemess Underground
<b>µg/m<sup>3</sup></b>	Micrograms per cubic metre
<b>MEM</b>	BC Ministry of Energy and Mines
<b>NAAQO</b>	National Ambient Air Quality Objectives
<b>NPRI</b>	National Pollutant Release Inventory
<b>ORAR</b>	Omineca Resource Access Road
<b>PM<sub>10</sub></b>	Inhalable particulate matter. PM <sub>10</sub> particles are airborne particles that have a diameter of 10 microns or less and are thus a subset of total suspended particulate. The majority of PM <sub>10</sub> particles are from fugitive dust sources. PM <sub>10</sub> can enter the respiratory system and has been linked to respiratory problems.
<b>PM<sub>2.5</sub></b>	Respirable particulate matter (PM <sub>2.5</sub> ) is a subset of PM <sub>10</sub> and defined as particles with a diameter less than 2.5 microns. These particles are small enough to enter deep into the respiratory system. The majority of particulate matter emitted in diesel engine exhaust is PM <sub>2.5</sub> .
<b>Project</b>	KUG Project
<b>QA/QC</b>	Quality assurance/quality control
<b>SOP</b>	Standard Operating Procedure
<b>t</b>	Tonnes
<b>TKN</b>	Tse Keh Nay First Nation
<b>tpd</b>	Tonnes per day
<b>TSF</b>	Tailings Storage Facility
<b>TSP</b>	Total suspended particulates (TSP) are solid matter or liquid droplets having aerodynamic particle sizes from 0.01 to 100 microns in diameter and are found in smoke, dust, fuel ash, or condensing vapours that can be suspended in the air.

## 1. PURPOSE AND OBJECTIVES

The purpose of the Kemess Underground (KUG) Project (Project) Fugitive Dust Management Plan (FDMP) is to identify:

- the legislation, standards, commitments and conditions relevant to air discharges from the Project;
- the environmental protection or mitigation measures that are established to avoid, control, and mitigate air discharge impacts;
- monitoring measures to collect on-site air quality data, as may be required, to meet regulatory requirements and to enable the implementation of adaptive follow-up programs as needed; and
- reporting requirements.

The objective of the FDMP is to establish measures to mitigate dust emissions from Project activities to meet air quality legislative requirements, commitments and conditions outlined in Section 1.3.

The FDMP was written in consideration of the guidelines outlined in *Developing a Fugitive Dust Management Plan* (MEM, ENV 2018).

The FDMP is also written to supplement the upcoming Air Quality Management Plan and Refuse Incinerator Management Plan.

## 2. COMPLIANCE OBLIGATIONS

### 2.1 LEGISLATION AND REGULATIONS

The federal government has set National Ambient Air Quality Objectives (NAAQOs) and Canadian Ambient Air Quality Standards (CAAQS) under the *Canadian Environmental Protection Act (CEPA)*, 1999 (S.C. 1999, c. 33). Canadian Council of Ministers of the Environment (CCME) CAAQSs are intended to be achievable targets that will reduce health and environmental risks within a specific timeframe, whereas NAAQOs identify benchmark levels of protection for people and the environment. The CAAQS for respirable particulate matter (PM<sub>2.5</sub>) were adopted in British Columbia (BC) in 2013 and are effective from 2015 and 2020. In addition, BC has also developed air quality objectives for a number of contaminants. Federal and Provincial air quality criteria presented below in Table 2.1-1 are not legal compliance requirements but rather objectives and/or targets.

The applicable air quality related standards, objectives, legislation, and regulations relevant to the Project include:

- National Ambient Air Quality Objectives (NAAQOs; CCME 1999);
- Canadian Ambient Air Quality Standards (CAAQS; CCME 2013);



- BC Ministry of Environment (BC MOE) Ambient Air Quality Objectives (AAQOs; BC MOE 2016);
- *Environmental Management Act*, SBC. C. 53 and associated regulations:
  - Open Burning Smoke Control Regulation (BC Reg. 145/93);
  - Waste Discharge Regulation (BC Reg. 320/2004); and
  - Code of Practice for the Concrete and Concrete Products Industry (BC Reg. 329/2007).

**Table 2.1-1. Summary of the Federal and Provincial Ambient Air Quality Criteria**

Pollutant	Averaging Time	Canada			British Columbia
		National Ambient Air Quality Objectives <sup>1</sup>		Canadian Ambient Air Quality Standards <sup>2</sup>	Ambient Air Quality Objectives <sup>3</sup>
		Maximum Desirable	Maximum Acceptable		Objectives
TSP ( $\mu\text{g}/\text{m}^3$ )	24-hour	-	120	-	-
	Annual	60	70	-	-
PM <sub>10</sub> ( $\mu\text{g}/\text{m}^3$ )	24-hour	-	-	-	50
PM <sub>2.5</sub> ( $\mu\text{g}/\text{m}^3$ )	24-hour	-	-	28 <sup>6</sup> (27 <sup>7</sup> in 2020)	25 <sup>4</sup>
	Annual	-	-	10 <sup>7</sup> (8.8 <sup>8</sup> in 2020)	8 <sup>5</sup>

Notes:

(-) dash indicates not applicable;  $\mu\text{g}/\text{m}^3$  – microgram per cubic metre

<sup>1</sup> Environment Canada (EC; 1999).

<sup>2</sup> CAAQS adopted in 2013 and are in effect from 2015 and 2020 (CCME 2013).

<sup>3</sup> BC MOE 2016.

<sup>4</sup> Based on annual 98<sup>th</sup> percentile value.

<sup>5</sup> BC objective of 8  $\mu\text{g}/\text{m}^3$  and planning goal of 6  $\mu\text{g}/\text{m}^3$  was established in 2009.

<sup>6</sup> The 3-year average of the annual 98<sup>th</sup> percentile of the daily 24-hour average concentrations.

<sup>7</sup> The 3-year average of the annual average concentrations.

Exposure to airborne pollutants in the workplace is regulated by the British Columbia Ministry of Energy and Mines (MEM) under Part 2 of the *Health, Safety and Reclamation Code for Mines in British Columbia* (MEM 2008).

## 2.2 PERMITTING

AuRico is in the process of amending *Mines Act* Permit M-206. This Fugitive Dust Management Plan (FDMP) fulfills Permit Condition D9, copied below for reference:

- (a) *The Permittee shall submit, by July 15, 2018, a Fugitive Dust Management Plan designed to effectively control dust emissions from the Mine Facilities and access roads, to the satisfaction of the Chief Inspector. The plan shall include, but not be limited to, the following:*
- (i) *identification of dust sources and specific measures to mitigate dust for each source;*
  - (ii) *a site-specific event- and activity-based effectiveness monitoring program;*

- (iii) a Trigger Action Response Plan (TARP) that addresses specific environmental and site conditions that could result in generation of dust and includes proactive reporting out procedures in the event that dust control measures are ineffective or inoperable for any reason;*
- (iv) contingency plans to address circumstances where prescribed dust control measures are ineffective or inoperable for any reason;*
- (v) procedures intended to evaluate and mitigate potential effects of dust; and*
- (vi) procedures to address and report out on public complaints.*
- (b) The Fugitive Dust Management Plan shall be reviewed at least annually and updated as procedures are modified to reflect site-specific considerations. Annual updates and monitoring results shall be reported in the Annual Reclamation Report. Substantive changes shall be provided to the Chief Inspector prior to implementation.*
- (c) In the event that airborne dust from the site is reported to be a nuisance, the Permittee shall implement immediate remedial action to mitigate the airborne dust.*

### **3. ROLES AND RESPONSIBILITIES**

#### **3.1 HUMAN RESOURCES**

AuRico's Executive Management Team will allocate the appropriate human resources to the Environmental Management Plans (EMPs) for the Project. AuRico's Board of Directors has a Technical and Sustainability Committee to assist the Board in overseeing related initiatives and the proper implementation of applicable policies. The Committee periodically reviews sustainability-related policies, programs, and performance.

The roles and responsibilities for personnel are listed below and address the need for on-site personnel to communicate ultimately to the Executive Management Team on sustainability management at the Project. The responsibilities will enable effective management of environmental commitments, early warning and response to environmental issues, compliance with regulatory and policy requirements, and the evaluation and revision of environmental performance. The responsibilities are ultimately aimed at demonstrating diligence and transparency in AuRico's environmental and sustainability management.

Based on the current construction and operations phases workforce envisaged for the Project, the following is the proposed organizational structure and responsibilities. It should be noted that refinement and confirmation of the organizational structure will emerge as the project progresses. The organizational arrangement of the personnel responsible for environmental-related aspects is as follows:

- Chief Executive Officer (CEO);
- Chief Operating Officer (COO);
- Environmental Manager;
- General Manager;
- Front Line Supervisors;

- Environmental Specialists;
- Environmental Technicians;
- Aboriginal Group Monitors; and
- Employees and Contractors.

### **3.1.1 Chief Executive Officer**

The CEO will carry the ultimate responsibility for environmental and sustainability management, both in terms of statutory compliance as well as corporate citizenship, and will direct, instruct, and approve the implementation of such management policy on site.

### **3.1.2 Chief Operating Officer**

The COO will ensure that the resources required for developing, applying, and monitoring an effective EMP are available. In this respect, the COO will maintain a reporting-function relationship with the Environmental Manager and the General Manager.

### **3.1.3 General Manager**

The on-site General Manager will carry the accountability for the Project's environmental performance, as one of a portfolio of management responsibilities. The General Manager will instruct and approve the on-site systems and resources, by delegation to appropriate line-function personnel and with the support and advice of Mine Management and Supervisors for planning, oversight, monitoring, and reporting.

### **3.1.4 Management and Supervisors**

Management and Supervisors will have the functional responsibility for all matters related to day-to-day environmental management and will ultimately report to the General Manager. They will interact via a supporting role with relevant on-site personnel that have specified environmental management responsibilities.

Management and Supervisors will maintain a scheduled and systematic approach to monitoring of environmental performance and follow approved EMPs and conditions, and include compiling, reviewing, and seeking approval from the General Manager, Environmental Superintendent (or delegate) for environmental management method statements and work instructions.

### **3.1.5 Environmental Manager**

The Environmental Manager will have the functional responsibility for environmental management matters at the Project and will provide reporting-function accountability to the General Manager. The Environmental Manager will interact with and direct on-site Environmental Specialists and Technicians to fulfill environmental management responsibilities and tasks and ensure contractors are compliant with EMP requirements. This includes ensuring programs and procedures to fulfill the EMPs are designed, implemented and reported on for internal sustainability and external permit or

regulatory commitments. The Environmental Manager will be responsible for communications with government and community, including First Nations groups.

### **3.1.6 Environmental Specialists and Technicians**

Environmental Specialists and Technicians will be responsible for implementing the various EMPs and permit monitoring measures for the Project. They will be under the direction of and will be accountable to the Environmental Manager. The Environmental Specialists and Technicians will complete the day-to-day tasks to fulfill EMP obligations, sample collection, on-site monitoring and reporting. This includes performing environmental monitoring roles during Construction and Operations. Environmental Technicians will complete tasks as directed to support responsibilities of the Environmental Specialists and Environmental Manager.

### **3.1.7 Aboriginal Group Monitors**

In accordance with KUG EAC Conditions AuRico must provide opportunities for one full time position of an Aboriginal Monitor from each of the Aboriginal Groups (Tsay Keh Dene, Kwadacha, and Takla) to the satisfaction of the BC Environmental Assessment Office (EAO) during Construction and Operations. Each Aboriginal Monitor reports information directly to their respective Aboriginal Group and is subject to safety requirements established by AuRico, and receives direction for the activities to monitor from the respective Aboriginal Group. AuRico must:

- Provide documents required by the EA Certificate to the Aboriginal Monitors for review consistent with the review timelines identified in the conditions requiring the documents in addition to the other parties identified in each condition requiring documents;
- Provide training opportunities for Aboriginal Monitors so that the Aboriginal Monitors have the ability to support effective participation in monitoring activities; and
- Provide opportunities for the Aboriginal Monitor to conduct environmental monitoring for the Project.

Further details of the role of the Aboriginal Monitor are included in the Terms of Engagement for the Aboriginal Monitors.

### **3.1.8 Employees and Contractors**

An environmental orientation will be developed for AuRico personnel and contractors involved in the Project and will include EMP actions specific to the activities in which they will be involved. A key component of this orientation is a clear explanation of each individual's role and responsibility in the environmental management of the Project.

#### Contractors' Personnel

Contractors that undertake aspects of the Project will be required to meet the prescribed environmental performance standards set by AuRico's EMPs. Contractors will require designated personnel to ensure compliance. Such personnel will typically provide an environmental oversight role for activities associated with the particular contract being carried out; in addition to other duties

and responsibilities. AuRico's Management, Supervisors and Environmental Manager will interact closely with the contractor's personnel to identify the environmental requirements. The Contractor's representative(s) will be responsible for ensuring compliance with the environmental requirements including undertaking regular inspections, recording and reporting on inspection findings, initiating corrective actions for non-compliance, and maintaining an acceptable level of training and awareness among the contractor's personnel.

### **3.2 QUALIFIED PROFESSIONAL**

AuRico will retain various qualified professionals to conduct various aspects of the Project's environmental monitoring as specified in various EMPs. A qualified professional is a person who has training, experience and expertise in a discipline relevant to the field of practice set out in the condition or regulation, and who is registered with the appropriate professional organization, is acting under that organization's code of ethics and is subject to disciplinary action by that organization.

### **3.3 ENVIRONMENTAL MONITORING COMMITTEE**

In accordance with the KUG EA Conditions (Appendix 1-A), AuRico must establish and maintain an environmental monitoring committee (EMC) for all phases of the Project.

AuRico must invite participation from Aboriginal Groups, ENV, MEM, FLNRO, EAO, and other agencies where relevant to particular topics being discussed. The purpose of the EMC is to facilitate information sharing and provide advice to AuRico on the ongoing development of the Project and mitigation measures in a coordinated and collaborative manner.

Further details on the role of the EMC are included in the Terms of Reference for the EMC.

### **3.4 MATERIAL RESOURCES**

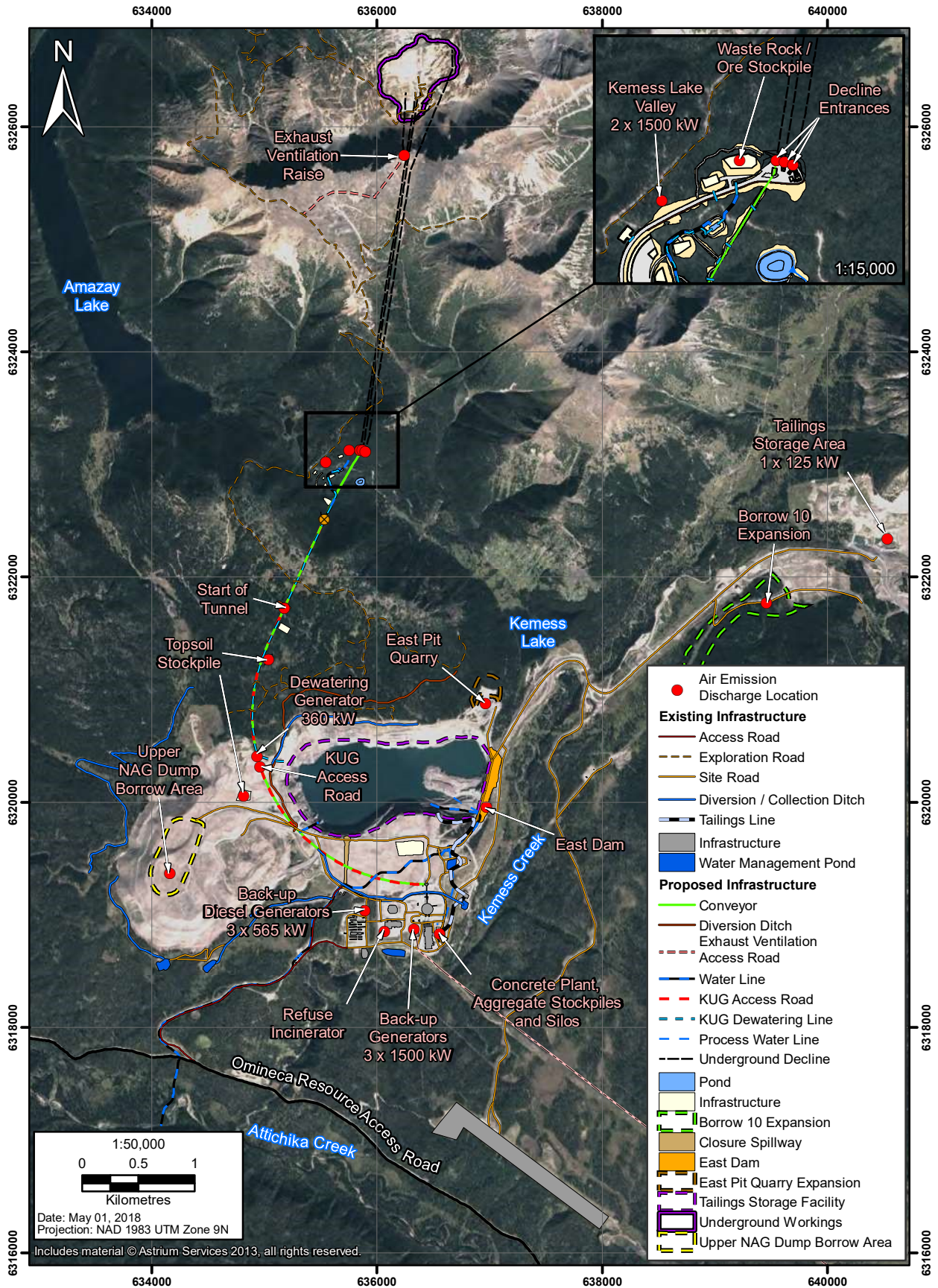
The implementation of EMPs requires material resources to be allocated for particular actions and procedures. AuRico's Environmental Policy provides for material resources via the mandates contained in the responsibilities for key personnel. Material resources in the form of salaries, equipment, facilities and consumables will be provided for implementing EMPs. Furthermore, budgets, facilities, and materials will be provided for the training of personnel who have the responsibility of meeting environmental performance targets and fulfilling the EMPs.

## **4. POTENTIAL SOURCES OF FUGITIVE DUST**

Fugitive dust discharges will be generated during the Project's Construction, Operations, Closure and Post-Closure phases from the following sources/activities. Fugitive dust discharge locations are shown in Figure 4-1.



**Figure 4-1**  
**KUG Project Air Discharge Locations**



## 4.1 SOURCE LIST REVIEW

Sources of fugitive dust will be updated annually, if needed, based on changes in mine operations and infrastructure locations. The source list will be updated as part of the annual reporting and using the adaptive management framework described in Section 7.

## 4.2 FUGITIVE DUST SOURCE LIST

The following is a list of potential sources of fugitive dust:

- surface blasting in the areas of the access tunnel and underground decline portals;
- earthworks (including land clearing) during Construction;
- construction of the KUG access road and upgrade of exploration access roads during Construction;
- underground blasting and mining activities during Construction and Operations;
- ore handling both underground and at surface during Operations;
- dust generated from the construction of the East Dam;
- dust generated from wind erosion of the exposed tailings beach within the KUG TSF;
- dust generated from material handling at surface portal facilities such as the non-hazardous waste landfill, Borrow 10 expansion, East Pit quarry, upper non-acid generating waste rock dump, waste stockpile, ore stockpile, topsoil stockpiles, conveyor system, and laydown areas;
- use of unpaved surfaces including the KS and KUG access roads, all-weather gravel airstrip, and service roads during all phases of the Project; and
- dust from the cement hoppers within the concrete batch plant that will operate during Construction.

## 5. FUGITIVE DUST MANAGEMENT

The following section details environmental protection (mitigation) and management measures designed to reduce or eliminate adverse air quality effects related to the Project. All mitigation and best management practices described in Section 5 will act to inhibit the emissions of all size fractions of particulate matter including total suspended particulate, PM<sub>10</sub>, and PM<sub>2.5</sub>. Environmental protection measures involve taking a tangible action to avoid, minimize, restore on-site, or offset air quality related Project effects. The general approach for the protection of air quality is:

- the FDMP will be implemented through all Project phases;
- adherence to all permit requirements, conditions, authorizations, and approvals;
- training will be provided on measures consistent with roles and responsibilities in Section 2.1;
- equipment that generate air contaminants will be maintained in good working order and operated in accordance with manufacturer recommendations; and

- standard best practices will be used for fuel conservation and fugitive dust control.

## 5.1 BEST MANAGEMENT PRACTICES AND MITIGATION MEASURES

### 5.1.1 Material Handling

The transport of ore and waste rock from underground to the processing plant and KUG TSF will be achieved by a system of conveyors. Dropping material from height and material handling in general will generate fugitive dust. The Project has the following environmental protection measures in place:

- the conveyor drop locations (between conveyors) will be enclosed;
- reducing drop heights wherever practical from the conveyors onto stockpiles;
- using enclosed, negative-pressure housings at conveyor transfer points; and
- enclosing or covering loads carried by vehicles wherever practical based on the loads and type of vehicle.

### 5.1.2 Stockpiles

Fugitive dust emissions may be generated by wind erosion when stockpiled materials have small particle sizes such as in silt and clay. Fugitive dust from stockpile wind erosion will be mitigated by the following environmental protection measures:

- during dry periods, apply dust suppressant, such as water, if visible dust events are observed;
- contour stockpiles to reduce wind erosion potential; and
- cover (with vegetative or material covers) or enclose stockpiles to reduce wind contact with the stockpiles.

In the event fugitive dust environmental protection measures mentioned above are shown to have little to no effect, the following contingency measures can be implemented:

- erection of windbreaks around identified problem areas to limit the dust emissions from equipment and stockpiles, and other activities likely to generate windblown or re-entrained dust; and
- installation of a fog/sprinkler system that releases small droplets of water on the stockpile material to suppress airborne dust and not cause water seepage.

### 5.1.3 Unpaved Surfaces

Fugitive dust emissions may be generated by vehicle movement on unpaved roads. Environmental protection measures for unpaved roads include vehicle use restrictions, surface improvements, and surface treatment. AuRico will contribute to shared resource road (ORAR) maintenance through road use agreements with other road users. Fugitive dust from unpaved roads will be mitigated by the following environmental protection measures:



- minimize rapid starts and stops;
- adhere to local speed limits;
- regular maintenance of unpaved roads to reduce the silt content;
- application of water to roadways to reduce dust from vehicle traffic linked to periods of prolonged dry weather; and
- operation of vehicles at designated speeds on site roads.

Road watering will occur regularly during periods of dry weather with increased frequency depending on visible dust emissions from mobile equipment. If water alone proves to be ineffective, alternative methods that will be considered for application will include calcium or magnesium chloride, lignin compounds, environmentally friendly oils or clay additives.

#### **5.1.4 Tailings Storage Facility**

The KUG TSF will be the disposal area where tailings will accumulate over the operational phase of the Project, reaching a maximum capacity at the end of Operations. The tailings and waste rock tonnage to be stored within the KUG TSF will result in an exposed tailings beach through Operations and at Closure which will be susceptible to wind erosion. Fugitive dust generated from use of the KUG TSF through all phases of the Project will be managed through the following environmental protection measures related to material movement and vehicle traffic, in addition to the fugitive dust environmental protection measures mentioned above:

- minimizing material movement within the KUG TSF from the use of heavy equipment;
- minimizing vehicle and heavy equipment traffic near the KUG TSF; and
- adding gravel over the KUG TSF roadways to cover any silt.

If these environmental protection measures prove to be ineffective, the following contingency measures will be considered for the KUG TSF beach:

- the application of water as watering increases the moisture content and conglomerates particles, effectively reducing the likelihood of them becoming re-suspended; and
- installation and maintenance of wind fences.

## **5.2 ENVIRONMENTAL PROTECTION MEASURES BY PROJECT PHASE**

Mitigation and management measures will be put in place in order to reduce fugitive dust impacts associated with the Project. The majority of measures will be relevant for all phases of the Project and for all contaminants. The following describe anticipated air discharge sources by project phase which would be addressed by the measures described above.

### 5.2.1 Construction

Environmental protection or mitigation measures will be in place to reduce suspended particulate matter during the Construction Phase of the Project. The following sources of emissions were identified:

- fugitive dust on unpaved roads from vehicles travelling on site roads; and
- other mine development activities such as earthworks and surface blasting.

### 5.2.2 Operations

Environmental protection measures will be in place to reduce suspended particulate matter emissions during the Operation Phase of the Project. The following sources of emissions were identified:

- material handling fugitive dust emissions;
- fugitive dust from the KUG TSF due to wind erosion and material movement;
- fugitive dust on unpaved roads from vehicles travelling on site roads; and
- other mine development activities such as earthworks and surface blasting.

### 5.2.3 Closure

Environmental protection measures will be in place to reduce suspended particulate matter emissions during the Closure Phase of the Project. Project emissions during the Closure Phase are much lower than the Operations and Construction Phases as mining and processing activities are halted and equipment is removed from the Mine. The following sources of emissions were identified:

- material handling fugitive dust emissions;
- fugitive dust from the KUG TSF due to wind erosion and material movement;
- fugitive dust on unpaved roads from vehicles travelling on site roads; and
- other mine development activities such as earthworks and surface blasting.

### 5.2.4 Post-Closure

Environmental protection measures will be in place to reduce suspended particulate matter emissions during the Post-Closure Phase of the Project. The following sources of emissions were identified:

- fugitive dust on unpaved roads from vehicles travelling on site roads.

## 5.3 EMERGENCY PREPAREDNESS AND RESPONSE

Emergency preparedness and response for the Project are addressed in the *Accidents and Malfunctions Communication Plan*, *Accidents and Malfunction Administration Plan*, and *Environmental Spill Emergency Plan*. No additional information specific to ambient air quality is presented here.

## 6. PLAN IMPLEMENTATION

### 6.1 TRAINING

Under the guidance of the Environmental Superintendent, Environmental Technicians and Assistants will be trained on implementing and updating the FDMP. The Environmental Technicians and Assistants will be responsible for making sure all site personnel are aware of the FDMP and are aware of who to contact in the event that they witness a potential dust concern. Training will be arranged for all new employees and contractors and refresher training will occur for all staff when changes are made to the FDMP.

Refuse incinerator operators will be sufficiently trained such that the incinerator is operated in accordance with manufacture recommendations and associated discharge permits.

### 6.2 MONITORING AND ANALYSIS

#### 6.2.1 Monitoring

The dust monitoring program is intended to allow:

- visual identification and recording of fugitive dust events;
- assessment of the effectiveness of mitigation and management measures;
- identify Project effects requiring further mitigation efforts; and
- comply with permit, approvals, and regulatory requirements.

The dust monitoring program will consist of visual monitoring of fugitive dust by mine personnel. On a daily basis when the ground is not covered under snow, an Environmental Technician will perform visual monitoring for dust at the following locations:

- Locations of active surface earthworks;
- Active KS and KUG access roads;
- Ore and waste stockpiles

In addition to these daily inspections mine personnel will be trained to inform the Environmental Technician on duty if persistent dust plumes are visible.

After daily inspections are complete a log of the findings will be filled out. The log will be updated for all dust events. The log will contain information on the location where dust plumes were visible, their size and temporal persistence, activities occurring that may have caused the dust plume, meteorological conditions at the time and any actions taken (see Section 6.4).

Monitoring will be conducted by trained personnel. Data are submitted to government authorities in compliance with Permit requirements and are kept and made available to others for review upon request.

#### 6.2.1.1 *Meteorological Monitoring*

Meteorological conditions are an important consideration when assessing air quality as they may contribute to windblown dust and will influence the behaviour of emissions following release. Site specific meteorological monitoring is expected to continue throughout the Construction and Operation phases of the Project. Information from the on-site stations will be used in analysis and evaluation of fugitive dust monitoring described above.

### 6.2.2 **Analysis and Evaluation**

Results from the monitoring programs will be reviewed annually to determine if any trends are evident and if regulatory criteria are being met. Evaluation of the results will take place during the annual review when looking for meaningful trends.

## 6.3 **QUALITY ASSURANCE/QUALITY CONTROL**

Quality assurance/quality control (QA/QC) measures are undertaken at four key stages in monitoring activities:

- during visual monitoring and data collection;
- during data entry and analysis;
- through reporting and reassessment of methods as part of the evaluation of the effectiveness of the plan; and
- through the development of standard operating procedures for standard sampling procedures.

The process of data gathering in the field are quality controlled through the use of trained personnel and a system of pre- and post-field checks to ensure that consistent, repeatable data are being gathered. All personnel will have necessary training.

## 6.4 **TRIGGER ACTION RESPONSE PLAN**

### 6.4.1 **Nonconformity and Corrective Action**

A non-conformance is anything that occurs at the Project which is not in alignment with this FDMP. Non-conformities include improper, or lack of, implementation of the measures outlined in this FDMP such as missed reporting deadline, an exceedance of permit discharges, not implementing mitigation or management measures effectively or not conducting sampling appropriately or according to an agreed upon schedule. Non-conformity reporting will be subject to Mines Act Permit M-206 and future EMA Permit conditions mentioned in Section 1.3. The need for any corrective actions to reduce on-site emissions or install additional control measures will be determined on a case-by-case basis.

Indications of the need for corrective actions and additional control measures may include:

- monitoring data showing persistent dust plumes;
- monitoring data showing an increasing trend in the presence or size of dust plumes; and
- issues raised by on-site staff, regulators, or local communities.

#### 6.4.2 Incident Identification

AuRico will take all reasonable measures to prevent incidents, accidents and malfunctions that may result in adverse environmental effects. If emergency or spill incidents occur it will be reported per the requirements of the *Emergency Response Plan*, *Environmental Spill Emergency Plan* and the *Hazardous Materials Handling Plan*. AuRico employees and subcontractors are responsible for complying with all environmental standards and regulations, including work site inspections and accident/incident investigations. Incident(s) will be immediately investigated to determine the cause(s) and effective and immediate preventative and remedial action(s) will be developed.

An air quality incident can be an exceedance of an air quality standard or guideline such as an incinerator stack exceedance. Other air quality incidents can include receipt of air quality complaints from local land users or Aboriginals groups (TKN), air quality related regulatory non-compliances and provincial or federal air quality related orders or notices.

All air quality related incidents in alignment with this FDMP at the Project will be reported as soon as reasonably possible and entered into AuRico's incident management system. Environmental incidents related to air quality will be assigned to the Environmental Superintendent. The Environmental Superintendent will determine if the air quality incident requires an external notice to be submitted to the relevant government department. Incidents that require emergency response will be handled through the *Emergency Response Plan*, *Environmental Spill Emergency Plan*, and the *Hazardous Materials Handling Plan*. All other incidents will be investigated and corrective action plans developed.

Local community members, First Nations and stakeholders can provide feedback on Kemess Underground and its operations and activities, through the following channels:

1. Contacting Kemess Underground mine by phone at 778-724-4420;
2. Contacting the Kemess Underground Sustainability and Community Development Dept. by email at [communityrelations@centerragold.com](mailto:communityrelations@centerragold.com); and
3. Speaking to the Kemess Underground Sustainability & Community Development Dept. in-person.

Once feedback has been received by the Sustainability & Community Development Dept., it will be reviewed and either resolved – in the event that the comment is simply a request for information or a question that can be answered easily – or determined to be a formal complaint or grievance.

If a formal complaint or grievance is filed, procedures outlined in *Kemess' Issues Identification/Grievance Management Procedure* document (In Draft) will be followed.

### 6.4.3 Trigger Action Response Table

Specific triggers and responses are provided in Table 6.4-1.

## 6.5 RECORD KEEPING

### 6.5.1 Monitoring Results

Record keeping is conducted by designated personnel. Data are entered into suitable electronic databases, checked for quality control and assurance purposes, and stored. Data are entered in a format and program that allow for comparison over time and storage in a single file format for each type of survey or monitoring activity. Designated personnel will coordinate preparation, review, and distribution of the data and reports required for regulatory purposes.

AuRico will assume the responsibility of data management and record-keeping of monitoring results. Data are entered into suitable electronic databases and have quality control checks completed upon receipt of results. Data are entered in a format and program that allows for comparison between years, and are stored in a single file format for each type of survey or monitoring activity. Monitoring data are stored for the life of the mine and be made available for review upon request.

### 6.5.2 Continuous Improvement

AuRico is committed to continuous improvement of the ambient air quality program at the Project. Annual reviews of the FDMP will be conducted internally with the mindset of continually improving the program. Continuous improvement measures could include implementing new technology as it become available, streamlining processes and/or any other measure to improve the program.

To achieve continual improvement, an iterative process of planning, doing (implementing), checking, and acting is undertaken. Such a management approach is typically applied in the following manner:

- planning – during which objectives are established and processes defined that accord with the company’s ethos (represented in the Environmental Policy);
- doing (implementing) – during which the defined processes (or actions) are carried out;
- checking – during which the processes carried out are monitored, measured against the objectives (including legal obligations), and reported; and
- acting – during which additional actions are undertaken, if necessary, to achieve continual improvement in the company’s environmental performance (may require revising high-level planning, i.e., policy).

### 6.5.3 Incident Response Records

Incident response records are stored for a minimum of five years and made available for review upon request.

**Table 6.4-1. Fugitive Dust Trigger Levels and Corresponding Action/Response**

Location	Normal		Level 1 Alert		Level 2 Alert		Level 3 Alert	
	Trigger	Action/Response	Trigger	Action/Response	Trigger	Action/Response	Trigger	Action/Response
Unpaved Roads	Minor localized dust during normal mine operations	Continue work in accordance with site management procedures	Visible dust above height of haul truck tray for any period of time up to 30 minutes. Visible dust above top of pick up truck for any period of time up to 30 minutes.	Divert watering truck to area of dust generation	Triggers per level 1 but with dust plume extending beyond local area for periods longer than 1 day	Increase frequency of road watering until dust plume subsides	Extensive areas of dust generation with large dust plumes for periods longer than 3 days, or when dust plumes extend beyond the active mine area/infrastructure	Increase frequency of watering and if not successful application of alternative dust suppressants (e.g. calcium or magnesium chloride, lignin compounds, environmentally friendly oils or clay additives) and reducing vehicle speeds
Active Surface Earthworks	Minor localized dust during normal mine operations	Continue work in accordance with site management procedures	Visible dust plumes rising over 2 metres above the active construction area for longer than 30 minutes	Minimize material movement in the active construction area the use of heavy equipment	Triggers per level 1 but with dust plume extending beyond local area for periods longer than 1 day	Application of water to exposed construction area (if this is a source)	Extensive areas of dust generation with large dust plumes for periods longer than 3 days or when dust plumes extend beyond the active mine area/infrastructure	Increase frequency of watering and if not successful application of gravel to exposed construction area (if this is a source) and investigation into further long term solutions if dust plumes persist
Stockpiles	Minor localized dust during normal mine operations	Continue work in accordance with site management procedures	Visible dust plumes rising over 2 metres above the ground for longer than 30 minutes	Apply dust suppressants to stockpiles	Triggers per level 1 but with dust plume extending beyond local area for periods longer than 1 day	Increase frequency of application of dust suppressants to stockpiles	Extensive areas of dust generation with large dust plumes for periods longer than 3 days or when dust plumes extend beyond the active mine area/infrastructure	Increase frequency of dust suppressant application and if dust plumes persist examine the installation of fog/sprinkler system and wind breaks

## 7. ADAPTIVE MANAGEMENT

Adaptive management means identifying and addressing FDMP components that are shown to be not functioning as intended. This could be as a result of ineffective mitigation measures, practical implementation of plan requirements or in response to changes in requirements or Project conditions. Scenarios related to air quality where adaptive management may be required include:

- reoccurring exceedance of compliance requirements;
- significant increasing trend in persistence or size of dust plumes;
- multiple incidents in any given year; or
- substantive regulatory changes and/or technological advances.

Adaptive management can also include additional protection measures mentioned in Sections 5.1 and 5.2. Additionally, adaptive management can include updates to this plan in terms of roles and responsibilities, training and/or supporting documents.

The cycle of mitigation activities, monitoring and evaluation, and instituting new mitigation activities if required, will provide adaptive management of air quality issues identified and arising as a result of the Project.

Monitoring data will also be used to provide feedback to modify the dust management measures implemented at the site, if required. This plan is designed to be adaptive, effective, and achievable in both the short and long term. Components of the FDMP may need to be revised over the life of the Project based on regulatory changes and/or technological advances.

### 7.1 PLAN REVISION

The FDMP is a “living document” and components of the plan may be revised over the life of the Project. The FDMP will be reviewed annually as part of reporting. Any revisions of FDMP will be implemented following a review by stakeholders and an opportunity for response by AuRico.

AuRico will conduct an annual (or as necessary) evaluation of the efficacy of mitigation and management activities and of monitoring activities. This plan may be updated as frequently as every year, or not at all, if the mine plan and methods for mitigation and monitoring are found to be robust.

### 7.2 NOTIFICATION AND CONSULTATION REQUIRED UPON PLAN REVISION

Any proposed modifications made to the FDMP will be communicated to the Environmental Monitoring Committee, including member regulatory authorities and First Nations. The Environmental Monitoring Committee will be provided with an opportunity to comment on the proposed revisions before revisions are implemented.



## 8. REPORTING

Information collected through application of the FDMP will be included in relevant reports prepared annually and as required to meet external and internal needs. FDMP reports may contain the following:

- description of record keeping of monitoring data and analyses (e.g., a description of the analyses that were performed, and QA/QC procedures);
- monitoring results logs;
- identification of any emerging negative environmental trends likely attributable to the Project identified by monitoring; and
- description of proposed revisions to the FDMP to address emerging negative trends, or to adjust monitoring programs, if required.

In addition to the FDMP reporting, there may be additional National Pollutant Release Inventory (NPRI) reporting if the amounts of pollutant released are above the relevant reporting threshold.

### 8.1 MONITORING REPORTING

AuRico will assume the responsibility of data management and record-keeping of monitoring results. Data will be entered into suitable electronic databases and have quality control checks completed upon receipt of results. Data will be entered in a format and program that allows for comparison between years, and will be stored in a single file format for each type of survey or monitoring activity. Monitoring data will be stored for the life of the mine and available for review upon request.

The information gathered during visual monitoring will be summarized annually. Annual reports will be produced and submitted in accordance with the Permit specifications. The report will provide a summary of visual monitoring results and an assessment of compliance with the Permit, including a summary of any mitigation actions applied to rectify non-compliances where required. The fugitive dust report will provide results of monitoring described in Section 6.2.1 and analyses described in Section 6.2.2, assessment of any established key performance indicators, and any other pertinent information.

### 8.2 COMPLIANCE REPORTING

Information from reporting described in Section 8.1 will be incorporated as needed into other general compliance reports in which AuRico will prepare under various authorizations such as the EAC and Decision Statement. Reporting will also be required as specified in the *Mines Act* Permit M-206 (see Section 2.2) and it is anticipated to be included in the forthcoming EMA Air Emissions Permit.

### 8.3 INCIDENT REPORTING

Incidents related to fugitive dust identified per Section 6.4, including any fugitive dust related complaints, will be reported internally to the Environmental Superintendent. External reporting will be completed, as required, by the Environmental Manager.

## 9. QUALIFIED PROFESSIONALS

Under the direction of AuRico Metals Inc., a team of consultants have supported preparation of this management plan. This management plan has been prepared and reviewed by, or under the direct supervision of, the following qualified professionals:

Prepared by:

Reviewed by:

<original signed by>

<original signed by>

Andres Soux, M.Sc.  
ERM Consultants Canada Ltd.

Greg Norton, M.Sc.  
ERM Consultants Canada Ltd.

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Definitions of the acronyms and abbreviations used in this reference list can be found in the Glossary and Abbreviations section.

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