Emission Control Technology Review for NorthMet Project Mine Site

PolyMet Mining Inc.

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BARR

4700 West 77th Street
Minneapolis, MN 55435-4803
Phone: (952) 832-2600
Fax: (952) 832-2601

RS 58B – Emission Control Technology Review (Mine Site)

Emission Control Technology Review for NorthMet Project Mine Site PolyMet Mining, Inc. Hoyt Lakes, Minnesota (RS58B)

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1. Executive Summary

1.1. Project Description

PolyMet Mining Inc. (PolyMet) is proposing to construct and operate an open pit mine in the NorthMet mineral deposit to recover non-ferrous metallic minerals. The proposed Mine Site is approximately 10 miles northwest of Hoyt Lakes, MN. The ore from the mine will be processed in a Process Plant on the former LTV Steel Mining Company (LTVSMC) site, approximately 8 miles west of the Mine Site.

The Mine Site will include activities normally associated with open pit mining including:

- Drilling
- Blasting
- Operation of earth moving equipment for loading haul trucks
- Operation of haul trucks moving overburden, waste rock, lean ore and ore
- Overburden and approved rock screening and crushing
- Loading ore into rail cars
- Construction of lean ore, waste rock, and overburden storage piles.

The Mine Site will include a Waste Water Treatment Facility (WWTF). Particulate emissions from the WWTF are caused by operation of:

- Propane fired space heaters
- A diesel powered emergency generator

A detailed description of these activities is included in the Detailed Project Description (DPD) for the NorthMet project and the Supplemental Project Description.

Because the proposed project will not be a major source under Prevention of Significant Deterioration (PSD) regulations, Mine Site emission sources will not be required to have Best Available Control Technology (BACT). However, PolyMet has used the principles of US EPA's "Top Down" BACT evaluation protocol as a guideline for selecting the appropriate emission control technology at the Mine Site. The evaluation for the Mine Site sources was performed for particulate matter (PM) and particulate matter less than 10 microns (PM_{10}).

The purpose of this report is to identify appropriate emission controls and to propose appropriate emission limits for sources that emit PM and PM_{10} at the Mine Site.

1.2. Emission Units with Emission Control Technology Reviews

The emission units for which emission control technology reviews were completed and the selected control technology for the Mine Site are summarized in Table 1.1.

Table 1.1 Summary of Emission Control Technology Analyses

Emission Control Technology Selection		Emission Limitation
Emission Source	**Emission Control**	**PM PM_{10}**
Rail Transfer Hopper	Fugitive emission control plan	NA
Railcar loading	Fugitive emission control plan	NA
Overburden Screening	Fugitive emission control plan	NA
Overburden and other approved rock crushing and screening	Water sprays or similar performing techniques	7% Opacity if the source is vented through a stack
Fugitive dust emissions: drilling, blasting, earth moving equipment, roads and storage piles	Fugitive emission control plan	NA
WWTF Diesel Powered Emergency Generator	Emergency Equipment Classification	10% Opacity
Propane Fired Space Heaters for the WWTF Building	Good Combustion Practices	NA

NA – Not applicable

Table A-1 in Attachment 1 lists all emission units that were reviewed following the general principles of the "Top Down" BACT protocol, proposed emission controls, and proposed emission limits. This report includes selection of appropriate emission controls and a proposed emission control performance standard. Individual source mass emission limits, if needed, are listed in Table A-1.

2. Introduction

2.1. Project Description

Overview

PolyMet is proposing to construct a non-ferrous metallic mineral mine in an area approximately ten (10) miles east of Hoyt Lakes, MN – the Mine Site. The ore will be processed in a separate Process Plant located at the former LTVSMC site in Hoyt Lakes, MN – the Plant Site. The Process Plant will produce pure copper cathode, a mixed nickel/cobalt hydroxide, and gold/platinum group mineral concentrate from the ore mined at this facility. The proposed project is referred to as the NorthMet project. A detailed description of these processes is included in the Detailed Project Description (DPD) for the NorthMet project and the Supplemental Project Description. The project (Mine Site and Plant Site) will not be a major source under Prevention of Significant Deterioration (PSD) regulations.

Section 3 of this report provides a description of the "Top Down" BACT methodology used as a guideline in the selection of emission control technologies and Section 4 provides a description of the pollution control equipment and methods potentially applicable at the Mine Site.

The mining project includes the following equipment and facilities:

- Drilling and blasting equipment
- Earth-moving equipment
- Truck and railcar loading
- Storage piles and associated material handling equipment for mining operations and ore movement.
- Overburden screening to separate soils and clay for use as cover material, for use in stockpile foundation and liner system construction, and for use in pond liner construction.
- A crushing system to prepare large overburden rocks and other approved rock for use as roadbed material and other construction purposes.

The Mine Site will include a Waste Water Treatment Facility (WWTF). The WWTF treatment processes include pH control and metals precipitation/recovery from the wastewater. Hydrated lime from the Plant Site and CO_2 will be used for pH control. The hydrated lime will also be used to precipitate metals. All of these processes are wet and will not cause particulate emissions. However, the WWTF will be a source of particulate matter due to the operation of:

- Propane fired space heaters
- A diesel powered emergency generator

The Emission Control Technology Review report addresses the following Mine Site particulate emitting activities as follows:

Section 5 will consider control of fugitive particulate emissions from material activities such as:

- Drilling and Blasting
- Operation of earth moving equipment for loading haul trucks
- Operation of haul trucks moving overburden, waste rock, lean ore and ore
- Construction of ore, waste rock, lean ore and overburden storage piles.

Section 6 contains the PM/PM_{10} Emission Control Technology Review for the Rail Transfer Hopper.

Section 7 contains the PM/PM_{10} Emission Control Technology Review for overburden screening.

Section 8 contains the PM/PM_{10} Emission Control Technology Review for portable rock crushing operations.

Section 9 contains the PM/PM_{10} Emission Control Technology Review for the WWTF diesel powered emergency generator.

Section 10 contains the PM/PM_{10} Emission Control Technology Review for the propane fired space heaters in the WWTF building.

3. Methodology

3.1. PSD Applicability

PSD regulations do not apply to the Mine Site. However, PolyMet has proposed to follow BACT guidelines in selecting emission controls at the Mine Site. The Emission Control Technology Review follows EPA's "Top Down" protocol for conducting BACT reviews as found in the EPA's October 1990 draft *New Source Review Workshop Manual*.

The requirements for conducting a BACT analysis and determination are set forth in section 165(a)(4) of the Clean Air Act, in federal regulations at 40 CFR 52.21(j), the Minnesota State Implementation Plan (SIP) at 40 CFR Part 52 Subpart Y, and Minnesota Pollution Control Agency rules at MN 7000.3000.

40 CFR 52.21(j) specifies that BACT must be applied to a new source as follows:

> *(j) Control technology review. (1) A major stationary source or major modification shall meet each applicable emissions limitation under the State Implementation Plan and each applicable emissions standard and standard of performance under 40 CFR parts 60 and 61.*
>
> *(2) A new major stationary source shall apply best available control technology for each regulated NSR pollutant that it would have the potential to emit in significant amounts.*

Significant as defined at 40 CFR 52.21(b)(23) means, in reference to a net emissions increase or the potential of a source to emit any of the following pollutants at a rate of emissions that would equal or exceed any of the following rates:

<u>Pollutant and Emissions Rate</u>

- Carbon monoxide: 100 tons per year (tpy)
- Nitrogen oxides: 40 tpy
- Sulfur dioxide: 40 tpy
- Particulate matter:
  - o 25 tpy of particulate matter emissions;
  - o 15 tpy of PM_{10} emissions
- Ozone: 40 tpy of volatile organic compounds
- Lead: 0.6 tpy
- Fluorides: 3 tpy
- Sulfuric acid mist: 7 tpy

- Hydrogen sulfide (H_2S): 10 tpy
- Total reduced sulfur (including H_2S): 10 tpy
- Reduced sulfur compounds (including H_2S): 10 tpy

The PSD significance level was used as a guideline to identify the pollutants for which a control technology review is warranted. PolyMet has reviewed emission controls using the "top Down" BACT protocol at the Mine Site for the following PSD pollutants:

- Particulate matter (PM)
- Particulate matter less than 10 microns (PM_{10})

Although potential project emissions of NO_x and CO are above the PSD significant emission rate, projected actual project emissions of NO_x and CO are below the PSD significant emission rate. Nearly all NO_x emissions and a significant portion of CO emissions are emitted from combustions sources which operate intermittently. The only process related combustion source is the boiler used at autoclave startup. Utilization for this boiler is estimated as 6%. The remaining combustion sources are for emergency use or to provide space heating, so their utilization will be low. In other words, there are inherent limitations on how much the combustion sources will operate due to the nature of the sources and process that they support. The only combustion sources that are at the Mine Site are associated with the WWTF. Therefore, an Emissions Control Technology Review is not warranted for Mine Site sources of these pollutants.

VOC emissions are above the PSD significant emission rate. VOC sources at the Mine Site include diesel storage tanks, propane fired space heaters and emergency diesel engines. Theses sources have low VOC emission rates with total potential VOC emissions of 0.6 tpy. Similar sources were evaluated in the Plant Site ECTR (RS 58A), and it was determined that no add on controls were necessary. Therefore, additional analysis is not necessary for the Mine Site sources of VOC.

3.2. Emission Control Technology Review Methodology and Results

The Emission Control Technology Review was conducted in accordance with the requirements specified in EPA's draft *New Source Review Workshop Manual*, (October 1990). The review followed the EPA's top-down approach in which progressively less stringent control technologies were analyzed until a level of appropriate control was achieved.

The five basic steps of the top down approach using EPA's "Top Down" BACT guidelines are as follows:

Step 1 – Identify All Control Technologies

The first step in a top-down analysis is to identify all available control technologies for each emission unit.

Step 2 – Eliminate Technically Infeasible Options

In the second step, the technical feasibility of each control option identified in Step 1 is evaluated with respect to source-specific factors.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

In the third step, all remaining control technologies not eliminated in Step 2 are ranked and then listed in order of overall control effectiveness for the pollutant under review, with the most effective control alternative at the top.

Step 4 – Evaluate Most Effective Control Technologies and Document Results

In the fourth step, the energy, environmental, and economic impacts are considered for each of the control options.

Step 5 – Select Emission Control Technology

In the fifth step, the most effective control option, based on the impacts quantified in Step 4, is proposed as the appropriate control for the pollutant and emission unit under review. This step correlates with selecting BACT for the pollutant and emission unit when BACT is required.

BACT is defined as:

> ***"Best available control technology*** *means an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of*

measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results."

The proposed PolyMet project is large and complex. In order to keep the Emission Control Technology Review report at a reasonable size, a review has been done for each type of emission unit. This includes selection of appropriate emission controls and a proposed emission control performance standard. Individual source mass emission limits, as needed, are listed in Table A-1.

3.3. Identification of Applicable Standards under 40 CFR Parts 60 (NSPS), 61 (NESHAP), and 63 (NESHAP/MACT)

As noted in the definition of BACT, BACT emission limits for sources subject to emission standards 40 CFR Part 60 (NSPS) or 40 CFR Part 61 (NESHAPS) cannot be less stringent than the applicable standards. Maximum Achievable Control Technology (MACT) standards under 40 CFR Part 63 for the control of Hazardous Air Pollutants (HAPs) are not applicable to establishing BACT. As this Emission Control Technology Review follows BACT guidelines, the MACT standards for the control of HAPs are also not applicable in selecting the appropriate control technology.

MACT standards are intended for the regulation of HAPs; not PSD pollutants, and therefore, are not considered in establishing the minimum emission control requirements for BACT. However, in some cases, EPA has used criteria pollutant standards as MACT standards since the criteria pollutants are good indicators of HAP emission controls. In those cases, MACT standards may be used as an indicator of the level of emissions control which may be achieved by the best performing units. The total project HAP emissions are below the major source level and there is no MACT standard applicable to area sources at the Mine Site, so MACT standards will not apply to any sources at the Mine Site. However, the MACT standard for similar source categories may still be used as a guide in determining the appropriate level of emission control.

The NSPS and NESHAP standards were reviewed for applicability to the NorthMet project Mine Site.

No applicable standards under Part 61 were identified.

Standards under Part 60 that were identified as potentially applicable are the following:

- 40 CFR 60 Subpart LL, Standards of Performance for Metallic Mineral Processing Plants

- 40 CFR 60 Subpart OOO Standards of Performance for Nonmetallic Mineral Processing Plants

Standards under Part 63 that were identified as potentially applicable are the following:

- 40 CFR 63 Subpart RRRRR, National Emission Standards for Hazardous Air Pollutants for Taconite Ore Processing

Each of these regulations is discussed in the sections that follow in terms of specific source applicability and emission limits.

3.4. 40 CFR 60 Subpart LL, Standards of Performance for Metallic Mineral Processing Plants

As a processor of metallic minerals, PolyMet's facility is the type of source that would be subject to Subpart LL. However, this standard only applies to crushing and screening operations at open pit mines and no crushing or screening of metallic minerals will occur at the Mine Site. Therefore, Subpart LL is not applicable to any sources at the Mine Site.

3.5. 40 CFR 60 Subpart OOO Standards of Performance for Nonmetallic Mineral Processing Plants

As part of its mining operations PolyMet will process nonmetallic minerals which would be subject to NSPS Subpart OOO. Subpart OOO limits particulate emissions from stacks and vents at affected facilities at 0.022 grains per dry standard cubic foot; so emission control technology for PM emissions from affected sources should be at least as stringent as the Subpart OOO standard. The Mine Site will not contain any affected facilities subject to the Subpart OOO particulate standard. All sources are expected to be fugitive in nature which would be subject to visible emission limit under Subpart OOO.

3.6. 40 CFR 63 Subpart RRRRR, National Emission Standards for Hazardous Air Pollutants for Taconite Ore Processing

This subpart establishes national emission limits and work practice standards for hazardous air pollutants (HAP) emitted from taconite ore processing. The Taconite MACT regulates particulate matter as a surrogate for metallic HAP emissions. The NorthMet ore is not taconite, but ore processing for the project will be similar to taconite ore processing. Therefore, Taconite MACT particulate matter standards for new sources could be considered as an indicator of the best performing emission controls when evaluating equivalent sources in the PolyMet Emission Control

Technology Review. However, no operations, related to ore, similar to those regulated by the taconite MACT standard will occur at the Mine Site, so this standard is not relevant.

4. Emission Control Technologies

4.1. Overview of Emission Control Technologies

Due to the size and complexity of PolyMet's proposed facility, several individual sources must be included in this Emission Control Technology Review. Given that the list of potential control technologies for each of these sources is similar, detailed descriptions of each control technology are included in this section as a reference for the individual source Emission Control Technology Reviews. The emission control technologies evaluated include add-on controls and work practices which reduce emissions where applicable (e.g. water sprays on conveyor drops, use of dust suppressants and speed limits). Each source-specific Emission Control Technology Review analysis will contain a brief summary of the control technologies covered in this section. Source-specific emission controls and operating practices will be described in the sections relating to those individual sources.

4.2. Particulate Matter (PM & PM_{10}) Emission Control Technologies

PolyMet has evaluated control technologies for particulate matter emissions from the following sources:

1. Mining activities
2. Rail Transfer Hopper operation
3. Railcar loading
4. Overburden screening (grizzly)
5. Overburden or other approved rock crushing and screening
6. Fugitive emissions (fugitive emissions include dust generated by truck traffic and by wind erosion from storage piles)

4.3. Fabric Filter

A fabric filter or baghouse consists of a number of fabric bags placed in parallel inside of an enclosure. Particulate matter is collected on the surface of the bags as the gas stream passes through them. The dust cake which forms on the filter from the collected particulate can contribute significantly to increasing the collection efficiency.

Two major fabric filter types are the reverse-air fabric filter and the pulse-jet fabric filter. In a reverse-air fabric filter, the flue gas flows upward through the insides of vertical bags which open downward. The particulate matter thus collects on the insides of the bags, and the gas flow keeps the bags inflated. To clean the bags, a compartment of the fabric filter is taken off-line, and the gas flow in this compartment is reversed. This causes the bags to collapse, and collected dust to fall from the bags into hoppers. (Shaking or another method is sometimes employed to dislodge the dust from the bags.) The cleaning cycle in a reverse-air fabric filter typically lasts about three minutes per compartment. Because reverse-air cleaning is gentle, reverse-air fabric filters typically require a low air-to-cloth ratio of 2 ft/min.

In a pulse-jet fabric filter, dirty air flows from the outside of the bags inward, and the bags are mounted on cages to keep them from collapsing. Dust that collects on the outsides of the bags is removed by a reverse pulse of high-pressure air. This cleaning does not require isolation of the bags from the flue gas flow, and thus may be done on-line.

The main operating limitation of a baghouse is that its operating temperature is limited by the bag material. Most filter materials are limited to 200ºF – 300º F. Some materials such as glass fiber or Nomex may be operated at 400ºF, but are more expensive.

Baghouse control efficiency under normal loading conditions typically is in the 98 - 99+ percent range. Reduced efficiencies will occur when the inlet particle concentration is low. Outlet particle concentrations are as low as 0.0025 gr/dscf; however, outlet concentrations achieved will depend on the size range and nature of the particles being filtered.

4.4. Electrostatic Precipitators (ESP)

An electrostatic precipitator (ESP) applies electric forces to separate suspended particles from the flue gas stream. In an ESP, an intense electrostatic field is maintained between high-voltage discharge electrodes, typically wires or rigid frames, and grounded collecting electrodes, typically plates. A corona discharge from the discharge electrodes ionizes the gas passing through the precipitator, and gas ions subsequently ionize the particles. The electric field drives the negatively charged particles to the collecting electrodes. Periodically, the collecting electrodes are rapped mechanically to dislodge collected particulate matter, which falls into hoppers for removal. Collector dust is removed from the precipitator for disposal, recycling, or reprocessing. Risk of sparking and dust explosion prevents ESP installation for use with extremely dry applications.

Since ESPs use electrical forces for particle collection, the electrical properties of the particles can adversely impact ESP operation. Particles with high resistivity may not readily accept an electric charge and will be difficult to collect. Particles with high conductivity or magnetic properties will strongly adhere to the collection plates and be difficult to remove.

ESP control efficiency under normal loading conditions typically is in the 98 - 99+ percent range. Reduced efficiencies will occur when the inlet particle concentration is low. Outlet particle concentrations can be as low as 0.005 gr/dscf; however, outlet concentrations achieved will depend on the size range and nature of the particles.

4.5. Wet Electrostatic Precipitators (WESP)

A wet electrostatic precipitator (WESP) operates in the same manner as a dry ESP; it applies electric forces to separate suspended particles from the flue gas stream. In a WESP, an intense electrostatic field is maintained between high-voltage discharge electrodes, typically wires or rigid frames, and grounded collecting electrodes, typically plates. A corona discharge from the discharge electrodes ionizes the gas passing through the precipitator, and gas ions subsequently ionize the particles. The electric field drives the negatively charged particles to the collecting electrodes. Particle removal in a WESP is accomplished with water sprays instead of mechanical cleaning methods. As a result of using water sprays, WESPs generate wastewater which must be treated to remove suspended particles and dissolved solids.

Since WESPs use electrical forces for particle collection, the electrical properties of the particles can adversely impact WESP operation. Particles with high resistivity may not readily accept an electric charge and will be difficult to collect. Particles with high conductivity or magnetic properties will strongly adhere to the collection plates and be difficult to remove; WESP water sprays may reduce this problem. However, WESP water spray systems will require more maintenance than dry ESPs in order to keep the water spray system working properly.

WESP control efficiency under normal loading conditions typically is in the 98 - 99+ percent range. Reduced efficiencies will occur when the inlet particle concentration is low. Outlet particle concentrations can be as low as 0.005 gr/dscf; however, outlet concentrations achieved will depend on the size range and nature of the particles being filtered.

4.6. Wet Scrubbers

Wet scrubbers, also termed particulate scrubbers, remove particles from waste gas by capturing the particles in liquid droplets (usually water) and separating the droplets from the gas stream. The droplets transport the particulate out of the gas stream.

Scrubbers may capture particulates through the following mechanisms:

- Impaction of the particle directly into a target droplet;
- Interception of the particle by a target droplet as the particle comes near the droplet; or
- Diffusion of the particle through the gas surrounding the target droplet until the particle is close enough to be captured.

Scrubbers are generally classified according to the liquid contacting mechanism used. The most common scrubber designs are spray-chamber scrubbers, cyclone spray chambers, orifice and wet-impingement scrubbers, and venturi scrubbers. Wet scrubbers require attention for waste water discharge.

Operating conditions inside of a scrubber can be very corrosive if acid gases are present in the waste gas, and highly abrasive particulate matter can cause erosion problems. These conditions lead to reduced equipment operating life, and/or increased capital cost for materials of construction.

Scrubber control efficiency under normal loading conditions typically is in the 98 – 99+ percent range. Scrubber efficiency is a function of pressure drop across the scrubber. So, higher collection efficiencies will consume more electrical power to operate the scrubber blower. Reduced efficiencies will occur when the inlet particle concentration is low. Outlet particle concentrations can be as low as 0.005 gr/dscf; however, outlet concentrations achieved will depend on the size range and nature of the particles.

4.7. Mechanical Collectors

Mechanical collectors use a variety of mechanical forces to collect particulate matter:

- Inertial separators use inertia and gravity to remove larger particles from smaller ones.
- Cyclones use centrifugal force to separate particulate matter from gas streams.

Drop-out boxes are typically used as inertial separators. Larger particles are trapped in drop-out boxes as the inertia they contain forces them to go straight as the rest of the gas stream turns to flow into and out of the drop-out box. Particles are also removed by gravitational settling in the drop-out box. Inertial separators can only remove the larger dust particles (>75 microns). They are typically used upstream of other control devices in high inlet dust loading cases.

Cyclone separators are designed to remove particles by inducing a vortex as the gas stream enters the chamber, causing the exhaust gas stream to flow in a spiral pattern. Centrifugal forces cause the larger particles to concentrate on the outside of the vortex and consequently slide down the outer wall and fall to the bottom of the cyclone, where they are removed. The cleaned gas flows out the top of the cyclone.

There are two principal types of cyclones: tangential entry and axial entry. In tangential entry cyclones, the exhaust gas enters an opening located on the tangent at the top of the unit. In axial flow cyclones, the exhaust gases enter at the middle of one end of a cylinder and flows through vanes that cause the gas to spin. A peripheral stream removes collected particles while the cleaned gas exits at the center of the opposite end of the cylinder.

Overall cyclone control efficiencies range from 50 to 99 percent with higher efficiencies being achieved with large particles and low efficiencies for smaller particles ($< PM_{10}$).

4.8. Good Design Methods and Operating Practices

Good design includes process and mechanical equipment designs, which are either inherently lower polluting or are designed to minimize emissions.

Good operating practices include operating methods, procedures, and selection of raw materials to minimize emissions.

Since these methods are generally source-specific, they will be addressed for each process when such measures are available.

4.9. Fugitive PM Emission Control

PolyMet will follow Best Management Practices (BMP) for control of fugitive dust at the Mine Site. PolyMet has prepared at detailed dust management plan to describe the BMPs it will implement for fugitive dust control. A copy of the dust control plan is located in Attachment B to the Emission Control Technology Review report. The following sections are brief discussions of common methods used to control fugitive dust emissions.

4.10. Paved Roads

Paved roads are classified as a surface improvement under the three grouping options for controlling emissions from unpaved roads. Paved roads are the most obvious surface improvement but are quite expensive. The control efficiencies achievable by paving can be estimated by comparing emission factors for unpaved and paved road conditions. Based on normal silt loading (0.4 grams per square meter) conditions, paved roads generate 70 – 80 percent less PM/PM_{10}. Paved roads cannot be used in mine areas due to the excessive weight of the haul trucks.

4.11. Dust Suppression on Unpaved Roads

Surface treatment is one of the other options for controlling emissions from unpaved roads. Dust suppression can be in the form of wet suppression or chemical stabilization. Wet suppression refers to the addition of water to the roads which keeps the road surface wet. Chemical stabilization attempts to change the physical characteristics of the roadway surface. This is typically achieved by binding particles together to create a hardened surface that resembles a paved road except that the surface is not uniformly flat. Dust suppression applied as required or at least two times per year can reduce PM/PM_{10} emissions.

4.12. Dust Suppression on Storage Piles

Potential dust suppression measures for storage piles include enclosures, windscreens, wet suppression, installation of permanent covers on closed stockpile areas and best management practices. Enclosures and wind screens are effective only for small storage piles. Wet suppression may cause operational problems in freezing weather, and run-off water control may be required based on the nature of the material stored.

4.13. Dust Suppression for Material Handling

Potential dust suppression measures for material handling includes minimizing material drop heights, enclosures, windscreens, wet suppression and best management practices. Enclosures and wind screens are effective only for small and easily enclosed material handling areas. Wet suppression may cause operational problems in freezing weather, and run-off water control may be required based on the nature of the material being handled

5. Mining

5.1. Overview of Mining

The nonferrous metal ore is extracted from the earth in an open-pit mine. First the earth and glacial till (overburden) on top of the hard, consolidated bedrock are removed with excavators and loaded into haul trucks. These materials will be stockpiled near the mine pits to minimize the time for haul truck round trips. Some of these materials will be processed to produce cover materials, clay for stockpile foundation and liner systems, roadbed material, and rock suitable for construction of berms, dams and other purposes. The processing operations are discussed in Sections 7 and 8.

The waste rock and lean ore will require drilling and blasting prior to excavation. The waste rock and lean ore will be loaded into trucks with excavators and then segregated and stockpiled based on the mineral and sulfur content of the material in a manner which minimizes environmental impacts. The waste rock or lean ore will be transported to and unloaded at the appropriate stockpile.

The ore will be mined in a similar manner as the waste rock. After loading into haul trucks with excavators, the ore will be trucked out of the pit to the Rail Transfer Hopper. The ore will be transported to the Process Plant via rail. Ore will also be placed in a surge pile as needed to maintain a steady supply to the Process Plant.

This section (Mining Emission Control Technology Review - Section 5) will review emission control technologies for control of fugitive particulate emissions from material activities such as:

- Drilling and blasting
- Operation of earth-moving equipment
- Material drops during truck loading and unloading
- Haul truck traffic on mine roads
- Wind erosion from storage piles

Fugitive dust emissions are particulate emissions which occur from the mechanical disturbance of granular material exposed to the air. These emissions are termed “fugitive” because they are not discharged to the atmosphere in a confined flow stream. The dust-generation process is caused by two basic physical phenomena:

1. Pulverization and abrasion of surface materials by application of mechanical force through implements.

2. Entrainment of dust particles by the action of turbulent air currents associated with wind blowing across open areas or piles and through materials as they are dropped for transfer.

The individual fugitive dust sources are listed in Tables 1 and 2 of RS57B.

5.2. Identify Potential PM and PM_{10} Emission Control Technologies

Control technologies available for each emitted pollutant must be identified as the first step in a top-down Emission Control Technology Review. Descriptions of the various PM control technologies are discussed in Section 4.0 and Table 5.1. Potential control technologies for PM emissions are the following:

- Add-on controls such as baghouses, wet scrubbers and ESP's.
- Work practices for minimizing dust emissions.

5.3. Eliminate Technically Infeasible PM and PM_{10} Emission Controls for Mining Activities

Table 5.1 provides a list of potential control technologies for mining activities and summarizes technical feasibility.

Table 5.1 PM / PM_{10} Emission Control Technology Feasibility Analysis for Mining Activities

Technology	Description	Feasible? Yes or No	Reason Not Feasible
Add-on controls	Fabric filters, wet scrubbers, and electrostatic precipitators.	No	Mining activities take place in the open, and cannot be contained because mining operations shift locations as mining progresses
Good design methods & operating practices	Minimize emissions through operating methods, procedures, and selection of raw materials.	Yes	

5.4. Rank Remaining PM and PM_{10} Controls by Effectiveness

Emissions control effectiveness was evaluated for the remaining control technologies. The control equipment effectiveness analysis can be summarized as follows:

Table 5.2 PM / PM_{10} Control Technology Ranking for Mining Activities

Rank	Technology	Typical % Efficiency	Outlet Concentration
1	Good design methods & work practices	NA	NA

5.5. Evaluation of PM and PM_{10} Control Technologies

The only remaining alternative is to employ good work practices for minimizing dust generation as a result of mining activities.

5.6. Select Emission Control Technology for Fugitive PM and PM_{10} Emissions

PolyMet will follow industry best practices for controlling fugitive dust emissions.

PolyMet will prepare and implement a fugitive emission control plan which describes the measures PolyMet will take to control these emissions. PolyMet's preliminary fugitive emission control plan is located in Attachment A of this report. Dust control measures listed in the plan will be consistent with dust control techniques used by other mining facilities in the area. Examples of typical dust control measures include:

Table 5.3 Summary of PM Control Technologies for Fugitive Dust Emissions

Process	Control Technology	Applicable Locations
Stockpiles	Enclosures and Windscreens	Potential application of enclosures and wind screens is limited to construction rock crushing and overburden screening sites where stockpiles are of limited size and operations occur at a stationary location.
	Wet suppression	Wet Suppression is not an effective control method for stockpiles at the Mine Site. Particulate emissions from wind erosion from stockpiles are low due to the low silt content of the stockpiles materials.
	Best management practices	Best Management Practices apply to all stockpiles at the Mine Site
Loading/Unloading operation	Enclosures	Potential application of enclosures is limited to construction rock crushing and overburden screening sites where and operations occur at a stationary location, and equipment sizes are small enough that enclosures are practical.
	Wet suppression	Wet Suppression may be an appropriate control method for material transfers at construction rock crushing equipment at the Mine Site where operations occur at a stationary location. The natural moisture content of the overburden precludes additional control from water sprays.
	Best management practices	Best Management Practices apply to all loading and unloading operations at the Mine Site
Vehicle traffic	Wet suppression Physical stabilization Speed limits	Applicable to all unpaved roads at the Mine Site

Dust control measures selected will be based on control effectiveness and the practicality of implementing such measures at each particular fugitive dust source taking into account location, availability of water or other dust suppressants, chemical properties of the material handled, weather, nature of the mining equipment used, size of stockpiles and the type of operation being performed. The fugitive dust control measures listed above are consistent with recent BACT determination for the mining and metallic ore processing industries The RBCL clearinghouse information for these sources is summarized in Attachment C, Table C-1A and Table C-1B for fugitive dust sources.

Observation of fugitive visible emissions at mining operations will trigger an investigation, and if needed, corrective action per the Mines Site Fugitive Dust Control Plan.

6. Rail Transfer Hopper

6.1. Overview of Rail Transfer Hopper

PolyMet will use a railroad to transport the ore from the mine to its Process Plant which is about eight (8) miles from the Mine Site. Use of rail lines will minimize road traffic and the resultant dust emissions which would be associated with using mining haul trucks. Ore from the mine will be delivered to the Rail Transfer Hopper by mine haul trucks. The hopper is designed so the haul trucks can drive up an embankment to the hopper and discharge their loads directly into the hopper. Ore will be dropped into the hopper from two sides. This allows space for three haul trucks to be at the hopper at once. The bottom of the hopper has a large apron feeder which moves the ore into rail cars. Because the Rail Transfer Hopper is at a fixed location, it is being evaluated for possible application of add-on particulate controls.

Emission Control Technology Review Attachment D contains a photo of the existing LTVSMC Rail Transfer Hopper (Figure 1) and Figures 2, 3 and 4 are drawings of the proposed hopper for the Mine Site.

6.2. Identify Potential PM and PM_{10} Emission Control Technologies

Particulate matter emissions are the result of material drops as ore is dumped from the haul trucks into the Rail Transfer Hopper and when ore is loaded into rail cars from the hopper.

Table 6.1 PM / PM_{10} Emission Control Technology Feasibility Analysis for Mining Activities

Technology	Description	Feasible? Yes or No	Reason Not Feasible
Add-on controls	Fabric filters, wet scrubbers, and electrostatic precipitators.	No	The Rail Transfer Hopper is a large open structure which cannot be enclosed. Rail car loading cannot be enclosed. Rail cars must be accessible to manage car loading and the loading area be accessible for spill clean up,
Good design methods & operating practices	Minimize emissions through operating methods, procedures, and selection of raw materials.	Yes	

Particulate controls for emissions from truck dumping into the Rail Transfer Hopper are infeasible because:

- The haul truck drivers must have a clear view of the hopper in order to safely back up to the hopper and discharge their loads. Trucks must also have room to maneuver around the top of the hopper as they drive into and out of the unloading area. As shown in Figures 2 through 4, ore is unloaded into the hopper from two sides of the hopper. The hopper opening is 60 ft x 120 ft. The trucks are 24.3 ft wide, 42.25 ft long and the top of the truck bed is raised to 43.3 ft for unloading (based on use of Caterpillar 793C haul trucks, other similarly sized trucks may also be used). Given the need for a clear view of the unloading site, the space needed for truck maneuverability and the massive size of the haul trucks; it would not be feasible to build an enclosure around the hopper which could effectively shelter unloading operations from the wind because the structure would have to be open on two sides to accommodate haul truck operation.

- Hoods for collecting dust from haul truck dumping cannot be located close enough to the point of dust generation to be effective. Given the size and depth of the hopper, it is not possible to locate a dust collection hood close enough to the point of dust generation to be effective. The open area at the top of the hopper is 60 ft x 120 ft, and the hopper is 40 ft deep. Based on these dimensions, the closest a hood could be located to the point of dust generation is 20 ft – 30 ft. This is not close enough for effective dust collection. In addition, a dust collection hood could not be located below the truck discharge because large ore chunks would damage the hood as they fall out of the truck and into the hopper.

Particulate controls for emissions from rail car loading out of the Rail Transfer Hopper are infeasible because:

- The Rail Transfer Hopper operator must have a clear view of the ore train, the railcar loading area, and the surrounding area for safe operation. Dust collection hoods located directly over the car or on the side of the car opposite the conveyor would restrict the operator's view of loading operations. There is no room between the rail car and the hopper wall for dust collection hoods.

- Because of the large size of the ore being loaded and the unpredictable flow from the apron feeder, large pieces of ore sometimes overshoot the rail car. The rail car loading area must also be accessible by heavy equipment to clean up this spillage. Equipment capable of handling boulders four feet in diameter will be needed for the clean up operations.

- Hoods for collecting dust from rail car loading cannot be located close enough to the point of dust generation to be effective. The apron feeder and hopper door configuration prevent location of dust collection hoods over the top of the rail car. Large ore chunks would damage any dust collection hoods located close to the drop point of the load-out conveyor. As noted above chunks of ore may be up to four feet in diameter.

- Water sprays for dust mitigation are not feasible. The non-ferrous ore contains metallic sulfides. Water coming in contact with the ore creates the potential for acidic water runoff due to the sulfides in the ore. In addition, water sprays could not be used during freezing weather.

6.3. Rank Remaining PM and PM_{10} Controls by Effectiveness

Emissions control effectiveness was evaluated for the remaining control technologies. The control equipment effectiveness analysis can be summarized as follows:

Table 6.2 PM / PM_{10} Control Technology Ranking for Mining Activities

Rank	Technology	Typical % Efficiency	Outlet Concentration
1	Good design methods & work practices	NA	NA

6.4. Evaluation of PM and PM_{10} Control Technologies

The only remaining alternative is to employ good work practices for minimizing dust generation as a result of mining activities.

6.5. Select Emission Control Technology for Rail Car Loading PM and PM_{10} Emissions

PolyMet will include provisions for the Rail Transfer Hopper in its fugitive emission control plan. See Section 5 and Attachment B of this report. As previously noted, dust control measures incorporated in the plan will be consistent with dust control techniques used by other mining facilities in the area.

7. Overburden Screening

7.1. Overview of Overburden Processing

Overburden is comprised of the soil, clay, and glacial till which cover the bedrock. It must be removed from the site before the site can be mined. Earth-moving equipment will be used to clear the site of overburden and stockpile it for further use. The overburden will be screened to segregate the soils and clay from aggregate and loose rocks. Larger rocks may be crushed to produce materials for construction purposes as necessary (see Section 8). The natural moisture content of the overburden makes this a lower emitting process prior to the consideration of emission control techniques.

The soils will be used as cover materials for waste stockpiles. This will allow vegetative cover to grow on top of the piles.

Clay will be collected for use as construction material for the stockpile foundation and liner systems.

Aggregate and crushed rock will be used construction of stockpile foundations, roads, berms, dams and other construction purposes.

Particulate matter emissions which potentially could be controlled by add-on control devices include material drops into the screener and screener operations. The remaining emission sources from overburden processing are fugitive emissions. These emissions are addressed in the fugitive emission control plan.

7.2. Identify Potential PM and PM_{10} Emission Control Technologies

Because screening operations will be in a fixed location for extended periods of time, it may be feasible to enclose the screener emission points and route them to a control device. Table 7.1 provides a list of potential control technologies for material handling and summarizes technical feasibility.

Table 7.1 Material Handling PM / PM_{10} Emission Control Technology Feasibility Analysis

Technology	Description	Feasible? Yes or No	Reason Not Feasible
Fabric filter (baghouse)	A fabric filter, or baghouse, consists of a number of fabric bags placed inside an enclosure. Particulate matter is collected on the surface of the bags as the gas stream passes through them. The particulate is periodically removed from the bags and collected in hoppers located beneath the bags.	Yes	
Wet scrubber	Wet scrubbers remove particles from waste gas by capturing the particles in liquid droplets (usually water) and separating the droplets from the gas stream. The droplets transport the particulate out of the gas stream.	Yes	
Electrostatic precipitator	An electrostatic precipitator applies electrical forces to separate particles from the flue gas stream. Particles are given an electrical charge. The charged particles are attracted to and collected on oppositely charged collector plates. Particles on the collector plates are released by rapping and fall into hoppers for collection and removal.	No	No - Low flow sources The flow rate for the overburden screening sources is below the capacity of commercially available equipment.
Wet electrostatic precipitator	A wet ESP operates on the same collection principles as a dry ESP, and uses a water spray to remove particulate matter from the collection plates.	No	No - Low flow sources The flow rate for the overburden screening sources is below the capacity of commercially available equipment.
Centrifugal separation (e.g. cyclones)	Cyclone separators are designed to remove particles by causing the exhaust gas stream to flow in a spiral pattern inside of a tube. Owing to centrifugal forces, the larger particles slide down the wall and drop to the bottom of the cyclone where they are removed. The cleaned gas flows out of the top the cyclone.	No	No - Low flow sources The flow rate for the overburden screening sources is below the capacity of commercially available equipment.
Good design methods & operating practices	Minimize emissions through operating methods, procedures, and selection of raw materials.	Yes	

7.3. Rank Remaining PM and PM_{10} Controls by Effectiveness

Fabric filters are the most effective control technology in this application. The control technology rankings are as follows:

Table 7.2 Lime/Limestone Processing PM / PM_{10} Control Technology Ranking

Rank	Technology	Typical % Efficiency
1	Fabric filter (baghouse)	98 – 99+
2	Wet scrubber	95 – 99+
3	Good design methods & operating practices	NA

7.4. Evaluation of PM and PM_{10} Control Technologies

Fabric filters are the most effective control technology available for controlling the overburden screening PM/PM_{10} emissions and provide the least environmental impact (i.e. wet scrubbing would require water discharge handling and treatment).

However, overburden screening operations are not large enough sources for controls to be cost effective. Control costs were estimated by assuming a 1 gr/dscf loading and back calculating the air flow rate (152 acfm). The air flow rate was used to calculate control equipment costs. This cost estimate does not include the cost of installing enclosures; so, the actual installed costs will be higher. Table 7.3 summarizes the control cost analysis. At over $60,000 per ton of particulate removed, add-on controls are economically infeasible.

Table 7.3 Evaluation of Most Effective PM/PM_{10} Control Technologies for Overburden Screening Sources

Control Technology	Outlet Concentration	Emission Reduction T/yr	Installed Capital Cost $	Annualized Operating Cost $/yr	Pollution Control Cost $/ton
Wet scrubber	0.006 gr/dscf*	3.88	$21,005	$244,072	$62,954
Baghouse	0.0025 gr/dscf*	3.89	$49,042	$248,299	$63,820

*Total PM as measured by EPA Methods 5 (filterable) and 202 (condensable)

The detailed cost analysis for overburden screening is located in Attachment E to this report.

7.5. Select Emission Control Technology for PM and PM_{10}

No controls are recommended for overburden screening. Therefore PolyMet will implement good work practices for managing emissions from overburden screening. PolyMet will include provisions for overburden screening in its fugitive emission control plan. See Section 5 and Attachment B of this report. As previously noted, dust control measures incorporated in the plan will be consistent with dust control techniques used by other mining facilities in the area.

A 7% opacity limit is recommended as BACT for visible emissions from portable crushing and screening equipment at which particulate emissions are vented through a stack or similar opening (i.e. the average opacity of material handling equipment cannot exceed 7% for more the one 6-minute period during an hour). A 7% opacity limit is consistent with the requirements of the applicable NSPS (Subpart OOO). If PolyMet identifies visible emissions from stacks at crushing and screening equipment, it will take corrective action as soon as it is practicable to do so.

Observation of fugitive visible emissions at portable crushing and screening equipment will trigger an investigation, and if needed, corrective action per the Mines Site Fugitive Dust Control Plan.

8. Portable Crushing Plant

8.1. Overview of the Portable Crushing Operation

Large rocks will be separated from the other overburden materials as discussed in Section 7. These large rocks may be crushed to produce materials suitable for construction purposes through the use of a portable crushing plant. Other rock approved for construction purposes by the Minnesota Department of Natural Resources may also be crushed at the Mine Site.

It was assumed that a two-stage crusher/screener system will be used to generate the properly-sized crushed rock for use in the construction of roads, dikes, berms and for other construction purposes. The emission calculations for the portable crushing plant are based on the use of water sprays to reduce dust emissions to meet the NSPS or other applicable requirements. This is standard practice for portable crushing plants in the area. Other control technologies with similar effectiveness may be used in lieu of the water sprays.

Particulate matter emission sources for the crushing operations which potentially could be controlled by add-on control devices include material drops into the crusher, crusher operations, and screener operations. The remaining emission sources from waste rock processing are fugitive emissions. These emissions are addressed in the fugitive emission control plan.

8.2. Identify Potential PM and PM_{10} Emission Control Technologies

Because the portable crushing plant will potentially be in a fixed location for extended periods of time, it may be feasible to enclose the emission points and route them to a control device. Table 7.1 provides a list of potential control technologies for the crushing operation and summarizes technical feasibility.

Table 8.1 Portable Crushing Plant PM / PM_{10} Emission Control Technology Feasibility Analysis

Technology	Description	Feasible? Yes or No	Reason Not Feasible
Fabric filter (baghouse)	A fabric filter, or baghouse, consists of a number of fabric bags placed inside an enclosure. Particulate matter is collected on the surface of the bags as the gas stream passes through them. The particulate is periodically removed from the bags and collected in hoppers located beneath the bags.	Yes	
Wet scrubber	Wet scrubbers remove particles from waste gas by capturing the particles in liquid droplets (usually water) and separating the droplets from the gas stream. The droplets transport the particulate out of the gas stream.	Yes	
Electrostatic precipitator	An electrostatic precipitator applies electrical forces to separate particles from the flue gas stream. Particles are given an electrical charge. The charged particles are attracted to and collected on oppositely charged collector plates. Particles on the collector plates are released by rapping and fall into hoppers for collection and removal.	No	No - Low flow sources The flow rate for the overburden screening sources is below the capacity of commercially available equipment.
Wet electrostatic precipitator	A wet ESP operates on the same collection principles as a dry ESP, and uses a water spray to remove particulate matter from the collection plates.	No	No - Low flow sources The flow rate for the overburden screening sources is below the capacity of commercially available equipment.
Centrifugal separation (e.g. cyclones)	Cyclone separators are designed to remove particles by causing the exhaust gas stream to flow in a spiral pattern inside of a tube. Owing to centrifugal forces, the larger particles slide down the wall and drop to the bottom of the cyclone where they are removed. The cleaned gas flows out of the top the cyclone.	No	No - Low flow sources The flow rate for the overburden screening sources is below the capacity of commercially available equipment.
Good design methods & operating practices	Minimize emissions through operating methods, procedures (e.g. use of water sprays when feasible), and selection of raw materials.	Yes	

8.3. Rank Remaining PM and PM_{10} Controls by Effectiveness

Fabric filters are the most effective control technology in this application. The control technology rankings are as follows:

Table 8.2 Portable Crushing Plant PM / PM_{10} Control Technology Ranking

Rank	Technology	Typical % Efficiency
1	Fabric filter (baghouse)	98 – 99+
2	Wet scrubber	95 – 99+
3	Good design methods & operating practices(e.g. use of water sprays when feasible)	NA

8.4. Evaluation of PM and PM_{10} Control Technologies

Fabric filters are the most effective control technology available for controlling the portable crushing plant PM/PM_{10} emissions and provide the least environmental impact (i.e. wet scrubbing would require water discharge handling and treatment).

However, the crushing operations at the Mine Site are not large enough sources for add-on control equipment to be cost effective. Control costs were estimated by assuming a 1 gr/dscf loading and back calculating the air flow rate (133 acfm). The air flow rate was used to calculate control equipment costs. This cost estimate does not include the cost of installing enclosures; so, the actual installed costs will be higher. Table 7.3 summarizes the control cost analysis. At over $49,000 per ton of particulate removed, add-on controls are economically infeasible.

Table 8.3 Evaluation of Most Effective PM/PM_{10} Control Technologies for Portable Crushing Plant Sources

Control Technology	Outlet Concentration	Emission Reduction T/yr	Installed Capital Cost $	Annualized Operating Cost $/yr	Pollution Control Cost $/ton
Wet scrubber	0.006 gr/dscf*	4.96	$19,415	$243,907	$49,143
Baghouse	0.0025 gr/dscf*	4.98	$45,324	$247,787	$49,749

*Total PM as measured by EPA Methods 5 (filterable) and 202 (condensable)

The detailed cost analysis for the portable crushing plant is located in Attachment F to this report.

8.5. Select Emission Control Technology for PM and PM_{10}

No controls are recommended for the portable crushing plant. Therefore, work practices are the only remaining control option. PolyMet will implement good work practices for managing emissions from the portable crushing plant. PolyMet will include provisions for the portable crushing plant in its fugitive emission control plan. See Section 5 and Attachment B of this report. As previously noted, dust control measures incorporated in the plan will be consistent with dust control techniques used by other mining facilities in the area.

A 7% opacity limit is recommended as BACT for visible emissions from portable crushing and screening equipment at which particulate emissions are vented through a stack or similar opening (i.e. the average opacity of material handling equipment cannot exceed 7% for more the one 6-minute period during an hour). A 7% opacity limit is consistent with the requirements of the applicable NSPS (Subpart OOO). If PolyMet identifies visible emissions from stacks at crushing and screening equipment, it will take corrective action as soon as it is practicable to do so.

Observation of fugitive visible emissions at portable crushing and screening equipment will trigger an investigation, and if needed, corrective action per the Mines Site Fugitive Dust Control Plan.

9. Emergency Generator

9.1. Overview of Emergency Generator

PolyMet will have a diesel-powered emergency generator at the Mine Site WWTF to supply electricity to critical equipment in the event of a power failure, or other emergency. The nominal capacity of emergency generator is 500 kW; it is not sized to operate the entire WWTF. The emergency generator will only be operated for testing purposes and emergency conditions.

It is expected that the emergency generator will rarely be operated for extended periods of time as emergency events requiring its use should be infrequent. The most likely operating scenario is operation for short periods of time to make sure the generator is fully functional and available for operation should an emergency arise. The emission unit and stack number of the generator is listed in Attachment A, Table A-1.

The control technology review for the diesel-powered emergency generator will include emergency equipment classification (EEC) as a control option. This means that these sources will only operate for a limited number of hours for testing purposes (< 100 hrs/yr), and under emergency conditions.

9.2. Identify Potential PM and PM_{10} Emission Control Technologies

Control technologies available for each emitted pollutant must be identified as the first step in a top-down Emission Control Technology Review. Potential control technologies for PM emissions are the following:

- Good combustion practices
- Emergency equipment classification
- Oxidation catalyst
- Diesel filter

9.3. Eliminate Technically Infeasible PM and PM_{10} Emission Controls

Table 9.1 summarizes the technical feasibility of particulate control technologies for emissions from diesel generators. The identified control technologies for PM emissions control are all technically feasible.

Table 9.1 Technical Feasibility of PM Control Technologies for Emergency Diesel Generators and Pumps

Summary of Control Technology Feasibility		
Technology	**Description**	**Feasible? Yes or No**
Good combustion practices	Good combustion practices are preventative measures that minimize the release of pollutants into the environment. Good combustion practices may include the proper design and maintenance of equipment, good housekeeping, and good operating practices.	Yes
Emergency equipment classification	The proposed emergency diesels are classified as emergency equipment that is anticipated to operate no more than 100 hours per year for testing purposes, and under emergency conditions. This limitation will effectively minimize particulate matter emissions.	Yes
Oxidation catalyst	Add-on control using precious metals impregnated onto a high geometric surface area carrier that is placed in the exhaust stream.	Yes
Diesel filter	Add-on control consisting of a filter positioned in the exhaust stream	Yes

9.4. Rank Remaining PM and PM_{10} Controls by Effectiveness

Particulate control technologies applicable to emergency generators are ranked based on control effectiveness in Table 9.2.

Table 9.2 Ranking of Remaining Control Technologies for Emergency Diesel Generators and Pumps

PM Control Technology Ranking		
Rank	**Technology**	**Estimated Control Efficiency**
1	Emergency equipment classification	Minimum 98%
2	Diesel filter	90%
3	Oxidation catalyst	30%
4	GCP	Varies by design

A 98% control efficiency represents 100 hour per year of operation for testing and 100 hours per year of emergency operations.   Hours of operation under emergency conditions will vary from year to year, and under extreme conditions may exceed 100 hours per year.

Oxidation catalyst is primarily used for CO and VOC control. It is only effective on organic particles resulting from incomplete fuel combustion, so it does not have a high control efficiency for particulates.

9.5. Evaluation of PM and PM_{10} Control Technologies

Oxidation catalyst and diesel filters can be eliminated as control technologies based on excessive dollar per ton control cost values.

Table 9.3 Evaluation of Most Effective PM / PM_{10} Control Technologies for Emergency Generators and Pumps

Control Technology	Control Eff %	Emission Reduction T/yr	Installed Capital Cost $	Annualized Operating Cost $/yr	Pollution Control Cost $/ton
Emergency equipment classification	Minimum 98%	6.97 *	NA	NA	Site-specific
Good combustion practices	Varies by design	NA	NA	NA	Site-specific
Oxidation catalyst	30%	0.12	$387,072	$42,498	$349,101
Diesel filter	90%	0.37	$30,129	$4,243	$11,618

*for 8760 hrs.

Detailed control cost calculations for Table 9.3 are in Emission Control Technology Review Attachment G – Diesel Powered Emergency Equipment Control Cost Calculations.

9.6. Select Emission Control Technology for PM and PM10

Emergency equipment classification combined with good combustion practices is ranked as the highest control efficiency technology. Therefore, emergency equipment classification combined with good combustion practices is an appropriate emissions control for control for PM emissions.

A 10% opacity limit is recommended as BACT for visible emissions from emergency generators (i.e. the average opacity of the emergency diesel exhaust cannot exceed 10% for more the one 6-minute period during an hour). A 10% opacity limit is consistent with the median of BACT determination for visible emission from emergency diesel engines as found in the RBLC. If PolyMet identifies visible emissions from emergency generators in excess of 10%, it will take corrective action as soon as it is practicable to do so. When this equipment is operating under emergency conditions, corrective action may be delay until the emergency condition is over. Emergency equipment is exempt from opacity limits during startup until the time that the diesel engine reaches proper operating temperatures.

10. Propane Fired Space Heaters

10.1. Overview of Space Heater Operation

Propane fired space heaters will be used to provide heat in the Mine Site WWTF building. Total space heater capacity is rated at 8.3 MMBtu/hr. Pollutants emitted from the space heaters include: PM, PM_{10}, SO_2, NO_x, CO, VOC. The space heaters will be subject to Emission Control Technology Review using BACT guidelines for PM and PM_{10}. All emissions result from combustion of propane.

Particulate emissions from propane combustion are typically low. Particulate matter is generated during incomplete combustion. All particulates are assumed to be PM_{10}. Uncontrolled emissions were determined using AP-42 emission factors for propane combustion in commercial boilers (0.4 lb/Mgal PM/PM_{10}). The emission factors are equivalent to a particulate concentration of 0.003 gr/dscf, as calculated using the EPA Method 19 “F” factor for flue gas volumes generated by propane combustion. The F factor flow rate was adjusted to 3% oxygen in the exhaust gas; this is typical of space heating equipment, heaters and boilers following good combustion practices.

10.2. Identify Potential PM and PM_{10} Emission Control Technologies

Control technologies available for each emitted pollutant must be identified as the first step in a top-down Emission Control Technology Review. Descriptions of the various PM control technologies are discussed in Section 4.0 and Table 10.1. Potential control technologies for particulate emissions are the following:

- Fabric filter (baghouse)
- Wet scrubber
- Electrostatic precipitator
- Wet electrostatic precipitator
- Centrifugal separation (cyclones)
- Inertial separators (drop-out box)
- Good design methods and good combustion practices

10.3. Eliminate Technically Infeasible PM and PM_{10} Emission Controls

Table 10.1 summarizes the technical feasibility of each particulate control technology on the space heaters. At particulate concentrations of 0.003 gr/dscf, use of add-on controls for propane-fired combustion sources is technically infeasible because this particulate concentration level is at the limits of PM emissions control technology. In addition, particulates from propane, combustion are primarily condensable particulates. Condensable PM is not readily removed by these control devices.

Table 10.1 Technical Feasibility of PM/PM_{10} Control Technologies for the Space Heating

Technology	Description	Feasible? Yes or No	Reason Not Feasible
Fabric filter (baghouse)	A fabric filter, or baghouse, consists of a number of fabric bags placed inside an enclosure. Particulate matter is collected on the surface of the bags as the gas stream passes through them. The particulate is periodically removed from the bags and collected in hoppers located beneath the bags.	No	PM concentrations to low for control
Wet scrubber	Wet scrubbers remove particles from waste gas by capturing the particles in liquid droplets (usually water) and separating the droplets from the gas stream. The droplets transport the particulate out of the gas stream.	No	PM concentrations to low for control
Electrostatic precipitator	An electrostatic precipitator applies electrical forces to separate particles from the flue gas stream. Particles are given an electrical charge. The charged particles are attracted to and collected on oppositely charged collector plates. Particles on the collector plates are released by rapping and fall into hoppers for collection and removal.	No	PM concentrations to low for control
Wet electrostatic precipitator	A Wet ESP operates on the same collection principles as a dry ESP, and uses a water spray to remove particulate matter from the collection plates.	No	PM concentrations to low for control
Centrifugal separation (e.g. cyclones)	Cyclone separators are designed to remove particles by causing the exhaust gas stream to flow in a spiral pattern inside of a tube. Owing to centrifugal forces, the larger particles slide down the wall and drop to the bottom of the cyclone where they are removed. The cleaned gas flows out of the top the cyclone.	No	PM concentrations to low for control
Good design methods & good combustion practices	Minimize emissions through operating methods, procedures, and selection of raw materials. The boilers will use clean fuels (natural gas), and good combustion practices.	Yes	

10.4. Rank Remaining PM and PM_{10} Controls by Effectiveness

The only remaining control technology for control of PM emission from the space heaters is good burner design and good combustion practices.

Table 10.2 Ranking of Remaining PM/PM$_{10}$ Control Technologies for Space Heating

PM / PM$_{10}$ Control Technology Ranking		
Rank	**Technology**	**% Efficiency**
1	Good burner design & good combustion practices	NA Base case

10.5. Evaluation of PM and PM$_{10}$ Control Technologies

Since good burner design and operating practices are inherent to the process, no additional cost will be incurred.

Table 10.3 Evaluation of Most Effective PM/PM$_{10}$ Control Technologies for the Space Heating

Control Technology Effectiveness Evaluation					
Rank	**Technology**	**Amount Removed (tpy)**	**% Reduction**	**Annualized Cost ($MM)**	**Control Cost ($/ton removed)**
1	Good burner design & good combustion practices	NA Inherent controls	NA Inherent controls	NA	NA

10.6. Select Emission Control Technology for PM and PM$_{10}$

The emission control technology selected for PM/PM$_{10}$ for the propane fired space heaters is good burner design and use of good combustion practices to minimize particulate emissions from incomplete combustion. The space heater will be operated and maintained within manufacturer recommended ranges.

No performance standards or mass emission limits are recommended for the space heater due to their small size.

Attachment A

Sources Subject to Emission Control Technology Review and Proposed Mass Emission Limits

PolyMet Air Quality Permit Application
NorthMet Project   Hoyt Lakes, MN
Mine Site ECTR Report - Attachment A - Emission Units Subject to ECTR
Table A-1: Emission Unit Summary and Proposed Mass Emission Limits

Stack ID	Emission Unit ID	Emission Unit Description	APCD ID	Source Type	BACT PM10 Limit lb/hr 3-Hr Avg	BACT PM Limit lb/hr 3-Hr Avg
Mine Site Point Sources						
Stack ID	Emis Unit	Source	Cont Equip			
SV 226	EU 229	Mine Diesel Fuel Tank #1	NA	Tank Vent	NA	NA
SV 227	EU 230	Mine Diesel Fuel Tank #2	NA	Tank Vent	NA	NA
SV 338	EU 345	Mine Diesel Fuel Tank #3	NA	Tank Vent	NA	NA
SV 326	EU 332	WWTP Back up Generator	NA	Emerg Diesel	1.62	1.62
WWTP	EU 331	WWTF Propane Fired Space Heaters	NA	Space Heater	NA	NA
					NA if < 0.1 lb/hr	NA if < 0.1 lb/hr
Mine Site Fugitive Sources						
EASTP	FS 001	Surface Overburden, Truck Load - East (ESP)	NA	Mtl Hand Fug	NA	NA
WESTP	FS 001	Surface Overburden, Truck Load - West (WSP)	NA	Mtl Hand Fug	NA	NA
OBSRMH	FS 014	Surface Overburden, Truck Unload - storage pile	NA	Mtl Hand Fug	NA	NA
OBSRMH	FS 015	Surface Overburden, Screening	NA	Mtl Hand Fug	NA	NA
OBSRMH	FS 039	Surface Overburden, Screen Discharge	NA	Mtl Hand Fug	NA	NA
OBSRMH	FS 019	Surface Overburden, Truck Reload	NA	Mtl Hand Fug	NA	NA
OBSKMH	FS 002	Surface Overburden, Truck Unload - SW	NA	Mtl Hand Fug	NA	NA
EASTP	FS 004	Cat 1/2 Waste Rock, Truck Load East	NA	Mtl Hand Fug	NA	NA
EASTP	FS 050	Blast Hole Drilling Cat 1/2 WR East	NA	Mtl Hand Fug	NA	NA
EASTP	FS 005	East Waste Rock, Truck Unload - Cat 1/2	NA	Mtl Hand Fug	NA	NA
EASTP	FS 007	Ore, Truck Load East	NA	Mtl Hand Fug	NA	NA
LPMH	FS 009	East Ore, Truck Unload - Rail Transfer Hopper	NA	Mtl Hand Fug	NA	NA
C4LOMH	FS 020	East Ore, Truck Unload - Stockpile	NA	Mtl Hand Fug	NA	NA
LPMH	FS 010	East Ore, Railcar Load	NA	Mtl Hand Fug	NA	NA
AABB	FS 011	Mine Haul Roads, Segment AA to BB	NA	Traffic Fug	NA	NA
FS012A	FS 012	Unpaved Roads, Dunka Rd. A (Haul Trucks)	NA	Traffic Fug	NA	NA
RFCRD	FS 049	Fueling Facility Circle	NA	Traffic Fug	NA	NA
WEC12	FS 013	Cat 1 & 2 Stockpile Wind Erosion	NA	Stockpile Fug	NA	NA
WEC3WR	FS 022	Cat 3 Waste Rock Stockpile Wind Erosion	NA	Stockpile Fug	NA	NA
WEC3LO	FS 040	Cat 3 Lean Ore East Stockpile	NA	Stockpile Fug	NA	NA
WEC4WR	FS 041	Cat 4 Waste Rock Stockpile	NA	Stockpile Fug	NA	NA
WEC4LO	FS 042	Cat 4 Lean Ore/Surge Stockpile	NA	Stockpile Fug	NA	NA
WEOBSG	FS 043	Overburden Storage Pile Wind Erosion	NA	Stockpile Fug	NA	NA
WEOBSK	FS 044	Overburden Stockpile Wind Erosion	NA	Stockpile Fug	NA	NA
C12MH	FS 017	Surface Overburden, Truck Load - Cat 1/2	NA	Mtl Hand Fug	NA	NA
OBSRMH	FS 045	Surface Overburden, Truck Unload, storage pile	NA	Mtl Hand Fug	NA	NA
OBSRMH	FS 046	Surface Overburden, Screening	NA	Mtl Hand Fug	NA	NA
OBSRMH	FS 047	Surface Overburden, Screen Discharge	NA	Mtl Hand Fug	NA	NA
OBSRMH	FS 048	Surface Overburden, Truck Reload	NA	Mtl Hand Fug	NA	NA
OBSKMH	FS 018	Surface Overburden, Truck Unload - Stockpile	NA	FS 041	NA	NA
Dup	FS 021	Overburden Haul - storage pile - Cat 1/2	NA	Stockpile Fug	NA	NA
OBSRMH	FS 023	Primary Crushing	NA	Mtl Hand Fug	NA	NA
		Screening				
		To Product Conveyor				
		Conveyor to Secondary Crushing (2 transfers)				
		Secondary Crushing				
		Screening				
		Return Conveyor (2 transfers)				
		Product to Stock Pile				
		Truck Loading				
Note: not all segments of multi segmented sources listed. Only the first segment in the emission inventory is listed						

Attachment B

NorthMet Mine Site Fugitive Emission Control Plan

Hoyt Lakes, Minnesota
STANDARD PROCEDURE

MINE SITE FUGITIVE EMISSION CONTROL (FEC) PLAN

General Manager's Approval ______________________ Manager's Approval ____________________________ Initiator ____________________________	Date Effective 2/14/07	SP Number ER09
History: 2/15/07 – ER09 - preliminary version to support Detailed Project Description		

1.0 Introduction

PolyMet Mining Company (PolyMet) expects to be issued an Air Emissions Operating Permit upon completion of environmental review and processing of an Air Emissions Permit Application for its NorthMet project. The project proposes to operate a base and precious metals mine and processing plant located at Hoyt Lakes, Minnesota. This Fugitive Emission Control (FEC) Plan covers activities at the mine. **Note that this preliminary document is written to apply to the operating and fully staffed facility not the current non-operating situation and that all referenced procedures and manuals do not yet exist.**

2.0 Objectives

The objectives of the FEC Plan are to outline the basic procedures to prevent or minimize the release of fugitive emissions as required by the anticipated air emission permit. The plan outlines the practices followed to control emissions, how it will be determined when emissions require corrective action, the procedures that will be employed to manage the emissions, and the record keeping that will be used to demonstrate fugitive emission control.

The fugitive emission sources outlined in the permit application are discussed in the next section including a general description of each process involved and associated fugitive emission control procedures

3.0 Fugitive Emission Sources

The following offers a detailed overview of the operation of the fugitive emission sources and the factors relied upon to control fugitive emissions.

3.1 Drilling and Blasting

Blasting activity is conducted based on safety, noise reduction, and emission control. Several steps are taken to comply with the Minnesota Rules 6130.3800 and .3900, including:

1. Weather data obtained from Universal Weather and Aviation.

2. Aircraft fly-in service employed to monitor for proper meteorological conditions. The aircraft conducts safety surveillance and records temperatures aloft to approximately 6700 feet. PolyMet will not blast when temperature inversions and wind conditions create air overpressure beyond state and federal limits.

3. A test blast is also conducted a half-hour before each blast. Decibel readings are taken in the nearby communities to determine if it is safe, a maximum reading of 130db is allowed.

4. Proper blast agent loading and blast hole stemming alleviates noise and emissions by directing the blast energy outward, into the rock, instead of into the atmosphere.

5. Reliance on natural conditions.

The only actual fugitive emission abatements relied upon are the natural conditions of the environment, such as relative humidity, precipitation, and moisture content of the surface and refusal (waste rock and ore). The typical hygroscopic moisture content of the refusal is highly variable in a region where wet bottom mining is common.

3.2 Loading and Unloading Material

Several of the fugitive emission sources for material loading and unloading in the permit application are listed below:

FS001, FS014, FS019, FS002, FS017, FS045, FS048 and FS018	Surface overburden truck loading and unloading
FS007, FS009 and FS020	Ore truck loading and unloading
FS004 and FS005	Waste rock truck loading and unloading
FS010	Ore railcar loading

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

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 drop distance
5. The natural conditions of the environment

The drop distance from the shovel to the truck will be adjusted to minimize fugitive emissions during surface overburden truck loading (FS001, 019, 017, 048), ore truck loading (FS007) and waste rock truck loading (FS004). The drop distance at the Rail Transfer Hopper is also minimized to control fugitive emissions during ore rail loading (FS010). Fugitive emission control for material loading and dumping is contingent upon the natural conditions of the environment as mentioned previously. The fugitive emissions that may be created are minimized because of the material's large size, its natural moisture content, and the minimization of drop distances.

3.3 Haulage Roads

The emissions from transport on haulage roads and unpaved roads (FS011, FS012, and FS049) are the transport emission sources identified in the permit application. Natural conditions in the environment control fugitive emissions during material transport.

Controlling fugitive emissions from haulage and unpaved roads is important for safety as well as the environment. Standard operating procedures are in place to control these emissions, including:

1. If visible emissions are observed or reported by an equipment operator, PolyMet will investigate the condition and dispatch water trucks or other action to decrease the fugitive emissions.

2. Fugitive emission control is achieved with the application of water and/or several different MPCA approved commercial dust suppressants.

3. During the winter months, salts ($NaCl/CaCl_2$) and sand mixtures are used to enhance safety and control fugitive emissions from the roads.

4. The haulage roads are surfaced with crushed rock having low silt content, thus affording proper traction, vehicle support, minimizes tire wear, and reduces fugitive emissions.

PolyMet maintains adequate watering and/or dust suppressant application capacity to control emissions during typical summer months. PolyMet continues to evaluate new technologies in emission abatement for their effectiveness and economic feasibility.

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

The surface overburden (FS043, FS044), ore (FS042) and waste rock (FS013, FS022, FS041, FS040) including lean ore stockpiles may release minimal fugitive emissions during construction depending on:

1. Nominal size of the material
2. Dumping procedures
3. Drop distance
4. Natural conditions of the environment

Fugitive emission control during the construction is primarily dependent on natural conditions of the environment, while minimizing drop distances and the relatively large size of most of the surface and rock formation are used as control practices. Once construction is completed, PolyMet follows the Mineland Reclamation Rules set forth in Minnesota Rules. PolyMet benches and slopes the stockpile as needed, surface material and/or glacial till is normally spread over the stockpile and benches, and then vegetated. Vegetation provides structural support, erosion control, wildlife habitat, and aesthetic value.

3.5 Other Sources

Other sources of fugitive emissions include portable crushers on site and small truck traffic around the property. PolyMet will ensure that contractors control their fugitive emissions.

Dust from small truck traffic is controlled when the trucks travel on the main haul roads. Water and or dust suppressants are occasionally applied to the service roads in and around the mine area when traffic and weather conditions require.

4.0 Operating Practices and Control Measures

The operating practices and control measures that will be implemented and recorded for the significant fugitive emission sources are described/summarized below.

4.1 Truck Loading and Unloading,(FS001, FS014, FS019, FS002, FS017, FS045, FS048, FS018, FS007, FS009, FS020, FS004 and FS005) & Storage Piles (FS043, FS044, FS042, FS040, FS013, FS022 and FS041)

Primary Control: Natural moisture content
Rock size
Environmental conditions

Contingent Control: None

Practices:	Minimized the drop distance Dumping procedure
Records:	Fugitive emissions exception reporting

4.2 Haulage and Service Roads (FS011, FS012 and FS049) – haulage roads are subject to frequent haul truck traffic – service roads are subject to occasional haul truck traffic as haul trucks access fueling or maintenance facilities

Primary Control:	Water and/or dust suppressant application Rain during non-freezing conditions Snow during freezing conditions Road maintenance including crushed rock surfacing and grading
Contingent Control:	Other dust suppressant application
Practices:	Employees notify shift manager or appropriate personnel of fugitive emissions Road maintenance Water trucks
Records:	Fugitive emissions exception reporting

4.3 Railcar Loading (FS010)

Primary Control:	Environmental conditions
Contingent Control:	None
Practices:	Minimize drop distances One daily observation/check
Records:	Number of railcar loads Daily checks and corrective actions

4.4 Drilling and Blasting

Primary Control:	Natural conditions (i.e. humidity, precipitation, and moisture content)
Contingent Control:	None
Practices:	Blast under safe meteorological conditions Direct blast into rock rather than vertically into atmosphere

Test blast conducted

Records: Weather data from Universal Weather and Aviation
Decibel readings
Time and location of blast

5.0 Training

An integral part of the implementation of the FEC Plan is training the personnel involved. Specific training will be give to each person as it pertains to their job. Records of their names, dates, durations, and subjects of each training exercise will be kept. Each training exercise will cover the basics including:

1. Employee responsibilities
2. Reporting
3. Record keeping
4. Corrective actions
5. Maintenance
6. Work orders
7. Dust observation
8. Weather observations

These basic principles are taught to each employee and are addressed in the annual training log.

6.0 Records

The following records regarding fugitive emission controls will be maintained at PolyMet as required:

1. Commercial dust suppressant information (applications, permits, etc.)
2. Winter emission control activities
3. Water truck inspection and maintenance logs
4. Visible emissions exception reports
5. Work order numbers
6. Corrective action reports
7. Training records
8. MPCA Fugitive Emission Control Plan approval letter
9. Shift Coordinator’s report
10. Air Emission Inventory Reports
11. Daily checks records
12. Water and haulage truck Global Positioning System (GPS) tracking records
13. Records of truck loading and unloading

7.0 Notifications

PolyMet will comply with the MPCA notification rules as outlined in Minnesota Rules 7019.0100, for shutdowns and/or breakdowns.

Attachment C

RACT/BACT/LAER Clearinghouse Information

PolyMet Mining, Inc.
NorthMet Project Processing Plant Air Quality Permit Application
Emission Control Technology Review Report (RS58B) -Attachment C - EPA RACT BACT LAER Clearinghouse Data
Table C-1A: Fugitive PM

Mtl Hand = Mtl Trans via conveyor, hoppers, bins, crushing, grinding and loading/unloading in fixed location
Fug PM = Traffic, storage piles, transfers to piles & stackers, open dumping (e.g. loader to dump truck in quarry) and slag processing
Flyash Hand = any material handling which includes flyash or mixtures including flyash

Compiled data set for material handling and fugitive emissions from Process Codes: 12.110, 81.000, 82.000, 90.011, 90.018, 90.019, 90.020, 90.021, 90.023, 90.024, 90.026, 90.031, 90.999, 99.100, 99.999

Control Equipment Codes: P= Pollution prevention, A= Add on Controls. B= Both, N= No controls feasible

RBLCID	FACILITY NAME	FACILITY STATE	PERMIT NUM	Permit Date	Process	Process Type	Pollutant	Control Code	Control Desc.	Emission Limit 1	Emission Limit 1 Unit	Emission Limit 1 Avg Time	Case-by-case basis	Emission Limit 2	Emission Limit Unit 2	Emission Limit 2 Avg Time	STD Emission Limit	STD Limit Unit	STD Limit Unit Avg Time	BACT gr/dscf Limits	Non-BACT gr/dscf Limits
*NC-0112	NUCOR STEEL	NC	08680T09	11/23/2004	SLAG HANDLING PROCESS	Fug PM	Particulate Matter (PM)	B	SLAG PROCESS THROUGHPUT LIMITED TO 262,800 TONS PER 12 MONTH PERIOD. DROP HEIGHTS FROM CONVEYOR DISCHARGE LIMITED TO 15 FEET WITH SECONDARY PILES BY MOBILE EQUIPMENT LIMITED TO 4 FEET.	2.2	LB/H								NOT AVAILABLE		
*NC-0112	NUCOR STEEL	NC	08680T09	11/23/2004	UNPAVED ROADS	Fug PM	Particulate Matter (PM)	P	PERIODIC APPLICATION OF WATER AND CHEMICAL DUST SUPPRESSANTS TO UNPAVED ROADWAYS AND POSTED SPEED LIMIT OF 10 MILES PER HOUR			SEE NOTE	BACT-PSD								
AL-0202	CORUS TUSCALOOSA	AL	413-0033-X005,X008	6/3/2003	SLAG RECLAMATION OPERATIONS	Fug PM	Particulate Matter (PM)	A	WET SUPPRESSION			see note	BACT-PSD								
AR-0021	QUANEX CORPORATION - MACSTEEL DIVISION	AR	693-AOP-R0	2/18/1998	SLAG PROCESSING	Fug PM	Particulate Matter (PM)	B	THROUGHPUT LIMIT ON SLAG, WATER SPRAYS ON TRANSFERPOINTS	3.8	T/YR		BACT-PSD	0			0				
AR-0044	ARKANSAS STEEL ASSOCIATES	AR	35-AOP-R3	1/5/2001	SLAG PROCESSING	Fug PM	Particulate Matter (PM)	P	WATER APPLICATION TO CONTROL FUGITIVE EMISSIONS.	5.7	LB/H		BACT-PSD	8.3	T/YR				NOT AVAILABLE		
CO-0047	HOLNAM, FLORENCE	CO	98-FR-0895	7/29/1999	CEMENT KILN DUST HAULING	Fug PM	Particulate Matter (PM)	P	WETTING MATERIAL PRIOR TO PLACEMENT.	2.23	T/YR		N/A								
CO-0047	HOLNAM, FLORENCE	CO	98-FR-0895	7/29/1999	COAL STOCKPILE	Fug PM	Particulate Matter (PM)	P	SURFACE MOISTURE	0.45	T/YR		N/A								
CO-0047	HOLNAM, FLORENCE	CO	98-FR-0895	7/29/1999	DISTURBED AREAS IN QUARRY AND PLANT	Fug PM	Particulate Matter (PM)	P		167.21	T/YR		N/A								
CO-0047	HOLNAM, FLORENCE	CO	98-FR-0895	7/29/1999	DRILLING AND BLASTING	Fug PM	Particulate Matter (PM)	N		1.35	T/YR		N/A								
CO-0047	HOLNAM, FLORENCE	CO	98-FR-0895	7/29/1999	OVERBURDEN AND WASTE ROCK REMOVAL	Fug PM	Particulate Matter (PM)	P	CONTROL PLAN	32.37	T/YR		Other Case-by-Case								
CO-0047	HOLNAM, FLORENCE	CO	98-FR-0895	7/29/1999	PAVED ROADS, CEMENT PRODUCT HAULOUT	Fug PM	Particulate Matter (PM)	P	CONTROL PLAN	1.6	T/YR		Other Case-by-Case								
CO-0047	HOLNAM, FLORENCE	CO	98-FR-0895	7/29/1999	RAW MATERIAL, REMOVAL AND HAULAGE	Fug PM	Particulate Matter (PM)	P	CONTROL PLAN	62.47	T/YR		N/A								
CO-0047	HOLNAM, FLORENCE	CO	98-FR-0895	7/29/1999	RAW MATERIALS EXTRACTION	Fug PM	Particulate Matter (PM)	P	MINIMIZE DISTANCE AREA, REVEGETATION, CHEMICAL STABILIZERS	2.63	T/YR		N/A								
CO-0048	HOLNAM, LAPORTE CO.	CO	11LR338-1	9/22/1998	FUGITIVES	Fug PM	Particulate Matter (PM)	P	HAUL ROADS - ROAD WATERING, GRAVEL, CHEMICAL DUST SUPPRESSANTS KILN DUST DISPOSAL - WATERING, OMPACTION, REVEGETATION	157.1	T/YR		BACT-PSD								
CO-0048	HOLNAM, LAPORTE CO.	CO	11LR338-1	9/22/1998	PORTABLE CRUSHER	Fug PM	Particulate Matter (PM)	P	THROUGHPUT LIMITS	0.044	T/YR		BACT-PSD				0.0007	LB/T			
CO-0057	COMANCHE STATION	CO	04UNITPB1015	7/5/2005	COAL HANDLING AND STORAGE	Fug PM	Particulate Matter (PM)	B	CONTROLS INCLUDE USE OF WATER SPRAYS, LOWERING WELL, DUST SUPPRESSANTS, ENCLOSURES AND BAGHOUSES WHERE FEASIBLE.	0.01	GR/DSCF	AVG OF 3 TEST RUNS	BACT-PSD				0.01	GR/DSCF			
CO-0057	COMANCHE STATION	CO	04UNITPB1015	7/5/2005	HAUL ROADS	Fug PM	Particulate Matter (PM)	P	CHEMICAL STABILIZERS WILL BE ADDED TO ACTIVE UNPAVED HAUL ROADS, ADDITIONAL WATERING AS NECESSARY. PAVED ROADS TO BE SWEPT AND WATERED AS NECESSARY.			SEE NOTE									
IA-0067	MIDAMERICAN ENERGY COMPANY	IA	PROJECT 02-528	6/17/2003	ACTIVE COAL PILE	Fug PM	Particulate Matter (PM)	P	CHEMICAL DUST SUPPRESSANT				BACT-PSD								
IA-0067	MIDAMERICAN ENERGY COMPANY	IA	PROJECT 02-528	6/17/2003	HAUL ROADS	Fug PM	Particulate Matter (PM)	P	WATER FLUSHING FOLLOWED BY SWEEPING				BACT-PSD								
IA-0067	MIDAMERICAN ENERGY COMPANY	IA	PROJECT 02-528	6/17/2003	INACTIVE COAL STORAGE PILE	Fug PM	Particulate Matter (PM)	P	CHEMICAL DUST SUPPRESSANT				BACT-PSD								
IA-0067	MIDAMERICAN ENERGY COMPANY	IA	PROJECT 02-528	6/17/2003	RAIL UNLOADING COAL STOCKOUT PILE	Fug PM	Particulate Matter (PM)	P	CHEMICAL DUST SUPPRESSANT				BACT-PSD								
IA-0067	MIDAMERICAN ENERGY COMPANY	IA	PROJECT 02-528	6/17/2003	STACKER CONVEYOR	Fug PM	Particulate Matter (PM)	P	CHEMICAL DUST SUPPRESSANT				BACT-PSD								
IA-0067	MIDAMERICAN ENERGY COMPANY	IA	PROJECT 02-528	6/17/2003	TRANSFER TO ACTIVE PILE	Fug PM	Particulate Matter (PM)	P	CHEMICAL DUST SUPPRESSANT				BACT-PSD								
IN-0079	STEEL DYNAMICS, INC.	IN	CP-183-10097-00030	7/7/1999	SLAG, HANDLING AND PROCESSING	Fug PM	Particulate Matter (PM)	B	WATER SUPPRESSION AND MINIMIZING DROP HEIGHTS	55.4	LB/H		BACT-PSD	0					NOT AVAILABLE		
IN-0080	STEEL DYNAMICS, INC.	IN	CP-183-10097-00030(MOD)	7/7/1999	HANDLING AND PROCESSING, SLAG	Fug PM	Particulate Matter (PM)	B	WATER SUPPRESSION AND MINIMIZING DROP HEIGHTS	55	LB/H		BACT-PSD	0			0		NOT AVAILABLE		
KY-0070	NSA-A DIVISION OF SOUTHWIRE COMPANY	KY	F-96-024 (R2)	5/29/1998	0.4 MILE PLANT ROAD	Fug PM	Particulate Matter (PM)	P	REASONABLE POLLUTION PRECAUTIONS.	2.15	LB/H		Other Case-by-Case	9.23	T/YR						
NC-0113	NUCOR STEEL	NC	08680T09	11/23/2004	SLAG HANDLING PROCESS	Fug PM	Particulate Matter (PM)	B	SLAG PROCESS THROUGHPUT LIMITED TO 262,800 TONS PER 12 MONTH PERIOD. DROP HEIGHTS FROM CONVEYOR DISCHARGE LIMITED TO 15 FEET WITH SECONDARY PILES BY MOBILE EQUIPMENT LIMITED TO 4 FEET.	2.2	LB	PER HOUR									

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Fug PM = Traffic, storage piles, transfers to piles & stackers, open dumping (e.g. loader to dump truck in quarry) and slag processing
Flyash Hand = any material handling which includes flyash or mixtures including flyash

Compiled data set for material handling and fugitive emissions from Process Codes: 12.110, 81.000, 82.000, 90.011, 90.018, 90.019, 90.020, 90.021, 90.023, 90.024, 90.026, 90.031, 90.999, 99.100, 99.999
Control Equipment Codes: P= Pollution prevention, A= Add on Controls. B= Both, N= No controls feasible

RBLCID	FACILITY NAME	FACILITY STATE	PERMIT NUM	Permit Date	Process	Process Type	Pollutant	Control Code	Control Desc.	Emission Limit 1	Emission Limit 1 Unit	Emission Limit 1 Avg Time	Case-by-case basis	Emission Limit 2	Emission Limit Unit 2	Emission Limit 2 Avg Time	STD Emission Limit	STD Limit Unit	STD Limit Unit Avg Time	BACT gr/dscf Limits	Non-BACT gr/dscf Limits
NC-0113	NUCOR STEEL	NC	08680T09	11/23/2004	UNPAVED ROADS	Fug PM	Particulate Matter (PM)	P	PERIODIC APPLICATION OF WATER AND CHEMICAL DUST SUPPRESSANTS TO UNPAVED ROADWAYS AND POSTED SPEED LIMIT OF 10 MILES PER HOUR												
OH-0270	CARMEUSE LIME - MAPLE GROVE FACILITY	OH	03-13527	10/14/2003	MATERIAL STORAGE PILES	Fug PM	Particulate Matter (PM)	P	WATER APPLICATIONS AND DAILY INSPECTIONS OF EACH STORAGE PILE.	0.61	T/YR		BACT-PSD						NOT AVAILABLE		
OH-0272	HAVERHILL NORTH COKE COMPANY	OH	07-00466	2/27/2001	ROADWAYS AND PARKING	Fug PM	Particulate Matter (PM)	P	WATERING AS SUFFICIENT FREQUENCY TO ENSURE COMPLIANCE	8.01	T/YR	fugitive PM	BACT-PSD								
OH-0297	FDS COKE	OH	04-01360	9/20/2005	ROADWAYS	Fug PM	Particulate Matter (PM)	P	TREAT WITH APPROPRIATE MATERIAL (WATER)	24.88	T/YR		N/A						STANDARD NOT AVAILABLE		
OR-0025	SPRINGFIELD PLANT	OR	202125	6/4/1998	ROAD AND PARKING LOTS	Fug PM	Particulate Matter (PM)	N		27	LB/D		Other Case-by-Case	4.7	T/YR						
TX-0275	W.A. PARISH ELECTRIC GENERATING STATION	TX	PSD-TX-234	12/21/2000	RADIAL CONVEYOR STACKOUT, WH3	Fug PM	Particulate Matter (PM)	N	NONE INDICATED	0.01	LB/H		Other Case-by-Case	0.02	T/YR						
TX-0275	W.A. PARISH ELECTRIC GENERATING STATION	TX	PSD-TX-234	12/21/2000	STOCKPILE, LH2	Fug PM	Particulate Matter (PM)	N	NONE INDICATED	0.13	T/YR		Other Case-by-Case						NOT AVAILABLE		
TX-0275	W.A. PARISH ELECTRIC GENERATING STATION	TX	PSD-TX-234	12/21/2000	STORAGE PILE, WASTE, WH4	Fug PM	Particulate Matter (PM)	N	NONE INDICATED	0.2	LB/H		Other Case-by-Case	0.87	T/YR						
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	ADDITIVE PILE	Fug PM	Particulate Matter (PM)	N		0.16	LB/H		Other Case-by-Case	0.7	T/YR						
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	CLINKER PILE	Fug PM	Particulate Matter (PM)	N		0.42	LB/H		Other Case-by-Case	1.8	T/YR						
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	CLINKER TRUCK LOADING	Fug PM	Particulate Matter (PM)	N		0.53	LB/H		Other Case-by-Case	2.31	T/YR						
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	FRONT END LOADER DROP POINT TO CRUSHER	Fug PM	Particulate Matter (PM)	P	PARTIAL ENCLOSURE WITH WATER SPRAYER	0.57	LB/H		Other Case-by-Case	1.64	T/YR						
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	MAT HANDLING COAL/COKE CONVEYOR TO STACKER	Fug PM	Particulate Matter (PM)	P	COVERED CONVEYOR BELT	0.01	LB/H	LESS THAN	Other Case-by-Case	0.01	T/YR	LESS THAN			SEE NOTE		
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	MATERIAL HANDLING, COAL/COKE DROP POINT TO PILE	Fug PM	Particulate Matter (PM)	P	PARTIAL ENCLOSURE AND WATER SPRAY	0.47	LB/H		Other Case-by-Case	2.05	T/YR				SEE NOTE		
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	MATERIAL HANDLING, COAL/COKE DROP POINT TO STACKER	Fug PM	Particulate Matter (PM)	P	PARTIAL ENCLOSURE AND WATER SPRAY.	0.47	LB/H		Other Case-by-Case	2.05	T/YR				SEE NOTE		
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	MATERIAL HANDLING, COAL/COKE DROP TO HOPPER (MT05)	Fug PM	Particulate Matter (PM)	P	PARTIAL ENCLOSURE AND WATER SPRAY	0.47	LB/H		Other Case-by-Case	2.05	T/YR				SEE NOTE		
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	MATERIAL HANDLING, COAL/COKE STACKER TO PILE	Fug PM	Particulate Matter (PM)	P	PARTIAL ENCLOSURES, WATER SPRAYS	0.01	LB/H	LESS THAN	BACT-PSD	0.01	T/YR	LESS THAN			SEE NOTE		
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	MATERIAL STORAGE, COAL/COKE PILES	Fug PM	Particulate Matter (PM)	P	SPRAY THE C/C PILES	0.55	LB/H		Other Case-by-Case	2.41	T/YR				SEE NOTE		
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	MILL SCALE PILE	Fug PM	Particulate Matter (PM)	P	WATER SPRAYS	0.03	LB/H		Other Case-by-Case	0.11	T/YR						
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	MOBILE CRUSHER	Fug PM	Particulate Matter (PM)	N		0.65	LB/H		Other Case-by-Case	1.9	T/YR				SEE NOTE		
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	SAND PILE	Fug PM	Particulate Matter (PM)	N		0.03	LB/H		Other Case-by-Case	0.11	T/YR						
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	BELT TRANSFER DROP (F-R-2)	Fug PM	Particulate Matter (PM)	P	THE TOP AND SIDES OF ALL CONVEYOR BELTS SHALL BE COVERED. ALL CONVEYOR BELT TRANSFER POINTS SHALL BE ENCLOSED.	0.02	LB/H		N/A	0.06	T/YR						
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	CKD DRY KILN PUG MILL TO TRUCK (F-P-12)	Fug PM	Particulate Matter (PM)	P	INCOMING AND OUTGOING RR CARS AND TRUCKS USED IN TRANSPORTING CEMENT, CLINKER, COAL, AND PETCOKE SHALL BE CLEANED AND MAINTAINED, AS NECESSARY, TO MINIMIZE FUGITIVE EMISSIONS.	0.01	LB/H	LESS THAN	N/A	0.01	T/YR	LESS THAN					
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	KILN DUST DROP TO PILES (F-P-7)	Fug PM	Particulate Matter (PM)	N	NONE INDICATED.	0.01	LB/H	LESS THAN	N/A	0.01	T/YR	LESS THAN					
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	PAVED ROADS (F-TR-1)	Fug PM	Particulate Matter (PM)	P	PLANT ROADS SHALL BE PAVED AND CLEANED. QUARRY ROADS SHALL BE SPRINKLED WITH WATER AND/OR CHEMICALS TO MAINTAIN COMPLIANCE WITH ALL TNRCC RULES AND REGULATIONS.	10.37	T/YR		N/A								
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	PRIMARY CRUSHER (F-Q-6)	Fug PM	Particulate Matter (PM)	P	A WATER SPRAY SHALL BE APPLIED AT THE PRIMARY CRUSHER HOPPER WHEN VISIBLE DUST EMISSIONS CAN BE OBSERVED AT THE PRIMARY CRUSHER.	0.01	LB/H	LESS THAN	N/A	0.01	T/YR	LESS THAN					
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	QUARRY LOADER DROP TO TRUCK (F-Q-4)	Fug PM	Particulate Matter (PM)	P	INCOMING AND OUTGOING RR CARS AND TRUCKS USED IN TRANSPORTING CEMENT, CLINKER, COAL, AND PETCOKE SHALL BE CLEANED AND MAINTAINED, AS NECESSARY, TO MINIMIZE FUGITIVE EMISSIONS.	0.11	LB/H		N/A	0.29	T/YR						
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	RMS SHUTTLE BELT DROP TO PILE (F-R-7)	Fug PM	Particulate Matter (PM)	P	THE TOP AND SIDES OF ALL CONVEYOR BELTS SHALL BE COVERED. ALL CONVEYOR BELT TRANSFER POINTS SHALL BE ENCLOSED.	0.02	LB/H		N/A	0.04	T/YR						

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Mtl Hand = Mtl Trans via conveyor, hoppers, bins, crushing, grinding and loading/unloading in fixed location
Fug PM = Traffic, storage piles, transfers to piles & stackers, open dumping (e.g. loader to dump truck in quarry) and slag processing
Flyash Hand = any material handling which includes flyash or mixtures including flyash

Compiled data set for material handling and fugitive emissions from Process Codes: 12.110, 81.000, 82.000, 90.011, 90.018, 90.019, 90.020, 90.021, 90.023, 90.024, 90.026, 90.031, 90.999, 99.100, 99.999

Control Equipment Codes: P= Pollution prevention, A= Add on Controls. B= Both, N= No controls feasible

RBLCID	FACILITY NAME	FACILITY STATE	PERMIT NUM	Permit Date	Process	Process Type	Pollutant	Control Code	Control Desc.	Emission Limit 1	Emission Limit 1 Unit	Emission Limit 1 Avg Time	Case-by-case basis	Emission Limit 2	Emission Limit Unit 2	Emission Limit 2 Avg Time	STD Emission Limit	STD Limit Unit	STD Limit Unit Avg Time	BACT gr/dscf Limits	Non-BACT gr/dscf Limits
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	SOLID FUEL STORAGE DROP TO PILE (F-P-1)	Fug PM	Particulate Matter (PM)	P	THE TOP AND SIDES OF ALL CONVEYOR BELTS SHALL BE COVERED. ALL CONVEYOR BELT TRANSFER POINTS SHALL BE ENCLOSED.	0.01	LB/H		N/A	0.05	T/YR						
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	SOLID FUEL TRUCK UNLOADING DROP (F-TR-2)	Fug PM	Particulate Matter (PM)	P	INCOMING AND OUTGOING RR CARS AND TRUCKS USED IN TRANSPORTING CEMENT, CLINKER, COAL, AND PETCOKE SHALL BE CLEANED AND MAINTAINED, AS NECESSARY, TO MINIMIZE FUGITIVE EMISSIONS.	0.02	LB/H		N/A	0.04	T/YR						
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	UNPAVED ROADS (PT. F-L-1)	Fug PM	Particulate Matter (PM)	P	QUARRY ROADS SHALL BE SPRINKLED WITH WATER AND/OR CHEMICALS, AS NECESSARY TO MAINTAIN COMPLIANCE WITH ALL TNRCC RULES AND REGULATIONS.	25.34	T/YR		N/A								
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	WIND PILE EROSION (W-P-2)	Fug PM	Particulate Matter (PM)	P	COAL AND COKE STOCKPILES SHALL BE SPRINKLED WITH WATER AND/OR CHEMICALS, AS NECESSARY, TO MAINTAIN COMPLIANCE WITH ALL TNRCC RULES AND REGULATIONS.	0.1	LB/H		N/A	0.42	T/YR						
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	FEEDER TO FEEDER TO CONV TO SCREEN, S24-26	Fug PM	Particulate Matter (PM)	N	NONE INDICATED	0.0581	LB/H	EACH	Other Case-by-Case	0.0349	T/YR	EACH					
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	FEEDER TO FEEDER TO CONV TO SCREEN, S7-9	Fug PM	Particulate Matter (PM)	N	NONE INDICATED	0.0037	LB/H	EACH	Other Case-by-Case	0.0022	T/YR	EACH					
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	FINES/COARSE SAND/LIGHT ORGANIC MATERIAL STORAGE	Fug PM	Particulate Matter (PM)	N	NONE INDICATED	0.14	T/YR	EACH	Other Case-by-Case								
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	FRONT-END LOADER DROP @ MIXING BLDG, S35	Fug PM	Particulate Matter (PM)	N	NONE INDICATED	0.442	LB/H		Other Case-by-Case	1.95	T/YR						
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	GRIZZLY TO STOCK	Fug PM	Particulate Matter (PM)	N	NONE INDICATED	0.0004	LB/H	SEE NOTES	Other Case-by-Case	0.0002	T/YR						
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	IN-PLANT VEHICLE TRAFFIC	Fug PM	Particulate Matter (PM)	P	CHEMICAL AND WATER SPRAY	34.8	T/YR		Other Case-by-Case								
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	SCREEN TO CONV TO STOCK, S20&21	Fug PM	Particulate Matter (PM)	N	NONE INDICATED	0.001	LB/H	EACH, SEE NOTES	Other Case-by-Case	0.0006	T/YR	EACH					
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	SCREEN TO CONV TO STOCK, S22&23	Fug PM	Particulate Matter (PM)	N	NONE INDICATED	0.0021	LB/H	EACH, SEE NOTES	Other Case-by-Case	0.0013	T/YR	EACH					
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	SLAG RAW FEED, S1	Fug PM	Particulate Matter (PM)	N	NONE INDICATED	3.25	LB/H		Other Case-by-Case	1.95	T/YR						
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	SLAG ROAD EMISSIONS, S38	Fug PM	Particulate Matter (PM)	N	NONE INDICATED	21.26	T/YR		BACT-PSD								
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	STOCKPILE, S37	Fug PM	Particulate Matter (PM)	N		0.43	T/YR		Other Case-by-Case								
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	(2) FUEL HANDLING ACTIVE STORAGE PILES A&B	Fug PM	Particulate Matter (PM)	P	WATER SPRAY & UNDERGROND RECLAIM VENT TO BAGHOUSE	3.24	T/YR	EACH	BACT-PSD								
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	FUEL HANDLING ACTIVE STORAGE PILE	Fug PM	Particulate Matter (PM)	N	NONE INDICATED	2	T/YR		BACT-PSD								
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	FUEL HANDLING EMERGENCY STORAGE PILE	Fug PM	Particulate Matter (PM)	B	TELESCOPING CHUTE & WATER SPRAY	0.42	T/YR		BACT-PSD								
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	FUEL HANDLING INACTIVE STORAGE PILE	Fug PM	Particulate Matter (PM)	P	WATERING	18.4	T/YR		BACT-PSD								
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	LIMESTONE HANDLING STORAGE PILE	Fug PM	Particulate Matter (PM)	B	PARTIAL ENCLOSURE, TELESCOPING CHUTE, UNDERGROUND RECLAIM	0.42	T/YR		BACT-PSD								
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	PLANT ROADS	Fug PM	Particulate Matter (PM)	P	WATER SPRAY	17.42	T/YR		BACT-PSD								
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	WASTE HANDLING LANDFILL	Fug PM	Particulate Matter (PM)	P	WATER SPRAY	26.2	T/YR		BACT-PSD								
TX-0355	PORTLAND CEMENT MANUFACTURING PLANT	TX	PSD-TX-145 M1	6/29/2001	COAL/COKE STOCKPILES, S-01	Fug PM	Particulate Matter (PM)	N	NONE INDICATED	0.6	LB/H		Other Case-by-Case	1.71	T/YR						
TX-0355	PORTLAND CEMENT MANUFACTURING PLANT	TX	PSD-TX-145 M1	6/29/2001	CRUSHING OPERATION, B-06	Fug PM	Particulate Matter (PM)	A	BAGHOUSE	0.6	LB/H		Other Case-by-Case	2.52	T/YR						

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Fug PM = Traffic, storage piles, transfers to piles & stackers, open dumping (e.g. loader to dump truck in quarry) and slag processing
Flyash Hand = any material handling which includes flyash or mixtures including flyash

Compiled data set for material handling and fugitive emissions from Process Codes: 12.110, 81.000, 82.000, 90.011, 90.018, 90.019, 90.020, 90.021, 90.023, 90.024, 90.026, 90.031, 90.999, 99.100, 99.999
Control Equipment Codes: P= Pollution prevention, A= Add on Controls. B= Both, N= No controls feasible

RBLCID	FACILITY NAME	FACILITY STATE	PERMIT NUM	Permit Date	Process	Process Type	Pollutant	Control Code	Control Desc.	Emission Limit 1	Emission Limit 1 Unit	Emission Limit 1 Avg Time	Case-by-case basis	Emission Limit 2	Emission Limit Unit 2	Emission Limit 2 Avg Time	STD Emission Limit	STD Limit Unit	STD Limit Unit Avg Time	BACT gr/dscf Limits	Non-BACT gr/dscf Limits
TX-0355	PORTLAND CEMENT MANUFACTURING PLANT	TX	PSD-TX-145 M1	6/29/2001	QUARRYING, Q-1	Fug PM	Particulate Matter (PM)	N	NONE INDICATED	14.61	LB/H		Other Case-by-Case	13.49	T/YR						
TX-0355	PORTLAND CEMENT MANUFACTURING PLANT	TX	PSD-TX-145 M1	6/29/2001	TRANSPORT TO RAW MATERIAL/STORAGE BINS, RMS	Fug PM	Particulate Matter (PM)	P	CLEAN AND MAINTAIN OUTGOING VEHICLES TO MINIMIZE FUGITIVES.	5.58	LB/H		Other Case-by-Case	4.62	T/YR						
TX-0417	NUCOR CORP.	TX	PSD-TX-1029	1/15/2003	RAW MATERIAL RECEIVING AND HANDLING	Fug PM	Particulate Matter (PM)	A	FILTER SYSTEM	0.01	GR/DSCF		BACT-PSD								
UT-0061	NUCOR STEEL CORPORATION	UT	DAQE-846-97	8/29/1997	FUGITIVES / STOCK PILES / TRANSFER POINTS	Fug PM	Particulate Matter (PM)	P	WATER SPRAYS INSTALLED AT ALL CONVEYOR TRANSFER POINTS AND BATCHING EQUIPMENT DROP POINTS.				BACT-PSD		ENCLOSE TRANSFER PTS						
WI-0204	UWGP - FUEL GRADE ETHANOL PLANT	WI	03-DCF-048	8/14/2003	FUGITIVE DUST, F02	Fug PM	Particulate Matter (PM)	P	FUGITIVE DUST CONTROL (PAVING, CLEANING, TRANSPORTATION AND STORAGE). CLEAN AND SWEEP ROADS, WATER AND CHEMICAL CONTROLS FOR DUST, PLASTIC COVERINGS, ENCLOSURES, AND TRUCK SPEED AND WEIGHT LIMITS	30	% REDUCTION	see note	Other Case-by-Case								
WI-0228	WPS - WESTON PLANT	WI	04-RV-248	10/19/2004	F134 ROADWAYS	Fug PM	Particulate Matter (PM)	P	PAVE ALL HAUL ROADS WHERE POSSIBLE, FUGITIVE DUST CONTROL PLAN, WATERING ROADWAYS, SWEEPING ROADS, LIMIT ROAD HOURS OF OPERATION			SEE NOTE	BACT-PSD								
WI-0228	WPS - WESTON PLANT	WI	04-RV-248	10/19/2004	F56, WESTON UNIT 4 COAL PILE	Fug PM	Particulate Matter (PM)	P	FUGITIVE DUST CONTROL PLAN; WET SUPRESSANTS OR SURFACE STABILIZING AGENTS; COAL PILE MAINTENACE PROCEDURES; WEEKLY INSPECTION OF INACTIVE PILE	10	% OPACITY		BACT-PSD						NOT AVAILABLE		
WY-0047	ENCOAL CORPORATION-ENCOAL NORTH ROCHELLE FACILITY	WY	CT-1324	10/10/1997	STORAGE, PROCESS DERIVED FUEL	Fug PM	Particulate Matter (PM)	A	SCRUBBER 40000 DSCFM	0.01	GR/DSCF		BACT-PSD	0			0				
WY-0055	WOLD TRONA COMPANY, INC.	WY	MD-455	4/27/2000	FUGITIVE EMISSIONS - ROAD DUST	Fug PM	Particulate Matter (PM)	P	PAVED ROADS	41.3	T/YR		Other Case-by-Case								

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Table C-1B: Fugitive PM10

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Control Equipment Codes: P= Pollution prevention, A= Add on Controls. B= Both, N= No controls feasible

RBLCID	FACILITY NAME	FACILITY STATE	PERMIT NUM	Permit Date	Process	Process Type	Pollutant	Control Code	Control Desc.	Emission Limit 1	Emission Limit 1 Unit	Emission Limit 1 Avg Time	Case-by-case basis	Emission Limit 2	Emission Limit Unit 2	Emission Limit 2 Avg Time	STD Emission Limit	STD Limit Unit	STD Limit Unit Avg Time	BACT gr/dscf Limits	Non-BACT gr/dscf Limits
*LA-0202	RODEMACHER BROWNFIELD UNIT 3	LA	PSD-LA-711	2/23/2006	BULLDOZING/GRADING	Fug PM	Particulate Matter < 10 µ (PM10)	N		19.99	LB/H	HOURLY MAXIMUM	BACT-PSD	14.59	T/YR	ANNUAL MAXIMUM					
*LA-0202	RODEMACHER BROWNFIELD UNIT 3	LA	PSD-LA-711	2/23/2006	FUEL STOCKOUT PILE	Fug PM	Particulate Matter < 10 µ (PM10)	N		102	LB/H	HOURLY MAXIMUM	BACT-PSD	0.06	T/YR	ANNUAL MAXIMUM			NOT AVAILABLE		
*LA-0202	RODEMACHER BROWNFIELD UNIT 3	LA	PSD-LA-711	2/23/2006	INACTIVE FUEL PILE	Fug PM	Particulate Matter < 10 µ (PM10)	N		154.3	LB/H	HOURLY MAXIMUM	BACT-PSD	0.09	T/YR	ANNUAL MAXIMUM			NOT AVAILABLE		
*LA-0202	RODEMACHER BROWNFIELD UNIT 3	LA	PSD-LA-711	2/23/2006	INACTIVE LIMESTONE PILE	Fug PM	Particulate Matter < 10 µ (PM10)	N		823.2	LB/H	HOURLY MAXIMUM	BACT-PSD	0.46	T/YR	ANNUAL MAXIMUM			NOT AVAILABLE		
*LA-0202	RODEMACHER BROWNFIELD UNIT 3	LA	PSD-LA-711	2/23/2006	UNPAVED ROADS	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATERING OF AREAS USED BY HEAVY DUTY VEHICLES	3.82	LB/H	HOURLY MAXIMUM	BACT-PSD	3.82	T/YR	ANNUAL MAXIMUM					
*LA-0202	RODEMACHER BROWNFIELD UNIT 3	LA	PSD-LA-711	2/23/2006	UNPAVED ROADS	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATERING OF AREAS USED BY HEAVY DUTY VEHICLES	3.82	LB/H	HOURLY MAXIMUM	BACT-PSD	3.82	T/YR	ANNUAL MAXIMUM					
AR-0055	NUCOR YAMATO STEEL (ARMOREL)	AR	883-AOP-R1(47-0202)	10/10/2001	SLAG PROCESSING	Fug PM	Particulate Matter < 10 µ (PM10)	P	WET SUPPRESSION	1.2	LB/H		BACT-PSD								
AR-0074	PLUM POINT ENERGY	AR	1995-AOP-R0	8/20/2003	ROAD DUST	Fug PM	Particulate Matter < 10 µ (PM10)	P	DUST SUPPRESSION - WATERING, DUST SUPPRESSANTS	0.2	LB/H	paved roads	BACT-PSD	0.3	LB/H	unpaved roads					
AR-0077	BLUEWATER PROJECT	AR	2062-AOP-R0	7/22/2004	ROADWAY EMISSIONS	Fug PM	Particulate Matter < 10 µ (PM10)	P	APPLICATION OF WETTING AGENT	26.9	T/YR		BACT-PSD								
AR-0078	NUCOR STEEL, ARKANSAS	AR	1139-AOP-R5	9/9/1999	SLAG PROCESSING	Fug PM	Particulate Matter < 10 µ (PM10)	P	KEEP MATERIAL SUFFICIENTLY DAMP	1.8	LB/H		BACT-PSD	4.1	T/YR						
AR-0079	PLUM POINT ENERGY	AR	1995-AOP-R0	8/20/2003	CONTROLLED DUST SOURCES	Fug PM	Particulate Matter < 10 µ (PM10)	A	FABRIC FILTER			SEE NOTE	BACT-PSD								
AR-0079	PLUM POINT ENERGY	AR	1995-AOP-R0	8/20/2003	OTHER DUST SOURCES	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATER SPRAYS, DUST SUPPRESSANTS, ETC			SEE NOTE	BACT-PSD								
AR-0079	PLUM POINT ENERGY	AR	1995-AOP-R0	8/20/2003	PARTIALLY INCLOSED DUST SOURCES	Fug PM	Particulate Matter < 10 µ (PM10)	A	PARTIAL ENCLOSURES			SEE NOTE	BACT-PSD								
CO-0043	RIO GRANDE PORTLAND CEMENT CORP.	CO	98PB0893	9/25/2000	RAW MATERIAL TRANSFER, ROAD DUST	Fug PM	Particulate Matter < 10 µ (PM10)	P	CE = 85-90%. TREATMENT OF UNPAVED HAUL SURFACES WITH CHEMICAL STABILIZERS AND REGULAR WATERING. REGULAR INSPECTION AND CLEANING OF PAVED HAUL SURFACES. USE OF SURFACTANTS IN SPRAY WATERS. NO LIMIT SET FOR FUGITIVE EMISSION	85	% REDUCTION		BACT-PSD								
CO-0047	HOLNAM, FLORENCE	CO	98-FR-0895	7/29/1999	CEMENT KILN DUST HAULING	Fug PM	Particulate Matter < 10 µ (PM10)	P	WETTING MATERIAL PRIOR TO PLACEMENT.	1.34	T/YR		N/A								
CO-0047	HOLNAM, FLORENCE	CO	98-FR-0895	7/29/1999	COAL STOCKPILE	Fug PM	Particulate Matter < 10 µ (PM10)	P	SURFACE MOISTURE	0.33	T/YR		N/A								
CO-0047	HOLNAM, FLORENCE	CO	98-FR-0895	7/29/1999	DISTURBED AREAS IN QUARRY AND PLANT	Fug PM	Particulate Matter < 10 µ (PM10)	P		83.61	T/YR		N/A								
CO-0047	HOLNAM, FLORENCE	CO	98-FR-0895	7/29/1999	DRILLING AND BLASTING	Fug PM	Particulate Matter < 10 µ (PM10)	A		0.7	T/YR		N/A								
CO-0047	HOLNAM, FLORENCE	CO	98-FR-0895	7/29/1999	OVERBURDEN AND WASTE ROCK REMOVAL	Fug PM	Particulate Matter < 10 µ (PM10)	P	CONTROL PLAN	16.73	T/YR		Other Case-by-Case								
CO-0047	HOLNAM, FLORENCE	CO	98-FR-0895	7/29/1999	PAVED ROADS, CEMENT PRODUCT HAULOUT	Fug PM	Particulate Matter < 10 µ (PM10)	A	CONTROL PLAN	1.2	T/YR		Other Case-by-Case								
CO-0047	HOLNAM, FLORENCE	CO	98-FR-0895	7/29/1999	RAW MATERIAL, REMOVAL AND HAULAGE	Fug PM	Particulate Matter < 10 µ (PM10)	P	CONTROL PLAN	37.27	T/YR		N/A								
CO-0047	HOLNAM, FLORENCE	CO	98-FR-0895	7/29/1999	RAW MATERIALS EXTRACTION	Fug PM	Particulate Matter < 10 µ (PM10)	P	MINIMIZE DISTANCE AREA, REVEGETATION, CHEMICAL STABILIZERS	1.32	T/YR		N/A								
CO-0048	HOLNAM, LAPORTE CO.	CO	11LR338-1	9/22/1998	FUGITIVES	Fug PM	Particulate Matter < 10 µ (PM10)	P	HAUL ROADS - ROAD WATERING, GRAVEL, CHEMICAL DUST SUPPRESSANTS KILN DUST DISPOSAL - WATERING, OMPACTION, REVEGETATION	70.5	T/YR		BACT-PSD								

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RBLCID	FACILITY NAME	FACILITY STATE	PERMIT NUM	Permit Date	Process	Process Type	Pollutant	Control Code	Control Desc.	Emission Limit 1	Emission Limit 1 Unit	Emission Limit 1 Avg Time	Case-by-case basis	Emission Limit 2	Emission Limit Unit 2	Emission Limit 2 Avg Time	STD Emission Limit	STD Limit Unit	STD Limit Unit Avg Time	BACT gr/dscf Limits	Non-BACT gr/dscf Limits
CO-0048	HOLNAM, LAPORTE CO.	CO	11LR338-1	9/22/1998	PORTABLE CRUSHER	Fug PM	Particulate Matter < 10 µ (PM10)	P	THROUGHPUT LIMITS	0.037	T/YR		BACT-PSD				0.0006	LB/T			
CO-0057	COMANCHE STATION	CO	04UNITPB1015	7/5/2005	HAUL ROADS	Fug PM	Particulate Matter < 10 µ (PM10)	P	CHEMICAL STABILIZERS WILL BE APPLIED TO ACTIVE UNPAVED HAUL ROADS, WITH WATER ADDED AS NECESSARY. UNPAVED HAUL ROADS WILL BE SWEPT AND WATERED AS NECESSARY.			SEE NOTE	BACT-PSD								
IA-0067	MIDAMERICAN ENERGY COMPANY	IA	PROJECT 02-528	6/17/2003	ACTIVE COAL PILE	Fug PM	Particulate Matter < 10 µ (PM10)	P	CHEMICAL DUST SUPPRESSANT				BACT-PSD								
IA-0067	MIDAMERICAN ENERGY COMPANY	IA	PROJECT 02-528	6/17/2003	HAUL ROADS	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATER FLUSHING FOLLOWED BY SWEEPING				BACT-PSD								
IA-0067	MIDAMERICAN ENERGY COMPANY	IA	PROJECT 02-528	6/17/2003	INACTIVE COAL STORAGE PILE	Fug PM	Particulate Matter < 10 µ (PM10)	P	CHEMICAL DUST SUPPRESSANT				BACT-PSD								
IA-0067	MIDAMERICAN ENERGY COMPANY	IA	PROJECT 02-528	6/17/2003	RAIL UNLOADING COAL STOCKOUT PILE	Fug PM	Particulate Matter < 10 µ (PM10)	P	CHEMICAL DUST SUPPRESSANT				BACT-PSD								
IA-0067	MIDAMERICAN ENERGY COMPANY	IA	PROJECT 02-528	6/17/2003	STACKER CONVEYOR	Fug PM	Particulate Matter < 10 µ (PM10)	P	CHEMICAL DUST SUPPRESSANT				BACT-PSD								
IA-0067	MIDAMERICAN ENERGY COMPANY	IA	PROJECT 02-528	6/17/2003	TRANSFER TO ACTIVE PILE	Fug PM	Particulate Matter < 10 µ (PM10)	P	CHEMICAL DUST SUPPRESSANT				BACT-PSD								
IN-0090	NUCOR STEEL	IN	107-12143-00038	1/19/2001	TRANSPORTATION ON ROADS	Fug PM	Particulate Matter < 10 µ (PM10)	P	SPEED LIMITS, VACUUMING/SWEEPING EVERY 14 DAYS. DUST SUPPRESSANT ON UNPAVED ROADS AT A RATE OF 0.16 GAL/YD2 ONCE PER MONTH. EMISSION UNIT IS LB SILT PER MILE	16.8	LB/MI		BACT-PSD								
KY-0070	NSA-A DIVISION OF SOUTHWIRE COMPANY	KY	F-96-024 (R2)	5/29/1998	0.4 MILE PLANT ROAD	Fug PM	Particulate Matter < 10 µ (PM10)	P	REASONABLE POLLUTION PRECAUTIONS.	0.42	LB/H		Other Case-by-Case	1.84	T/YR						
KY-0095	RECMIX OF PA, INC.	KY	V-03-051	8/6/2004	CRUSHING OPERATION	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATER MIST SPRAYS AT MULTIPLE LOCATIONS	0.78	T/YR	PLANT WIDE EMISSION LIMIT	BACT-PSD								
KY-0095	RECMIX OF PA, INC.	KY	V-03-051	8/6/2004	FINAL AGGREGATE HANDLING, EXIT PILE	Fug PM	Particulate Matter < 10 µ (PM10)	P	HIGH MOISTURE CONTENT	0.78	T/YR	PLANT WIDE EMISSION LIMIT	BACT-PSD								
KY-0095	RECMIX OF PA, INC.	KY	V-03-051	8/6/2004	OVERSIZE SLAG HANDLING, CONVEYOR TO STOCKPILES	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATERING	0.78	T/YR	PLANT WIDE EMISSION LIMIT	BACT-PSD								
KY-0095	RECMIX OF PA, INC.	KY	V-03-051	8/6/2004	OVERSIZE SLAG HANDLING, STOCKPILES	Fug PM	Particulate Matter < 10 µ (PM10)	P	COVERS TO OPENINGS	0.78	T/YR	PLANT WIDE EMISSION LIMIT	BACT-PSD								
KY-0095	RECMIX OF PA, INC.	KY	V-03-051	8/6/2004	RAW SLAG HANDLING	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATERING	0.78	T/YR	PLANT WIDE EMISSION LIMIT	BACT-PSD								
KY-0095	RECMIX OF PA, INC.	KY	V-03-051	8/6/2004	RAW SLAG HANDLING, HOPPER	Fug PM	Particulate Matter < 10 µ (PM10)	P	ENCLOSURE TUNNEL	0.78	T/YR	PLANT WIDE EMISSION LIMIT	BACT-PSD								
KY-0095	RECMIX OF PA, INC.	KY	V-03-051	8/6/2004	SLAG SKULL HANDLING	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATERING	0.78	T/YR	PLANT WIDE EMISSION LIMIT	BACT-PSD								
KY-0095	RECMIX OF PA, INC.	KY	V-03-051	8/6/2004	STOCKPILES	Fug PM	Particulate Matter < 10 µ (PM10)	P	MATERIAL HAS HIGH MOISTURE CONTENT	0.78	T/YR	PLANT WIDE EMISSION LIMIT	BACT-PSD								
KY-0095	RECMIX OF PA, INC.	KY	V-03-051	8/6/2004	UNPAVED ROAD	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATERING	0.78	T/YR	PLANTWIDE EMISSION LIMIT	BACT-PSD								
LA-0122	MANSFIELD MILL	LA	PSD-LA-93 (M-6)	8/14/2001	HAUL ROADS	Fug PM	Particulate Matter < 10 µ (PM10)	P	WET SUPPRESSION ON UNPAVED ROADS TWICE PER 8 HOURS PERIOD DURING DAYLIGHT HOURS (EXCEPT WHEN RAINING)	18.5	LB/H		BACT-PSD	80.8	T/YR						
LA-0209	GRAVELITE DIVISION	LA	PSD-LA-713	6/28/2006	CONVEYOR SYSTEM, NIGHT STOCKPILE	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATER SPRAYS AND/OR PARTIAL ENCLOSURE	0.04	LB/H	HOURLY MAXIMUM	BACT-PSD	0.17	T/YR	ANNUAL MAXIMUM					
LA-0209	GRAVELITE DIVISION	LA	PSD-LA-713	6/28/2006	CONVEYOR SYSTEMS AND STOCKPILES	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATER SPRAYS AND/OR PARTIAL ENCLOSURE	0.1	LB/H	HOURLY MAXIMUM	BACT-PSD	0.43	T/YR	ANNUAL MAXIMUM					
LA-0209	GRAVELITE DIVISION	LA	PSD-LA-713	6/28/2006	COOLER, NOS. 1-4, FUGITIVES	Fug PM	Particulate Matter < 10 µ (PM10)	N		0.02	LB/H	HOURLY MAXIMUM	BACT-PSD	0.08	T/YR	ANNUAL MAXIMUM					

Table C-1B: Fugitive PM10

Mtl Hand = Mtl Trans via conveyor, hoppers, bins, crushing, grinding and loading/unloading in fixed location
Fug PM = Traffic, storage piles, transfers to piles & stackers, open dumping (e.g. loader to dump truck in quarry) and slag processing
Flyash Hand = any material handling which includes flyash or mixtures including flyash

Compiled data set for material handling and fugitive emissions from Process Codes: 12.110, 81.000, 82.000, 90.011, 90.018, 90.019, 90.020, 90.021, 90.023, 90.024, 90.026, 90.031, 90.999, 99.100, 99.999
Control Equipment Codes: P= Pollution prevention, A= Add on Controls. B= Both, N= No controls feasible

RBLCID	FACILITY NAME	FACILITY STATE	PERMIT NUM	Permit Date	Process	Process Type	Pollutant	Control Code	Control Desc.	Emission Limit 1	Emission Limit 1 Unit	Emission Limit 1 Avg Time	Case-by-case basis	Emission Limit 2	Emission Limit Unit 2	Emission Limit 2 Avg Time	STD Emission Limit	STD Limit Unit	STD Limit Unit Avg Time	BACT gr/dscf Limits	Non-BACT gr/dscf Limits
LA-0209	GRAVELITE DIVISION	LA	PSD-LA-713	6/28/2006	CRUSHER NO. 1	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATER SPRAY	0.01	LB/H	HOURLY MAXIMUM	BACT-PSD	0.04	T/YR	NNUAL MAXIMUM					
LA-0209	GRAVELITE DIVISION	LA	PSD-LA-713	6/28/2006	UNPAVED ROADS	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATERING AND REDUCED SPEED LIMIT	0.7	LB/H	HOURLY MAXIMUM	BACT-PSD	3.05	T/YR	NNUAL MAXIMUM					
MO-0048	LAFARGE CORPORATION	MO	0897-019	8/20/1997	ASH BIN, ASH CONVEYOR(EP 61)	Fug PM	Particulate Matter < 10 µ (PM10)	P	ENCLOSURE	0	EE CONTROLS/P2		BACT-PSD	0			0				
MO-0048	LAFARGE CORPORATION	MO	0897-019	8/20/1997	CLINKER TRUCK LOADOUT(EP 83)	Fug PM	Particulate Matter < 10 µ (PM10)	P	TELESCOPING CHUTE AND ENCLOSURE	0	EE CONTROLS/P2		BACT-PSD	0			0				
MO-0048	LAFARGE CORPORATION	MO	0897-019	8/20/1997	CONVEYOR TRANSFER POINTS(EP 58, 98, 99)	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATER SPRAY AND ENCLOSURES	0	EE CONTROLS/P2		BACT-PSD	0			0				
MO-0048	LAFARGE CORPORATION	MO	0897-019	8/20/1997	PAVED HAUL ROADS(EP 95)	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATER FLUSHING FOLLOWED BY VACUUM SWEEPING	0	EE CONTROLS/P2		BACT-PSD	0			0				
MO-0048	LAFARGE CORPORATION	MO	0897-019	8/20/1997	STORAGE PILE(EP 60)	Fug PM	Particulate Matter < 10 µ (PM10)	P	PARTIAL ENCLOSURES OR WIND GUARDS	0	EE CONTROLS/P2		BACT-PSD	0			0				
MO-0048	LAFARGE CORPORATION	MO	0897-019	8/20/1997	STORAGE PILE(EP 63)	Fug PM	Particulate Matter < 10 µ (PM10)	P	PARTIAL ENCLOSURES OR WIND GUARDS	0	EE CONTROLS/P2		BACT-PSD	0			0				
MO-0048	LAFARGE CORPORATION	MO	0897-019	8/20/1997	STORAGE PILE(EP 65)	Fug PM	Particulate Matter < 10 µ (PM10)	P	PARTIAL ENCLOSURES OR WIND GUARDS	0	EE CONTROLS/P2		BACT-PSD	0			0				
MO-0048	LAFARGE CORPORATION	MO	0897-019	8/20/1997	STORAGE PILES	Fug PM	Particulate Matter < 10 µ (PM10)	P	PARTIAL ENCLOSURE OR WIND GUARD	0	EE CONTROLS/P2		BACT-PSD	0			0				
MO-0048	LAFARGE CORPORATION	MO	0897-019	8/20/1997	UNPAVED HAUL ROADS(EP 96)	Fug PM	Particulate Matter < 10 µ (PM10)	P	USE OF EMULSION AT MANUFACTURER'S SPECIFIED APPLICATION RATE (SURFACTANT, DUST SUPPRESSANT)	0	EE CONTROLS/P2		BACT-PSD	0			0				
MT-0022	BULL MOUNTAIN, NO. 1, LLC - ROUNDUP POWER PROJECT	MT	3182-00	7/21/2003	ACTIVE COAL STORAGE PILE	Fug PM	Particulate Matter < 10 µ (PM10)	P	WIND FENCE AND DUST SUPPRESSION; WORK PRACTICE LIMITS	98	% REDUCTION	see note	BACT-PSD								
MT-0022	BULL MOUNTAIN, NO. 1, LLC - ROUNDUP POWER PROJECT	MT	3182-00	7/21/2003	INACTIVE COAL STORAGE PILE	Fug PM	Particulate Matter < 10 µ (PM10)	P	WIND FENCE, DUST SUPPRESSION, PILE COMPACTION	98	% REDUCTION	see note	BACT-PSD								
OH-0270	CARMEUSE LIME - MAPLE GROVE FACILITY	OH	03-13527	10/14/2003	MATERIAL STORAGE PILES	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATER APPLICATIONS AND DAILY INSPECTIONS OF EACH STORAGE PILE.	0.4	T/YR		BACT-PSD						NOT AVAILABLE		
OH-0272	HAVERHILL NORTH COKE COMPANY	OH	07-00466	2/27/2001	ROADWAYS AND PARKING	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATERING AS SUFFICIENT FREQUENCY TO ENSURE COMPLIANCE	1.56	T/YR	fugitive PM10	BACT-PSD								
OH-0276	CHARTER STEEL	OH	13-04176	4/14/2003	SLAG PROCESSING OPERATION	Fug PM	Particulate Matter < 10 µ (PM10)	P	ENCLOSURE WHERE PRACTICLE	0.79	LB/H		BACT-PSD	0.56	T/YR						
OH-0297	FDS COKE	OH	04-01360	9/20/2005	ROADWAYS	Fug PM	Particulate Matter < 10 µ (PM10)	P	TREAT WITH APPROPRIATE MATERIAL (WATER)	4.85	T/YR		BACT-PSD						STANDARD NOT AVAILABLE		
OR-0025	SPRINGFIELD PLANT	OR	202125	6/4/1998	ROAD AND PARKING LOTS	Fug PM	Particulate Matter < 10 µ (PM10)	N		11	LB/D		Other Case-by-Case	1.9	T/YR						
OR-0025	SPRINGFIELD PLANT	OR	202125	6/4/1998	SCREEN & CRUSH FUGITIVES F7	Fug PM	Particulate Matter < 10 µ (PM10)	N		102	LB/D		Other Case-by-Case	16	T/YR						
SD-0003	GCC DACOTAH	SD	28.1101-PSD	4/10/2003	COAL STACKER TOP	Fug PM	Particulate Matter < 10 µ (PM10)	A	FABRIC FILTER	0.01	GR/DSCF		BACT-PSD				0.01	GR/DSCF			
TX-0275	W.A. PARISH ELECTRIC GENERATING STATION	TX	PSD-TX-234	12/21/2000	RADIAL CONVEYOR STACKOUT, WH3	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.01	LB/H		Other Case-by-Case	0.01	T/YR						
TX-0275	W.A. PARISH ELECTRIC GENERATING STATION	TX	PSD-TX-234	12/21/2000	STOCKPILE, LH2	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.06	T/YR		Other Case-by-Case						NOT AVAILABLE		
TX-0275	W.A. PARISH ELECTRIC GENERATING STATION	TX	PSD-TX-234	12/21/2000	STORAGE PILE, WASTE, WH4	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.1	LB/H		Other Case-by-Case	0.42	T/YR						
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	ADDITIVE PILE	Fug PM	Particulate Matter < 10 µ (PM10)	N		0.08	LB/H		BACT-PSD	0.35	T/YR						
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	CLINKER PILE	Fug PM	Particulate Matter < 10 µ (PM10)	N		0.21	LB/H		BACT-PSD	0.9	T/YR						

Mtl Hand = Mtl Trans via conveyor, hoppers, bins, crushing, grinding and loading/unloading in fixed location
Fug PM = Traffic, storage piles, transfers to piles & stackers, open dumping (e.g. loader to dump truck in quarry) and slag processing
Flyash Hand = any material handling which includes flyash or mixtures including flyash

Compiled data set for material handling and fugitive emissions from Process Codes: 12.110, 81.000, 82.000, 90.011, 90.018, 90.019, 90.020, 90.021, 90.023, 90.024, 90.026, 90.031, 90.999, 99.100, 99.999
Control Equipment Codes: P= Pollution prevention, A= Add on Controls. B= Both, N= No controls feasible

RBLCID	FACILITY NAME	FACILITY STATE	PERMIT NUM	Permit Date	Process	Process Type	Pollutant	Control Code	Control Desc.	Emission Limit 1	Emission Limit 1 Unit	Emission Limit 1 Avg Time	Case-by-case basis	Emission Limit 2	Emission Limit Unit 2	Emission Limit 2 Avg Time	STD Emission Limit	STD Limit Unit	STD Limit Unit Avg Time	BACT gr/dscf Limits	Non-BACT gr/dscf Limits
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	CLINKER TRUCK LOADING	Fug PM	Particulate Matter < 10 µ (PM10)	N		0.02	LB/H		BACT-PSD	0.07	T/YR						
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	FRONT END LOADER DROP POINT TO CRUSHER	Fug PM	Particulate Matter < 10 µ (PM10)	P	PARTIAL ENCLOSURE WITH WATER SPRAYER	0.27	LB/H		BACT-PSD	0.78	T/YR						
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	MAT HANDLING COAL/COKE CONVEYOR TO STACKER	Fug PM	Particulate Matter < 10 µ (PM10)	P	COVERED CONVEYOR BELT	0.01	LB/H	LESS THAN	BACT-PSD	0.01	T/YR	LESS THAN			SEE NOTE		
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	MATERIAL HANDLING, COAL/COKE DROP POINT TO PILE	Fug PM	Particulate Matter < 10 µ (PM10)	P	PARTIAL ENCLOSURE AND WATER SPRAY	0.22	LB/H		BACT-PSD	0.97	T/YR				SEE NOTE		
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	MATERIAL HANDLING, COAL/COKE DROP POINT TO STACKER	Fug PM	Particulate Matter < 10 µ (PM10)	P	PARTIAL ENCLOSURE AND WATER SPRAY	0.22	LB/H		BACT-PSD	0.97	T/YR				SEE NOTE		
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	MATERIAL HANDLING, COAL/COKE STACKER TO PILE	Fug PM	Particulate Matter < 10 µ (PM10)	P	ENCLOSURE, WATER SPRAY	0.01	LB/H	LESS THAN	BACT-PSD	0.01	T/YR	LESS THAN			SEE NOTE		
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	MATERIAL STORAGE, COAL/COKE PILES	Fug PM	Particulate Matter < 10 µ (PM10)	P	SPRAY THE C/C PILES	0.28	LB/H		BACT-PSD	1.21	T/YR				SEE NOTE		
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	MILL SCALE PILE	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATER SPRAY	0.02	LB/H		BACT-PSD	0.06	T/YR						
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	MOBILE CRUSHER	Fug PM	Particulate Matter < 10 µ (PM10)	N		0.65	LB/H		BACT-PSD	1.9	T/YR				SEE NOTE		
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	SAND PILE	Fug PM	Particulate Matter < 10 µ (PM10)	N		0.02	LB/H		BACT-PSD	0.06	T/YR						
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	CKD DRY KILN PUG MILL TO TRUCK (F-P-12)	Fug PM	Particulate Matter < 10 µ (PM10)	P	INCOMING AND OUTGOING RR CARS AND TRUCKS USED IN TRANSPORTING CEMENT, CLINKER, COAL, AND PETCOKE SHALL BE CLEANED AND MAINTAINED, AS NECESSARY, TO MINIMIZE FUGITIVE EMISSIONS.	0.01	LB/H	LESS THAN	N/A	0.01	T/YR	LESS THAN					
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	KILN DUST DROP TO PILES (F-P-7)	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED.	0.01	LB/H	LESS THAN	N/A	0.01	T/YR	LESS THAN					
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	PAVED ROADS (F-TR-1)	Fug PM	Particulate Matter < 10 µ (PM10)	P	PLANT ROADS SHALL BE PAVED AND CLEANED. QUARRY ROADS SHALL BE SPRINKLED WITH WATER AND/OR CHEMICALS, AS NECESSARY, TO MAINTAIN COMPLIANCE WITH ALL TNRCC RULES AND REGULATIONS.	0.86	T/YR		N/A								
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	PRIMARY CRUSHER (F-Q-6)	Fug PM	Particulate Matter < 10 µ (PM10)	P	A WATER SPRAY SHALL BE APPLIED AT THE PRIMARY CRUSHER HOPPER WHEN VISIBLE DUST EMISSIONS CAN BE OBSERVED AT THE PRIMARY CRUSHER.	0.01	LB/H	LESS THAN	N/A	0.01	T/YR	LESS THAN					
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	QUARRY LOADER DROP TO TRUCK (F-Q-4)	Fug PM	Particulate Matter < 10 µ (PM10)	P	INCOMING AND OUTGOING RR CARS AND TRUCKS USED IN TRANSPORTING CEMENT, CLINKER, COAL, AND PETCOKE SHALL BE CLEANED AND MAINTAINED, AS NECESSARY, TO MINIMIZE FUGITIVE EMISSIONS.	0.05	LB/H		N/A	0.14	T/YR						
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	RMS SHUTTLE BELT DROP TO PILE (F-R-7)	Fug PM	Particulate Matter < 10 µ (PM10)	P	THE TOP AND SIDES OF ALL CONVEYOR BELTS SHALL BE COVERED. ALL CONVEYOR BELT TRANSFER POINTS SHALL BE ENCLOSED.	0.01	LB/H		N/A	0.02	T/YR						
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	SOLID FUEL STORAGE DROP TO PILE (F-P-1)	Fug PM	Particulate Matter < 10 µ (PM10)	P	THE TOP AND SIDES OF ALL CONVEYOR BELTS SHALL BE COVERED. ALL CONVEYOR BELT TRANSFER POINTS SHALL BE ENCLOSED.	0.01	LB/H		N/A	0.02	T/YR						
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	SOLID FUEL TRUCK UNLOADING DROP (F TR-2)	Fug PM	Particulate Matter < 10 µ (PM10)	P	INCOMING AND OUTGOING RR CARS AND TRUCKS USED IN TRANSPORTING CEMENT, CLINKER, COAL, AND PETCOKE SHALL BE CLEANED AND MAINTAINED, AS NECESSARY, TO MINIMIZE FUGITIVE EMISSIONS.	0.01	LB/H		N/A	0.02	T/YR						
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	UNPAVED ROADS (PT. F-L-1)	Fug PM	Particulate Matter < 10 µ (PM10)	P	QUARRY ROADS SHALL BE SPRINKLED WITH WATER AND/OR CHEMICALS, AS NECESSARY, TO COMPLY WITH ALL TNRCC RULES AND REGULATIONS.	11.4	T/YR		N/A								

PolyMet Mining, Inc.
NorthMet Project Processing Plant Air Quality Permit Application
Emission Control Technology Review Report (RS58B) -Attachment C - EPA RACT BACT LAER Clearinghouse Data
Table C-1B: Fugitive PM10

Mtl Hand = Mtl Trans via conveyor, hoppers, bins, crushing, grinding and loading/unloading in fixed location
Fug PM = Traffic, storage piles, transfers to piles & stackers, open dumping (e.g. loader to dump truck in quarry) and slag processing
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RBLCID	FACILITY NAME	FACILITY STATE	PERMIT NUM	Permit Date	Process	Process Type	Pollutant	Control Code	Control Desc.	Emission Limit 1	Emission Limit 1 Unit	Emission Limit 1 Avg Time	Case-by-case basis	Emission Limit 2	Emission Limit Unit 2	Emission Limit 2 Avg Time	STD Emission Limit	STD Limit Unit	STD Limit Unit Avg Time	BACT gr/dscf Limits	Non-BACT gr/dscf Limits
TX-0282	CAPITOL CEMENT DIVISION	TX	PSD-TX-120M3	9/16/1998	WIND PILE EROSION (W-P-2)	Fug PM	Particulate Matter < 10 µ (PM10)	P	COAL AND COKE STOCKPILES SHALL BE SPRINKLED WITH WATER AND/OR CHEMICALS, AS NECESSARY, TO MAINTAIN COMPLIANCE WITH ALL TNRCC RULES AND REGULATIONS.	0.05	LB/H		N/A	0.2	T/YR						
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	FEEDER TO FEEDER TO CONV TO SCREEN, S24-26	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.0277	LB/H	EACH	Other Case-by-Case	0.0166	T/YR	EACH					
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	FEEDER TO FEEDER TO CONV TO SCREEN, S7-9	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.0018	LB/H	EACH	Other Case-by-Case	0.0011	T/YR	EACH					
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	FINES/COARSE SAND/LIGHT ORGANIC MATERIAL STORAGE	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.14	T/YR	EACH	Other Case-by-Case								
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	FRONT-END LOADER DROP @ MIXING BLDG, S35	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.221	LB/H		Other Case-by-Case	0.98	T/YR						
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	FRONT-END LOADER DROP @ MIXING BLDG, S35	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.221	LB/H		Other Case-by-Case	0.98	T/YR						
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	GRIZZLY TO STOCK	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.0002	LB/H	SEE NOTES	Other Case-by-Case	0.0001	T/YR						
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	IN-PLANT VEHICLE TRAFFIC	Fug PM	Particulate Matter < 10 µ (PM10)	P	CHEMICAL AND WATER SPRAY	12.5	T/YR		Other Case-by-Case								
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	MOLTEN SLAG POT DUMP, S34A	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	1.19	LB/H		Other Case-by-Case	5.3	T/YR						
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	SCREEN TO CONV TO STOCK, S20&21	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.0005	LB/H	EACH, SEE NOTES	Other Case-by-Case	0.0003	T/YR	EACH					
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	SCREEN TO CONV TO STOCK, S22&23	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.001	LB/H	EACH	Other Case-by-Case	0.0006	T/YR	EACH					
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	SLAG ROAD EMISSIONS, S38	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	10.63	T/YR		Other Case-by-Case								
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	SLAG SKUL POT DUMP, S34B	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.065	LB/H		Other Case-by-Case	0.29	T/YR						
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	STOCKPILE, S37	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.21	T/YR		Other Case-by-Case								
TX-0332	CHAPPARRAL STEEL MIDLOTHIAN STEEL MILL	TX	PSD-TX-138 (M5)	4/24/2000	VIBRATING SCREEN, 22	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.015	LB/H		Other Case-by-Case	0.065	T/YR						
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	(2) FUEL HANDLING ACTIVE STORAGE PILES A&B	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATER SPRAY & UNDERGROUND RECLAIM VENT TO BAGHOUSE	1.56	T/YR	EACH	BACT-PSD								
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	(2) FUEL HANDLING ACTIVE STORAGE PILES A&B RECLAIM	Fug PM	Particulate Matter < 10 µ (PM10)	A	BAGHOUSE	1.03	LB/H	EACH	BACT-PSD	4.51	T/YR	EACH					
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	FUEL HANDLING ACTIVE STORAGE PILE	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.98	T/YR		BACT-PSD								
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	FUEL HANDLING ACTIVE STORAGE PILE RECLAIM	Fug PM	Particulate Matter < 10 µ (PM10)	B	BAGHOUSE & WATERSPRAY	0.17	LB/H		BACT-PSD	0.74	T/YR						
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	FUEL HANDLING EMERGENCY STORAGE PILE	Fug PM	Particulate Matter < 10 µ (PM10)	B	TELESCOPING CHUTE & WATER SPRAY	0.21	T/YR		BACT-PSD								
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	FUEL HANDLING INACTIVE STORAGE PILE	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATERING	9.02	T/YR		BACT-PSD								
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	INDOOR ABRASIVE CLEANING & PAINTING FACILITY	Fug PM	Particulate Matter < 10 µ (PM10)	A	BAGHOUSE	2.57	LB/H		BACT-PSD	2.67	T/YR						
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	LIMESTONE HANDLING STORAGE PILE	Fug PM	Particulate Matter < 10 µ (PM10)	B	PARTIAL ENCLOSURE, TELESCOPING CHUTE, UNDERGROUND RECLAIM	0.21	T/YR		BACT-PSD								
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	PLANT ROADS	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATER SPRAY	8.71	T/YR		BACT-PSD								

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Table C-1B: Fugitive PM10

Mtl Hand = Mtl Trans via conveyor, hoppers, bins, crushing, grinding and loading/unloading in fixed location
Fug PM = Traffic, storage piles, transfers to piles & stackers, open dumping (e.g. loader to dump truck in quarry) and slag processing
Flyash Hand = any material handling which includes flyash or mixtures including flyash

Compiled data set for material handling and fugitive emissions from Process Codes: 12.110, 81.000, 82.000, 90.011, 90.018, 90.019, 90.020, 90.021, 90.023, 90.024, 90.026, 90.031, 90.999, 99.100, 99.999
Control Equipment Codes: P= Pollution prevention, A= Add on Controls. B= Both, N= No controls feasible

RBLCID	FACILITY NAME	FACILITY STATE	PERMIT NUM	Permit Date	Process	Process Type	Pollutant	Control Code	Control Desc.	Emission Limit 1	Emission Limit 1 Unit	Emission Limit 1 Avg Time	Case-by-case basis	Emission Limit 2	Emission Limit Unit 2	Emission Limit 2 Avg Time	STD Emission Limit	STD Limit Unit	STD Limit Unit Avg Time	BACT gr/dscf Limits	Non-BACT gr/dscf Limits
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	WASTE HANDLING LANDFILL	Fug PM	Particulate Matter < 10 µ (PM10)	P	WATER SPRAY	13.1	T/YR		BACT-PSD								
TX-0355	PORTLAND CEMENT MANUFACTURING PLANT	TX	PSD-TX-145 M1	6/29/2001	COAL/COKE STOCKPILES, S-01	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.28	LB/H		Other Case-by-Case	0.81	T/YR						
TX-0355	PORTLAND CEMENT MANUFACTURING PLANT	TX	PSD-TX-145 M1	6/29/2001	QUARRYING, Q-1	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	8.64	LB/H		Other Case-by-Case	9.59	T/YR						
TX-0355	PORTLAND CEMENT MANUFACTURING PLANT	TX	PSD-TX-145 M1	6/29/2001	TRANSPORT TO RAW MATERIAL/STORAGE BINS, RMS	Fug PM	Particulate Matter < 10 µ (PM10)	P	CLEAN AND MAINTAIN OUTGOING VEHICLES TO MINIMIZE FUGITIVES.	1.33	LB/H		Other Case-by-Case	1.21	T/YR						
TX-0366	AMARILLO COPPER REFINE	TX	PSD-TX-847	10/17/2000	FUGITIVES, 6G	Fug PM	Particulate Matter < 10 µ (PM10)	N	NONE INDICATED	0.1	LB/H		BACT-PSD	0.33	T/YR						
VA-0240	CHAPARRAL STEEL COMPANY	VA	51264	4/24/1998	UNPAVED RDS,STORAGE PILES & MATERIAL TRANSFER OP.	Fug PM	Particulate Matter < 10 µ (PM10)	P	DUST MANAGEMENT PLAN; WORK PRACTICE (90%)	0.1	LB/H		Other Case-by-Case	0			0				

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Table C-1C: Fugitive Opacity Limits

Mtl Hand = Mtl Trans via conveyor, hoppers, bins, crushing, grinding and loading/unloading in fixed location
Fug PM = Traffic, storage piles, transfers to piles & stackers, open dumping (e.g. loader to dump truck in quarry) and slag processing
Flyash Hand = any material handling which includes flyash or mixtures including flyash

Compiled data set for material handling and fugitive emissions from Process Codes: 12.110, 81.000, 82.000, 90.011, 90.018, 90.019, 90.020, 90.021, 90.023, 90.024, 90.026, 90.031, 90.999, 99.100, 99.999
Control Equipment Codes: P= Pollution prevention, A= Add on Controls. B= Both, N= No controls feasible

RBLCID	FACILITY NAME	FACILITY STATE	PERMIT NUM	Permit Date	Process	Process Type	Pollutant	Control Code	Control Desc.	Emission Limit 1	Emission Limit 1 Unit	Emission Limit 1 Avg Time	Case-by-case basis	Emission Limit 2	Emission Limit Unit 2	Emission Limit 2 Avg Time	STD Emission Limit	STD Limit Unit	STD Limit Unit Avg Time	BACT Oapcity Limits	Non-BACT Opacity Limits
AZ-0046	ARIZONA CLEAN FUELS YUMA	AZ	1001205	4/14/2005	COKE PAD AND COKE PIT	Fug PM	Visible Emissions (VE)	B	WATER SPRAY SYSTEMS, COMPLETELY WALLED ENCLOSURE	0	% OPACITY	ACROSS THE REFINERY'S PROPERTY BOUNDARY	BACT-PSD				0	% OPACITY	EFINERY'S PROPE	0	
IN-0079	STEEL DYNAMICS, INC.	IN	CP-183-10097-00030	7/7/1999	SLAG, HANDLING AND PROCESSING	Fug PM	Visible Emissions (VE)	B	WATER SUPPRESSION AND MINIMIZING DROP HEIGHTS OPACITY REQUIREMENTS, SIX MINUTE AVERAGING	10	% OPAC		BACT-PSD	0			10	% OPAC		10	
IN-0080	STEEL DYNAMICS, INC.	IN	CP-183-10097-00030(MOD)	7/7/1999	DUMPING, SLAG	Fug PM	Visible Emissions (VE)	P	PARTIALLY ENCLOSED BUILDING	3	% OPACITY	6-minute avg	BACT-PSD				3	% OPACITY	6-minute avg	3	
IN-0080	STEEL DYNAMICS, INC.	IN	CP-183-10097-00030(MOD)	7/7/1999	HANDLING AND PROCESSING, SLAG	Fug PM	Visible Emissions (VE)	B	WATER SUPPRESSION AND MINIMIZING DROP HEIGHTS OPACITY, 3-10%, SIX-MINUTE AVERAGE	3	% OPAC		BACT-PSD	0			3	% OPAC		3	
IN-0090	NUCOR STEEL	IN	107-12143-00038	1/19/2001	DUMPING STORAGE & TRANSFER	Fug PM	Visible Emissions (VE)	P	WATERING STORAGE PILES	5	% OPACITY		BACT-PSD				5	% OPACITY		5	
IN-0090	NUCOR STEEL	IN	107-12143-00038	1/19/2001	TRANSPORTATION ON ROADS	Fug PM	Visible Emissions (VE)	A		10	% OPACITY		BACT-PSD				10	% OPACITY		10	
IN-0119	AUBURN NUGGET	IN	033-19475-00092	5/31/2005	ROADS	Fug PM	Visible Emissions (VE)	P	FOLLOW FUGITIVE DUST PLAN	10	% OPACITY		BACT-PSD							10	
MN-0061	ERIE NUGGET	MN	13700318-001	6/26/2005	FUGITIVES FROM PAVED ROADS	Fug PM	Visible Emissions (VE)	P	FUGITIVE DUST CONTROL PLAN.	5	% OPACITY		BACT-PSD				5	% OPACITY		5	
MN-0061	ERIE NUGGET	MN	13700318-001	6/26/2005	FUGITIVES FROM STORAGE PILES	Fug PM	Visible Emissions (VE)	P	FUGITIVE DUST CONTROL PLAN.	5	% OPACITY		BACT-PSD				5	% OPACITY		5	
OH-0270	CARMEUSE LIME - MAPLE GROVE FACILITY	OH	03-13527	10/14/2003	MATERIAL STORAGE PILES	Fug PM	Visible Emissions (VE)	P	WATER APPLICATIONS AND DAILY INSPECTIONS OF EACH STORAGE PILE.	0	% OPACITY		BACT-PSD				0	% OPACITY		0	
OH-0272	HAVERHILL NORTH COKE COMPANY	OH	07-00466	2/27/2001	ROADWAYS AND PARKING	Fug PM	Visible Emissions (VE)	P	WATERING AS SUFFICIENT FREQUENCY T	0	% OPACITY		BACT-PSD				0	% OPACITY		0	
OH-0276	CHARTER STEEL	OH	13-04176	4/14/2003	SLAG PROCESSING OPERATION	Fug PM	Visible Emissions (VE)	P	ENCLOSURE WHERE PRACTICLE	15	% OPACITY	AS A 6-MINUTE AVERAGE					15	% OPACITY	-MINUTE AVERAG		15
OR-0025	SPRINGFIELD PLANT	OR	202125	6/4/1998	ROAD AND PARKING LOTS	Fug PM	Visible Emissions (VE)	N	NONE INDICATED	20	% OPACITY	FOR NO > 3 MIN/H	Other Case-by-Case				20	% OPACITY	FOR NO > 3 MIN/H		20
OR-0025	SPRINGFIELD PLANT	OR	202125	6/4/1998	SCREEN & CRUSH FUGITIVES F7	Fug PM	Visible Emissions (VE)	N	NONE INDICATED	20	% OPACITY	FOR NO > 3 MIN/H	Other Case-by-Case				20	% OPACITY	FOR NO > 3 MIN/H		20
OR-0036	DURKEE FACILITY	OR	01-0029	2/26/1998	BEDROCK BLASTING	Fug PM	Visible Emissions (VE)	N		40	% OPACITY	3 MIN IN 60 MIN	Other Case-by-Case				40	% OPACITY	3 MIN IN 60 MIN		40
OR-0036	DURKEE FACILITY	OR	01-0029	2/26/1998	PAVED & UNPAVED ROADS	Fug PM	Visible Emissions (VE)	N		20	% OPACITY	3 MIN IN 60 MIN	Other Case-by-Case				20	% OPACITY	3 IN IN 60 MIN		20
TX-0279	NORTH TEXAS CEMENT COMPANY	TX	PSD-TX-893	3/4/1999	MOBILE CRUSHER	Fug PM	Visible Emissions (VE)	N		10	% OPACITY	6 MINUTE AVERAGE	BACT-PSD				10	% OPACITY		10	
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	(2) FUEL HANDLING ACTIVE STORAGE PILES A&B	Fug PM	Visible Emissions (VE)	P	WATER SPRAY AND UNDERGROUND RECLAIM VENT TO BAGHOUSE	0	% OPACITY	EACH	N/A				0	% OPACITY	EACH		0
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	FUEL HANDLING ACTIVE STORAGE PILE	Fug PM	Visible Emissions (VE)	N	NONE INDICATED	0	% OPACITY		N/A				0	% OPACITY			0
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	FUEL HANDLING ACTIVE STORAGE PILE RECLAIM	Fug PM	Visible Emissions (VE)	B	BAGHOUSE AND WATERSPRAY	5	% OPACITY	6 MIN AV	N/A				5	% OPACITY	6 MIN AV		5
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	FUEL HANDLING EMERGENCY STORAGE PILE	Fug PM	Visible Emissions (VE)	B	TELESCOPING CHUTE AND WATER SPRAY	0	% OPACITY		N/A				0	% OPACITY			0
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	FUEL HANDLING INACTIVE STORAGE PILE	Fug PM	Visible Emissions (VE)	P	WATERING	0	% OPACITY		N/A				0	% OPACITY			0
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	LIMESTONE HANDLING STORAGE PILE	Fug PM	Visible Emissions (VE)	B	PARTIAL ENCLOSURE, TELESCOPING CHUTE, UNDERGROUND RECLAIM	0	% OPACITY		N/A				0	% OPACITY			0
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	PLANT ROADS	Fug PM	Visible Emissions (VE)	P	WATER SPRAY	0	% OPACITY		N/A				0	% OPACITY			0
TX-0342	LIMESTONE ELECTRIC GENERATING STATION	TX	PSD-TX-371 (M3)	5/23/2001	WASTE HANDLING LANDFILL	Fug PM	Visible Emissions (VE)	P	WATER SPRAY	0	% OPACITY		N/A				0	% OPACITY			0
TX-0355	PORTLAND CEMENT MANUFACTURING PLANT	TX	PSD-TX-145 M1	6/29/2001	COAL/COKE STOCKPILES, S-01	Fug PM	Visible Emissions (VE)	N	NONE INDICATED	10	% OPACITY		N/A				10	% OPACITY			10
TX-0355	PORTLAND CEMENT MANUFACTURING PLANT	TX	PSD-TX-145 M1	6/29/2001	CRUSHING OPERATION, B-06	Fug PM	Visible Emissions (VE)	P	WET SPRAY	10	% OPACITY		N/A				10	% OPACITY			10
TX-0355	PORTLAND CEMENT MANUFACTURING PLANT	TX	PSD-TX-145 M1	6/29/2001	QUARRYING, Q-1	Fug PM	Visible Emissions (VE)	N	NONE INDICATED	10	% OPACITY		N/A				10	% OPACITY			10
TX-0355	PORTLAND CEMENT MANUFACTURING PLANT	TX	PSD-TX-145 M1	6/29/2001	TRANSPORT TO RAW MATERIAL/STORAGE BINS, RMS	Fug PM	Visible Emissions (VE)	P	CLEAN AND MAINTAIN VEHICLES TO MINIMIZE FUGITIVES	10	% OPACITY		N/A				10	% OPACITY			10
UT-0061	NUCOR STEEL CORPORATION	UT	DAQE-846-97	8/29/1997	FUGITIVES / STOCK PILES / TRANSFER POINTS	Fug PM	Visible Emissions (VE)	A	FABRIC FILTERS	10	% OPACITY		BACT-PSD							10	
UT-0061	NUCOR STEEL CORPORATION	UT	DAQE-846-97	8/29/1997	ROADS (PAVED)	Fug PM	Visible Emissions (VE)	P	SWEPT OR WATER FLUSHED	10	% OPACITY		BACT-PSD							10	

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Table C-1C: Fugitive Opacity Limits

Mtl Hand = Mtl Trans via conveyor, hoppers, bins, crushing, grinding and loading/unloading in fixed location
Fug PM = Traffic, storage piles, transfers to piles & stackers, open dumping (e.g. loader to dump truck in quarry) and slag processing
Flyash Hand = any material handling which includes flyash or mixtures including flyash

Compiled data set for material handling and fugitive emissions from Process Codes: 12.110, 81.000, 82.000, 90.011, 90.018, 90.019, 90.020, 90.021, 90.023, 90.024, 90.026, 90.031, 90.999, 99.100, 99.999
Control Equipment Codes: P= Pollution prevention, A= Add on Controls. B= Both, N= No controls feasible

RBLCID	FACILITY NAME	FACILITY STATE	PERMIT NUM	Permit Date	Process	Process Type	Pollutant	Control Code	Control Desc.	Emission Limit 1	Emission Limit 1 Unit	Emission Limit 1 Avg Time	Case-by-case basis	Emission Limit 2	Emission Limit Unit 2	Emission Limit 2 Avg Time	STD Emission Limit	STD Limit Unit	STD Limit Unit Avg Time	BACT Oapcity Limits	Non-BACT Opacity Limits
UT-0061	NUCOR STEEL CORPORATION	UT	DAQE-846-97	8/29/1997	ROADS (UNPAVED)	Fug PM	Visible Emissions (VE)	P	WATER SPRAYED OR CHEMICALLY TREATED	20	% OPACITY		Other Case-by-Case								20
WY-0047	ENCOAL CORPORATION-ENCOAL NORTH ROCHELLE FACILITY	WY	CT-1324	10/10/1997	STORAGE, PROCESS DERIVED FUEL	Fug PM	Visible Emissions (VE)	N		20	% OPACITY		N/A	0			0				20

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Table C-1C: Fugitive Opacity Limits

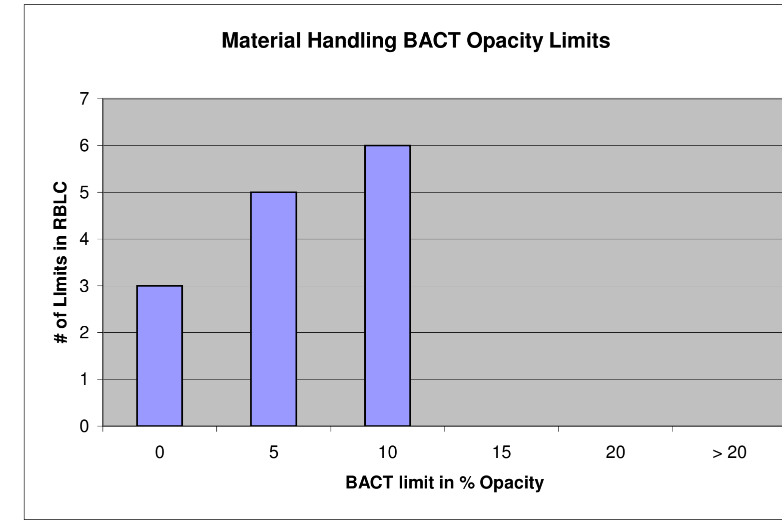
Mtl Hand = Mtl Trans via conveyor, hoppers, bins, crushing, grinding and loading/unloading in fixed location
Fug PM = Traffic, storage piles, transfers to piles & stackers, open dumping (e.g. loader to dump truck in quarry) and slag processing
Flyash Hand = any material handling which includes flyash or mixtures including flyash

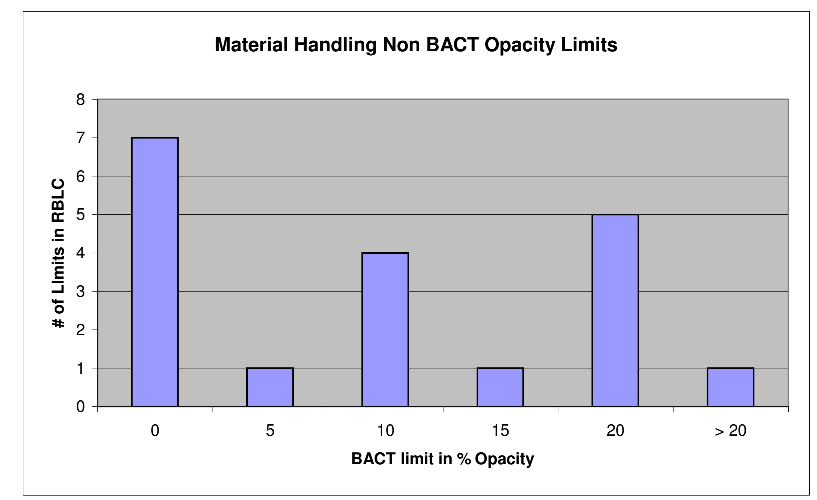
Compiled data set for material handling and fugitive emissions from Process Codes: 12.110, 81.000, 82.000, 90.011, 90.018, 90.019, 90.020, 90.021, 90.023, 90.024, 90.026, 90.031, 90.999, 99.100, 99.999
Control Equipment Codes: P= Pollution prevention, A= Add on Controls. B= Both, N= No controls feasible

RBLCID	FACILITY NAME	FACILITY STATE	PERMIT NUM	Permit Date	Process	Process Type	Pollutant	Control Code	Control Desc.	Emission Limit 1	Emission Limit 1 Unit	Emission Limit 1 Avg Time	Case-by-case basis	Emission Limit 2	Emission Limit Unit 2	Emission Limit 2 Avg Time	STD Emission Limit	STD Limit Unit	STD Limit Unit Avg Time	BACT Oapcity Limits	Non-BACT Opacity Limits

RBLC PM BACT Limits Summary					
BACT-PSD Opacity Emission Limits			Other (non-BACT) Opacity Emission Limits		
MIN	0	% Opacity	MIN	0	% Opacity
MAX	10	% Opacity	MAX	40	% Opacity
MEDIAN	5	% Opacity	MEDIAN	10	% Opacity
COUNT	14	CASES	COUNT	19	CASES

Frequency Dist of Limits	BACT		Other	
% Opacity	# <= Limit	# in range	# <= Limit	# in range
0	3	3	7	7
5	8	5	8	1
10	14	6	12	4
15	14	0	13	1
20	14	0	18	5
> 20	0	0	1	1
		14		19





Attachment D

NorthMet Mine Site Rail Loading Hopper Figures

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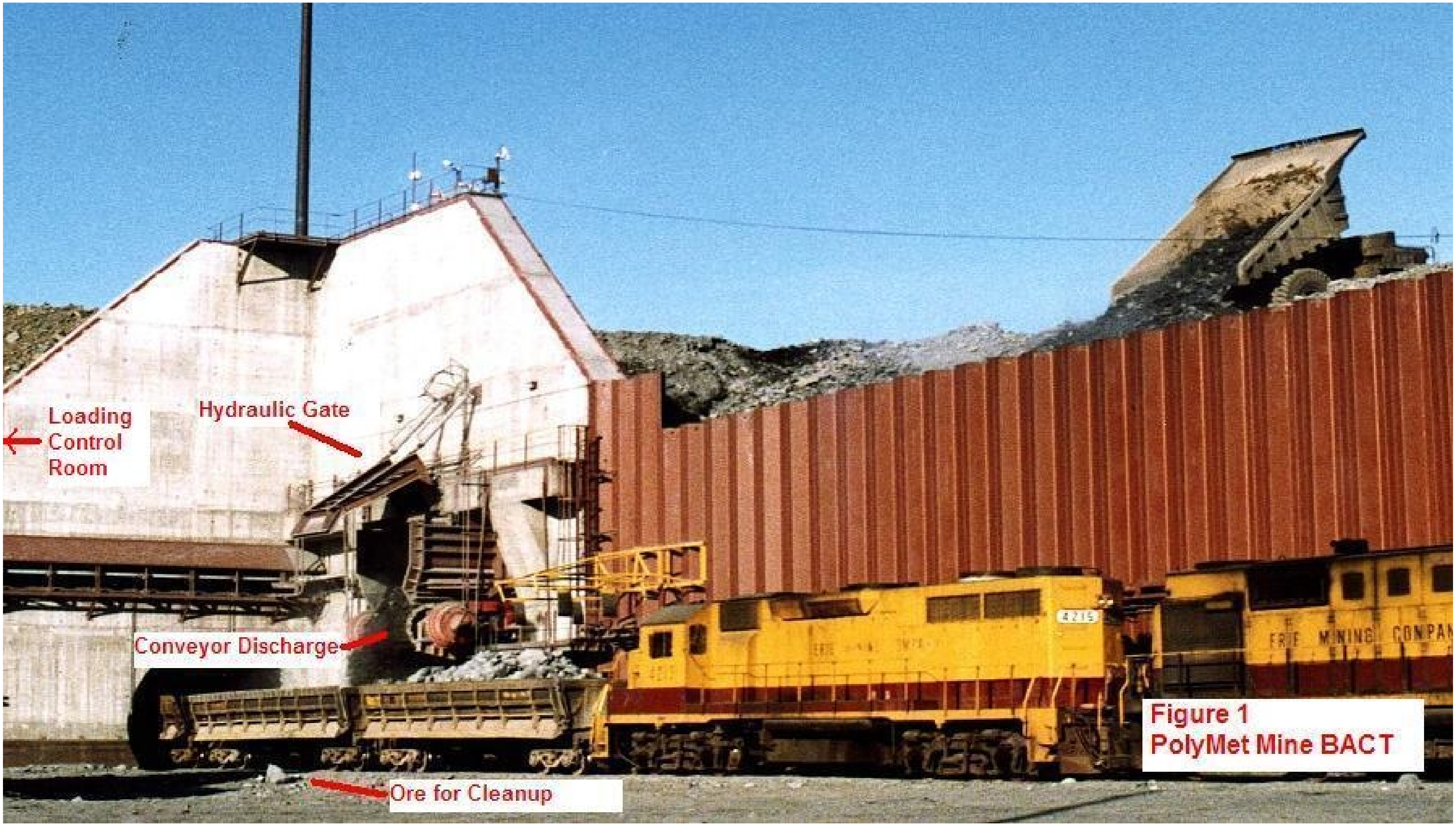

Figure 1

LOADING POCKET WITH NOTES
NorthMet Project
PolyMet Mining, Inc.
Hoyt Lakes, MN

POLYMET MINE AREA - RAIL LOADING POCKET

KRECH OJARD & ASSOCIATES, P.A.
Engineers & Architects
227 West First Street ~ Suite 200 ~ Duluth, Minnesota 55802
Ph: 218.727.3282 Fax: 218.727.1216
• Web: www.KrechOjard.com •

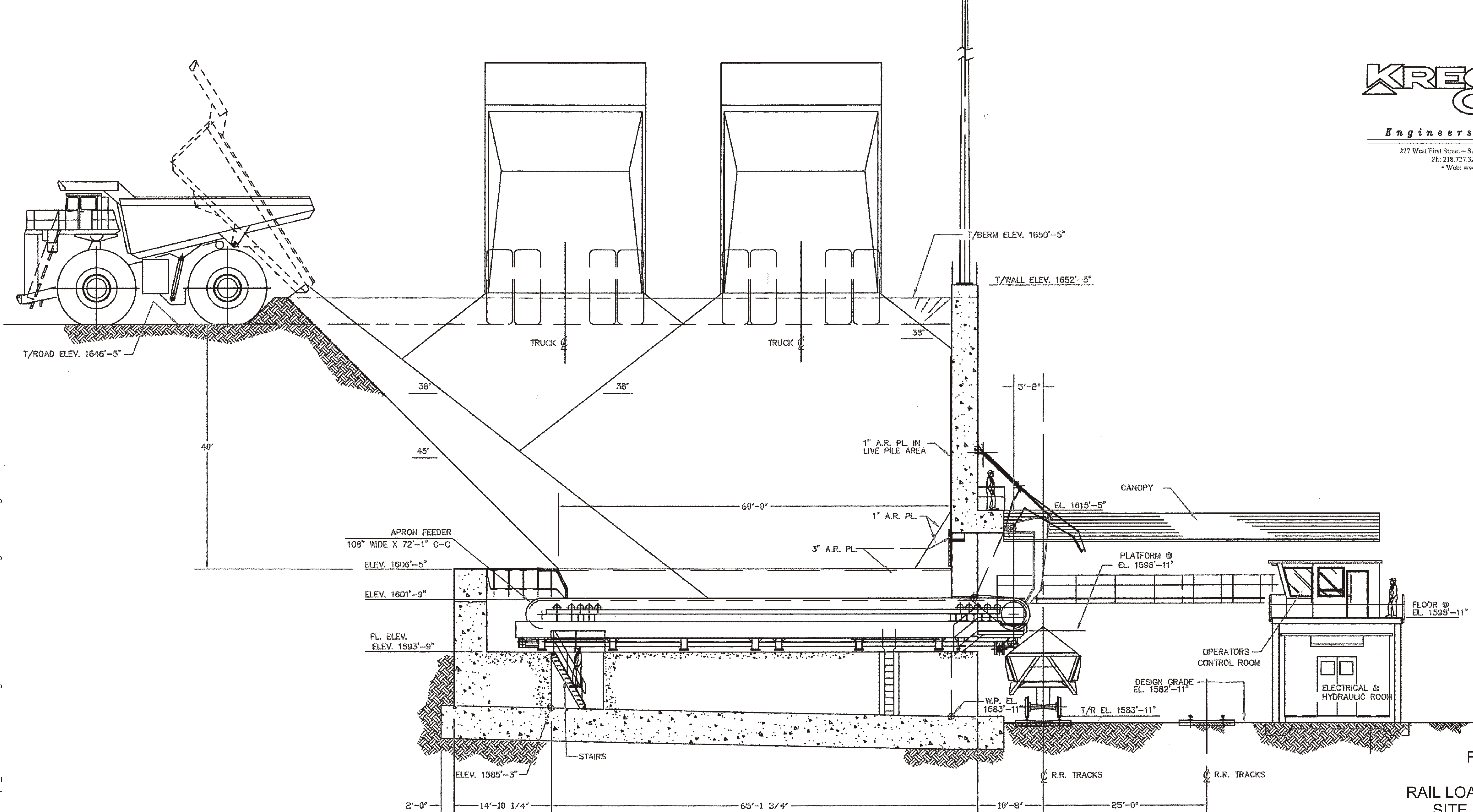

Figure 2

RAIL LOADING POCKET
SITE ELEVATION
NorthMet Project
PolyMet Mining, Inc.
Hoyt Lakes, MN

RAIL LOADING POCKET SITE ELEVATION
SCALE: 1" -28'-0"

0 7' 14' 28'

P:\Mpls\23 MN\69\2369862\MovedFromMpls_P\WO 009 Air Permitting\BACT\Contro Tech Eval Mine\Fig 2 Rail Loading Pocket Site Elevation.CDR RLG 09-13-07

POLYMET MINE AREA - RAIL LOADING POCKET

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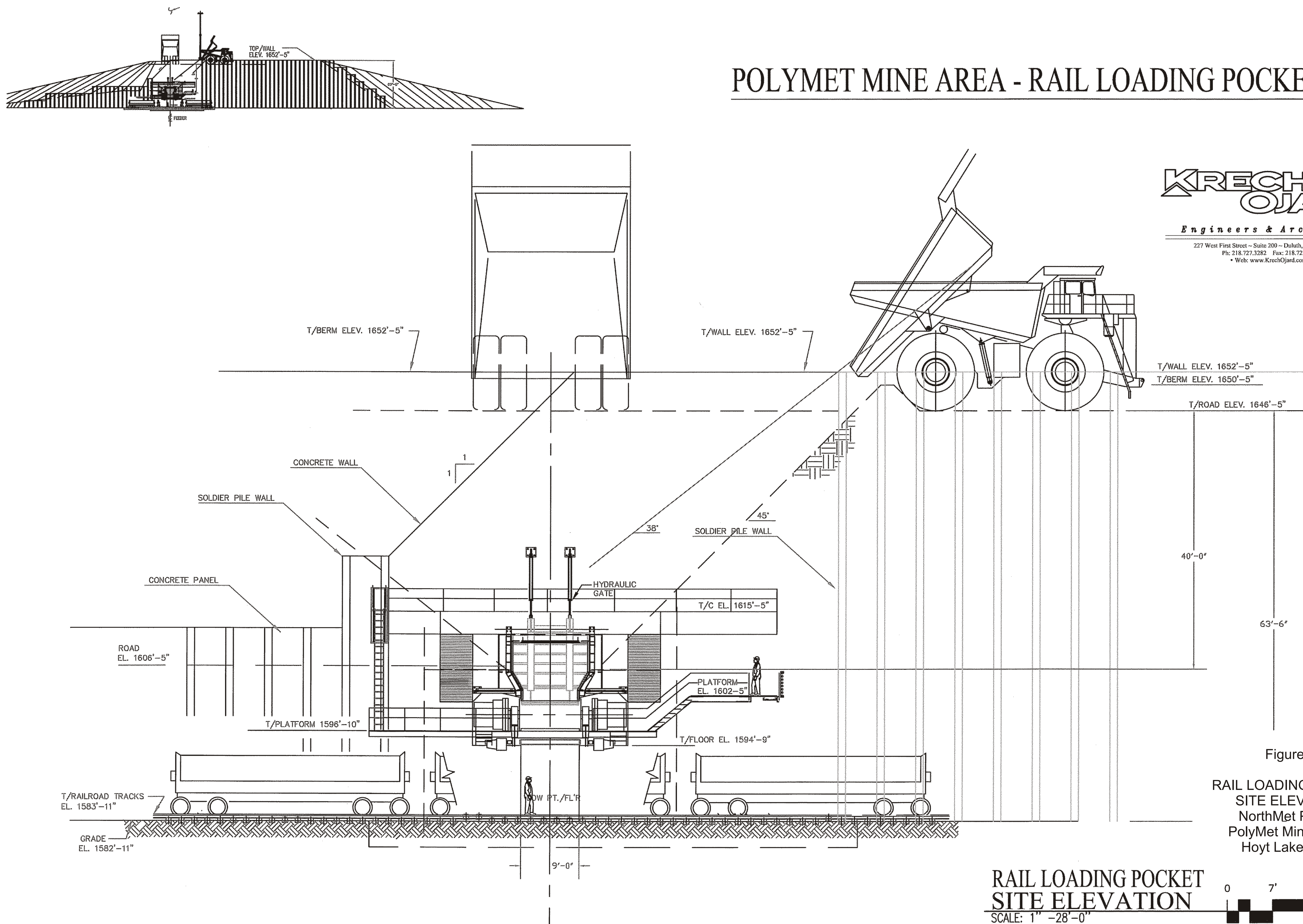


Figure 3

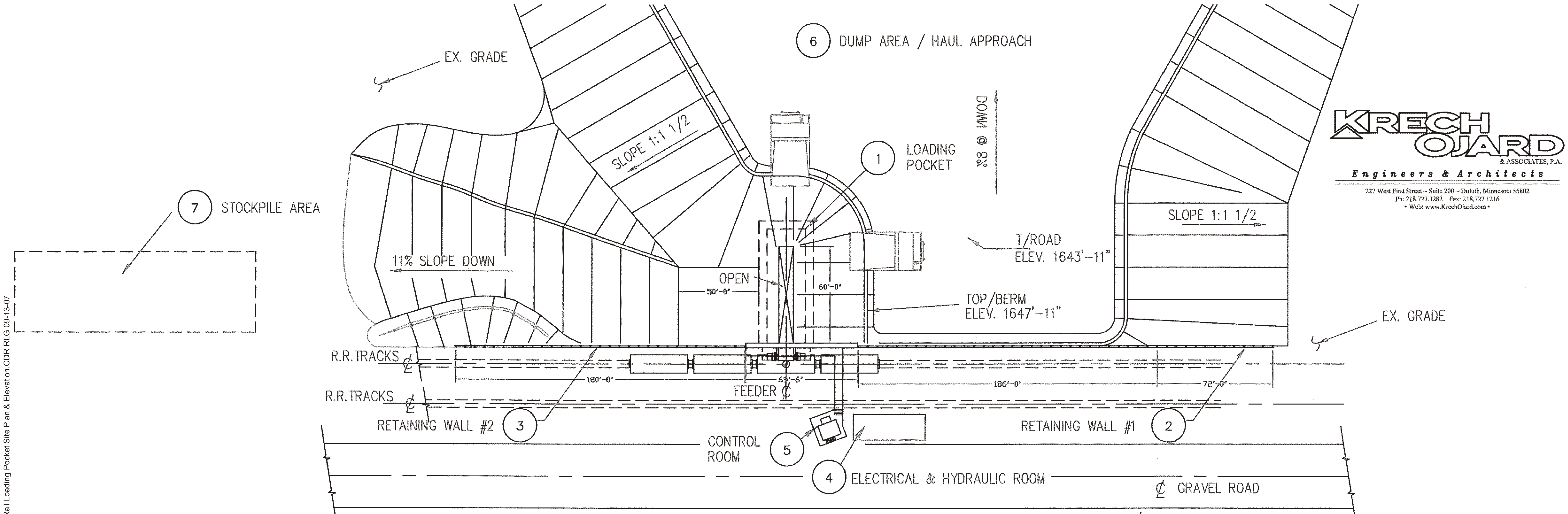
RAIL LOADING POCKET
SITE ELEVATION
NorthMet Project
PolyMet Mining, Inc.
Hoyt Lakes, MN

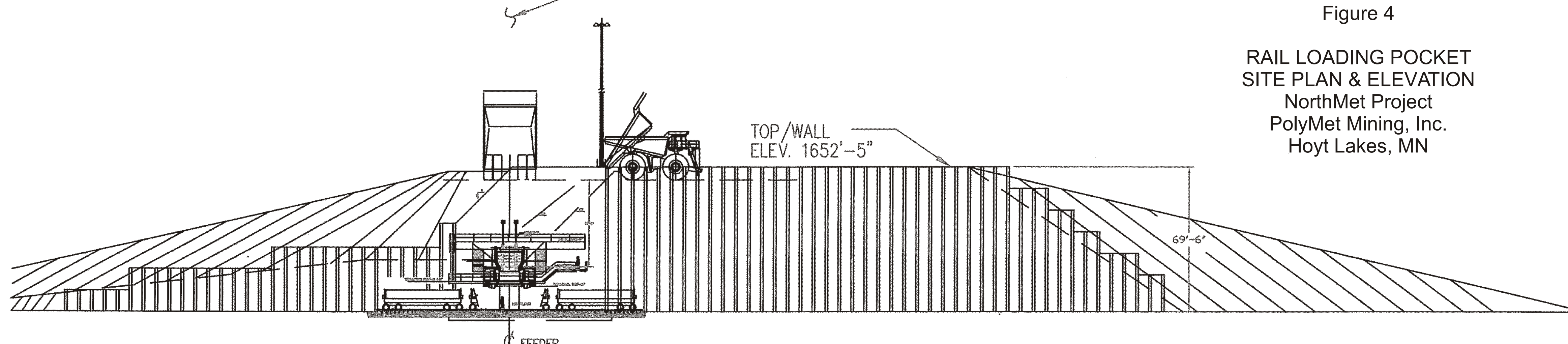
RAIL LOADING POCKET
SITE ELEVATION
SCALE: 1" -28'-0"

0 7' 14' 28'

P:\Mpls\23 MN\69\2369862\MovedFromMpls_P\WO 009 Air Permitting\BACT\Contro Tech Eval Mine\Fig 3 Rail Loading Pocket Site Elevation.CDR RLG 09-13-07

POLYMET MINE AREA - RAIL LOADING POCKET





SITE PLAN LEGEND
1. RAIL LOADING POCKET
2. RETAINING WALL #1
3. RETAINING WALL #2
4. ELECTRICAL & HYDRAULICS BUILDING
5. OPERATION CONTROL ROOM
6. DUMP AREA / HAUL APPROACH
7. STOCKPILE AREA

Figure 4

RAIL LOADING POCKET
SITE PLAN & ELEVATION
NorthMet Project
PolyMet Mining, Inc.
Hoyt Lakes, MN

RAIL LOADING POCKET
SITE PLAN & ELEVATION
SCALE: 1" -60'-0"

0 30' 60' 120'

P:\Mpls\23 MN\69\2369862\MovedFromMpls_P\WO 009 Air Permitting\BACT\Contro Tech Eval Mine\Fig 4 Rail Loading Pocket Site Plan & Elevation.CDR RLG 09-13-07

Attachment E

Material Handling Control Cost Calculations – Overburden Screening

PolyMet Mining Air Quality Permit Application
Emission Control Technology Review (ECTR) Report - Attachment E - Emission Control Cost Analysis
Table E-1: Cost Summary - Material Handling, Overburden Screening

PM/PM10 Control Cost Summary *

Control Technology	Control Eff %	Controlled Emissions T/y	Emission Reduction T/yr	Installed Capital Cost $	Annualized Operating Cost $/yr	Pollution Control Cost $/ton	Incremental Control Cost $/ton	Air Toxic's & AQRV's?	Energy Impacts?	Non-Air Env Impacts?
Wet Scrubber	**99%**	**0.023**	**3.88**	**$21,005**	**$244,072**	**$62,954**	**NA**	**None**	**High**	**Waste Recycled**
Baghouse	**99%**	**0.010**	**3.89**	**$49,042**	**$248,299**	**$63,820**	**NA**	**None**	**Low**	**Waste Recycled**
Uncontrolled	**0%**	**4**								

* Based on highest emission rate if PM not equal to PM10

PolyMet Mining Air Quality Permit Application
ECTR Report -Attachment E - Emission Control Cost Analysis
Table E-2: - Summary of Utility, Chemical and Supply Costs

Operating Unit:	Overburden Screening		**Study Year**	2006
Emission Unit Number	FS 015 + 039			
Stack/Vent Number	NA			

Item	Unit Cost	Units	Reference Cost	Year	Data Source	Notes
Operating Labor	32	$/hr			Average union labor rate for MN mining industry	
Maintenance Labor	32	$/hr			Average union labor rate for MN mining industry	
Electricity	0.052	$/kwh	0.049	2004	DOE Average Retail Price of Industrial Electricity, 2004	http://www.eia.doe.gov/emeu/aer/txt/ptb0810.html
Natural Gas	6.85	$/mscf		2005	Average natural gas spot price July 04 - June 05, Henry La Hub.,	WTRG Economics, WWW.wtrg.com/daily/small/ngspot.gig
Water	0.23	$/mgal	0.20	2002	EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 6 Chapter 2 p 2-58	Example problem. Cost adjusted for 3% inflation
Cooling Water	0.28	$/mgal	0.23	1999	EPA Air Pollution Control Cost Manual, 6th ed. Section 3.1 Ch 1	Ch 1 Carbon Absorbers, 1999 $0.15 - $0.30 Avg of 22.5 and 7 yrs and 3% inflation
Compressed Air	0.32	$/mscf	0.25	1998	EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 6 Chapter 1	Example problem; Dried & Filtered, Ch 1.6 '98 cost adjusted for 3% inflation
Wastewater Disposal Neutralization	0.00	$/mgal	0.00	2002	Water reused in process, no additional cost incurred	Section 2 lists $1- $2/1000 gal. Cost adjusted for 3% inflation Sec 6 Ch 3 lists $1.30 - $2.15/1,000 gal
Wastewater Disposal Bio-Treat	4.28	$/mgal	3.80	2002	EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 5.2 Chapter 1	Ch 1lists $1.00 - $6.00 for municipal treatment, $3.80 is average. Cost adjusted for 3% inflation
Solid Waste Disposal	28.14	$/ton	25.00	2002	EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 2 Chapter 2.5.5.5	Section 2 lists $20 - $30/ton Used $25/ton. Cost adjusted for 3% inflation
Hazardous Waste Disposal	281.38	$/ton	250.00	2002	EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 2 Chapter 2.5.5.5	Section 2 lists $200 - $300/ton Used $250/ton. Cost adjusted for 3% inflation
Waste Transport	0.56	$/ton-mi	0.50	2002	EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 6 Chapter 3	Example problem. Cost adjusted for 3% inflation
Chemicals & Supplies						
Lime	24.57	$/ton	24.57	2006	Polymet design basis	cost adjusted for 3% inflation
Caustic	280	$/ton		2005	Hawkins Chemical	50% solution (50 Deg Be) includes delivery
Urea	405	$/ton		2005	Hawkins Chemical	50% solution of urea in water, includes delivery
Soda Ash		$/ton				
Oxygen	0.00	Mscf	0.00	2004	Vendor quote if needed	cost adjusted for 3% inflation
EPA Urea	179.1	$/ton				
Ammonia	0.101	$/lb				
Reagent #8		$/ton				
Catalyst & Replacement Parts						
SCR Catalyst	500	$/ft^3			Vendor quote if needed	
CO Catalyst	650	$/ft^3			Vendor quote if needed	
Catalyst #3						
Catalyst #4						
Catalyst #5						
Filter Bags	37.94	$/bag	33.71	2002	EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 6, Chapter 1	Example problem cost for 10 ft bags. Cost adjusted for 3% inflation
Tower Packing	100	$/ft^3				
Replacement Parts						
Replacement Parts						
Replacement Parts						
Other						
Sales Tax	6.5	%				
Interest Rate	7.00%	%				EPA/OMB suggested interest rate per R Cordes, MPCA
Operating Information						
Annual Op. Hrs	8760	Hours				Engineering Estimate
Utilization Rate	69%	Annual Avg Throughput for Life of Mine				
Equipment Life	20	yrs				Engineering Estimate
Design Capacity	500	Tons/hr				
Standardized Flow Rate	141	scfm @ 32º F				
Temperature	68	Deg F				
Moisture Content	0.0%					
Actual Flow Rate	152	acfm				
Standardized Flow Rate	152	scfm @ 68º F				
Dry Std Flow Rate	152	dscfm @ 68º F	Air flow rate based on 1 gr/dscf loading on control device inlet			

Pollutant	Max Emis Lb/Hr	Uncontrolled Conc			
PM10	0.47	0.36	gr/dscf		
Total Particulates	1.30	1.00	gr/dscf		
Wet Controls	**Controlled lb/hr & conc**		Control Eff	**98.3%**	
PM10	0.0	0.006	gr/dscf		
Total Particulates	0.0	0.006	gr/dscf		
Dry Controls	**Controlled lb/hr & conc**		Control Eff	**99.3%**	
PM10	0.0	0.003	gr/dscf		
Total Particulates	0.0	0.003	gr/dscf		
Difference					
PM10	0.0				
Total Particulates	0.0				

PolyMet Mining Air Quality Permit Application
ECTR Report -Attachment E - Emission Control Cost Analysis Material Handling
Table E - 3: PM Control - Wet Scrubber

Operating Unit: **Overburden Screening**

Emission Unit Number	FS 015 + 039		Stack/Vent Number	NA	
Design Capacity	500	Tons/hr	Standardized Flow Rate	141	scfm @ 32º F
Expected Utilization Rate	69%		Temperature	68	Deg F
Expected Annual Hours of Operation	8,760	Hours	Moisture Content	0.0%	
Annual Interest Rate	7.0%		Actual Flow Rate	152	acfm
Expected Equipment Life	20	yrs	Standardized Flow Rate	152	scfm @ 68º F
			Dry Std Flow Rate	152	dscfm @ 68º F

CONTROL EQUIPMENT COSTS

Capital Costs			
Direct Capital Costs			
Purchased Equipment (A)			9,051
Purchased Equipment Total (B)	22%	of control device cost (A)	**10,997**
Installation - Standard Costs	56%	of purchased equip cost (B)	6,158
Installation - Site Specific Costs			NA
Installation Total			6,158
Total Direct Capital Cost, DC			17,156
Total Indirect Capital Costs, IC	35%	of purchased equip cost (B)	3,849
Total Capital Investment (TCI) = DC + IC			**21,005**
Operating Costs			
Total Annual Direct Operating Costs		Labor, supervision, materials, replacement parts, utilities, etc.	150,845
Total Annual Indirect Operating Costs		Sum indirect oper costs + capital recovery cost	93,226
Total Annual Cost (Annualized Capital Cost + Operating Cost)			**244,072**

Emission Control Cost Calculation

Pollutant	Max Emis Lb/Hr	Annual T/Yr	Cont Eff %	Exit Conc.	Conc. Units	Cont Emis T/yr	Reduction T/yr	Cont Cost $/Ton Rem
PM10	0.5	1.4		0.006	gr/dscf	0.023	1.4	176,004
Total Particulates	1.3	3.9		0.006	gr/dscf	0.023	3.9	62,954
Nitrous Oxides (NOx)						-	-	NA
Sulfur Dioxide (SO_2)						-	-	NA
Sulfuric Acid Mist						-	-	NA
Fluorides						-	-	NA
Volatile Organic Compounds (VOC)						-	-	NA
Carbon Monoxide (CO)						-	-	NA
Lead (Pb)						-	-	NA

Notes & Assumptions

1 Scrubber Cost per Barr Engineering 2004 Scrubber Project. Adjusted prices per Chemical Engineering Magazine CPI Index 2004 = 444, 2005 =465
2 Calculations per EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 6 Chapter 2
3 Used 0.6 power law factor to adjust price to 97,500 acfm from bid basis of 500,000 acfm
4 ESP supervision cost = 48% of operator cost = supervisor 15% + coordinator 33% per EPA Cont Cost Manual Section 6 Chapter 3. Table 3.21 adjusted for inflation
5 The control efficiencies for sulfuric acid mist, fluorides and lead are for example calculations and do not represent actual control efficiencies.

PolyMet Mining Air Quality Permit Application

ECTR Report -Attachment E - Emission Control Cost Analysis Material Handling

Table E - 3: PM Control - Wet Scrubber

CAPITAL COSTS			
Direct Capital Costs			
Purchased Equipment (A) (1)			**9,051**
Purchased Equipment Costs (A) - Absorber + packing + auxiliary equipment, EC			
Instrumentation	10%	of control device cost (A)	905
MN Sales Taxes	6.5%	of control device cost (A)	588
Freight	5%	of control device cost (A)	453
Purchased Equipment Total (B)	22%		**10,997**
Installation			
Foundations & supports	6%	of purchased equip cost (B)	660
Handling & erection	40%	of purchased equip cost (B)	4,399
Electrical	1%	of purchased equip cost (B)	110
Piping	5%	of purchased equip cost (B)	550
Insulation	3%	of purchased equip cost (B)	330
Painting	1%	of purchased equip cost (B)	110
Installation Subtotal Standard Expenses	56%		**6,158**
Site Preparation, as required		Site Specific	NA
Buildings, as required		Site Specific	NA
Site Specific - Other		Site Specific	NA
Total Site Specific Costs			NA
Installation Total			**6,158**
Total Direct Capital Cost, DC			**17,156**
Indirect Capital Costs			
Engineering, supervision	10%	of purchased equip cost (B)	1,100
Construction & field expenses	10%	of purchased equip cost (B)	1,100
Contractor fees	10%	of purchased equip cost (B)	1,100
Start-up	1%	of purchased equip cost (B)	110
Performance test	1%	of purchased equip cost (B)	110
Model Studies	NA	of purchased equip cost (B)	NA
Contingencies	3%	of purchased equip cost (B)	330
Total Indirect Capital Costs, IC	35%	of purchased equip cost (B)	**3,849**
Total Capital Investment (TCI) = DC + IC			**21,005**
Adjusted TCI for Replacement Parts (Catalyst, Filter Bags, etc) for Capital Recovery Cost			**21,005**
OPERATING COSTS			
Direct Annual Operating Costs, DC			
Operating Labor			
Operator	32.00	$/Hr, 2.0 hr/8 hr shift, 8760 hr/yr	70,080
Supervisor	15%	15% of Operator Costs	10,512
Maintenance			
Maintenance Labor	32.00	$/Hr, 1.0 hr/8 hr shift, 8760 hr/yr	35,040
Maintenance Materials	100.00	% of Maintenance Labor	35,040
Utilities, Supplies, Replacements & Waste Management			
Electricity	0.05	$/kwh, 0 kW-hr, 8760 hr/yr, 68.5% utilization	149
NA	NA		-
Water	0.23	$/mgal, 0 gpm, 8760 hr/yr, 68.5% utilization	25
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
Total Annual Direct Operating Costs			**150,845**
Indirect Operating Costs			
Overhead	60%	of total labor and material costs	90,403
Administration (2% total capital costs)	2%	of total capital costs (TCI)	420
Property tax (1% total capital costs)	1%	of total capital costs (TCI)	210
Insurance (1% total capital costs)	1%	of total capital costs (TCI)	210
Capital Recovery	0.0944	for a 20- year equipment life and a 7% interest rate	1,983
Total Annual Indirect Operating Costs		Sum indirect oper costs + capital recovery cost	**93,226**
Total Annual Cost (Annualized Capital Cost + Operating Cost)			**244,072**

See summary page for notes and assumptions

PolyMet Mining Air Quality Permit Application
ECTR Report -Attachment E - Emission Control Cost Analysis Material Handling
Table E - 3: PM Control - Wet Scrubber

Capital Recovery Factors		
Primary Installation		
Interest Rate	7.00%	
Equipment Life	20	years
CRF	0.0944	

Replacement Catalyst:		
Equipment Life	5	years
CRF	0.0000	
Rep part cost per unit	500	$/ft^3
Amount Required	0	ft^3
Packing Cost	0	Cost adjusted for freight & sales tax
Installation Labor	0	Assume Labor = 15% of catalyst cost (basis labor for baghouse replacement)
Total Installed Cost	**0**	**Zero out if no replacement parts needed**
Annualized Cost	**0**	

Replacement Parts & Equipment:			
Equipment Life	3		
CRF	0.3811		
Rep part cost per unit	37.94090199	$ each	
Amount Required	0	Number	
Total Rep Parts Cost	0	Cost adjusted for freight & sales tax	
Installation Labor	0	10 min per bag (13 hr total) Labor at $29.65/hr	OAQPS list replacement times from 5 - 20 min per bag.
Total Installed Cost	**0**	**Zero out if no replacement parts needed**	
Annualized Cost	**0**		

Electrical Use							
	Flow acfm		D P in H2O	Efficiency	Hp	kW	
Blower, Scrubber	152		15	0.6	0.6	0.4	EPA Cont Cost Manual 6th ed - Sec 6 Ch 2 Eq 2.40
	L/G ratio*	Liquid SPGR	D P ft H2O	Efficiency	Hp	kW	
Circ Pump	10	1.125	40	0.5	0.0	0.0	EPA Cont Cost Manual 6th ed - Sec 6 Ch 2 Eq 2.41
H2O WW Disch Pump	0 gpm	1.125	40	0.5	0.0	0.0	EPA Cont Cost Manual 6th ed - Sec 6 Ch 2 Eq 2.41
Other							
Other							
Other							
Total						0.5	

* L/G = Gal/1,000 acf

Reagent Use & Other Operating Costs				
Caustic Use	0.00 lb/hr SO2	2.50 lb NaOH/lb SO2		0.00 lb/hr Caustic
Lime Use	0.00 lb/hr SO2	1.53 lb Lime/lb SO2		0.00 lb/hr Lime
Circulating Water Rate	2 gpm			
Water Makeup Rate/WW Disch =	20%	of circulating water rate =	0 gpm	

Operating Cost Calculations — **Annual hours of operation:** **8,760** — **Utilization Rate:** **68.5%**

Item	Unit Cost $	Unit of Measure	Use Rate	Unit of Measure	Annual Use*	Annual Cost	Comments
Operating Labor							
Op Labor	32	$/Hr	2.0	hr/8 hr shift	2,190	70,080	$/Hr, 2.0 hr/8 hr shift, 8760 hr/yr
Supervisor	15%	of Op.			NA	10,512	15% of Operator Costs
Maintenance							
Maint Labor	32.00	$/Hr	1.0	hr/8 hr shift	1,095	35,040	$/Hr, 1.0 hr/8 hr shift, 8760 hr/yr
Maint Mtls	100	% of Maintenance Labor			NA	35,040	100% of Maintenance Labor
Utilities, Supplies, Replacements & Waste Management							
Electricity	0.052	$/kwh	0.5	kW-hr	2,855	149	$/kwh, 0 kW-hr, 8760 hr/yr, 68.5% utilization
Natural Gas	6.85	$/mscf	0	scfm	0	0	$/mscf, 0 scfm, 8760 hr/yr, 68.5% utilization
Water	0.23	$/mgal	0.3	gpm	109	25	$/mgal, 0 gpm, 8760 hr/yr, 68.5% utilization
Cooling Water	0.28	$/mgal	0.0	gpm	0	0	$/mgal, 0 gpm, 8760 hr/yr, 68.5% utilization
Comp Air	0.32	$/mscf	0	Mscfm	0	0	$/mscf, 0 Mscfm, 8760 hr/yr, 68.5% utilization
WW Treat Neutralizatior	0.00	$/mgal	0.3	gpm	109	0	$/mgal, 0 gpm, 8760 hr/yr, 68.5% utilization
WW Treat Biotreatemer	4.28	$/mgal	0.0	gpm	0	0	$/mgal, 0 gpm, 8760 hr/yr, 68.5% utilization
SW Disposal	28.14	$/ton	0.0	ton/hr	0	0	$/ton, 0 ton/hr, 8760 hr/yr, 68.5% utilization
Haz W Disp	281	$/ton	0.0	ton/hr	0	0	$/ton, 0 ton/hr, 8760 hr/yr, 68.5% utilization
Waste Transport	0.56	$/ton-mi	0.0	ton/hr	0	0	$/ton-mi, 0 ton/hr, 8760 hr/yr, 68.5% utilization
Waste Recycle	0.00	0.00	0.0	ton/hr	0	0	0, 0 ton/hr, 8760 hr/yr, 68.5% utilization
Lime	24.5728	$/ton	0.0	lb/hr	0	0	$/ton, 0 lb/hr, 8760 hr/yr, 68.5% utilization
Urea	405	$/ton	0.0	lb/hr	0	0	$/ton, 0 lb/hr, 8760 hr/yr, 68.5% utilization
Oxygen	0	Mscf	0.0	Mscf/hr	0	0	Mscf, 0 Mscf/hr, 8760 hr/yr, 68.5% utilization
SCR Catalyst	500	$/ft3	0	ft^3	0	0	$/ft3, 0 ft3, 8760 hr/yr, 68.5% utilization
Filter Bags	37.940902	$/bag	0	bags	0	0	$/bag, 0 bags, 8760 hr/yr, 68.5% utilization

*annual use rate is in same units of measurement as the unit cost factor

See summary page for notes and assumptions

PolyMet Mining Air Quality Permit Application
ECTR Report -Attachment E - Emission Control Cost Analysis Material Handling
Table E-4: PM Control -Baghouse

Operating Unit: **Overburden Screening**

Emission Unit Number	FS 015 + 039		Stack/Vent Number	NA	
Design Capacity	500	Tons/hr	Standardized Flow Rate	141	scfm @ 32º F
Expected Utilization Rate	69%		Temperature	68	Deg F
Expected Annual Hours of Operation	8,760	Hours	Moisture Content	0.0%	
Annual Interest Rate	7.0%		Actual Flow Rate	152	acfm
Expected Equipment Life	20	yrs	Standardized Flow Rate	152	scfm @ 68º F
			Dry Std Flow Rate	152	dscfm @ 68º F

CONTROL EQUIPMENT COSTS

Capital Costs			
Direct Capital Costs			
Purchased Equipment (A)			18,431
Purchased Equipment Total (B)	22%	of control device cost (A)	**22,393**
Installation - Standard Costs	74%	of purchased equip cost (B)	16,571
Installation - Site Specific Costs			NA
Installation Total			16,571
Total Direct Capital Cost, DC			38,964
Total Indirect Capital Costs, IC	45%	of purchased equip cost (B)	10,077
Total Capital Investment (TCI) = DC + IC			**49,042**
Operating Costs			
Total Annual Direct Operating Costs		Labor, supervision, materials, replacement parts, utilities, etc.	151,642
Total Annual Indirect Operating Costs		Sum indirect oper costs + capital recovery cost	96,657
Total Annual Cost (Annualized Capital Cost + Operating Cost)			**248,299**

Emission Control Cost Calculation

Pollutant	**Max Emis Lb/Hr**	**Annual T/Yr**	**Cont Eff %**	**Exit Conc.**	**Conc. Units**	**Cont Emis T/yr**	**Reduction T/yr**	**Cont Cost $/Ton Rem**
PM10	0.5	1.4		0.0025	gr/dscf	0.010	1.4	177,307
Total Particulates	1.3	3.9		0.0025	gr/dscf	0.010	3.9	63,820
Nitrous Oxides (NOx)						-	-	NA
Sulfur Dioxide (SO_2)						-	-	NA
Sulfuric Acid Mist						-	-	NA
Fluorides						-	-	NA
Volatile Organic Compounds (VOC)						-	-	NA
Carbon Monoxide (CO)						-	-	NA
Lead (Pb)						-	-	NA

Notes & Assumptions

1. Barr Project Feb 2006. Average baghouse cost estimate for coal fired boiler at 23,000 acfm
2. Calculations per EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 6 Chapter 1
3. Compressed air for baghouse assumed to be 2 scfm / 1000 acfm EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 6 Chapter 1.5.1.8
4. Bag replacement at 10 min/bag EPA Cont Cost Manual 6th ed Section 6 Chapter 1.5.1.4 lists replacement times from 5 - 20 min per bag.
5. Used 0.6 power law factor to adjust price to 33,000 acfm from bid basis of 23,000 acfm
6. $250,000 bag replacement cost from vendor adjusted for flow rate as noted above. Bid basis of flow rate 217,000 acfm
7. Baghouse cloth area estimated using 9:1 air to cloth ratio for rock dust per Table 1.1, EPA Cont Cost Manual 6th ed Section 6 Chapter 1.
8. The control efficiencies for sulfuric acid mist, fluorides and lead are for example calculations and do not represent actual control efficiencies.

PolyMet Mining Air Quality Permit Application

ECTR Report -Attachment E - Emission Control Cost Analysis Material Handling

Table E-4: PM Control -Baghouse

CAPITAL COSTS			
Direct Capital Costs			
Purchased Equipment (A) (1)			**18,431**
Purchased Equipment Costs (A) - Absorber + packing + auxiliary equipment, EC			
Instrumentation	10%	of control device cost (A)	1,843
MN Sales Taxes	6.5%	of control device cost (A)	1,198
Freight	5%	of control device cost (A)	922
Purchased Equipment Total (B)	22%		**22,393**
Installation			
Foundations & supports	4%	of purchased equip cost (B)	896
Handling & erection	50%	of purchased equip cost (B)	11,197
Electrical	8%	of purchased equip cost (B)	1,791
Piping	1%	of purchased equip cost (B)	224
Insulation	7%	of purchased equip cost (B)	1,568
Painting	4%	of purchased equip cost (B)	896
Installation Subtotal Standard Expenses	74%		**16,571**
Site Preparation, as required		Site Specific	NA
Buildings, as required		Site Specific	NA
Site Specific - Other		Site Specific	NA
Total Site Specific Costs			NA
Installation Total			**16,571**
Total Direct Capital Cost, DC			**38,964**
Indirect Capital Costs			
Engineering, supervision	10%	of purchased equip cost (B)	2,239
Construction & field expenses	20%	of purchased equip cost (B)	4,479
Contractor fees	10%	of purchased equip cost (B)	2,239
Start-up	1%	of purchased equip cost (B)	224
Performance test	1%	of purchased equip cost (B)	224
Model Studies	NA	of purchased equip cost (B)	NA
Contingencies	3%	of purchased equip cost (B)	672
Total Indirect Capital Costs, IC	45%	of purchased equip cost (B)	**10,077**
Total Capital Investment (TCI) = DC + IC			**49,042**
Adjusted TCI for Replacement Parts (Catalyst, Filter Bags, etc) for Capital Recovery Cost			**45,469**
OPERATING COSTS			
Direct Annual Operating Costs, DC			
Operating Labor			
Operator	32.00	$/Hr, 2.0 hr/8 hr shift, 8760 hr/yr	70,080
Supervisor	15%	15% of Operator Costs	10,512
Maintenance			
Maintenance Labor	32.00	$/Hr, 1.0 hr/8 hr shift, 8760 hr/yr	35,040
Maintenance Materials	100%	of maintenance labor costs	35,040
Utilities, Supplies, Replacements & Waste Management			
Electricity	0.05	$/kwh, 0 kW-hr, 8760 hr/yr, 68.5% utilization	64
NA	NA		-
NA	NA		-
NA	NA		-
Comp Air	0.32	$/mscf, 2 scfm/kacfm, 8760 hr/yr, 68.5% utilization	35
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
Filter Bags	33.71	$/bag, 1 bags, 8760 hr/yr, 68.5% utilization	871
Total Annual Direct Operating Costs			**151,642**
Indirect Operating Costs			
Overhead	60%	of total labor and material costs	90,403
Administration (2% total capital costs)	2%	of total capital costs (TCI)	981
Property tax (1% total capital costs)	1%	of total capital costs (TCI)	490
Insurance (1% total capital costs)	1%	of total capital costs (TCI)	490
Capital Recovery	0.0944	for a 20- year equipment life and a 7% interest rate	4,292
Total Annual Indirect Operating Costs		Sum indirect oper costs + capital recovery cost	**96,657**
Total Annual Cost (Annualized Capital Cost + Operating Cost)			**248,299**

See Summary page for notes and assumptions

PolyMet Mining Air Quality Permit Application
ECTR Report -Attachment E - Emission Control Cost Analysis Material Handling
Table E-4: PM Control -Baghouse

Capital Recovery Factors		
Primary Installation		
Interest Rate	7.00%	
Equipment Life	20	years
CRF	0.0944	

Replacement Catalyst:		
Equipment Life	5	years
CRF	0.0000	
Rep part cost per unit	500	$/ft^3
Amount Required	0	ft^3
Total Rep Parts Cost	0	Cost adjusted for freight & sales tax
Installation Labor	0	Assume Labor = 15% of catalyst cost (basis labor for baghouse replacement)
Total Installed Cost	**0**	**Zero out if no replacement parts needed**
Annualized Cost	**0**	

Replacement Parts & Equipment:			
	Filter bags & cages		
Equipment Life	5	years	
CRF	0.2439		
Rep part cost per unit	~~33.711~~	$/bag - Calculated cost not used	
Amount Required	1		
Total Rep Parts Cost	3,564	Cost adjusted for freight & sales tax	
Installation Labor	9	10 min per bag, Labor + Overhead (68% = $29.65/hr)	EPA Cont Cost Manual 6th ed Section 6 Chapter 1.5.1.4
Total Installed Cost	**3,573**	**Zero out if no replacement parts needed**	lists replacement times from 5 - 20 min per bag.
Annualized Cost	**871**		

Electrical Use	Flow acfm		D P in H2O	Efficiency	Hp	kW	
Blower, Baghouse	152		7.5			0.2	
Baghouse Shaker	0.0	Gross fabric area ft^2				0	EPA Cont Cost Manual 6th ed Section 6 Chapter 1 Eq 1.14
Other							
Other							
Other							
Other							
Other							
Total						0.2	

Baghouse Filter Cost						
						See Control Cost Manual Sec 6 Ch 1 Table 1.8 for bag costs
Gross BH Filter Area	17	ft^2				
Cages	16 ft long	5 in dia	13.42 area/cage ft^2	1 Cages	11.036	$/cage
Bags	1.69	$/ft2 of fabric			22.68	$/bag
Total					33.711	

Operating Cost Calculations — **Annual hours of operation:** **8,760** — **Utilization Rate:** **68.5%**

Item	Unit Cost $	Unit of Measure	Use Rate	Unit of Measure	Annual Use*	Annual Cost	Comments
Operating Labor							
Op Labor	32	$/Hr	2.0	hr/8 hr shift	2,190	70,080	$/Hr, 2.0 hr/8 hr shift, 8760 hr/yr
Supervisor	15%	of Op.			NA	10,512	15% of Operator Costs
Maintenance							
Maint Labor	32.00	$/Hr	1.0	hr/8 hr shift	1,095	35,040	$/Hr, 1.0 hr/8 hr shift, 8760 hr/yr
Maint Mtls	100	% of Maintenance Labor			NA	35,040	100% of Maintenance Labor
Utilities, Supplies, Replacements & Waste Management							
Electricity	0.052	$/kwh	0.2	kW-hr	1,236	64	$/kwh, 0 kW-hr, 8760 hr/yr, 68.5% utilization
Natural Gas	6.85	$/mscf	0	scfm	0	0	$/mscf, 0 scfm, 8760 hr/yr, 68.5% utilization
Water	0.23	$/mgal	0.0	gpm	0	0	$/mgal, 0 gpm, 8760 hr/yr, 68.5% utilization
Cooling Water	0.28	$/mgal	0.0	gpm	0	0	$/mgal, 0 gpm, 8760 hr/yr, 68.5% utilization
Comp Air	0.32	$/mscf	2	scfm/kacfm	109	35	$/mscf, 2 scfm/kacfm, 8760 hr/yr, 68.5% utilization
WW Treat Neutralizatior	0.00	$/mgal	0.0	gpm	0	0	$/mgal, 0 gpm, 8760 hr/yr, 68.5% utilization
WW Treat Biotreatemer	4.28	$/mgal	0.0	gpm	0	0	$/mgal, 0 gpm, 8760 hr/yr, 68.5% utilization
SW Disposal	28.14	$/ton	0.0	ton/hr	0	0	$/ton, 0 ton/hr, 8760 hr/yr, 68.5% utilization
Haz W Disp	281	$/ton	0.0	ton/hr	0	0	$/ton, 0 ton/hr, 8760 hr/yr, 68.5% utilization
Waste Transport	0.56	$/ton-mi	0.0	ton/hr	0	0	$/ton-mi, 0 ton/hr, 8760 hr/yr, 68.5% utilization
Waste Recycle	0.00	0.00	0.0	ton/hr	4	0	0, 0 ton/hr, 8760 hr/yr, 68.5% utilization
Lime	24.5728	$/ton	0.0	lb/hr	0	0	$/ton, 0 lb/hr, 8760 hr/yr, 68.5% utilization
Caustic	280	$/ton	0.0	lb/hr	0	0	$/ton, 0 lb/hr, 8760 hr/yr, 68.5% utilization
Oxygen	0	Mscf	0.0	Mscf/hr	0	0	Mscf, 0 Mscf/hr, 8760 hr/yr, 68.5% utilization
SCR Catalyst	500	$/ft3	0	ft^3	0	0	$/ft3, 0 ft3, 8760 hr/yr, 68.5% utilization
Filter Bags	33.71	$/bag	1	bags	NA	871	$/bag, 1 bags, 8760 hr/yr, 68.5% utilization

*annual use rate is in same units of measurement as the unit cost factor

See Summary page for notes and assumptions

Attachment F

Material Handling Control Cost Calculations – Portable Rock Crushing

PolyMet Air Quality Permit Application
Emission Control Technology Review (ECTR) Report -Attachment F - Emission Control Cost Analysis
Table F-1: Cost Summary - Material Handling, Rock Crushing

PM/PM10 Control Cost Summary *

Control Technology	Control Eff %	Controlled Emissions T/y	Emission Reduction T/yr	Installed Capital Cost $	Annualized Operating Cost $/yr	Pollution Control Cost $/ton	Incremental Control Cost $/ton	Air Toxic's & AQRV's?	Energy Impacts?	Non-Air Env Impacts?
Wet Scrubber	99%	0.03	4.96	$19,415	$243,907	$49,143	NA	None	High	Waste Recycled
Baghouse	99%	0.01	4.98	$45,324	$247,787	$49,749	$222,038	None	Low	Waste Recycled
Uncontrolled	0%	5								

* Based on highest emission rate if PM not equal to PM10

PolyMet Air Quality Permit Application
ECTR Report -Attachment F - Emission Control Cost Analysis
Table F-2: - Summary of Utility, Chemical and Supply Costs

Operating Unit:	Waste Rock Crushing		**Study Year**	2006		
Emission Unit Number	FS 023	Crushing, Screening, Product to Conveyor & Conveyor to Secondary Crusher				
Stack/Vent Number	NA - Fug					

Item	Unit Cost	Units	Reference Cost	Year	Data Source	Notes
Operating Labor	32	$/hr			Average union labor rate for MN mining industry	
Maintenance Labor	32	$/hr			Average union labor rate for MN mining industry	
Electricity	0.052	$/kwh	0.049	2004	DOE Average Retail Price of Industrial Electricity, 2004	http://www.eia.doe.gov/emeu/aer/txt/ptb0810.html
Natural Gas	6.85	$/mscf		2005	Average natural gas spot price July 04 - June 05, Henry La Hub.,	WTRG Economics, WWW.wtrg.com/daily/small/ngspot.gig
Water	0.23	$/mgal	0.20	2002	EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 6 Chapter 2 p 2-58	Example problem. Cost adjusted for 3% inflation
Cooling Water	0.28	$/mgal	0.23	1999	EPA Air Pollution Control Cost Manual, 6th ed. Section 3.1 Ch 1	Ch 1 Carbon Absorbers, 1999 $0.15 - $0.30 Avg of 22.5 and 7 yrs and 3% inflation
Compressed Air	0.32	$/mscf	0.25	1998	EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 6 Chapter 1	Example problem; Dried & Filtered, Ch 1.6 '98 cost adjusted for 3% inflation
Wastewater Disposal Neutralization	0.00	$/mgal	0.00	2002	Water reused in process, no additional cost incurred	Section 2 lists $1- $2/1000 gal. Cost adjusted for 3% inflation Sec 6 Ch 3 lists $1.30 - $2.15/1,000 gal
Wastewater Disposal Bio-Treat	4.28	$/mgal	3.80	2002	EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 5.2 Chapter 1	Ch 1lists $1.00 - $6.00 for municipal treatment, $3.80 is average. Cost adjusted for 3% inflation
Solid Waste Disposal	28.14	$/ton	25.00	2002	EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 2 Chapter 2.5.5.5	Section 2 lists $20 - $30/ton Used $25/ton. Cost adjusted for 3% inflation
Hazardous Waste Disposal	281.38	$/ton	250.00	2002	EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 2 Chapter 2.5.5.5	Section 2 lists $200 - $300/ton Used $250/ton. Cost adjusted for 3% inflation
Waste Transport	0.56	$/ton-mi	0.50	2002	EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 6 Chapter 3	Example problem. Cost adjusted for 3% inflation
Chemicals & Supplies						
Lime	24.57	$/ton	24.57	2006	Polymet design basis	cost adjusted for 3% inflation
Caustic	280	$/ton		2005	Hawkins Chemical	50% solution (50 Deg Be) includes delivery
Urea	405	$/ton		2005	Hawkins Chemical	50% solution of urea in water, includes delivery
Soda Ash		$/ton				
Oxygen	0.00	Mscf	0.00	2004	Vendor quote if needed	cost adjusted for 3% inflation
EPA Urea	179.1	$/ton				
Ammonia	0.101	$/lb				
Reagent #8		$/ton				
Catalyst & Replacement Parts						
SCR Catalyst	500	$/ft^3			Vendor quote if needed	
CO Catalyst	650	$/ft^3			Vendor quote if needed	
Catalyst #3						
Catalyst #4						
Catalyst #5						
Filter Bags	37.94	$/bag	33.71	2002	EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 6, Chapter 1	Example problem cost for 10 ft bags. Cost adjusted for 3% inflation
Tower Packing	100	$/ft^3				
Replacement Parts						
Replacement Parts						
Replacement Parts						
Other						
Sales Tax	6.5	%				
Interest Rate	7.00%	%				EPA/OMB suggested interest rate per R Cordes, MPCA
Operating Information						
Annual Op. Hrs	8760	Hours				Engineering Estimate
Utilization Rate	100%					
Equipment Life	20	yrs				Engineering Estimate
Design Capacity	7,043,040	Tons/yr				
Standardized Flow Rate	124	scfm @ 32º F				
Temperature	68	Deg F				
Moisture Content	0.0%					
Actual Flow Rate	133	acfm				
Standardized Flow Rate	133	scfm @ 68º F				
Dry Std Flow Rate	133	dscfm @ 68º F	Air flow rate based on 1 gr/dscf loading on control device inlet			

Pollutant	**Max Emis Lb/Hr**	**Uncontrolled Conc**			
PM10	0.4	0.37	gr/dscf		
Total Particulates	1.1	1.00	gr/dscf		
Wet Controls	**Controlled lb/hr & conc**		Control Eff	**98.6%**	
PM10	0.0	0.005	gr/dscf		
Total Particulates	0.0	0.005	gr/dscf		
Dry Controls	**Controlled lb/hr & conc**		Control Eff	**99.3%**	
PM10	0.0	0.0025	gr/dscf		
Total Particulates	0.0	0.0025	gr/dscf		
Difference					
PM10	0.0				
Total Particulates	0.0				

PolyMet Air Quality Permit Application
ECTR Report -Attachment F - Emission Control Cost Analysis Material Handling, Rock Crushing
Table F - 3: PM Control - Wet Scrubber

Operating Unit: **Waste Rock Crushing**

Emission Unit Number	FS 023		Stack/Vent Number	NA - Fug	
Design Capacity	7,043,040	Tons/yr	Standardized Flow Rate	124	scfm @ 32º F
Expected Utilization Rate	100%		Temperature	68	Deg F
Expected Annual Hours of Operation	8,760	Hours	Moisture Content	0.0%	
Annual Interest Rate	7.0%		Actual Flow Rate	133	acfm
Expected Equipment Life	20	yrs	Standardized Flow Rate	133	scfm @ 68º F
			Dry Std Flow Rate	133	dscfm @ 68º F

CONTROL EQUIPMENT COSTS

Capital Costs			
Direct Capital Costs			
Purchased Equipment (A)			8,366
Purchased Equipment Total (B)	22%	of control device cost (A)	**10,165**
Installation - Standard Costs	56%	of purchased equip cost (B)	5,692
Installation - Site Specific Costs			NA
Installation Total			5,692
Total Direct Capital Cost, DC			15,857
Total Indirect Capital Costs, IC	35%	of purchased equip cost (B)	3,558
Total Capital Investment (TCI) = DC + IC			**19,415**
Operating Costs			
Total Annual Direct Operating Costs		Labor, supervision, materials, replacement parts, utilities, etc.	150,894
Total Annual Indirect Operating Costs		Sum indirect oper costs + capital recovery cost	93,012
Total Annual Cost (Annualized Capital Cost + Operating Cost)			**243,907**

Emission Control Cost Calculation

Pollutant	Max Emis Lb/Hr	Annual T/Yr	Cont Eff %	Exit Conc.	Conc. Units	Cont Emis T/yr	Reduction T/yr	Cont Cost $/Ton Rem
PM10	0.4	1.8		0.006	gr/dscf	0.03	1.8	134,782
Total Particulates	1.1	5.0		0.006	gr/dscf	0.03	5.0	49,143
Nitrous Oxides (NOx)						-	-	NA
Sulfur Dioxide (SO_2)						-	-	NA
Sulfuric Acid Mist						-	-	NA
Fluorides						-	-	NA
Volatile Organic Compounds (VOC)						-	-	NA
Carbon Monoxide (CO)						-	-	NA
Lead (Pb)						-	-	NA

Notes & Assumptions

1. Scrubber Cost per Barr Engineering 2004 Scrubber Project. Adjusted prices per Chemical Engineering Magazine CPI Index 2004 = 444, 2005 =465
2. Calculations per EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 6 Chapter 2
3. Used 0.6 power law factor to adjust price to 97,500 acfm from bid basis of 500,000 acfm
4. ESP supervision cost = 48% of operator cost = supervisor 15% + coordinator 33% per EPA Cont Cost Manual Section 6 Chapter 3. Table 3.21 adjusted for inflation
5. The control efficiencies for sulfuric acid mist, fluorides and lead are for example calculations and do not represent actual control efficiencies.

PolyMet Air Quality Permit Application
ECTR Report -Attachment F - Emission Control Cost Analysis Material Handling, Rock Crushing
Table F - 3: PM Control - Wet Scrubber

CAPITAL COSTS			
Direct Capital Costs			
Purchased Equipment (A) (1)			**8,366**
Purchased Equipment Costs (A) - Absorber + packing + auxiliary equipment, EC			
Instrumentation	10%	of control device cost (A)	837
MN Sales Taxes	6.5%	of control device cost (A)	544
Freight	5%	of control device cost (A)	418
Purchased Equipment Total (B)	22%		**10,165**
Installation			
Foundations & supports	6%	of purchased equip cost (B)	610
Handling & erection	40%	of purchased equip cost (B)	4,066
Electrical	1%	of purchased equip cost (B)	102
Piping	5%	of purchased equip cost (B)	508
Insulation	3%	of purchased equip cost (B)	305
Painting	1%	of purchased equip cost (B)	102
Installation Subtotal Standard Expenses	56%		**5,692**
Site Preparation, as required		Site Specific	NA
Buildings, as required		Site Specific	NA
Site Specific - Other		Site Specific	NA
Total Site Specific Costs			NA
Installation Total			**5,692**
Total Direct Capital Cost, DC			**15,857**
Indirect Capital Costs			
Engineering, supervision	10%	of purchased equip cost (B)	1,017
Construction & field expenses	10%	of purchased equip cost (B)	1,017
Contractor fees	10%	of purchased equip cost (B)	1,017
Start-up	1%	of purchased equip cost (B)	102
Performance test	1%	of purchased equip cost (B)	102
Model Studies	NA	of purchased equip cost (B)	NA
Contingencies	3%	of purchased equip cost (B)	305
Total Indirect Capital Costs, IC	35%	of purchased equip cost (B)	**3,558**
Total Capital Investment (TCI) = DC + IC			**19,415**
Adjusted TCI for Replacement Parts (Catalyst, Filter Bags, etc) for Capital Recovery Cost			**19,415**
OPERATING COSTS			
Direct Annual Operating Costs, DC			
Operating Labor			
Operator	32.00	$/Hr, 2.0 hr/8 hr shift, 8760 hr/yr	70,080
Supervisor	15%	15% of Operator Costs	10,512
Maintenance			
Maintenance Labor	32.00	$/Hr, 1.0 hr/8 hr shift, 8760 hr/yr	35,040
Maintenance Materials	100.00	% of Maintenance Labor	35,040
Utilities, Supplies, Replacements & Waste Management			
Electricity	0.05	$/kwh, 0 kW-hr, 8760 hr/yr, 100% utilization	191
NA	NA		-
Water	0.23	$/mgal, 0 gpm, 8760 hr/yr, 100% utilization	31
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
Total Annual Direct Operating Costs			**150,894**
Indirect Operating Costs			
Overhead	60%	of total labor and material costs	90,403
Administration (2% total capital costs)	2%	of total capital costs (TCI)	388
Property tax (1% total capital costs)	1%	of total capital costs (TCI)	194
Insurance (1% total capital costs)	1%	of total capital costs (TCI)	194
Capital Recovery	0.0944	for a 20- year equipment life and a 7% interest rate	1,833
Total Annual Indirect Operating Costs		Sum indirect oper costs + capital recovery cost	**93,012**
Total Annual Cost (Annualized Capital Cost + Operating Cost)			**243,907**

See summary page for notes and assumptions

PolyMet Air Quality Permit Application
ECTR Report -Attachment F - Emission Control Cost Analysis Material Handling, Rock Crushing
Table F - 3: PM Control - Wet Scrubber

Capital Recovery Factors		
Primary Installation		
Interest Rate	7.00%	
Equipment Life	20	years
CRF	0.0944	

Replacement Catalyst:		
Equipment Life	5	years
CRF	0.0000	
Rep part cost per unit	500	$/ft^3
Amount Required	0	ft^3
Packing Cost	0	Cost adjusted for freight & sales tax
Installation Labor	0	Assume Labor = 15% of catalyst cost (basis labor for baghouse replacement)
Total Installed Cost	**0**	**Zero out if no replacement parts needed**
Annualized Cost	**0**	

Replacement Parts & Equipment:			
Equipment Life	3		
CRF	0.3811		
Rep part cost per unit	37.94090199	$ each	
Amount Required	0	Number	
Total Rep Parts Cost	0	Cost adjusted for freight & sales tax	
Installation Labor	0	10 min per bag (13 hr total) Labor at $29.65/hr	OAQPS list replacement times from 5 - 20 min per bag.
Total Installed Cost	**0**	**Zero out if no replacement parts needed**	
Annualized Cost	**0**		

Electrical Use							
	Flow acfm		D P in H2O	Efficiency	Hp	kW	
Blower, Scrubber	133		15	0.6	0.5	0.4	EPA Cont Cost Manual 6th ed - Sec 6 Ch 2 Eq 2.40
	L/G ratio*	Liquid SPGR	D P ft H2O	Efficiency	Hp	kW	
Circ Pump	10	1.125	40	0.5	0.0	0.0	EPA Cont Cost Manual 6th ed - Sec 6 Ch 2 Eq 2.41
H2O WW Disch Pump	0 gpm	1.125	40	0.5	0.0	0.0	EPA Cont Cost Manual 6th ed - Sec 6 Ch 2 Eq 2.41
Other							
Other							
Other							
Total						0.4	

* L/G = Gal/1,000 acf

Reagent Use & Other Operating Costs						
Caustic Use	0.00	lb/hr SO2	2.50	lb NaOH/lb SO2	0.00	lb/hr Caustic
Lime Use	0.00	lb/hr SO2	1.53	lb Lime/lb SO2	0.00	lb/hr Lime
Circulating Water Rate	1	gpm				
Water Makeup Rate/WW Disch =	20%	of circulating water rate =	0 gpm			

Operating Cost Calculations — **Annual hours of operation:** **8,760** — **Utilization Rate:** **100.0%**

Item	**Unit Cost $**	**Unit of Measure**	**Use Rate**	**Unit of Measure**	**Annual Use***	**Annual Cost**	**Comments**
Operating Labor							
Op Labor	32	$/Hr	2.0	hr/8 hr shift	2,190	70,080	$/Hr, 2.0 hr/8 hr shift, 8760 hr/yr
Supervisor	15%	of Op.			NA	10,512	15% of Operator Costs
Maintenance							
Maint Labor	32.00	$/Hr	1.0	hr/8 hr shift	1,095	35,040	$/Hr, 1.0 hr/8 hr shift, 8760 hr/yr
Maint Mtls	100	% of Maintenance Labor			NA	35,040	100% of Maintenance Labor
Utilities, Supplies, Replacements & Waste Management							
Electricity	0.052	$/kwh	0.4	kW-hr	3,656	191	$/kwh, 0 kW-hr, 8760 hr/yr, 100% utilization
Natural Gas	6.85	$/mscf	0	scfm	0	0	$/mscf, 0 scfm, 8760 hr/yr, 100% utilization
Water	0.23	$/mgal	0.3	gpm	140	31	$/mgal, 0 gpm, 8760 hr/yr, 100% utilization
Cooling Water	0.28	$/mgal	0.0	gpm	0	0	$/mgal, 0 gpm, 8760 hr/yr, 100% utilization
Comp Air	0.32	$/mscf	0	Mscfm	0	0	$/mscf, 0 Mscfm, 8760 hr/yr, 100% utilization
WW Treat Neutralizatior	0.00	$/mgal	0.3	gpm	140	0	$/mgal, 0 gpm, 8760 hr/yr, 100% utilization
WW Treat Biotreatemer	4.28	$/mgal	0.0	gpm	0	0	$/mgal, 0 gpm, 8760 hr/yr, 100% utilization
SW Disposal	28.14	$/ton	0.0	ton/hr	0	0	$/ton, 0 ton/hr, 8760 hr/yr, 100% utilization
Haz W Disp	281	$/ton	0.0	ton/hr	0	0	$/ton, 0 ton/hr, 8760 hr/yr, 100% utilization
Waste Transport	0.56	$/ton-mi	0.0	ton/hr	0	0	$/ton-mi, 0 ton/hr, 8760 hr/yr, 100% utilization
Waste Recycle	0.00	0.00	0.0	ton/hr	0	0	0, 0 ton/hr, 8760 hr/yr, 100% utilization
Lime	24.5728	$/ton	0.0	lb/hr	0	0	$/ton, 0 lb/hr, 8760 hr/yr, 100% utilization
Urea	405	$/ton	0.0	lb/hr	0	0	$/ton, 0 lb/hr, 8760 hr/yr, 100% utilization
Oxygen	0	Mscf	0.0	Mscf/hr	0	0	Mscf, 0 Mscf/hr, 8760 hr/yr, 100% utilization
SCR Catalyst	500	$/ft3	0	ft^3	0	0	$/ft3, 0 ft3, 8760 hr/yr, 100% utilization
Filter Bags	37.940902	$/bag	0	bags	0	0	$/bag, 0 bags, 8760 hr/yr, 100% utilization

*annual use rate is in same units of measurement as the unit cost factor

See summary page for notes and assumptions

PolyMet Air Quality Permit Application
ECTR Report -Attachment F - Emission Control Cost Analysis Material Handling, Rock Crushing
Table F - 4: PM Control -Baghouse

Operating Unit: **Waste Rock Crushing**

Emission Unit Number	FS 023		Stack/Vent Number	NA - Fug	
Design Capacity	7,043,040	Tons/yr	Standardized Flow Rate	124	scfm @ 32º F
Expected Utilization Rate	100%		Temperature	68	Deg F
Expected Annual Hours of Operation	8,760	Hours	Moisture Content	0.0%	
Annual Interest Rate	7.0%		Actual Flow Rate	133	acfm
Expected Equipment Life	20	yrs	Standardized Flow Rate	133	scfm @ 68º F
			Dry Std Flow Rate	133	dscfm @ 68º F

CONTROL EQUIPMENT COSTS

Capital Costs			
Direct Capital Costs			
Purchased Equipment (A)			17,034
Purchased Equipment Total (B)	22%	of control device cost (A)	**20,696**
Installation - Standard Costs	74%	of purchased equip cost (B)	15,315
Installation - Site Specific Costs			NA
Installation Total			15,315
Total Direct Capital Cost, DC			36,011
Total Indirect Capital Costs, IC	45%	of purchased equip cost (B)	9,313
Total Capital Investment (TCI) = DC + IC			**45,324**
Operating Costs			
Total Annual Direct Operating Costs		Labor, supervision, materials, replacement parts, utilities, etc.	151,604
Total Annual Indirect Operating Costs		Sum indirect oper costs + capital recovery cost	96,183
Total Annual Cost (Annualized Capital Cost + Operating Cost)			**247,787**

Emission Control Cost Calculation

Pollutant	Max Emis Lb/Hr	Annual T/Yr	Cont Eff %	Exit Conc.	Conc. Units	Cont Emis T/yr	Reduction T/yr	Cont Cost $/Ton Rem
PM10	0.4	1.8		0.0025	gr/dscf	0.01	1.8	135,616
Total Particulates	1.1	5.0		0.0025	gr/dscf	0.01	5.0	49,749
Nitrous Oxides (NOx)						-	-	NA
Sulfur Dioxide (SO_2)						-	-	NA
Sulfuric Acid Mist						-	-	NA
Fluorides						-	-	NA
Volatile Organic Compounds (VOC)						-	-	NA
Carbon Monoxide (CO)						-	-	NA
Lead (Pb)						-	-	NA

Notes & Assumptions

1 Barr Project Feb 2006. Average baghouse cost estimate for coal fired boiler at 23,000 acfm
2 Calculations per EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 6 Chapter 1
3 Compressed air for baghouse assumed to be 2 scfm / 1000 acfm EPA Air Pollution Control Cost Manual 6th Ed 2002, Section 6 Chapter 1.5.1.8
4 Bag replacement at 10 min/bag EPA Cont Cost Manual 6th ed Section 6 Chapter 1.5.1.4 lists replacement times from 5 - 20 min per bag.
5 Used 0.6 power law factor to adjust price to 33,000 acfm from bid basis of 23,000 acfm
6 $250,000 bag replacement cost from vendor adjusted for flow rate as noted above. Bid basis of flow rate 217,000 acfm
7 Baghouse cloth area estimated using 9:1 air to cloth ratio for rock dust per Table 1.1, EPA Cont Cost Manual 6th ed Section 6 Chapter 1.
8 The control efficiencies for sulfuric acid mist, fluorides and lead are for example calculations and do not represent actual control efficiencies.

PolyMet Air Quality Permit Application

ECTR Report -Attachment F - Emission Control Cost Analysis Material Handling, Rock Crushing

Table F - 4: PM Control -Baghouse

CAPITAL COSTS			
Direct Capital Costs			
Purchased Equipment (A) (1)			**17,034**
Purchased Equipment Costs (A) - Absorber + packing + auxiliary equipment, EC			
Instrumentation	10%	of control device cost (A)	1,703
MN Sales Taxes	6.5%	of control device cost (A)	1,107
Freight	5%	of control device cost (A)	852
Purchased Equipment Total (B)	22%		**20,696**
Installation			
Foundations & supports	4%	of purchased equip cost (B)	828
Handling & erection	50%	of purchased equip cost (B)	10,348
Electrical	8%	of purchased equip cost (B)	1,656
Piping	1%	of purchased equip cost (B)	207
Insulation	7%	of purchased equip cost (B)	1,449
Painting	4%	of purchased equip cost (B)	828
Installation Subtotal Standard Expenses	74%		**15,315**
Site Preparation, as required		Site Specific	NA
Buildings, as required		Site Specific	NA
Site Specific - Other		Site Specific	NA
Total Site Specific Costs			NA
Installation Total			**15,315**
Total Direct Capital Cost, DC			**36,011**
Indirect Capital Costs			
Engineering, supervision	10%	of purchased equip cost (B)	2,070
Construction & field expenses	20%	of purchased equip cost (B)	4,139
Contractor fees	10%	of purchased equip cost (B)	2,070
Start-up	1%	of purchased equip cost (B)	207
Performance test	1%	of purchased equip cost (B)	207
Model Studies	NA	of purchased equip cost (B)	NA
Contingencies	3%	of purchased equip cost (B)	621
Total Indirect Capital Costs, IC	45%	of purchased equip cost (B)	**9,313**
Total Capital Investment (TCI) = DC + IC			**45,324**
Adjusted TCI for Replacement Parts (Catalyst, Filter Bags, etc) for Capital Recovery Cost			**42,021**
OPERATING COSTS			
Direct Annual Operating Costs, DC			
Operating Labor			
Operator	32.00	$/Hr, 2.0 hr/8 hr shift, 8760 hr/yr	70,080
Supervisor	15%	15% of Operator Costs	10,512
Maintenance			
Maintenance Labor	32.00	$/Hr, 1.0 hr/8 hr shift, 8760 hr/yr	35,040
Maintenance Materials	100%	of maintenance labor costs	35,040
Utilities, Supplies, Replacements & Waste Management			
Electricity	0.05	$/kwh, 0 kW-hr, 8760 hr/yr, 100% utilization	82
NA	NA		-
NA	NA		-
NA	NA		-
Comp Air	0.32	$/mscf, 2 scfm/kacfm, 8760 hr/yr, 100% utilization	44
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
NA	NA		-
Filter Bags	33.71	$/bag, 1 bags, 8760 hr/yr, 100% utilization	806
Total Annual Direct Operating Costs			**151,604**
Indirect Operating Costs			
Overhead	60%	of total labor and material costs	90,403
Administration (2% total capital costs)	2%	of total capital costs (TCI)	906
Property tax (1% total capital costs)	1%	of total capital costs (TCI)	453
Insurance (1% total capital costs)	1%	of total capital costs (TCI)	453
Capital Recovery	0.0944	for a 20- year equipment life and a 7% interest rate	3,966
Total Annual Indirect Operating Costs		Sum indirect oper costs + capital recovery cost	**96,183**
Total Annual Cost (Annualized Capital Cost + Operating Cost)			**247,787**

See Summary page for notes and assumptions

PolyMet Air Quality Permit Application
ECTR Report -Attachment F - Emission Control Cost Analysis Material Handling, Rock Crushing
Table F - 4: PM Control -Baghouse

Capital Recovery Factors		
Primary Installation		
Interest Rate	7.00%	
Equipment Life	20	years
CRF	0.0944	

Replacement Catalyst:			
Equipment Life	5	years	
CRF	0.0000		
Rep part cost per unit	500	$/ft^3	
Amount Required	0	ft^3	
Total Rep Parts Cost	0	Cost adjusted for freight & sales tax	
Installation Labor	0	Assume Labor = 15% of catalyst cost (basis labor for baghouse replacement)	
Total Installed Cost	**0**	**Zero out if no replacement parts needed**	
Annualized Cost	**0**		

Replacement Parts & Equipment:	**Filter bags & cages**		
Equipment Life	5	years	
CRF	0.2439		
Rep part cost per unit	~~33.711~~	$/bag - Calculated cost not used	
Amount Required	1		
Total Rep Parts Cost	3,294	Cost adjusted for freight & sales tax	
Installation Labor	9	10 min per bag, Labor + Overhead (68% = $29.65/hr)	EPA Cont Cost Manual 6th ed Section 6 Chapter 1.5.1.4
Total Installed Cost	**3,303**	**Zero out if no replacement parts needed**	lists replacement times from 5 - 20 min per bag.
Annualized Cost	**806**		

Electrical Use							
	Flow acfm		D P in H2O	Efficiency	Hp	kW	
Blower, Baghouse	133		7.5			0.2	
Baghouse Shaker	0.0	Gross fabric area ft^2				0	EPA Cont Cost Manual 6th ed Section 6 Chapter 1 Eq 1.14
Other							
Other							
Other							
Other							
Other							
Total						0.2	

Baghouse Filter Cost						
						See Control Cost Manual Sec 6 Ch 1 Table 1.8 for bag costs
Gross BH Filter Area	15	ft^2				
Cages	16 ft long	5 in dia	13.42 area/cage ft^2	1 Cages	11.036	$/cage
Bags	1.69	$/ft2 of fabric			22.68	$/bag
Total					33.711	

Operating Cost Calculations — **Annual hours of operation:** **8,760** — **Utilization Rate:** **100.0%**

Item	Unit Cost $	Unit of Measure	Use Rate	Unit of Measure	Annual Use*	Annual Cost	Comments
Operating Labor							
Op Labor	32	$/Hr	2.0	hr/8 hr shift	2,190	70,080	$/Hr, 2.0 hr/8 hr shift, 8760 hr/yr
Supervisor	15%	of Op.			NA	10,512	15% of Operator Costs
Maintenance							
Maint Labor	32.00	$/Hr	1.0	hr/8 hr shift	1,095	35,040	$/Hr, 1.0 hr/8 hr shift, 8760 hr/yr
Maint Mtls	100	% of Maintenance Labor			NA	35,040	100% of Maintenance Labor
Utilities, Supplies, Replacements & Waste Management							
Electricity	0.052	$/kwh	0.2	kW-hr	1,582	82	$/kwh, 0 kW-hr, 8760 hr/yr, 100% utilization
Natural Gas	6.85	$/mscf	0	scfm	0	0	$/mscf, 0 scfm, 8760 hr/yr, 100% utilization
Water	0.23	$/mgal	0.0	gpm	0	0	$/mgal, 0 gpm, 8760 hr/yr, 100% utilization
Cooling Water	0.28	$/mgal	0.0	gpm	0	0	$/mgal, 0 gpm, 8760 hr/yr, 100% utilization
Comp Air	0.32	$/mscf	2	scfm/kacfm	140	44	$/mscf, 2 scfm/kacfm, 8760 hr/yr, 100% utilization
WW Treat Neutralizatior	0.00	$/mgal	0.0	gpm	0	0	$/mgal, 0 gpm, 8760 hr/yr, 100% utilization
WW Treat Biotreatemer	4.28	$/mgal	0.0	gpm	0	0	$/mgal, 0 gpm, 8760 hr/yr, 100% utilization
SW Disposal	28.14	$/ton	0.0	ton/hr	0	0	$/ton, 0 ton/hr, 8760 hr/yr, 100% utilization
Haz W Disp	281	$/ton	0.0	ton/hr	0	0	$/ton, 0 ton/hr, 8760 hr/yr, 100% utilization
Waste Transport	0.56	$/ton-mi	0.0	ton/hr	0	0	$/ton-mi, 0 ton/hr, 8760 hr/yr, 100% utilization
Waste Recycle	0.00	0.00	0.0	ton/hr	5	0	0, 0 ton/hr, 8760 hr/yr, 100% utilization
Lime	24.5728	$/ton	0.0	lb/hr	0	0	$/ton, 0 lb/hr, 8760 hr/yr, 100% utilization
Caustic	280	$/ton	0.0	lb/hr	0	0	$/ton, 0 lb/hr, 8760 hr/yr, 100% utilization
Oxygen	0	Mscf	0.0	Mscf/hr	0	0	Mscf, 0 Mscf/hr, 8760 hr/yr, 100% utilization
SCR Catalyst	500	$/ft3	0	ft^3	0	0	$/ft3, 0 ft3, 8760 hr/yr, 100% utilization
Filter Bags	33.71	$/bag	1	bags	NA	806	$/bag, 1 bags, 8760 hr/yr, 100% utilization

*annual use rate is in same units of measurement as the unit cost factor

See Summary page for notes and assumptions

Attachment G

Diesel Powered Emergency Equipment Control Cost Calculations

PolyMet Mining, Inc.
NorthMet Project Processing Plant Air Quality Permit Application
ECTR Report (RS58B) -Attachment G - Emission Control Cost Analysis
Table G-1: Cost Summary - Emergency Generators and Pumps

PM/PM10 Control Cost Summary

Control Technology	Control Eff %	Emission Reduction T/yr	Installed Capital Cost $	Annualized Operating Cost $/yr	Pollution Control Cost $/ton
Emergency Generator Classification	Minimum 98%	6.97 *	NA	NA	Site Specific
GCP	Varies by Design	NA	NA	NA	Site Specific
Oxidation Catalyst	30%	0.12	$387,072	$42,498	$349,101
Diesel Filter	90%	0.37	$30,129	$4,243	$11,618

* for 8760 hrs

PolyMet Mining, Inc.
NorthMet Project Processing Plant Air Quality Permit Application
ECTR Report (RS58B) -Attachment G - Emission Control Cost Analysis
Table G-2: Control Cost Analysis
PM/VOC/CO Emission Controls: Oxidation Catalyst

Capital Recovery Factors			
Primary Installation			
Interest Rate	7.0%		
Equipment Life	15	years	Equipment Life Estimate (1)
CRF	0.1098		

Catalyst Replacement Cost			
Equipment Life	15	years	
CRF	0.1098		
Catalyst cost per unit	53000	$\$/ft^3$	Vendor Estimate (2)
Amount Required	6.55	ft^3	
# of units	1.00		
Equipment Size	5.236	MMBtu/hr	
Catalyst Cost	387,072	Cost adjusted for freight & sales tax	
Installation Labor	0	Assume packaged unit	
Total Installed Cost	**387,072**		
Annualized Cost	**42,498**		
Annual Op Hrs	**500**	hrs	
Annual Fuel Use	**23,393**	gal	

PM Control Efficiency (%)	30	(3)
Uncontrolled PM Emissions (tpy)	0.406	
Controlled PM Emissions (tpy)	0.284	
Emission Reduction PM (tpy)	0.122	
Controlled Cost ($/ton PM)	$349,101	

Notes:
(1) "Control of Compressor Emissions, Related Costs and Considerations, Thomas P. Mark, 10/31/03.
(2) Ziegler Power Systems, proposal cost estimate for a catalytic oxidiation unit, 10/22/03
(3) "Emission Control Technology for Stationary Internal Combustion Engines", MACE, July 1997.

PolyMet Mining, Inc.
NorthMet Project Processing Plant Air Quality Permit Application
ECTR Report (RS58B) -Attachment G - Emission Control Cost Analysis
Table G-3: Control Cost Analysis
PM Emission Controls: Diesel Filter

Capital Recovery Factors			
Primary Installation			
Interest Rate	7.0%		
Equipment Life	15	years	Equipment Life Estimate (1)
CRF	0.1098		

Capital Cost			
Equipment Life	15	years	
CRF	0.1098		
Unit Cost	36	$/bhp	Vendor Estimate (2)
Equipment Size	5.236	MMBtu/hr	
Equipment Size	750.60	bhp	
# of units	1.00		
Capital Cost	30,129	Cost adjusted for freight & sales tax	
Installation Labor	0	Assume packaged unit	
Total Installed Cost	**30,129**		
Annual Op Hrs	**500**	hrs	
Annual Fuel Use	**18,700**	gal	
Additive Cost	**935**	$/yr	
Annualized Cost	**4,243**	$/yr	

Control Efficiency (%)	90	(2)
Uncontrolled PM Emissions (tpy)	0.406	
Controlled PM Emissions (tpy)	0.041	
Emission Reduction PM (tpy)	0.365	
Controlled Cost ($/ton PM)	$11,618	

Notes:
(1) "Control of Compressor Emissions, Related Costs and Considerations, Thomas P. Mark, 10/31/03.
(2) "Emission Control Technology for Stationary Internal Combustion Engines", MACE, July 1997.