Appendix 12

Fugitive Emission Control and Blasting Plans

Appendix 12.1

Fugitive Emission Control Plan: Mine Site

Mine Site Fugitive Emission Control Plan

Revision 0

Prepared for
Poly Met Mining, Inc.
NorthMet Project

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Mine Site Fugitive Emission Control (FEC) Plan
NorthMet Project
Revision 0

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1.0 Introduction

This Mine Site Fugitive Emission Control (FEC) Plan ("FEC Plan" or "Mine Site FEC Plan") is an attachment to the Air Emissions Operating Permit (air emission permit) issued to Poly Met Mining, Inc. (PolyMet) for its NorthMet Project (Project). The Project consists of the operation of a base and precious metals mine and process plant located near Hoyt Lakes, Minnesota ("Mine Site" and "Plant Site," respectively). This FEC Plan covers activities at the Mine Site.

2.0 Objective

The objective of the Mine Site FEC Plan is to outline the basic procedures to prevent or minimize the release of fugitive emissions in accordance with Minn. R. 7011.0150. The facility also has an obligation to control dust in areas disturbed by mining as identified in Minnesota Rules, part 6132.2800. The FEC Plan does not eliminate all fugitive emissions, but establishes practices and procedures to reduce emissions and respond to observed fugitive emissions (i.e., Dusty Conditions) in a timely and effective manner. Therefore, and as utilized below, "Dusty Conditions" are considered visible dust that is a potential safety hazard and/or that does not settle out near the source and has the potential to have impacts beyond the property boundary. The purpose of the FEC Plan is to establish procedures to support the control factor set forth below and to comply with the facility's obligation to prevent fugitive emissions from leaving the site. Therefore, an observation of fugitive emissions is not itself a violation of any applicable regulations.

The FEC Plan targets a daily control efficiency of 90% for Mine Haul Roads (Level III-B; greater than 80% control efficiency on a 24-hour basis on unpaved roads). Dunka Road, used for site access, will have much lower traffic levels, so an assumed daily control efficiency of 80% (Level III-A) was found sufficient to produce acceptable modeling results. The Level III-A and B requirements are as outlined by Minnesota Pollution Control Agency (MPCA) guidance (Reference (1)).

The fugitive emission sources for the Mine Site are discussed in the next section, including a general description of each process that has the potential to generate fugitive emissions. Sections 4 and 6 describe the selected control options and set forth the associated inspection and recordkeeping measures. Section 5 describes training requirements for personnel responsible for implementing the FEC Plan and Section 7 describes reporting requirements.

As part of the Level III-B controls for haul roads, as described in Section 4, PolyMet will conduct semiannual evaluations of the Mine Site FEC plan. If during this review changes are suggested, such changes will be implemented within 60 days of the review. Although the driver for these requirements is the haul roads, the review may suggest the need for changes in controls for other sources.

PolyMet may periodically revise the Mine Site FEC Plan, either as part of the semi-annual review process or due to other reasons. These revisions will be made under the terms of the air emission permit, to improve performance, efficiency, or usability without prior approval from MPCA. Changes that do not affect the emissions performance characteristics of the FEC Plan will be considered non-substantive and shall not require MPCA approval. Substantive changes to the Plan would include any reduction in control techniques employed or associated corrective actions, monitoring, recordkeeping, and reporting requirements. If substantive changes are made to the FEC Plan, PolyMet will submit the revised FEC Plan to the MPCA no later than the effective date of the revised FEC Plan. If a revised FEC Plan is submitted, PolyMet will follow the revised FEC Plan until such time as MPCA raises objection to the revisions, at which time PolyMet will revert to the previous version of the FEC Plan until agreement is reached with MPCA on FEC Plan revisions. PolyMet's compliance with the revised FEC Plan prior to the MPCA's objections will constitute compliance with the above-referenced control factors and the obligation to prevent fugitive emissions from leaving the Mine Site. If there is any discrepancy between this document and the terms of

the air emission permit, the terms of the permit must be followed, except as allowed by Minnesota Rules, part 7007.1200 – 7007.1500.

3.0 Fugitive Emission Sources

The following subsections offer an overview of the fugitive emission sources.

3.1 Drilling and Blasting

Table 3-1 Drilling and Blasting Sources

Source ID Number(s)	Source Description
FUGI 25	Mine Site Blast Hole Drilling

Drilling and blasting activity is a highly variable process to release waste rock and ore formations to be processed. The amount of fugitive emissions generated by drilling and blasting is influenced by a number of factors, including:

1. Waste rock and ore type
2. Waste rock and ore hardness and potential to fractionate
3. Waste rock and ore moisture content
4. Drilling and blasting patterns
5. Drilling method employed (e.g., dry or wet)
6. Environmental conditions
7. Time and location of drilling and blasting
8. Blasting agent
9. Frequency of blasting

3.2 Truck Loading and Unloading Material

Table 3-2 Loading and Unloading Sources

Activity Description	Source ID Number(s)	Source Descriptions
Surface overburden truck loading and unloading	FUGI 10 FUGI 11 FUGI 12 FUGI 13	Mine Site Surface Overburden, Truck Load Mine Site Surface Overburden, Truck Unload - reclaim area Mine Site Surface Overburden, Truck Unload - stockpile/storage pile/East Pit Mine Site Surface Overburden, Truck Reload
Ore truck loading and unloading	FUGI 16 FUGI 17 FUGI 19	Mine Site Ore, Truck Load Mine Site Ore, Truck Unload - Rail Transfer Hopper Mine Site Ore Load/Unload - Surge Pile
Waste rock truck loading and unloading	FUGI 14 FUGI 15 FUGI 20 FUGI 21	Mine Site Waste Rock Truck Load Mine Site Waste Rock Truck Unload Mine Site Stockpile Reclaim Truck Load Mine Site Stockpile Reclaim Truck Unload

The amount of fugitive emissions generated by truck loading and unloading and railcar loading is influenced by a number of factors, including:

1. The type of materials (surface, waste rock, ore, etc.)
2. the nominal size of the material
3. the dumping procedure (direct or dump and push)
4. the natural conditions of the environment such as the moisture content of the material being loaded and unloaded

The drop distance from the shovel or loader to the truck is minimized by the operator during loading operations to avoid injuries to truck drivers and harm to equipment. As a result, fugitive emissions are minimized during surface overburden truck loading (FUGI 10, FUGI 13), ore truck loading (FUGI 16) and waste rock truck loading (FUGI 14, FUGI 20).

3.3 Haulage and Service Roads

Table 3-3 Haulage Road Sources

Activity Description	Source ID Number(s)	Source Descriptions
Haulage roads and other unpaved roads	FUGI 1 FUGI 2 FUGI 26	Unpaved Roads, Dunka Rd. Mine Site Fueling Facility Circle Mine Haul Roads

The transport emission sources include emissions from transport on haulage roads and other unpaved roads. The amount of fugitive emissions generated by vehicles traveling on haul roads and unpaved roads is influenced by a number of factors, including:

1. Vehicle speed
2. Vehicle weight
3. Natural conditions of the environment such as moisture content of the roadway
4. Fugitive emission control measures employed

3.4 Railcar Loading

Table 3-4 Railcar Loading Sources

Activity Description	Source ID Number(s)	Source Descriptions
Ore railcar loading	FUGI 18	Mine Site Ore, Railcar Load

The amount of fugitive emissions generated by railcar loading is influenced by a number of factors, including:

1. the fines content and the moisture content of the material, and
2. the natural conditions of the environment

3.5 Surface Overburden, Ore and Waste Rock (Including Lean Ore) Stockpiles

Table 3-5 Surface Overburden, Ore and Waste Rock (Including Lean Ore) Stockpile Sources

Activity Description	Source ID Number(s)	Source Descriptions
Mine Site Overburden Storage Pile	FUGI 31	Mine Site Overburden Storage Pile Wind Erosion
Mine Site Waste Rock Stockpiles	FUGI 27 FUGI 28 FUGI 29	Mine Site Category 1 Stockpile Wind Erosion Mine Site Category 2/3 Waste Rock Stockpile Wind Erosion Mine Site Category 4 Waste Rock Stockpile Wind Erosion
Mine Site Ore Surge Pile	FUGI 30	Mine Site Ore Surge Pile Wind Erosion

The surface overburden and waste rock stockpiles and ore surge pile may release fugitive emissions during construction and operation depending on:

1. nominal size of the material
2. natural conditions of the environment

3.6 Other Sources

Table 3-6 Other Sources

Activity Description	Source ID Number(s)	Source Descriptions
Portable Crushing Plant (Subject to NSPS OOO)	FUGI 24	Mine Site Portable Crushing Plant - Crusher 1
	FUGI 32	Mine Site Portable Crushing Plant - non-NSPS - Truck Load 1
	FUGI 37	Mine Site Portable Crushing Plant - Crusher 2
	FUGI 38	Mine Site Portable Crushing Plant - Crusher 3
	FUGI 39	Mine Site Portable Crushing Plant - Crusher 4
	FUGI 40	Mine Site Portable Crushing Plant - Screen 1
	FUGI 41	Mine Site Portable Crushing Plant - Screen 2
	FUGI 42	Mine Site Portable Crushing Plant - Screen 3
	FUGI 43	Mine Site Portable Crushing Plant - Screen 4
	FUGI 44	Mine Site Portable Crushing Plant - Transfer Point 1
	FUGI 45	Mine Site Portable Crushing Plant - Transfer Point 2
	FUGI 46	Mine Site Portable Crushing Plant - Transfer Point 3
	FUGI 47	Mine Site Portable Crushing Plant - Transfer Point 4
	FUGI 48	Mine Site Portable Crushing Plant - Transfer Point 5
	FUGI 50	Mine Site Portable Crushing Plant - Transfer Point 7
	FUGI 51	Mine Site Portable Crushing Plant - Transfer Point 8
	FUGI 52	Mine Site Portable Crushing Plant - Transfer Point 9
	FUGI 53	Mine Site Portable Crushing Plant - Transfer Point 10
	FUGI 54	Mine Site Portable Crushing Plant - Transfer Point 11
Portable Crushing Plant (non-NSPS)	FUGI 49	Mine Site Portable Crushing Plant - Non-NSPS - Transfer to Stockpile 1
	FUGI 55	Mine Site Portable Crushing Plant - Non-NSPS - Transfer to Stockpile 2
	FUGI 56	Mine Site Portable Crushing Plant - non-NSPS - Truck Load 2
Portable Overburden Screens	FUGI 22	Mine Site Surface Overburden, Screen #1
	FUGI 23	Mine Site Surface Overburden, Screen #1 Discharge
	FUGI 33	Mine Site Surface Overburden, Screen #2
	FUGI 34	Mine Site Surface Overburden, Screen #2 Discharge
	FUGI 35	Mine Site Surface Overburden, Screen #3
	FUGI 36	Mine Site Surface Overburden, Screen #3 Discharge

Portable crushing and screening equipment will also be operated at the Mine Site to prepare approved material for use in construction, for road surfacing, for blast hole stemming, and for use as railroad ballast. Fugitive emissions may occur at these sources from the material handling and processing activities.

4.0 Emissions Control Strategies

PolyMet implements multiple types of fugitive dust control measures to minimize materials from becoming airborne. Table 4-1 summarizes the controls appropriate for site conditions at NorthMet.

Table 4-1 Control Strategies to Reduce Fugitive Emissions

Source	Source Identification Numbers	Meteorological Conditions	Primary Control Strategy	Contingent Control Strategy
Drilling and Blasting	FUGI 25	Any	• Blasting: conducting blasts under proper conditions with good blast design • Drilling: Water application down drill hole	Temporarily cease operations until conditions improve
Truck Loading and Unloading	FUGI 10, FUGI 11, FUGI 12, FUGI 13, FUGI 14, FUGI 15, FUGI 16, FUGI 17, FUGI 18, FUGI 19, FUGI 20, and FUGI 21	Any	• Material size • Natural moisture content • Minimize drop distances	If Dusty Conditions persist, temporarily cease operations until conditions improve
Haulage and Service Roads	FUGI 1, FUGI 2, FUGI 3, and FUGI 26	Temperature above freezing	• Road watering	• Other dust suppressant application • Reroute traffic away from dusty road sections as possible (e.g., if there is an alternate route available)
		Temperature below freezing	• Application of chemical dust suppressants; • Scarification of road surface; • Application of new road material; and/or • Application of snow to road surface	• Reroute traffic away from road sections with potential for Dusty Conditions as possible (e.g., if there is an alternate route available) • If Dusty Conditions persist, temporarily cease operations until conditions improve
Railcar Loading	FUGI 18	Any	• Minimize drop distances • Natural moisture content	If Dusty Conditions persist, temporarily cease operations until conditions improve

Source	Source Identification Numbers	Meteorological Conditions	Primary Control Strategy	Contingent Control Strategy
Waste Rock Stockpiles, Ore Surge Pile, and Overburden Storage Pile	FUGI 27, FUGI 28, FUGI 29, FUGI 30, and FUGI 31	Any	• Material size • Natural moisture content	• Overburden Storage Areas - Application of dust suppressants and/or mulch
Portable Crushing Plant	FUGI 24, FUGI 32, FUGI 37, FUGI 38, FUGI 39, FUGI 40, FUGI 41, FUGI 42, FUGI 43, FUGI 44, FUGI 45, FUGI 46, FUGI 47, FUGI 48, FUGI 49, FUGI 50, FUGI 51, FUGI 52, FUGI 53, FUGI 54, and FUGI 55	Not Raining	Water sprays	• Chemical dust suppressants • If Dusty Conditions persist, temporarily cease operations until conditions improve
Overburden Screening	FUGI 22, FUGI 23, FUGI 33, FUGI 34, FUGI 35, and FUGI 36	Not Raining	• Natural moisture content • Minimize drop distances	• Water sprays • If Dusty Conditions persist, temporarily cease operations until conditions improve

4.1 Drilling and Blasting

See Table 3-1 for drilling and blasting activity potential fugitive emission sources.

Blasting activity is managed to achieve safety and emission control. Several steps may be taken to comply with applicable regulations, including:

1. Obtaining required weather data from a weather monitoring and forecasting service;
2. Employing aircraft flying service to monitor meteorological conditions and conduct safety surveillance;

3. Following proper blast hole loading, stemming and blast pattern timing procedures to control noise and emissions by directing the blast energy into the rock, instead of into the atmosphere; and/or

4. Timing drilling and blasting to take advantage of natural conditions (e.g., humidity, precipitation) that are favorable for controlling fugitive emissions.

The experience and judgment of the blasting team is critical in abating and minimizing noise and fugitive emissions. The key to reducing potential impacts is for the team to proceed with blasts when it has been verified that conditions are suitable.

During the blast hole drilling operation, water is mixed with the compressed bailing air to minimize the generation of fugitive emissions (FUGI 25).

4.1.1 Primary Control Strategies

Natural conditions such as humidity, precipitation, moisture content, wind speed, and wind direction will be monitored for blasting activities. Water will be applied down the drill holes to minimize fugitive dust from the blast hole drilling operation.

4.1.2 Contingent Control Strategies

PolyMet may temporarily cease drilling operations and/or postpone blasting until conditions improve, if primary controls do not reduce fugitive emissions from drilling and blasting.

4.1.3 Best Management Practices

Blasting personnel will schedule blasting to be conducted as possible under meteorological conditions that provide appropriate control of air overpressure and ground vibrations, and control of fugitive emissions. The blasting will be directed into the rock rather than vertically into atmosphere. Test blasts will be conducted on as needed basis as conditions allow. Water will be applied down the drill holes during blast hole drilling. Fugitive emission checks will be completed on a daily basis.

4.1.4 Recordkeeping

Recordkeeping for drilling and blasting activity will include weather data from weather monitoring and forecasting service, time, and location of blasts, completed fugitive emission check forms, and number of blast holes drilled each operating day.

4.2 Truck Loading and Unloading

See Table 3-2 for truck loading and unloading potential fugitive emission sources.

4.2.1 Primary Control Strategies

The primary control to reduce fugitive emissions with truck loading and unloading and storage pile activity is associated with inherent conditions of the material loaded and unloaded. The combination of

natural moisture content, material size distribution and environmental conditions minimize fugitive emissions. The drop distance during truck loading and unloading will also be minimized.

4.2.2 Contingent Control Strategies

PolyMet may temporarily cease operations until conditions improve if primary controls do not reduce fugitive emissions from truck loading and unloading and storage pile activity.

4.2.3 Best Management Practices

Best management practices to reduce fugitive emissions with truck loading and unloading activity will include minimizing drop distances and following dumping procedures that are aligned with the material size distribution, moisture content, and conditions. Additionally, fugitive emission checks will be completed on a daily basis.

4.2.4 Recordkeeping

Truck loading and unloading and storage piles activity will be recorded by completed fugitive emission check forms.

4.3 Haulage and Service Roads

See Table 3-3 for haulage and service roads potential fugitive emission sources.

MPCA guidance includes specific requirements for various levels of control on unpaved roads up to Level III-A. Level III-B controls must be agreed upon with MPCA on a case-by-case basis. The enumerated items below indicate where measures are needed to fulfill Level III-A requirements and identify measures that go beyond Level III-A requirements and should be considered part of the proposal for Level III-B controls. A daily control efficiency of 80% was assumed for the Dunka Road source (FUGI 1) in the emission inventory and air dispersion modeling, so only the Level III-A requirements apply to this road section.

Controlling fugitive emissions from haulage and unpaved roads is important for employee safety and industrial hygiene as well as the environment. Procedures to control these emissions include the measures described below. These measures are further detailed in Section 4.3.3.

1. Fugitive emission control is achieved with the application of water and/or MPCA-approved commercial dust suppressants (Level III-A). The decision of when to apply water or other dust suppressants to the roads will be made by the Mine Site supervisors based on meteorological data, traffic levels, historic operating data, reports from equipment operators and fugitive emission evaluators, as well as their experience and professional judgement.

2. During the winter months, water will not normally be applied, even if fugitive emissions are observed. Application of salts (sodium chloride, calcium chloride and magnesium chloride), application of sand mixtures, scarification of the road surface, and/or application of new road material is used to enhance safety and control fugitive emissions from the roads (use of chemical dust suppressants would require MPCA approval under terms of the appropriate NPDES permit)

during the winter months. Snow may also be applied on roads and under the appropriate conditions based on the experience of mine management personnel. In addition, very light applications of water can be effective in freezing conditions (Level III-A).

3. The haulage roads are surfaced with screened crushed rock, thus affording proper traction and vehicle support, minimizing tire wear, and reducing fugitive emissions.

4. A Mine Management System utilizing Global Positioning Systems (GPS) is implemented at the Mine Site. This system will be utilized to automatically record data relevant to road emissions controlled by the Mine Site FEC Plan and perform other tasks related to fugitive emissions control such as haul truck data. Additional details regarding the system are provided below:

    a. In order to collect data that may be used to improve the performance of the Mine Site FEC Plan, GPS units and appropriate instrumentation on the water trucks provide tracking of water truck routes, times of operation, and amount of water applied. This level of tracking detail helps the facility optimize water application. Equipment operators (haul trucks, loaders, graders) manually enter locations where Dusty Conditions are observed into the Mine Management System from their equipment or notify appropriate personnel via radio. Mine supervisors also have the ability to manually enter locations where Dusty Conditions are observed into the Mine Management System. The Mine Management System or Mine supervisor can then dispatch a water truck to the area where Dusty Conditions are observed or implement other emission reduction measures based on meteorological and operating conditions. It is the Mine supervisors' responsibility to implement an appropriate response to any observation of Dusty Conditions is initiated as soon as possible. The Mine Management System maintains an electronic history of specific road segments where Dusty Conditions are observed and noted, as well as the times and amount of water applied to specific road segments. This system documents responses to notification of fugitive emissions, including the time the notification was made, the corrective action taken and the time corrective action was initiated. (Reporting of the presence of Dusty Conditions, corrective action taken and recording quantity of total water applied during a 24-hour period would be part of Level III-A. Use of the GPS-based system and flow-metering of water application would be beyond this and therefore Level III-B).

    b. The Mine Management System also records the routes of the haul trucks and the total vehicle miles travelled (VMT) for the fleet (VMT record required for Level III-A, using GPS-based system = Level III-B).

    c. The Mine Management System electronic history (water/chemical application, road usage, observed fugitive emission notifications), along with daily fugitive emission check forms and data from the Special Purpose PM_{10} monitors and meteorological data, are reviewed at a minimum on a semi-annual basis to aid in analyzing trends and to determine if fugitive emission controls are effective. The Mine Site FEC Plan will be modified as needed based on the semi-annual plan reviews or other improvements that have been identified.

This review might also indicate that changes to Mine Site operations are warranted, such as redistribution of haul truck traffic or variation of mining activities under certain weather conditions. The information described in the FEC Plan stored by the Mine Management System will be available for review during inspections (Level III-B).

5. In addition to the continuous evaluation of the effectiveness of fugitive emission control by equipment operators and other personnel, a trained fugitive emission evaluator will make checks related to fugitive emissions once per day during daylight hours on each active haul road. These checks include notation of the presence or absence of fugitive emissions and, if present, its severity (minor, moderate or severe) will be recorded on a Fugitive Emission Check Form. Any corrective action taken, if needed, will also be recorded on the form (Level III-A).

6. Occurrences of Dusty Conditions and the actions taken to address Dusty Conditions are identified on the daily Fugitive Emission Check Form (Level III-A). Records of daily fugitive emission checks will be kept and made available to MPCA upon request.

7. Mine operations personnel that have responsibilities related to the control of fugitive emissions will receive training as described in Section 5 (Level III-A).

8. Sufficient water truck capacity is maintained to provide control during all non-freezing conditions. The proposed water trucks are described in detail in Section 4.5.3.1 below (Level III-A).

9. Detailed Mine layout figures, showing haul road locations, are included with the Project's Air Permit Application (Large Figure A11) and will be updated as necessary during operations at the Mine Site. The figures will be reviewed at least semi-annually after Mine Site operations commence and they will be updated after the review, if needed. Information on road length along with projected traffic levels for the various road segments are presented for each year of operations in the Mine Site emission calculation spreadsheet (Level III-A).

10. As a further evaluation of the effectiveness of the Mine Site FEC Plan, PM10 monitors are installed at the Mine Site. This is discussed in more detail in the Special Purpose Monitoring Plan. The monitors are used to document the effectiveness of the Mine Site FEC Plan and trigger corrective action, using measures described in this FEC Plan, if monitored air concentrations are above the action levels in the Special Purpose Monitoring Plan (Submitted as Appendix D to the NorthMet Air Permit Application).

11. Wind speed and direction, temperature, and precipitation is gathered and recorded from a meteorological station operated by PolyMet. The electronic history of the on-site meteorological station data will be maintained (recording precipitation is a Level III-A requirement, but on-site monitoring is not required, additional parameters is Level III-B). The meteorological data will be considered as part of the semi-annual review and may be used on a more frequent basis to further evaluate the effectiveness of the Mine Site FEC Plan.

4.3.1 Primary Control Strategies

Primary control strategies for haulage roads include the application of water and/or dust suppressant, meteorological conditions (i.e., rain or snow) and road maintenance, including crushed rock surfacing and grading.

4.3.2 Contingent Control Strategies

Contingent control measures for haulage roads include the application of other chemical dust suppressants subject to conditions in all applicable permits. Additional potential measures include rerouting traffic on alternate routes as available or temporarily ceasing operations until conditions improve.

4.3.3 Additional Detail on Control Strategies

The sections below provide additional detail for road watering and the application of chemical dust suppressants.

4.3.3.1 Road Watering

PolyMet will operate a water truck or trucks with the capacity to apply water to all active haul roads rapidly during non-freezing conditions as the primary control method for fugitive emissions from unpaved roads. The decision on when to water the roads will be made by Mine Site supervisors based on traffic levels, meteorological conditions (temperature, precipitation), historic operating data, reports from equipment operators and fugitive emission evaluators, as well as their experience and professional judgement.

4.3.3.2 Chemical Application

Chemical application to unpaved roads provides added protection in a proactive manner against fugitive emissions, especially during freezing conditions. These chemicals are applied by a tank truck and spray system. Determination of the appropriate timing of application is based upon expected meteorological conditions (such as seasonal transitions to freezing conditions, or expected periods of hotter temperatures and low humidity), review of past records, experience and professional judgment.

The date, time, quantity, and location of each chemical application is recorded.

PolyMet will continue to evaluate new chemicals as potential fugitive emissions control for their effectiveness and economic feasibility. As new chemicals are available and existing chemicals may become limited by availability, PolyMet will evaluate their feasible implementation. Independent of chemical availability is that production processing is sensitive to change, including reagent availability, ore type, production, and market demand, amongst others. Compatibility testing may be conducted to evaluate existing and new chemicals on an as needed basis to match compatibility with production requirements.

In addition to chemical application during the winter months, sand mixtures or snow may be applied on roads, and under the right conditions, very light applications of water can be effective in freezing

conditions. Scarification of the road surface, and/or application of new road material will also be used to enhance safety and control fugitive emissions from the roads.

4.3.4 Best Management Practices

Best management practices for haulage and service roads will empower employees to notify shift managers or appropriate personnel of fugitive emissions. If corrective action is needed, measures such as road maintenance or deployment of water trucks will be taken. Additionally, fugitive emission checks of active roads will be conducted on a daily basis.

4.3.5 Recordkeeping

Recordkeeping associated with haulage and service roads will include completed fugitive emission check forms, GPS tracking records for haul and water trucks, water application records for water trucks, chemical application or other fugitive emission control measures implemented, meteorological data, monthly haul vehicle-miles-traveled (VMT) and annual totals, shift logs, and reports identifying of Dusty Conditions related to road dust.

4.4 Railcar Loading

See Table 3-4 for railcar loading potential fugitive emission sources.

The drop distance at the Rail Transfer Hopper is minimized to control fugitive emissions during ore railcar loading. Fugitive emission control for the loading of ore is dependent upon the natural conditions of the environment, as mentioned previously.

4.4.1 Primary Control Strategies

Operators responsible for railcar loading will adjust drop distances, loading rate and other parameters as needed based on environmental conditions.

4.4.2 Contingent Control Strategies

PolyMet may temporarily cease operations until conditions improve if primary controls do not reduce fugitive emissions from railcar loading.

4.4.3 Best Management Practices

Best management practices for controlling fugitive emissions for railcar loading include managing drop distances and other loading parameters as environmental conditions change, operators reporting Dusty Conditions, and conducting one fugitive emission check per train loaded.

4.4.4 Recordkeeping

Recordkeeping associated with railcar loading will include throughput based on the number of railcars loaded and completed fugitive emission check forms.

4.5 Waste Rock Stockpiles, Ore Surge Pile, and Overburden Storage Pile

See Table 3-5 for waste rock stockpiles, ore surge pile and overburden storage pile potential fugitive emission sources.

Fugitive emission control during the construction of the waste rock stockpiles (FUGI 027, FUGI 028, FUGI 029), the ore surge pile (FUGI 030), and the surface overburden storage pile (FUGI 31), is primarily dependent on natural conditions of the environment; however, the relatively large size of most of the surface and run-of-mine rock minimizes the potential for fugitive emissions. Once waste rock placement is completed, reclamation of the Category 1 Waste Rock Stockpile will follow the Mineland Reclamation Rules set forth in Minnesota Rules. The waste rock stockpiles will be benched and sloped as needed and a geomembrane cover will be applied beginning in Mine Year 14. Suitable material will be placed underneath and on top of the cover. The surface material will then be vegetated. Vegetation provides erosion control, wildlife habitat, and aesthetic value and minimizes the long-term potential for fugitive emission generation.

The stockpiled ore and waste rock will be run-of-mine material with secondary breakage as needed for handling and loading into haul trucks. The overburden will have its natural size distribution. Based on the anticipated size distribution on the surface overburden storage pile and waste rock stockpiles, meteorological data, and approved fugitive emission calculation procedures, wind erosion will not occur on the stockpile surface.

4.5.1 Primary Control Strategies

The material size and the natural moisture content will minimize the potential for fugitive emissions from the waste rock stockpiles, ore surge pile and overburden storage pile.

4.5.2 Contingent Control Strategies

Contingent controls of fugitive emissions from the waste rock stockpiles, ore surge pile, and overburden storage pile include application of dust suppressants and/or mulch.

4.5.3 Best Management Practices

Best management practices to minimize fugitive emissions from the waste rock stockpiles and ore surge pile will include only stockpiling material as per design to avoid wind erosion and conducting daily fugitive emission checks. The stockpiled ore and waste rock will be run-of-mine material with secondary breakage as needed for handling and loading into haul trucks. The overburden will have its natural size distribution. Based on the anticipated size distribution on the surface overburden storage pile and waste rock stockpiles, meteorological data, and approved fugitive emission calculation procedures, wind erosion will not occur on the stockpile surface.

4.5.4 Recordkeeping

Records of the daily fugitive emission checks will be kept.

4.6 Overburden Screening

See Table 3-6 for overburden screening potential fugitive emission sources.

Contractors may operate up to three screens and associated activities on-site (FUGI 22, FUGI 23, FUGI 33, FUGI 34, FUGI 35, and FUGI 36) to separate overburden into fractions usable for construction purposes. The natural moisture content of the overburden limits fugitive emission generation under most handling and processing conditions.

4.6.1 Primary Control Strategies

The overburden material that may be screened by contractors for construction purposes is naturally high in moisture at the Mine Site. If overburden with lower moisture content is to be processed, blending with higher moisture screen feed material may be utilized to control fugitive emissions.

4.6.2 Contingent Control Strategies

If the inherent moisture content in the overburden material is not sufficient to control fugitive emissions, then portable water sprays may be used on an as needed basis. Alternatively, the contractor may temporary cease operations until conditions improve if primary controls do not reduce fugitive emissions from overburden screening.

4.6.3 Best Management Practices

Best management practices for overburden screening will include minimizing drop distances, verifying that the natural moisture content of the material is sufficient to avoid excessive dusting and conducting daily fugitive emission checks when operating.

4.6.4 Recordkeeping

Recordkeeping associated with overburden screening will include throughput per operating day in tons, completed fugitive emission check forms, and a summary of corrective action if needed.

4.7 Contractor Construction Rock Crushing

See Table 3-6 for contractor construction rock crushing potential fugitive emission sources.

In the Portable Crushing Plant, all crushers, screens and material transfer points, with the exception of transfer to stockpiles and truck loading, are subject to 40 CFR Part 60 Subpart OOO – Standards of Performance for Non-metallic Mineral Processing Plants and terms within the air emission permit that govern Portable Crushing Plants. Sources subject to the New Source Performance Standard include FUGI 24, FUGI 37, FUGI 38, FUGI 39, FUGI 40, FUGI 41, FUGI 42, FUGI 43, FUGI 44, FUGI 45, FUGI 46, FUGI 47, FUGI 48, FUGI 50, FUGI 51, FUGI 52, FUGI 53, and FUGI 54.

4.7.1 Primary Control Strategies

Water sprays or similarly performing techniques will be utilized by the contractor responsible for construction rock crushing as a primary control strategy.

4.7.2 Contingent Control Strategies

When the primary control strategy is not practicable due to weather conditions, water availability, or other conditions, then the use of chemical dust suppressants will be evaluated and implemented as needed by the contractor. The contractor may temporary cease operations until conditions improve if primary controls do not reduce fugitive emissions from contractor construction rock crushing.

4.7.3 Best Management Practices

Best management practices for contractors responsible for construction rock crushing will be to inspect water sprays once per operating day and implement corrective action if needed. Additionally, contractors will conduct daily fugitive emission check when operating. NSPS performance testing on all portable rock crushing sources except FUGI 32, FUGI 49, FUGI 55, and FUGI 56 will be completed as required.

4.7.4 Recordkeeping

Recordkeeping associated with the Portable Crushing Plant sources will include throughput per operating day in tons, completed fugitive emission check forms, a summary of corrective action if needed, and NSPS OOO test reports on applicable sources.

4.8 Other Potential Fugitive Emission Sources

Fugitive emissions from small truck traffic is controlled when the trucks travel on the main haul roads. Water and/or dust suppressants are applied to the service roads in and around the Mine area as required by traffic and weather conditions, including humidity, precipitation, moisture content, and wind speed.

5.0 Training

An integral part of the Mine Site FEC Plan is training the personnel responsible for implementing the FEC Plan.

At least two individuals employed at the Mine Site (or more, if needed to assure daily coverage) are trained to observe potential fugitive emission sources and their control system(s) for proper operation of control measures. Personnel responsible for making these observations are trained in proper fugitive emission observation techniques.

All Haul Truck, Excavator, Front End Loader, Bulldozer, Locomotive, Grader and Water Truck Operators, as well as laborers, mine dispatchers and mine shift supervisors, receive annual training specific to haul road fugitive emissions, including training on the importance of eliminating fugitive emissions, methods used to control fugitive emissions, and the procedures and processes for reporting and controlling fugitive emissions.

All mine managers, supervisors, mine dispatchers and those individuals trained as fugitive emission evaluators receive annual training on the Mine Site FEC Plan as a whole, including the importance of controlling fugitive emissions, the process for reporting and controlling fugitive emissions and associated recordkeeping.

Specific training is given to each person as it pertains to his or her job. Records of their names, dates of training and subjects of each training exercise are maintained for five years. Training exercises cover, as appropriate, the following:

1. Employee responsibilities
2. Reporting
3. Recordkeeping
4. Corrective actions
5. Maintenance
6. Fugitive emission checks
7. Weather observations

The Mine Site supervisors and managers are responsible for making sure that all employees understand their roles and responsibilities related to fugitive emission control and undertake them properly. The supervisors shall take appropriate action, such as ordering additional training or individual counseling for employees, as necessary to facilitate ensure employee compliance with applicable requirements. Records of any additional training given and the topics covered are kept with the training records.

6.0 Recordkeeping

The records of daily fugitive emission checks where required include whether or not Dusty Conditions were observed; whether corrective action was undertaken pursuant to the Mine Site FEC Plan and whether the corrective action was effective and/or if additional action was warranted. Records of fugitive emission checks are kept for five years and made available to MPCA upon request. A deviation shall occur if PolyMet failed to follow the requirements of the FEC Plan or if Dusty Conditions led to a violation of an air quality rule. Deviations shall be noted on the daily check form and/or logged into the Mine Management System and reported in the semi-annual deviation report.

The following records regarding fugitive emission controls will be maintained:

1. Drilling and blasting records, including weather data from weather monitoring and forecasting service, and time and location of blast
2. Commercial dust suppressant information (applications, permits, etc.)
3. Fugitive emission check forms (see attached example form[1]), corrective actions taken and any failures to follow the requirements of the Mine Site FEC Plan
4. Mine Management System electronic history consisting of (1) date, time, and road segment where dust is observed, (2) corrective action taken to address observed dust including time action initiated (3) date, time, amount of water application to each road segment, and (4) date and time of each haul truck use of a road segment. Information will be recorded by the Mine Management System on a continuous basis as it is generated. Electronic records will be retained consistent with the air emission permit's records retention requirements.
5. Data from the on-site meteorological station
6. Date, quantity and location of all chemical dust suppressant applications
7. Training records
8. MPCA Mine Site FEC Plan record(s) of receipt
9. Shift report
10. Air Emission Inventory Reports
11. Records of rail and truck loading and unloading

[1] Forms are attached to show the minimum information that will be recorded and not necessarily the format of the form. Actual data collection may also be done on a computer, tablet, or other electronic device.

12. Summaries of the results of the fugitive emission control procedure review to be conducted at least semi-annually and superseded versions of the Mine Site FEC plan. If it is determined that no revisions to the FEC Plan are warranted during a review, a notation to this effect will be added to the electronic and/or paper files for the FEC Plan.

13. Fugitive emission control monitoring data (i.e., PM_{10} monitoring) along with records of any monitored levels in excess of the ambient air quality standards and any deviations from the requirements of the air emission permit

14. Records of contractor construction rock crushing tons throughput

15. Records of NSPS required performance testing (affected sources in Portable Crushing Plant)

16. Records of quantity of overburden screened

17. Any instances where the control strategies detailed in the Mine Site FEC Plan were not implemented

7.0 Reporting

PolyMet will promptly notify MPCA if corrective action is required to address fugitive emissions that may adversely impact neighboring property owners or the general public.

Certain information related to the Mine Site FEC Plan will be included in the semi-annual deviation reports that will be required by the air emission permit. This information will include all reportable deviations, such as:

1. Fugitive emissions observed beyond the property boundary
2. Corrective action that was not taken consistent with the FEC Plan

All other records described in the Mine Site FEC Plan will be available for review during an inspection or will be provided upon request from MPCA.

8.0 References

1. **IMA-MPCA Fugitive Emissions Workgroup.** Taconite Industry Haul Truck Unpaved Road Fugitive Particulate Emission Factor and Control Efficiency. (Attachment to Letter from Todd Biewen of MPCA to Larry Salmela of U.S. Steel Company dated November 24, 1998). November 18, 1998.

Mine Site Fugitive Emission Check Form

Date: _____ Time: _____ AM/PM (Circle one)

Employee Making Reading

Print: _____ Signature: _____ Title: _____

Weather Conditions at Time of Reading

Temperature	_____ degrees Fahrenheit
Wind Speed	_____ mph
Wind Direction	N NE E SE S SW W NW (circle one)
Sky Conditions	Clear / Partly Cloudy / Completely Cloudy / Fog (circle one)
Precipitation	Rain / Snow / None (circle one)
Precipitation in past 24 hours?	_____ inches water

Fugitive Emission Source	Equipment Operating	Fugitive Emissions Observed?[1]	If Fugitive Emissions Observed, Corrective Action Required?	Was corrective action taken?	List Corrective Action Taken if Required	Did a Potential Deviation Occur? If yes, describe. [2]	Deviation Occurred? [3]
Blast Hole Drilling (FUGI 25)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Haul Roads (FUGI 26)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
OVERBURDEN HANDLING AND SCREENING (If portions of the overburden screening do not exist, cross out that source on the form)							
Mine Site Surface Overburden, Truck Load (FUGI 10)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Surface Overburden, Truck Unload - reclaim area (FUGI 11)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Surface Overburden, Truck Unload - stockpile/storage pile/East Pit (FUGI 12)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Surface Overburden, Truck Reload (FUGI 13)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Surface Overburden, Screen #1 (FUGI 22)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Surface Overburden, Screen #1 Discharge (FUGI 23)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Surface Overburden, Screen #2 (FUGI 33)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Surface Overburden, Screen #2 Discharge (FUGI 34)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Surface Overburden, Screen #3 (FUGI 35)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Surface Overburden, Screen #3 Discharge (FUGI 36)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Overburden Storage Pile Wind Erosion (FUGI 31)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
ORE AND WASTE ROCK HANDLING							
Mine Site Ore, Truck Load (FUGI 16)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Ore, Truck Unload - Rail Transfer Hopper (FUGI 17)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Ore, Railcar Load (FUGI 18)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Ore Load/Unload - Surge Pile (FUGI 19)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Ore Surge Pile Wind Erosion (FUGI 30)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Stockpile Reclaim Truck Load (FUGI 20)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Stockpile Reclaim Truck Unload (FUGI 21)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N

Mine Site Fugitive Emission Check Form

Mine Site Waste Rock Truck Load (FUGI 14)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Waste Rock Truck Unload (FUGI 015)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Cat 1 Stockpile Wind Erosion (FUGI 27)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Cat 2/3 Waste Rock Stockpile Wind Erosion (FUGI 28)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Cat 4 Waste Rock Stockpile Wind Erosion (FUGI 29)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
PORTABLE CRUSHING (If portions of portable crushing do not exist, cross out that source on the form)							
Mine Site Portable Crushing Plant - Crusher 1 (FUGI 24)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - non-NSPS - Truck Load 1 (FUGI 32)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Crusher 2 (FUGI 37)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Crusher 3 (FUGI 38)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Crusher 4 (FUGI 39)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Screen 1 (FUGI 40)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Screen 2 (FUGI 41)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Screen 3 (FUGI 42)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Screen 4 (FUGI 43)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Transfer Point 1 (FUGI 44)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Transfer Point 2 (FUGI 45)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Transfer Point 3 (FUGI 46)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Transfer Point 4 (FUGI 47)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Transfer Point 5 (FUGI 48)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Non-NSPS - Transfer to Stockpile 1 (FUGI 49)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Transfer Point 7 (FUGI 50)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Transfer Point 8 (FUGI 51)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Transfer Point 9 (FUGI 52)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Transfer Point 10 (FUGI 53)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Transfer Point 11 (FUGI 54)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Portable Crushing Plant - Non-NSPS - Transfer to Stockpile 2 (FUGI 55)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Unpaved Roads, Dunka Rd. (FUGI 1) Only section between west and east markers on Dunka Road	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Mine Site Fueling Facility Circle (FUGI 2)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N

Y = Yes, N = No, NA = Not Applicable

[1] Fugitive emissions are visible dust that is a potential safety hazard and/or that does not settle out near the source and has the potential to have impacts beyond the property boundary.

[2] A deviation may occur if corrective action is required, but not taken or if fugitive emissions cross the property line. If a potential deviation occurs include description for environmental manager review.

[3] To be completed by environmental manager

Appendix 12.2

Fugitive Emission Control Plan: Plant Site

Plant Site Fugitive Emission Control Plan

Revision 0

Prepared for
Poly Met Mining, Inc.
NorthMet Project

December 2017

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Plant Site Fugitive Emission Control (FEC) Plan
NorthMet Project
Revision 0

December 2017

Contents

List of Tables

1.0 Introduction

This Plant Site Fugitive Emission Control (FEC) Plan ("FEC Plan" or "Plant Site FEC Plan") is an attachment to the Air Emissions Operating Permit (air emission permit) issued to Poly Met Mining, Inc. (PolyMet) for its NorthMet Project (Project). The Project consists of the operation of a base and precious metals mine and process plant located at Hoyt Lakes, Minnesota ("Mine Site" and "Plant Site," respectively). This FEC Plan covers activities at the Plant Site.

2.0 Objective

The objective of the Plant Site FEC Plan is to outline the basic procedures to prevent or minimize the release of fugitive emissions in accordance with Minn. R. 7011.0150. The facility also has an obligation to control dust in areas disturbed by mining as identified in Minnesota Rules, part 6132.2800. The FEC Plan does not eliminate all fugitive emissions, but establishes practices and procedures to reduce emissions and respond to observed fugitive emissions (i.e. Dusty Conditions) in a timely and effective manner. Therefore, and as utilized below, "Dusty Conditions" are considered visible dust that is a potential safety hazard and/or that does not settle out near the source and has the potential to have impacts beyond the property boundary. The purpose of the FEC Plan is to establish procedures to support the control factor set forth below and to comply with the facility's obligation to prevent fugitive emissions from leaving the site. Therefore, an observation of fugitive emissions is not itself a violation of any applicable regulations.

Note: 80% daily control for unpaved roads at the Plant Site was assumed in the modeling conducted for the Project air emissions permit. Consistent with MPCA guidance (Reference (1)), Level III-A controls are proposed for the Plant Site roads to achieve an 80% reduction in fugitive emissions on a daily basis.

The fugitive emission sources for the Plant Site are discussed in the next section, including a general description of each process that has the potential to generate fugitive emissions. Sections 4.0, 5.0, and 7.0 describe the selected control options and set forth the associated inspection and recordkeeping measures. Section 6.0 describes training requirements for personnel responsible for implementing the FEC Plan and Section 8.0 describes reporting requirements.

PolyMet will review the Plant Site FEC Plan on at least an annual basis and implement improvements based on past performance, newly available dust control measures, changes in operations and/or other considerations.

PolyMet may periodically revise the Plant Site FEC Plan, either as part of the annual review process or due to other reasons. These revisions will be made under the terms of the air emission permit, to improve performance, efficiency, or usability without prior approval from MPCA. Changes that do not affect the emissions performance characteristics of the FEC Plan will be considered non-substantive and shall not require MPCA approval. Substantive changes to the Plan would include any reduction in control techniques employed or associated corrective actions, monitoring, recordkeeping, and reporting requirements. If substantive changes are made to the FEC Plan, PolyMet will submit the revised FEC Plan to the MPCA no later than the effective date of the revised FEC Plan. If a revised FEC Plan is submitted, PolyMet will follow the revised FEC Plan until such time as MPCA raises objection to the revisions, at which time PolyMet will revert to the previous version of the FEC Plan until agreement is reached with MPCA on FEC Plan revisions. PolyMet's compliance with the revised FEC Plan prior to the MPCA's objections will constitute compliance with the above-referenced control factors and the obligation to prevent fugitive emissions from leaving the Plant Site. If there is any discrepancy between this document and the terms of the air emission permit, the terms of the permit must be followed, except as allowed by Minnesota Rules, part 7007.1200 – 7007.1500.

3.0 Fugitive Emission Sources

The following subsections offer an overview of the fugitive emission sources.

3.1 Flotation Tailings Basin (FTB) Roads (Light Truck Traffic)

Table 3-1 Flotation Tailings Basin (FTB) Road Sources

Activity Description	Source ID Number(s)	Source Descriptions
Unpaved Roads, Tailings Basin - Light Trucks	FUGI 8	Unpaved Roads, Tailings Basin - Light Trucks

Light truck traffic on the Flotation Tailings Basin (FTB) Roads allows construction and maintenance activity throughout the FTB. As dictated by traffic and weather conditions, potential fugitive emissions are likely to be influenced by the following factors:

1. Construction supervision/observation activity
2. Maintenance and monitoring activity
3. Monitoring of FTB wind erosion
4. Dewatering and water reclaim activity

3.2 Flotation Tailings Basin (FTB) Wind Erosion

Table 3-2 Flotation Tailings Basin (FTB) Wind Erosion Sources

Activity Description	Source ID Number(s)	Source Descriptions
Tailings Basin Wind Erosion	FUGI 9	Tailings Basin Wind Erosion

Wind erosion is a primary factor in potential fugitive emissions from the FTB (FUGI 9). Tailings are spigotted from the outside edges of the FTB across the beach area to the pond. The medium and coarse tailings are generally retained on the beach area, with the finest tailings generally flowing toward and into the pond. Tailings will also be deposited subaqueously by using a tremi diffuser.

The first several years of tailing deposition and LTV Steel Mining Company (LTVSMC) tailings movement will take place around the current Cell 2E. The FTB design includes a single large cell after the splitter dike between Cell 2E and 1E is inundated. The total area of the Tailings Basin will be approximately 1,400 acres, which is smaller than those found typically at taconite operations in Minnesota. The maximum total beach length at one time during the duration of the current operational plan will be approximately 29,800 feet. However, only a limited portion of the basin will be active as the tailings will be spigotted from piping located around the basin. Inactive areas will be reclaimed as conditions allow resulting in a subset of the

total beach potentially subject to wind erosion. For the purposes of potential emission calculations, the maximum active beach length potentially subject to wind erosion has been estimated as about 1,500 feet or about 5% of the total maximum beach length.

The proposed dams will have roads along their crests that provide access for inspection and to allow for implementation of fugitive emission control measures.

Based on these physical characteristics of the FTB, measures similar to those utilized at Minnesota taconite operations will be sufficient to control emissions.

The potential of fugitive emissions generated at the Flotation Tailings Basin is influenced by a number of factors, including:

1. Exterior slopes and beaches contour and compaction integrity
2. Vegetation cover
3. Water elevation related to the interior slopes and beaches
4. Exposed and inactive areas of beaches
5. The natural conditions of the environment including seasonal factors

3.3 Limestone Unloading, Storage, and Reclaim

Table 3-3 Limestone Unloading, Storage, and Reclaim Sources

Activity Description	Source ID Number(s)	Source Descriptions
Limestone Stacker Conveyor to stockpile	FUGI 4	Limestone Stacker Conveyor to stockpile
Outdoor transfer limestone operations subject to NSPS OOO	EQUI 137 EQUI 139	Limestone conveyor to stacker conveyor Limestone Reclaim Feeder to Conveyor
Front end loader to a reclaim hopper	EQUI 150	Limestone Reclaim Pocket Dump

Limestone is delivered to the limestone storage yard where the limestone is inventoried before being added to the process. Transport to the yard is by railroad (enclosed dumping serviced by a fabric filter system and stacker conveyor). Transport from the yard to the process is by front-end loader to a reclaim hopper (EQUI 112). Certain outdoor transfer limestone operations, including EQUI 99 and EQUI 101, are subject to 40 CFR Part 60 Subpart OOO – National Emission Standards for Nonmetallic Mineral Processing Plants

The potential of fugitive emissions generated by Limestone Unloading, Storage, and Reclaim is influenced by a number of factors, including:

1. The nominal size of the material

2. The moisture content of the material being stored and unloaded

3. The natural conditions of the environment

3.4 LTVSMC Tailings/Off-site Borrow/Bentonite/Other Material Loading and Unloading

Table 3-4 LTVSMC Tailings/Off-site Borrow, Bentonite, and Other Loading and Unloading Sources

Activity Description	Source ID Number(s)	Source Descriptions
Tailings Basin Construction	FUGI 5	Tailings Basin Construction
Tailings Basin Bentonite Handling	FUGI 6	Tailings Basin Bentonite Handling

LTVSMC tailings are used for dam construction at the FTB and in construction of the Hydrometallurgical Residue Cell (HRF). Tailings are excavated, loaded into trucks, and unloaded in the construction area. The majority of the in-place tailings are damp, which limits the potential for fugitive emission generation. Off-site borrow material is used to construct the buttresses. Off-site construction material will also be used to construct the FTB dams and HRF construction if the supply of LTVSMC tailings is not sufficient to construct all of the dams and the HRF. The potential of fugitive emissions to be generated is likely to be varied in location within the tailings and off-site borrow handling areas dependent on active and inactive areas.

During FTB dam construction, the exterior face of the dams will be amended with a bentonite layer. Bentonite is hauled from the delivery location to the dam construction area where the bentonite is unloaded. Construction only occurs during warmer months.

The LTVSMC tailings, off-site borrow material and bentonite handling have the potential for fugitive emissions depending on:

1. Nominal size of the material

2. Natural conditions of the environment

3. Moisture content of the material

3.5 LTVSMC Tailings/Off-site Borrow/Bentonite/Other Material Hauling

Table 3-5 LTVSMC Tailings/Off-site Borrow, Bentonite, and Other Material Hauling Sources

Activity Description	Source ID Number(s)	Source Descriptions
Tailings Basin Construction	FUGI 5	Tailings Basin Construction
Tailings Basin Bentonite Hauling	FUGI 7	Tailings Basin Bentonite Hauling

LTVSMC tailings, off-site borrow material and bentonite are hauled to the site of FTB dam, and buttress construction and HRF construction. Bentonite is hauled from the delivery location to the dam construction area. Construction only occurs during warmer months.

The LTVSMC tailings, off-site borrow material, and bentonite hauling may release fugitive emissions depending on:

1. Haul distance
2. Natural conditions of the environment
3. Moisture content of roadway

3.6 Other Sources

Table 3-6 Other Sources

Activity Description	Source ID Number(s)	Source Descriptions
Miscellaneous truck traffic on the Dunka Road and other unpaved roads	FUGI 1	Unpaved Roads, Dunka Rd.
Movement and handling of non-tailings based materials	FUGI 5	Tailings Basin Construction

Other sources of fugitive emissions include truck traffic on the Dunka Road and other access roads around the property, including pickup trucks and trucks hauling material for wastewater treatment operations. Other non-road sources of fugitive emissions include the movement and handling of non-tailings based materials within the boundary of the Tailings Basin not related to the activities described previously, such as movement of the Closed Coal Ash Pile materials.

4.0 Emissions Control Strategies

PolyMet implements multiple types of fugitive dust control measures to minimize materials from becoming airborne. Table 4-1 summarizes the controls appropriate for site conditions at NorthMet.

Table 4-1 Control Strategies to Reduce Fugitive Emissions

Source	Source Identification Number	Meteorological Conditions	Primary Control Strategy	Contingent Control Strategy
Tailings Basin Roads (light trucks)	FUGI 8	Temperature above freezing	Water application	• Application of chemical dust suppressants • Reroute traffic away from road sections with potential for Dusty Conditions as possible (e.g., if there is an alternate route available) • If Dusty Conditions persist, temporarily cease operations until conditions improve unless areas within the FTB require attention
		Temperature below freezing	• Application of chemical dust suppressants; • Scarification of road surface; • Application of new road material; and/or application of snow to road surface	• Reroute traffic away from road sections with potential for dusty conditions as possible (e.g., if there is an alternate route available) • If Dusty Conditions persist, temporarily cease operations until conditions improve unless areas within the FTB require attention
FTB Wind Erosion	FUGI 9	Any	• Compaction of exterior slopes and beaches • Application of water or chemical dust suppressants; • Seeding/mulching; • Minimize exposed areas by controlling water level	• Other dust suppressant application • Beach area reduction • Reduction of active deposition areas • Targeted application of wet tailings
Limestone Unloading, Storage, and Reclaim	EQUI 99, FUGI 004, EQUI 112 and EQUI 101	Temperature above freezing	N/A	Water application via water monitors or additional portable equipment
		Any	Equipment Design (minimize drop distances)	If Dusty Conditions persist, temporarily cease operations until conditions improve

Source	Source Identification Number	Meteorological Conditions	Primary Control Strategy	Contingent Control Strategy
LTVSMC Tailings/Off-site Borrow/Bentonite/Other Material Loading and Unloading	FUGI 5 and FUGI 6	Temperature above freezing	• Environmental conditions (damp material handled); and • Minimize drop distances	Water application via portable equipment
		Any		If Dusty Conditions persists, temporarily cease operations until conditions improve
LTVSMC Tailings/Off-site Borrow/Bentonite/Other Material Hauling	FUGI 5 and FUGI 7	Any	• Application of water or chemical dust suppressants; and • Environmental conditions	• Reroute traffic away from road sections with potential for Dusty Conditions as possible (e.g., if there is an alternate route available) • If Dusty Conditions persist, temporarily cease operations until conditions improve
Miscellaneous truck traffic and movement and handling of non-tailings based materials	FUGI 1 and FUGI 5	Any	• Application of water or chemical dust suppressants; and • Environmental conditions	• Reroute traffic away from road sections with potential for Dusty Conditions as possible (e.g., if there is an alternate route available) • If Dusty Conditions persist, temporarily cease operations until conditions improve

4.1 Flotation Tailings Basin (FTB) Roads (Light Truck Traffic)

See Table 3-1 for FTB Roads (Light Truck Traffic) activity for potential fugitive emission sources.

Controlling fugitive emissions from FTB roads (FUGI 8) is important for safety as well as the environment. Fugitive emission control methods for light truck traffic on Tailings Basin unpaved roads includes water application, application of salts (sodium chloride, calcium chloride and magnesium chloride) and/or application of sand mixtures are used to enhance safety and control fugitive emissions from the roads (use of chemical dust suppressants would require MPCA Water Quality Division approval). Similarly, road maintenance, such as scarification of the road surface and/or application of new road material, may be used to achieve the same objectives.

Watering and/or dust suppressant application capacity is maintained to control emissions during typical summer months. Please see Section 5.0 for detailed explanation of control measures for unpaved roads.

4.1.1 Primary Control Strategies

In addition to water application, natural conditions such as temperature, precipitation, wind speed, wind direction, and humidity will be monitored by Plant Site supervisors during active FTB road use. Seasonal

controls include rain during non-freezing conditions and snow during freezing conditions. Road maintenance including grading can be used to control fugitive emissions if conditions allow road access.

4.1.2 Contingent Control Strategies

As a contingency control, dust suppressant application may be used during summer months to control fugitive dust from FTB roads. PolyMet may reroute traffic away from dusty road sections as possible (e.g., if there is an alternate route available) until conditions improve if primary controls do not reduce fugitive emissions.

4.1.3 Best Management Practices

Employees utilizing the FTB roads shall notify shift manager or appropriate personnel of fugitive emissions. Water trucks will apply water as needed per operator experience and professional judgement including proximity to water stands and other environmental factors such as temperature, precipitation, wind speed, wind direction, and humidity. Road maintenance will routinely be utilized as a best management practice to allow safe access and minimization of fugitive emissions. Additionally, fugitive emission checks will be completed on a daily basis.

4.1.4 Recordkeeping

Recordkeeping for FTB road activity will include completed fugitive emission check forms and dust suppressant application records.

4.2 Flotation Tailings Basin (FTB) Wind Erosion

See Table 3-2 for FTB Wind Erosion potential fugitive emission sources.

The control of fugitive emissions includes the following:

1. Exterior slopes and beaches are contoured with a bulldozer as construction is completed, resulting in compaction.
2. Seeding for permanent cover is performed during the planting seasons (spring and fall). Seeding is completed by June 15 in the spring and October 30 in the fall.
3. During the freezing months, freshly deposited tailings freeze and are covered with snowfall. Road plowing and general traffic are limited to active areas during the cold weather months.
4. During freezing months, the number of active areas is minimized to reflect a maximum of approximately 30 acres of uncovered or unmulched beach.
5. Water elevation is maintained to provide maximum inundated safe level coverage for interior slopes and beaches. A minimum area of beach is maintained between the crest of the perimeter dam and the water's edge, with a minimum free board from the top of the perimeter dam and the water line. A minimum 625 ft. beach length is required to maintain slope stability factors of safety for the perimeter dam.

6. Exposed areas of beaches are seeded if inactive for three (3) months or longer, and mulched if inactive for one (1) to three (3) months, dependent upon safe access. Depending on meteorological conditions, it may be difficult to mulch within a specified timeframe because the tailings may not readily support mulching equipment. MPCA-approved dust suppressants that are determined to not adversely affect the environment or the process may be applied if uncontrolled areas of beaches are inactive for less than two (2) months. The time periods above may be altered by seasonal/climatic conditions and ability of tailings to support mulching seeding and mulching equipment.

7. The active FTB work area is kept wet by moisture from the wet tailings deposition, natural conditions (i.e. precipitation), and by capillary action (near the pond). The beach areas are accessed when conditions allow the beach to bear the weight of maintenance vehicles used to conduct additional emission control procedures, such as seeding, mulching, or applying water and/or dust suppressant on any eroding areas. If the potential for Dusty Conditions is present for a specific beach area, wet tailings may be applied to this area as a corrective action.

8. Mulching and seeding operations using best practices established in the region, employing equipment with low ground pressure and similar procedures to maximize the ability to safely access beach areas will be conducted. Specific mulching and seeding procedures will be optimized to the FTB design as PolyMet and/or their contractors obtain specific operating experience.

Dust suppressants approved by the MPCA, such as Lignosulfonate, Lignosulfonate-magnesium chloride mix, and Coherex, are also applied, as needed, for fugitive emission control. The natural conditions of the environment also provide emission control and affect when other forms of control need to be implemented. Seeding and mulching provides a cover to exposed areas of beaches and prevents them from being vulnerable to wind erosion. Details on seeding and mulching, including equipment utilized and seed mixtures employed for temporary dust control and permanent reclamation, are provided in the Reclamation Seeding and Mulching Procedure, which is included as Appendix A of the *NorthMet Project Reclamation Plan* (Reference (2)). Information on seeding and mulching in the reference procedure includes:

1. Seeding will typically occur four times per year in March, May/June, August/September, and October.

2. Mulch may be used to cover seed during regular plantings as protection to foster growth; and/or

3. Mulch may be used by itself as a temporary cover to prevent wind erosion between plantings when conditions are suitable for safe access

4. Mulch may consist of grain straw, hay, or cutting of agricultural grasses and legumes, and

5. Mulch may also consist of wood fiber, newsprint, chopped straw, cotton fiber or any combination of these materials, and

6. Mulch may include binders or dust retarding chemicals

Seed and mulch is applied to exposed areas with the use of typical farm type equipment, such as wheeled or tracked tractors, and is raked or disked into the surface. Other specialized equipment with low-ground pressure, such as tracked or wheeled all-terrain vehicles, may be utilized to mulch or seed areas that are difficult to access. .

4.2.1 Primary Control Strategies

The primary control to reduce fugitive emissions with FTB wind erosion is associated with proper design and operation of the FTB as described above, the application of water and dust suppressant, seeding and mulching, and the natural conditions present at the FTB.

4.2.2 Contingent Control Strategies

Contingent control measures for FTB wind erosion include other dust suppressant application methods or chemicals, beach area reduction, reduction of active deposition areas and application of wet tailings.

4.2.3 Best Management Practices

Best management practices for controlling fugitive emissions from FTB wind erosion will include monitoring the FTB, minimizing the exposed areas, conducting grading, compacting, seeding, and mulching. Additionally, fugitive emission checks will be completed on a daily basis.

4.2.4 Recordkeeping

Records will include seeding and mulching locations with application dates, FTB surveys and reports highlighting deposition and/or reduction and completed fugitive emission check forms.

4.3 Limestone Unloading, Storage, and Reclaim

See Table 3-3 for Limestone Unloading, Storage, and Reclaim potential fugitive emission sources.

Certain outdoor transfer limestone operations, including EQUI 99 and EQUI 101, are subject to 40 CFR Part 60 Subpart OOO – National Emission Standards for Nonmetallic Mineral Processing Plants and respective appropriate control measures and terms within the air emission permit that govern Non-metallic mineral processing. In addition to weather conditions and moisture content of the limestone, procedures to reduce fugitive emissions are as follows:

1. The stacker is positioned to minimize drop distance. Considerations for safety and proper stockpile formation, along with meteorological conditions and visible emission observations, will be used to set the conveyor height to the appropriate level.

2. Limestone stacking is stopped if high wind conditions are causing Dusty Conditions. The wind speed at which dusty condition occur will depend on other factors, such as wind direction, material size distribution, and moisture content. The decision to suspend conveyor stacking will

be made by trained personnel on a real time basis based on visual observations, with verification recorded on the Daily Fugitive Emission Check Form.

3. Water sprays may be used during limestone handling as a contingent measure for emission control if primary controls are not adequate (i.e. Dusty Conditions are still observed after implementation or it is not practical to implement primary controls). The purpose of water application is to reduce emissions. Water may be applied to the storage piles via water sprayers. Water can also be applied to conveyors via spray bars and racks.

4. Dust suppressants that are determined to not adversely affect the environment (i.e., not likely to introduce chemicals to stormwater or have other detrimental water quality impacts) or the process may be applied as a contingent measure.

5. A partial enclosure may be installed around the reclaim hopper as a contingent measure.

4.3.1 Primary Control Strategies

The equipment design, which includes variable belt speed and enclosed dumping serviced by fabric filter systems as per NSPS OOO, serves as the primary control strategy.

4.3.2 Contingent Control Strategies

As a contingency control strategy, water application via water monitors or additional portable equipment is available as needed during non-freezing months. PolyMet may temporarily cease operations until conditions improve if primary controls do not reduce fugitive emissions.

4.3.3 Best Management Practices

Best management practices for controlling fugitive emissions from Limestone Unloading, Storage, and Reclaim include minimizing drop distances and conducting daily fugitive emission checks.

4.3.4 Recordkeeping

Records of the number of railcar loads and daily fugitive emission checks will be kept.

4.4 LTVSMC Tailings/Off-site Borrow/Bentonite/Other Material Loading and Unloading

See Table 3-4 for LTVSMC tailings/off-site borrow/bentonite/other material loading and unloading potential fugitive emission sources.

Water can be applied as needed as a contingent measure if the natural moisture is not sufficient. If Dusty Conditions are observed, trained personnel will visit the location of the activity to evaluate if the application of water is warranted.

4.4.1 Primary Control Strategies

Operators responsible for LTVSMC Tailings/Off-site Borrow/Bentonite/Other Material Loading and Unloading will adjust drop distances as needed based on environmental conditions.

4.4.2 Contingent Control Strategies

A contingent control strategy may utilize water application via portable equipment if needed and if safe access is present. PolyMet may temporarily cease operations until conditions improve if primary controls do not reduce fugitive emissions.

4.4.3 Best Management Practices

Best management practices for controlling fugitive emissions for LTVSMC Tailings/Off-site Borrow/Bentonite/Other Material Loading and Unloading include managing drop distances and other loading parameters as environmental conditions change and operators are reporting Dusty Conditions.

4.4.4 Recordkeeping

Recordkeeping associated with LTVSMC Tailings/Off-site Borrow/Bentonite/Other Material Loading and Unloading will include throughput based on the number of truckloads of tailings or off-site borrow material and completed fugitive emission check forms.

4.5 LTVSMC Tailings/Off-site Borrow/Bentonite/Other Material Hauling

See Table 3-5 for LTVSMC Tailings/Off-site Borrow/Bentonite/Other Material Hauling potential fugitive emission sources.

Controlling fugitive emissions from hauling associated with Tailings Basin construction (FUGI 5/ FUGI 7) is important for safety as well as the environment. Standard operating procedures in place to control these emissions are as follows:

1. If Dusty Conditions are observed or reported by an equipment operator, the condition will be investigated by trained personnel to determine if corrective action is needed. If PolyMet determines that corrective action is needed, fugitive emission control measures consistent with the Plant Site FEC Plan will be initiated.

2. Fugitive emission control is achieved with the application of water and/or MPCA approved dust suppressants. The decision of when to apply water or other dust suppressants to the roads is made by the Plant Site supervisors based on meteorological data, traffic levels, historic operating data, reports from equipment operators and fugitive emission evaluators, as well as their experience and professional judgement.

3. During the winter months, other control measures are implemented if fugitive emissions are observed. Application of salts (sodium chloride, calcium chloride and magnesium chloride) and/or application of sand mixtures are used to enhance safety and control fugitive emissions from the

roads (use of chemical dust suppressants would require MPCA Water Quality Division approval – salts such as those listed above are frequently approved and used at mines in Minnesota) during the winter months. Similarly, road maintenance such as scarification of the road surface, and/or application of new road material may be used to achieve the same objectives. Snow may also be applied on roads, and under the right conditions, very light applications of water can be effective in freezing conditions.

Watering and/or dust suppressant application capacity is maintained to control emissions during typical summer months. Please see Section 5.0 for detailed explanation of control measures for unpaved roads.

4.5.1 Primary Control Strategies

Primary control strategies for LTVSMC Tailings/Off-site Borrow/Bentonite/Other Material Hauling include the application of water and/or dust suppressant, meteorological conditions (i.e. rain or snow) and road maintenance, including grading.

4.5.2 Contingent Control Strategies

Contingent control measures for LTVSMC Tailings/Off-site Borrow/Bentonite/Other Material Hauling include the application of other chemical dust suppressants subject to conditions in all applicable permits. PolyMet may reroute traffic away from dusty road sections as possible (e.g., if there is an alternate route available) until conditions improve if primary controls do not reduce fugitive emissions.

4.5.3 Best Management Practices

Best management practices for LTVSMC Tailings/Off-site Borrow/Bentonite/Other Material Hauling will require employees to notify shift managers or appropriate personnel of fugitive emissions. If corrective action is needed, measures such as road maintenance or deployment of water trucks will be taken. LTVSMC Tailings/Off-site Borrow/Bentonite Hauling/Other Material Hauling will only be operated during construction season. Additionally, fugitive emission checks of active roads will be conducted on a daily basis.

4.5.4 Recordkeeping

Recordkeeping associated with LTVSMC Tailings/Off-site Borrow/Bentonite/Other Material Hauling will include completed fugitive emission check forms and chemical application or other fugitive emission control measures implemented.

4.6 Other Sources

See Table 3-6Table 3-6 for Other Sources of potential fugitive emissions.

Over-the-road sized truck traffic occurs on the Dunka Road and other access/service roads at the Plant Site. Some of the roads travelled by these vehicles are covered by Tailings Basin road control measures. Water and/or dust suppressants are applied as necessary to the service roads in and around the Plant area as dictated by traffic and weather conditions. Water will be applied as necessary to working faces and access ramps.

4.6.1 Primary Control Strategies

Primary control strategies for roads include the application of water and/or dust suppressant, meteorological conditions (i.e. rain or snow) and road maintenance, including grading.

4.6.2 Contingent Control Strategies

Contingent control measures for roads include the application of other chemical dust suppressants subject to conditions in all applicable permits.

4.6.3 Best Management Practices

Best management practices for roads will require employees to notify shift managers or appropriate personnel of fugitive emissions. If corrective action is needed, measures such as road maintenance or deployment of water trucks will be taken. Additionally, fugitive emission checks of active roads will be conducted on a daily basis.

4.6.4 Recordkeeping

Recordkeeping associated with other sources will include completed fugitive emission check forms when applicable and chemical application or other fugitive emission control measures implemented.

5.0 Control Measures for Unpaved Roadways

The following subsections offer an overview of the measures to control fugitive emissions from unpaved roadways at the Tailings Basin as discussed in Section 4.0.

5.1 Road Watering

PolyMet will operate a water truck or trucks with the capacity to apply water to active unpaved roads rapidly during non-freezing conditions as the primary control method for fugitive emissions. The decision on when to water the roads will be made by Plant Site supervisors based on traffic levels, meteorological conditions (temperature, precipitation), historic operating data, reports from equipment operators and fugitive emission evaluators, as well as the supervisors' experience and professional judgement.

Use of the water trucks varies depending upon the meteorological conditions. Monitoring of the site conditions, along with visual observations, experience, and professional judgment, determines the daily water activities. Each active unpaved road is watered as required, except when weather or safety conditions make watering impractical or unnecessary. The following sections on Chemical Application and Other Fugitive Emission Control Measures describe fugitive emission control measures available when meteorological conditions make road watering unsafe or ineffective. Tailings Basin construction activities will occur predominantly during non-freezing conditions, so water application will be appropriate during most heavy traffic periods at the Tailings Basin.

5.2 Chemical Application

Chemical application to unpaved roads provides added protection in a proactive manner against fugitive emissions, especially during freezing conditions. These chemicals are applied by a tank truck and spray system. Determination of the appropriate timing of application is based upon expected meteorological conditions (such as seasonal transitions to freezing conditions, or expected periods of hotter temperatures and low humidity), review of past records, experience and professional judgment.

The date, time, quantity, and location of each chemical application is recorded.

PolyMet will continue to evaluate new chemicals as potential fugitive emissions control for their effectiveness and economic feasibility. As new chemicals are available and existing chemicals may become limited by availability, PolyMet will evaluate their feasible implementation. Independent of chemical availability is that production processing is sensitive to change, including reagent availability, ore type, production, and market demand, amongst others. Compatibility testing may be conducted to evaluate existing and new chemicals on an as needed basis to match compatibility with production requirements.

5.3 Other Fugitive Emission Control Measures

In addition to chemical application during the winter months, sand mixtures or snow may be applied on roads, and under the right conditions, very light applications of water can be effective in freezing conditions. Scarification of the road surface, and/or application of new road material will also be used to enhance safety and control fugitive emissions from the roads.

6.0 Training

An integral part of the Plant Site FEC Plan is training the personnel responsible for implementing the FEC Plan.

At least two individuals employed at the Plant Site (or more, if needed to assure daily coverage) are trained to observe potential fugitive emission sources and their control system(s) for proper operation of control measures. Personnel responsible for making these checks will be trained in proper fugitive emission observation techniques.

All equipment operators, shift supervisors, and other PolyMet employees whose job functions include work at the FTB, the Limestone Yard and/or frequent travel on unpaved roads, receive annual training specific to fugitive emissions, including training on the importance of eliminating fugitive emissions, methods used to control fugitive emissions, and the procedures and process for reporting and controlling fugitive emissions. PolyMet contractors and their employees also are trained specific to their job duties if those duties involve work related to fugitive emission sources or control.

All managers and supervisors and those individuals trained as fugitive emission evaluators receive annual training on the Plant Site FEC Plan as a whole, including the importance of controlling fugitive emissions, the process for reporting and controlling fugitive emissions and associated recordkeeping.

Specific training is given to each person as it pertains to his or her job. Records of their names, dates of training and subjects of each training exercise are maintained for five years. Training exercises cover, as appropriate, the following:

1. Employee responsibilities
2. Reporting
3. Recordkeeping
4. Corrective actions
5. Maintenance
6. Fugitive emission checks
7. Weather observations

The Plant Site supervisors and managers are responsible for making sure that all employees understand their roles and responsibilities related to fugitive emission control and undertake them properly. If the supervisors observe this is not the case, they will take appropriate action that may include additional training or individual counseling for employees. Records of any additional training given and the topics covered are kept with the training records.

7.0 Recordkeeping

The records of daily fugitive emission checks where required include whether or not Dusty Conditions were observed; whether corrective action was undertaken pursuant to the Plant Site FEC Plan and whether the corrective action was effective and/or if additional action was warranted. Records of fugitive emission checks are kept for five years and made available to MPCA upon request. A deviation shall occur if PolyMet failed to follow the requirements of the FEC Plan or if Dusty Conditions led to a violation of an air quality rule. Deviations shall be reported in the semi-annual deviation report.

The following records regarding fugitive emission controls will be maintained:

1. Commercial dust suppressant information (applications, permits, etc.)
2. Fugitive emission daily check forms (see attached example form[1]), corrective actions taken and any failures to follow the requirements of the Plant Site FEC Plan
3. Water truck logs (including number of trucks, capacity, and daily amount of loads applied)
4. Daily precipitation records
5. Haul vehicle miles traveled
6. FTB records of deposition plans, records of mulching and seeding applications
7. Training records
8. MPCA Plant Site FEC Plan record(s) of receipt
9. Records as appropriate relating to limestone delivery, road watering, dust suppressant application, etc.
10. Air Emission Inventory Reports
11. Records of any NSPS required performance testing (limestone system)
12. Any instances where the control strategies detailed in the Plant Site FEC Plan were not implemented

Electronic records will be retained consistent with the air emission permit's records retention requirements.

[1] Forms are attached to show the minimum information that will be recorded and not necessarily the format of the form. Actual data collection may also be done on a computer, tablet, or other electronic device.

8.0 Reporting

PolyMet will promptly notify MPCA if corrective action is required to address fugitive emissions that may adversely impact neighboring property owners or the general public.

Certain information related to the Plant Site FEC Plan will be included in the semi-annual deviation reports that will be required by the air emission permit. This information will include all reportable deviations, such as:

1. Fugitive emissions observed beyond the property boundary
2. Corrective action that was not taken consistent with the Plant Site FEC Plan

All other records described in the Mine Site FEC Plan will be available for review during an inspection or will be provided upon request from MPCA.

9.0 References

1. **IMA-MPCA Fugitive Emissions Workgroup.** Taconite Industry Haul Truck Unpaved Road Fugitive Particulate Emission Factor and Control Efficiency. (Attachment to Letter from Todd Biewen of MPCA to Larry Salmela of U.S. Steel Company dated November 24, 1998). November 18, 1998.

2. **Poly Met Mining Inc.** NorthMet Project Reclamation Plan (v7). July 2016.

Plant Site Fugitive Emission Check Form

Date: _____ Time: _____ AM/PM (Circle one)

Employee Making Reading

Print: _____ Signature: _____ Title: _____

Weather Conditions at Time of Reading

Temperature	_____ degrees Fahrenheit
Wind Speed	_____ mph
Wind Direction	N NE E SE S SW W NW (circle one)
Sky Conditions	Clear / Partly Cloudy / Completely Cloudy / Fog (circle one)
Precipitation	Rain / Snow / None (circle one)
Precipitation in past 24 hours?	_____ inches water

Fugitive Emission Source	Equipment Operating	Fugitive Emissions Observed?[1]	If Fugitive Emissions Observed, Corrective Action Required?	Was corrective action taken?	List Corrective Action Taken if Required	Did a Potential Deviation Occur? If yes, describe. [2]	Deviation Occurred? [3]
Limestone Unloading, Storage, Reclaim – Rail Haul (EQUI 99, FUGI 4, EQUI 112 and EQUI 101)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
LTVSMC Tailings/Offsite Borrow Loading and Unloading (FUGI 5)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
LTVSMC Tailings/Offsite Borrow/Bentonite Haul/ Other Material Haul (FUGI 5, FUGI 7)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Bentonite Handling (FUGI 6)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
Tailings Basin Roads - Light Truck Traffic (FUGI 8)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
FTB Wind Erosion (FUGI 9)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N
General Small Truck Traffic (FUGI 1)	Y / N	Y / N / NA	Y / N / NA	Y / N / NA			Y / N

Y = Yes
N = No
NA = Not Applicable
[1] Fugitive emissions are visible dust that is a potential safety hazard and/or that does not settle out near the source and has the potential to have impacts beyond the property boundary.
[2] A deviation may occur if corrective is required, but not taken or if fugitive emissions cross the property line. If a potential deviation occurs include description for environmental manager review.
[3] To be completed by environmental manager

Appendix 12.3

Blasting Plan

NorthMet Project

Mine Site Blasting Plan

Version 2

Issue Date: November 22, 2017

This document was prepared for Poly Met Mining, Inc.
by Barr Engineering Co.

Table of Contents

Acronyms, Abbreviations, and Units

Acronym	Stands For
ANFO	Ammonium Nitrate and Fuel Oil
DNR	Minnesota Department of Natural Resources

1.0 Introduction

This document provides a summary of the Mine Site Blasting Plan (Blasting Plan) for the Poly Met Mining, Inc. (PolyMet) NorthMet Project (Project). The Project is described in the Permit to Mine Application (Reference (1)). The Project will include blasting of Mine Site waste rock and ore throughout the 20 years of ore processing. Blasting will also occur during the construction phase where necessary to modify bedrock outcrops that impinge on designs (such as the mine water ponds, haul roads, ditches, etc.) This Blasting Plan is for operations-phase blasting, and it will be periodically reviewed and updated as PolyMet:

- retains operating and engineering personnel responsible for blasting operations
- engages blasting contractors upon completion of permitting and initiation of mining activities
- gains site-specific blasting experience

Blasting during the construction phase of the Project and during future construction activities will be carried out using contractors and methods normally employed for construction blasting of rock, with the resulting blast rock utilized or managed as proposed for the Project. PolyMet will require the contractor to provide a blasting plan for PolyMet's review and approval prior to the initiation of any blasting on-site. PolyMet will notify the Minnesota Department of Natural Resources (DNR) personnel prior to blasting for construction and for production.

1.1 Regulatory Criteria

Regulatory criteria for production blasting are outlined in Minnesota Rules, chapter 6132 (Nonferrous Metallic Mineral Mining), part 6132.2900 (Air Overpressure and Ground Vibrations from Blasting). Minnesota Rules, part 6132.2900 generally require:

- limitations on air overpressure on lands not owned or controlled by the permittee
- blasting in open pits to be limited to daylight hours, with exemptions allowed for hazardous conditions
- control of ground vibrations
- monitoring of all open pit blasts by the permittee
- maintenance of a blaster's log of production blasts

This Blasting Plan establishes the methods and data collection proposed for maintenance of Minnesota Rule compliance and for maintenance of the safety of Mine Site personnel during blasting operations.

1.2 Blast Plan Summary

Blast hole drilling will be done before blasting. Because the ore has physical characteristics that are similar to the waste rock, a common drilling fleet will be utilized for both ore and waste rock drilling. PolyMet will use conventional electric or diesel powered rotary drilling rigs. The drill pattern design and possibly drill hole diameter will evolve over time as each blast provides information on how to refine the designs of subsequent blast patterns to achieve individual blast pattern performance and to adapt to evolving technology and varying geology. Drill logs of blast holes and a blast report for each blast will be maintained by PolyMet.

Production blasts are anticipated to occur 2 to 3 times a week. This will usually include separate blasts of ore and waste rock, totaling about 200,000 tons or more of broken material per blast. A blasting contractor will be utilized. No explosives will be stored on-site. The DNR and other appropriate agencies will be notified in advance if it is subsequently decided to store blasting materials on-site.

1.3 Outline

The outline of this document is:

Section 1.0 Introduction and summary description of the Mine Site Blasting Plan

Section 2.0 Description of the Mine Site Blasting Plan implementation, blast monitoring, blast monitoring documentation and data retention, and corrective/preventative measures

2.0 Blast Implementation and Monitoring Plan

Blast implementation and monitoring will be carried out by PolyMet mining personnel and contracted blasting crews. Blasting for mine development and operations is a well-developed skillset in the mining district of northcentral/northeastern Minnesota, and there are a number of highly qualified and experienced blasting contractors in the region. Upon Project initiation, PolyMet will select a preferred blasting contractor for further development of the waste rock and ore blasting plan, implementation and monitoring of test blasts, and ongoing full-scale blasting operations.

2.1 Blast Implementation

Blast hole planning, drilling, and preparation will be done in advance of blasting. Because the ore has physical characteristics that are similar to the waste rock, the same drilling fleet will be utilized for both ore and waste rock drilling. PolyMet will use conventional electric or diesel powered rotary drilling rigs to conduct the drilling operations. Blast hole drilling will occur as needed throughout a 24-hour day with multiple drill rigs. Two drill rigs are currently planned, but this may change over time. Loading of explosives into drill holes and blast initiation will only occur during daylight hours.

PolyMet has undertaken blast design studies to determine initial drilling and blasting parameters which will subsequently be refined. Table 2-1 presents the general blasting parameters based on current drilling and blasting models. By monitoring and video recording the blasts, PolyMet will refine drilling and blasting designs over time to achieve fragmentation goals while limiting overpressure and ground vibrations from production blasts to below the levels established in Minnesota Rules, part 6132.2900, thereby avoiding injury to human health or welfare and property outside the Mining Area. Blast monitoring is discussed in more detail in Section 2.2 and Section 2.3.

Based on currently anticipated annual ore movement rates and modeled blast design parameters, it is estimated that ore blasting will use approximately 8 million pounds of blasting agents annually, primarily consisting of emulsion blends and Ammonium Nitrate and Fuel Oil (ANFO). The planned annual waste rock movement will use approximately an additional 7.3 million pounds of blasting agents, primarily consisting of emulsion blends and ANFO.

Production blasts are anticipated to occur an average of 2 to 3 times per week, year-round. This will usually include separate blasts of ore and waste rock, totaling an average of about 200,000 tons or more of broken material per blast. An experienced blasting contractor will deliver blasting agents to the site on an as-needed basis. At this time, explosives are not planned to be stored on-site. The DNR and other appropriate agencies will be notified in advance if it is subsequently decided to store blasting materials on-site.

In the current production blasting models, the blast pattern design parameters are slightly different between ore and waste rock, but the diameter of the blast hole will likely be the same for both material types. Drill pattern design will evolve over time as each blast provides

information on how to refine the designs of subsequent blast patterns to achieve performance goals within air overpressure and ground vibration limits. Logs of blast holes and blast reports will be maintained and made available to the DNR commissioner upon request.

Table 2-1 Blasting Parameter Summary

Blasting Parameter	Specifications(1)
Blast Hole Diameter	10 – 16 inch
Explosive Type/Blasting Agent	Ammonia nitrate fuel oil (ANFO); emulsion and emulsion blends
Burden (distance from free face) x Spacing (distance between holes)	Approximately 25 feet x 28 feet with 5 feet of sub-drilling for ore and 29 feet x 33 feet with 6 feet of sub-drilling for waste rock (based on a 12-1/4 inch diameter blast hole)
Powder Factor	Approximately 0.69 pounds per ton for ore and 0.45 pounds per ton for waste rock (based on a 12-1/4 inch diameter blast hole)
Drilling Rate (approximate drilling time per rig, 24 hours per day with 80% to 90% availability to accommodate maintenance, shift change, and rig movement)	50 to 70 feet per hour (based on a 12-1/4 inch diameter drill bit)
Feet Drilled Per Month	Average of 30,000 to 40,000 feet per month
Drilling Rigs Required	2 drill rigs

(1) Specifications presented above will evolve over time as each blast provides information on how to refine the designs of subsequent blast patterns.

After blast holes are drilled and explosive loading begins, limited activities will be permitted within the planned blast area. Activities directly related to the blasting operations, as well as surveying, mapping, and sampling of geology will be allowed following established procedures.

Near the completion of the blast pattern drilling and initiation of explosives loading, mine staff will be informed of the upcoming blasts through meetings and communication with the blasting coordinators and their supervisors and by warning signs. A set of warning signs for blasting and/or flagging will be developed and prominently displayed around the blast site at all potential vehicle entry areas to prevent unauthorized entry. Signs informing employees will also be posted the day of the blast. Sentries will be posted at each of the mine pit entry roads and any other

roads located within the exclusion zone to confirm that there is no unauthorized access to the area. A security aircraft will be utilized to test for temperature inversions, provide an additional level of security by verifying all unauthorized personnel are outside the exclusion zone, and provide information to the blasters prior to the blasters approach of the muck pile after the blast. Blast warning and control methods are summarized in Table 2-2.

Table 2-2 Blast Warning and Control Methods

Activity	Type	Location Utilized
Advanced Warning	Meetings, Radio Communications, Audible Pre-Blast Alarm (Siren/Horn), and E-mail to external stakeholders/ adjacent landowners	Mine Pit Undergoing Blasting and the Pre-Established Security Perimeter
Secondary Warning	Radio Communications, Audible Pre-Blast Alarm (Siren/Horn)	Mine Pit Undergoing Blasting and the Pre-Established Security Perimeter
Audible Warning	Siren/Horn	Pre-Established Sounding Sequence and Time Prior to Blast Initiation
Sentries	Operations Personnel	At Mine Pit Entry Roads and the Pre-Established Security Perimeter Entrances
	Security Aircraft	Flyover of the Mine Pit Undergoing Blasting and the Pre-Established Security Perimeter
Signs	Lights and/or Signage	At Mine Pit Entry Roads and the Pre-Established Security Perimeter Entrances
Traffic Management	Signs and Sentries, Blockades (Gates and/or Vehicles)	At Mine Pit Entry Roads and the Pre-Established Security Perimeter Entrances

Drill hole loading and blasting will be conducted as a continuous process with the blast fired as soon as possible after the blast pattern has been loaded. Secondary breaking of oversize rock will be done in the pit using a wheel loader or excavator-mounted drop weight hammer.

2.2 Blast Monitoring and Log

Blast information will be maintained in a Blaster's Log that will be updated with each blast. The log will be maintained by the Mine Engineering Department and will include the following:

- date and time of blast
- type(s) of explosives, boosters, and initiation system(s) used

- initiation layout with locations of blast holes and time intervals of delays (within each explosive deck if applicable)
- pounds of explosives per each delay of eight milliseconds or more
- total pounds of explosives in the entire pattern
- type of material blasted
- monitoring locations and results of monitoring
- meteorological conditions at time of blast
    - temperature, temperature inversions, and humidity (from daily published weather bureau data and/or onsite weather station)
    - wind speed and direction (from daily published weather bureau data and/or onsite weather station)
- directional orientation of free faces of benches blasted

Monitoring stations will be established adjacent to the nearest structure located on lands not owned or controlled by PolyMet. At the time of the development of this plan, the nearest structure would be on Cliffs Natural Resources NorthShore Mining property. Prior to the first production blast on NorthMet Property, PolyMet will confirm the location of the nearest structure located on lands not owned or controlled by PolyMet for monitoring.

2.3 Documentation and Retention

There are two specific regulatory limits associated with blasting as follows:

- air overpressure at blast-specific monitoring locations; regulatory limit is 130 decibels as measured on a linear peak scale, sensitive to a frequency band ranging from six cycles to 200 cycles per second. Minnesota Rules, part 6132.2900, subpart 1A(1)
- maximum peak particle velocity at blast-specific monitoring locations; regulatory limit is one inch per second measured using a seismograph capable of measuring three mutually perpendicular peak particle velocities (x-axis, y-axis, z-axis). Minnesota Rules, part 6132.2900, subpart 2B(1)

As described in Minnesota Rules, part 6132.1300, blast monitoring data for air overpressure and maximum peak particle velocity will be collected and maintained in a blaster's log of production blasts, and retained for a period of at least six years. All monitoring data collected will be made available to the DNR commissioner on request.

2.4 Corrective/Preventative Measures

In the event that blast monitoring indicates an exceedance of the regulatory limit for air overpressure and/or maximum peak particle velocity, mitigation measures will be implemented and may include:

- modification of the blast initiation layout
- modification of the pounds of explosives per delay
- modification of total pounds of explosives in the entire blast pattern
- adjustment of blast timing relative to meteorological conditions that may have site-specific impacts on the effects of blasting, air overpressure, and maximum peak particle velocity

If complaints about blasting activities from nearby property owners occur absent the exceedance of the regulatory limits noted above, PolyMet will investigate the complaint, and implement mitigation measures to the extent practicable.

Revision History

Date	Version	Description
08/24/2017	1	Initial release
11/22/2017	2	Added Section 2.3 Documentation and Retention and Section 2.4 Corrective/Preventative Measures

References

1. **Barr Engineering Co.** Permit to Mine Application (v3). Prepared for Poly Met Mining, Inc. NorthMet Project. December 2017.

List of Tables