Air Quality Impact Study

Stationary Source and Site Operations

Sand & Gravel Mining and Accessory Uses
Empire Township, Dakota County, MN

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TABLE OF CONTENTS

TABLES

FIGURES

APPENDICIES

1.0 INTRODUCTION

1.1 Project Description

A consortium of mine operators and landowners (Mining Consortium) propose to open new mines and expand existing aggregate mining areas to include a total area of approximately 3,600 acres in the northwest portion of Empire Township, Dakota County. Mining would be conducted in a similar manner to the current practices at existing mines within and adjacent to the Mining Area. Routine functions as well as ancillary operations are described in detail below.

Mining and Aggregate Processing

- Clearing and grubbing the site of vegetation and structures, as necessary
- Relocation of infrastructure, as necessary
- Excavation and transport of the raw aggregate materials
- Excavation, stockpiling, and transporting of other soils materials, including clay and topsoil, which may be present within the Mining Area for shipment to sites out of the Mining Area or for use in reclamation
- Washing, grading and stockpiling aggregate materials for sale or later internal use
- Transporting and stockpiling waste "fines" for potential later use in reclamation
- Transporting finished aggregate materials internally for subsequent processing and to construction sites beyond the Mining Area
- Transporting, accepting, and stockpiling clean, compactable fill materials, typically referred to as "backhauled", for potential later use in reclamation
- Transporting, accepting, and stockpiling clean organic soil materials (i.e., peat) for potential later use in reclamation
- Eventual redistribution, compacting, grading of overburden and clean fill materials to reclaim the sites

Ancillary Manufacturing

- Manufacture and transport of asphalt products
- Manufacture, stockpiling, warehousing and transporting of ready-mixed concrete, bagged mortar products, concrete block, concrete pavers, concrete pipe, concrete plank, etc.
- Importing, grading, processing and stockpiling aggregates to be blended with local aggregates in the production of various products which will increase the effective use of the local aggregates and extend the life of the resource
- Transporting, accepting and recycling products returned from construction sites, including "come-back" asphalt, ready-mixed

concrete, bagged mortar products, concrete block, concrete pavers, concrete pipe, concrete plank, etc.

- Transporting, accepting, stockpiling and processing recycled construction materials for inclusion in new products

General Operations and Administrative

- Offices and sales areas
- Equipment maintenance areas
- Fuel storage and refueling areas

Currently, various companies included in the Mining Consortium either own, lease, or have purchase options on a majority of the Mining Area. Those properties not currently controlled by the mining companies are included in this study in recognition that future mining could occur. The mine operators with current and/or future interest or ownership in the Mining Area include:

- Aggregate Industries North Central Regional (Aggregate Industries)
- Cemstone Products Company (Cemstone)
- Dakota County Transportation Department (Dakota County)
- Fischer Sand and Aggregate Company (Fischer)
- Heikes Property (Heikes)
- McNamara Contracting, Inc. (McNamara)
- Tiller Corporation (Tiller)
- Don Peterson (Peterson)

1.2 Purpose of this Study

Over the next 30 to 40 years the Mining Consortium will remove and process approximately 200 million tons of sand and gravel reserves within the Mining Area. A Scoping Environmental Assessment Worksheet (Scoping EAW) was prepared for the proposed project in October 2003. The Scoping Decision Document required that additional analysis be completed for the Mining Area, addressing a number of topics, including air quality. This Impact Study has been prepared using assumptions that are worst case (Refer to Section 2.5) to provide an analysis of potential air quality impacts in the Mining Area, and to identify options for mitigating these potential impacts.

1.3 Project Location and Setting

The Mining Area evaluated in this Impact Study is located in Empire Township, in the central portion of Dakota County, Minnesota (**Figure 1)**. The proposed Mining Area is in the northwest portion of the township, occurring in all or part of T114N, R19W Sections 5, 6, 7, 8, 9, 10 and 16.

1.4 Study Area

The Study Area is largely contained within the proposed Mining Area, shown in **Figure 2**. This area was delineated according to current mining operations, and areas where mining operators have current and future interests in mining available aggregate deposits.

1.5 Previous Studies

No previous site-specific air quality studies were referenced as a part of this document, as none were identified for areas near the project site.

2.0 METHODOLOGY AND ASSUMPTIONS

Site activities at the proposed Mining Area include the mining of sand and gravel and the subsequent processing of the mined material to support construction material production such as ready-mix concrete, asphalt, and concrete block.

2.1 Pollutants

The activities associated with mining and subsequent production of construction related materials from the mined product are particulate matter (PM) and particulate matter less than or equal to 10 microns (PM_{10}) and as well as other criteria pollutants, such as nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2) and volatile organic compounds (VOC). These emissions will result from fuel combustion of aggregate processing equipment, on-site generators and asphalt operations.

2.2 Operations

2.2.1 Existing Conditions

The Mining Consortium provided Year 2003 exported material for each of the current mining operators, as well as projected volumes for the Year 2030. The Traffic Impact Study extrapolated from these numbers projected export quantities for 2015 and 2025, which were used in this analysis.

Two mining companies, Cemstone and Tiller, are currently in operation on properties within the proposed Mining Area. Three other companies, Aggregate Industries, McNamara, and Fischer are in full operations nearby, outside of the proposed Mining area. Heikes, which is located east of Biscayne Avenue and South of 170th Street is currently being mined by Aggregate Industries.

Emissions calculations were completed for the Year 2003 scenario in Section 4.1. Table 2.1 provides the 2003 annual exported material, which was used to perform the emission calculations. The Year 2003 scenario export quantities include only the companies currently in operation at the proposed Mining Area. Operations currently located outside of the proposed Mining Area were not included in the Year 2003 scenario.

Table 2-1. Year 2003 Material Export Quantities[1]

Mining Company	Aggregate (tons)	Ready-Mix (Cubic yards)	Concrete Block (EIE)[2]	Asphalt (tons)
Aggregate Ind.	--	--	--	--
Cemstone	286,000	73,214	--	--
Fischer	--	--	--	--
McNamara	--	--	--	--
Tiller	273,000	--	--	318,000
Heikes	20,000	--	--	--
Total	**579,000**	**73,214**	**0**	**318,000**

[1]Existing conditions = 2 plants (Tiller and Cemstone) and 1 other permitted area (Heikes) [2]EIE =Eight Inch Equivalents

2.2.2 Proposed Mining

The proposed mining operations will be a phased project. The assumptions for the scenarios analyzed are as follows:

1. By Year 2015
    - Aggregate Industries, McNamara, and Fischer are expected to have exhausted all exports from their remote locations outside of the proposed Mining Area.
    - All miners are located and producing in the Mining Area.
    - The current Heikes sand and gravel property is no longer being mined for material.
    - Tiller and Cemstone exports are expected to grow by two percent per year (from 2003 to 2015).

2. By Year 2025
    - All mining companies are expected to have exhausted all exports from their remote locations.
    - All mining companies are producing from their new locations in the Mining Area.
    - Cemstone is expected to be exporting approximately 300,000 tons of aggregate per year from their railroad off-loading. Assuming a similar ratio of ready-mix to aggregate as existing, Cemstone could be expected to also export 75,000 cubic yards of ready-mix per year.

In addition, by Year 2029 the Scoping EAW identifies the projected year 2029 yearly exported mining quantities to be as follows:

- 11 million tons of aggregate
- 1 million cubic yards of ready-mix
- 8 million eight-inch concrete blocks
- 1 million tons of asphalt.

The projected export quantities for all mining companies (Aggregate Industries, Cemstone, Fischer, McNamara, Tiller, Dakota Co. and Heikes) under the Year 2015 and 2025 "build" conditions are summarized in Table 2-2. These projected export quantities were used in the emission calculations provided in Section 4.2.

Table 2-2. Projected Annual Mining Export Quantities[1]

Mining Company	Aggregate (tons)	Ready-Mix (Cubic yards)	Concrete Block (EIE)[2]	Asphalt (tons)
Year 2015 Build Condition				
Aggregate Ind.	3,401,653	125,709	6,458,439	--
Cemstone	517,210	111,290	--	--
Fischer	2,401,592	376,520	--	--
McNamara	202,544	--	--	346,524
Tiller	332,000	--	--	405,834
Dakota Co.	45,000	--	--	--
Heikes	0	--	--	--
Total	**6,900,000**	**613,519**	**6,458,439**	**752,358**
Year 2025 Build Condition				
Aggregate Ind.	4,642,149	178,205	7,525,395	--
Cemstone	705,824	157,764	--	--
Fischer	3,277,392	533,752	--	--
McNamara	276,407	--	--	424,621
Tiller	453,072	--	--	497,298
Dakota Co.	61,410	--	--	--
Heikes	0	--	--	--
Total	**9,416,254**	**869,720**	**7,525,395**	**921,919**

[1]2015 and 2025 Build Condition = 5 plants (Tiller, Cemstone, Fischer, McNamara, Aggregate Industries) and 2 other permitted areas (Heikes and Dakota County)
[1]EIE =Eight Inch Equivalents

2.3 Internal Haul Road Traffic

By the year 2015, all six mining operations will be located at the Mining Area site. The quantity of material exported (as presented in Table 2-2) is the main factor contributing to the internal haul road traffic on-site. The projected haul road traffic count information for the Year 2015 and 2025 build conditions is presented in Table 2-3. The following conversion factors from the Mining Consortium and as reported in the Scoping EAW, were used to compute the haul road traffic counts from the projected mining export quantities.

- Aggregate: 20 tons per truck
- Ready Mix: 7 cubic yards per truck
- Concrete Block: 540 eight-inch blocks per truck
- Asphalt: 13 tons per truck

The internal haul road distance used in these calculations was 2640 feet (round-trip) for all operators. These annual traffic counts were used in the haul road emission calculations presented in Section 4.2. These data are the same as those used in the mobile source air quality impact analysis.

Table 2-3. Projected Annual Haul Road Traffic Counts[1]

Mining Company	Aggregate (trips/yr)	Ready-Mix (trips/yr)	Concrete (trips/yr)	Asphalt (trips/yr)
Year 2015 Build Condition				
Aggregate Ind.	170,083	17,958	11,960	--
Cemstone	25,861	15,899	--	--
Fischer	120,080	53,789	--	--
McNamara	10,127	--	--	26,656
Tiller	16,600	--	--	31,218
Dakota Co.	2,250	--	--	--
Heikes	0	--	--	--
Total	**345,000**	**87,646**	**11,960**	**57,874**
Year 2025 Build Condition				
Aggregate Ind.	232,107	25,458	13,936	--
Cemstone	35,291	22,538	--	--
Fischer	163,870	76,250	--	--
McNamara	13,820	--	--	32,663
Tiller	22,654	--	--	38,254
Dakota Co.	3,071	--	--	--
Heikes	0	--	--	--
Total	**470,813**	**124,246**	**13,936**	**70,917**

[1]2015 and 2025 Build Condition = 5 plants (Tiller, Cemstone, Fischer, McNamara, Aggregate Industries) and 2 other permitted areas (Heikes and Dakota County)

2.4 Emission Factors

The emission rates for all sources at the proposed Mining Area are computed using emission factors. The most widely-used source for emission factors is called Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume 1: Stationary Point and Area Sources (AP-42), published by US EPA. AP-42 emission factors are available on EPA's website (http://www.epa.gov/ttn/chief/ap42/) and are distributed by the Clearinghouse for Inventories and Emission Factors (CHIEF). The Minnesota Pollution Control Agency (MPCA) uses AP-42 factors in its permit application forms. The MPCA provides some additional emission factors in its guidance (*MPCA Air Dispersion Modeling Guidance for Minnesota Title V Modeling Requirements and Federal Prevention of Significant Deterioration (PSD) Requirements (Version 2.1)*, January 6, 2004 (Reference 1)).

Table 2-4 outlines the source of the emission factors used in the emission calculation analysis. The emission factors are described in greater detail in Section 3. The detailed emission factors are included in the detailed calculations in Appendices A through C.

Table 2-4. Emission Factor Documentation

Type of Operation/Source	Emission Factor Source
Aggregate Processing (i.e. crushing, screening, transfer operations)	AP-42 Section 11.19.2, Crushed Stone Processing and Pulverized Mineral Processing (8/04)
Ready-Mix Operations (including the Block Plant)	AP-42 Section 11.12, Concrete Batching (10/01)
Asphalt Operations	AP-42 Section 11.1, Hot Mix Asphalt Plants (4/04)
Unpaved Haul Roads	AP-42 Section 13.2.2, Unpaved Roads (12/03)
Storage Pile Wind Erosion	MPCA Air Dispersion Modeling Guidance
Fuel Combustion (Generators)	AP-42 Section 3.3, Gasoline and Diesel Industrial Engines (10/96)
Aggregate Heater	PM_{10} (Method 201A) Test completed on November 22, 1993, for Aggregate Industries

2.5 Key Assumptions

The assumptions used in this analysis are very conservative. Because the exact design of the new facilities is not known, this analysis assumes that all operations will be the same. The default design uses the following number of pieces of equipment:

- Crushers = 4
- Screens = 7
- Conveyors/stackers/bins = 41
- Truck Loading/Unloading = 1

This count is deliberately larger than the largest current operation (Aggregate Industries on 160th Street). This analysis also assumes that 100% of the production crosses each piece of equipment and that none of the operations are wet (from washing product). The probable actual design will average many pieces less than this. Many of the pieces of equipment will see only a fraction of the total production and the three largest producers will install wash plants. In those plants approximately 1/3 of the drop points will be after the wash section and, therefore, will have no emissions.

The largest single source of emissions is the internal haul roads. This analysis assumes a half mile round trip haul road for each facility. This is also deliberately longer than the probable actual length. The actual emissions compared to the very conservative assumptions above will be substantially reduced from these worst-case numbers.

The following list summarizes additional assumptions used in this analysis:

- 1.5% or greater moisture content of aggregate.
- Scenarios using 50% and 75% control efficiency for unpaved internal haul roads were analyzed. Haul road watering requirements summarized in Section 5.2.
- No paved haul roads.
- Internal haul roads are limited to internal roads leaving the site from storage piles or with final product materials (concrete block, asphalt, etc). All transfer between operations is done by conveyor rather than by truck.
- Unpaved haul road silt content obtained from AP-42 Table 13.2.2-1 for Sand and Gravel Processing Plant Roads.
- The internal haul road distance at each operation is 2640 feet (round-trip).
- One electrical generator per operation at the proposed Mining Area.
- Production capacity limits for the aggregate heater using natural gas.
- Production capacity limits for on-site generators using diesel fuel.
- Natural gas combustion at Asphalt facilities.

Note: These assumptions could affect the analysis results if changed.

3.0 EMISSION CALCULATION METHODLOGY

The following sections address each type of emission source at the proposed Mining Area. The methodology for computing the emissions from each source and a summary of the required inputs to calculate the emissions are presented below. These methods were used to compute the emissions summaries provided in Section 4.

3.1 Material Processing and Handling Emission Sources (from Aggregate Operations)

The majority of the emission sources at the proposed Mining Area are associated with aggregate material processing or handling. These sources include crushing, screening, conveying, and truck loading and unloading. Emissions from these sources were calculated using AP-42 Section 11.19.2, Crushed Stone Processing (8/04), emission factors. There are very limited emissions data available for sand and gravel processing. Therefore, the crushed stone processing data is used as it is more current and provides additional factors. Note: Only emissions from PM/PM_{10} occur from these activities.

Emissions from conveyors are considered at each 'drop' from one conveyor belt or conveyor segment to the next. Wash plant emissions are considered to be zero after the point that the material enters the wet portion of the wash plant. At that point the material moisture content is sufficiently high to control particulate emissions. Therefore, wash plant sources of this nature are not considered in this analysis.

3.1.1. Required Inputs

The following inputs are required to calculate the annual emission rates for the existing and proposed material processing and handling sources using AP-42 Section 11.19.2 emission factors:

- Material Throughput (tons/yr) as provided on Tables 2-1 and 2-2
- Emission Factor (lb/ton)

Note: Throughputs vary by operator. The annual material throughput data used in the emission calculations was based on Tables 2.1 and 2.2. Section 2.5 discusses the numbers and types of pieces of equipment.

3.1.2. AP-42 Methodology

AP-42 Table 11.19.2-1 provides emission factors for crushing, screening, conveying, and truck loading and unloading. The appropriate factors were applied to each activity.

Both controlled and uncontrolled emission factors are presented in AP-42. Typically, equipment processing material with a moisture content greater than 1.5% is considered controlled. The material for the proposed Mining Area is assumed to be greater than 1.5%; therefore, the controlled emission factors were used in the analysis.

The annual emissions for material processing and handling sources were calculated in the following manner:

Annual Export Quantities (tons/yr) * Emission Factor (lb/ton) * (1 ton/2000 lb) = Annual Emission Rate (ton PM or PM_{10}/yr)

3.2 Ready-Mix Operations

Ready-mix operations, also known as concrete batching, will occur at three (3) operations (Aggregate Industries, Cemstone, and Fisher) at the proposed Mining Area. In the existing Year 2003 scenario, only Cemstone operates a ready-mix facility at the Mining Area.

Ready-mix operations essentially make concrete by mixing water, cement, and aggregate. The concrete is manufactured in a central mix drum and transferred to a transport truck. Concrete can also be manufactured in a factory setting into pre-cast products. Operations such as this will occur at the proposed Aggregate Industries Block Plant.

Emissions from the existing and proposed ready-mix plants and the proposed block plant were calculated using AP-42 Section 11.12, Concrete Batching (10/01), emission factors. Note: Only emissions from PM/PM_{10} occur from these activities.

3.2.1. Required Inputs

The following inputs are required to calculate the emission rate for the ready-mix operations using AP-42 Section 11.12 emission factors:

- Material Throughput (yd^3/yr) as provided on Tables 2-1 and 2-2
- Emission Factor (lb/yd^3)

3.2.2. AP-42 Methodology

AP-42 Table 11.12-4, provides a total facility ready-mix emission factor for PM and PM_{10}. Both uncontrolled and controlled emission factors are presented. It is assumed that the ready-mix plants will have particulate controls because Minnesota rules require controls on cement silos. The emission factors are per yards of concrete for an average batch formulation at a typical facility. Emissions from the ready-mix operations are calculated using these total ready-mix emission factors for PM and PM_{10} from AP-42 for a central mix facility. Note: that the total facility value does not include emissions from haul roads. Those are included in section 3.4.

The annual emissions for the ready-mix operations and block plant were calculated in the following manner:

$$\text{Annual Throughput (yd}^3\text{/yr)} * \textbf{\textit{Total Facility}} \text{ Emission Factor (lb/yd}^3\text{)} * \text{(1 ton/2000 lb)} = \text{Annual Emission Rate (ton PM or PM}_{10}\text{/yr)}$$

3.3 Asphalt Operations

The proposed Mining area will also have two (2) asphalt facilities on-site. The proposed asphalt facilities will be drum mix plants and will be fueled by natural gas. At a drum mix asphalt plant, aggregate is fed into a drum with a burner that dries the aggregate as it moves through the drum. Liquid asphalt (asphalt cement) is added in the drum and coats the dried aggregate, producing asphalt used for paving (asphalt concrete). The asphalt concrete then is conveyed to storage silos or transport trucks.

Emissions from asphalt operations were calculated using AP-42 Section 11.1, Hot Mix Asphalt Plants (04/04), emission factors.

3.3.1. Required Inputs

The following inputs are required to calculate the emissions for the asphalt plants using AP-42 Section 11.1 emission factors:

- Material Throughput (tons/yr) as provided in Tables 2-1 and 2-2
- Emission Factor (lb/ton)

3.3.2. AP-42 Methodology

AP-42 Section 11.1, Hot Mix Asphalt Plants, provides emission factors for PM, PM_{10}, NO_x, SO_2, CO and VOC for drum mix plants. These emission factors were used to calculate emissions from the existing and proposed plants. It is assumed that the asphalt plants will have fabric filters for particulate control. Fabric filter controls are the standard for the industry. Therefore, controlled emission factors for PM and PM_{10} were used in the calculations.

The annual emissions for the asphalt plants were calculated in the following manner:

$$\text{Annual Throughput (tons/yr)} * \text{Emission Factor (lb/ton)} * \text{(1 ton/2000 lb)} = \text{Annual Emission Rate (ton per pollutant/yr)}$$

3.4 Unpaved Internal Haul Roads

Haul roads in the proposed Mining Area will consist of unpaved haul roads only. It is assumed that no haul roads will be paved at the proposed site. The haul roads considered are only those for moving final product out of each facility for transport off site. All on-site movement of raw material is assumed to be via conveyor.

Unpaved haul road particulate emissions are created when the force of the vehicles wheels on the surface causes pulverization of the surface material. In addition, the particulate matter are lifted and dropped from the rolling wheels of the vehicle.

The emission rates for the unpaved haul roads were computed using AP-42 Section 13.2.2 (12/03) Unpaved Road Equation (Equation 1a) (12/03). This equation is outlined below along with a list of the required inputs and an example of the equation.

3.4.1. Required Inputs

The following inputs are required to calculate the emission rate for haul roads using the AP-42 Section 13.2.2 Unpaved Road Equation:

- Surface Material Silt Content (AP-42 default values available)
- Mean Vehicle Weight
- Particle Size Multiplier
- Distance Traveled
- Days per year with at least 0.01 inch precipitation

3.4.2. AP-42 Unpaved Road Equation

The unpaved road equation used to compute proposed Mining Area unpaved haul road emissions is provided below.

Unpaved Road PM_{10} Emission Factor:

$$E = k\,(s/12)^{a}(W/3)^{b}[(365 - P)/365]$$

Where:

E	=	Emission factor (lb/Vehicle Miles Traveled (VMT))
k	=	Particle Size Multiplier (lb/VMT) = 4.9 for PM emissions and 1.5 for PM_{10} emissions
s	=	Silt Content (%) = 4.8 %
W	=	Mean Vehicle Weight (tons)
a	=	Empirical constant = 0.7 for PM emissions and 0.9 for PM_{10} emissions
b	=	Empirical constant = 0.45 for PM and PM_{10} emissions
P	=	Days per year with at least 0.01 inch precipitation (i.e. “wet days”)

Note: That k, a, and b are default values and were obtained from AP-42 Table 13.2.2-2. The proposed Mining Area road silt content value was obtained from AP-42 Table 13.2.2-1, Sand and Gravel Processing Plant Road category.

The amount of natural moisture occurring during operation can be considered. This is done by assuming that annual average emissions are inversely proportional to the number of days with measurable (more than 0.01 inch) precipitation. This is consistent with EPA methodology. The number of “wet days” used in this analysis was determined from AP-42 Figure 13.2.2-1, which provides a geographical distribution for the mean annual number of wet days for the United States.

The unpaved haul road equation provides an emission factor in lbs/VMT. The annual emission rate from vehicle activity was then found by multiplying the resulting emission factor by the vehicle miles traveled each year for each operation at the proposed Mining Area. The vehicle miles traveled per year (provided in Table 2-3) were based on the material export quantities (provided in Tables 2-1 and 2-2), the truck capacities, and roundtrip length of the trucking route.

An example of how to use the unpaved haul road equation is provided below.

k	=	Particle Size Multiplier = 1.5 for PM_{10} emissions
s	=	Silt Content (%) = 4.8 % (AP-42 Default)
W	=	Mean Vehicle Weight = 30 tons
a	=	Empirical constant = 0.9 for PM_{10} emissions
b	=	Empirical constant = 0.45 for PM_{10} emissions
P	=	Days per year with at least 0.01 inch precipitation = 110 days

Annual Production	=	4,642,149 tons for Year 2025
Truck Capacity	=	20 tons
Travel Distance	=	2,640 feet (round trip)

<u>Example 1. Unpaved Haul Road Equation</u>

Unpaved Road PM_{10} EF:

$$lb/VMT = 1.5 * (4.8/12)^{0.9}(30\ tons/3)^{0.45} * [(365-110)/365] = 1.55\ lb/VMT$$

In order to determine the emission rate, the emission factor calculated above must be multiplied by the vehicle miles traveled per year. In this example, the vehicle miles traveled equals the annual production divided by the truck capacity multiplied by the travel distance as shown below:

$$(4{,}642{,}149\ tons/20\ tons) * (2{,}640\ ft/trip) * (1\ mile/5{,}280\ ft) = 116{,}053\ VMT/yr$$

Therefore, the emission rate for this activity is:

$$(1.55\ lb/VMT)(116{,}053\ VMT/yr) * 1\ ton/2000\ lb = 89.9\ tons/yr$$

Note: no control efficiency was assumed in this example. Haul road control efficiencies were assumed in the haul road emission calculations for the proposed Mining Area. Two (2) haul road emissions scenarios are assumed for this analysis:

- 50% control
- 75% control

The 50% and 75% control levels are used here because they typically occur in air quality permitting analyses and permit requirements for limiting fugitive emissions from haul roads. Techniques for achieving control levels higher than these are not generally recognized in Minnesota permits. Therefore, higher levels are not considered.

The emissions summary of these scenarios is presented in Section 4.2. Additional documentation of the requirements for reaching the 50% and 75% control levels is presented in Section 5.2.

3.5 Storage Pile Wind Erosion

The proposed Mining Area will have product storage piles at each mining operation. The emissions from a storage pile are created by wind traveling over the pile, releasing dust and particulate into the air. The emissions from the storage pile are a continuous activity since they are not based on a specific handling activity, but rather atmospheric conditions (i.e. high winds). Therefore, the emissions will occur 24 hours per day and will be present year-round.

The storage pile emissions are computed using an emission factor from Minnesota Pollution Control Agency (MPCA) guidance (*MPCA Air Dispersion Modeling Guidance for Minnesota Title V Modeling Requirements and Federal Prevention of Significant Deterioration (PSD) Requirements (Version 2.1)*, January 6, 2004 (Reference 1)).

3.5.1. Required Inputs

The following input was required to calculate the emission rate for the proposed Mining area storage piles using the MPCA storage pile emission factor:

- Storage pile footprint (Acres)

3.5.2. MPCA Emission Calculation Methodology

The MPCA storage pile emission factor is: 1.0 tons of PM or PM_{10} /acre – year

The emission factor assumes that PM_{10} emissions are equal to PM emissions. The storage pile emission rate is then calculated by multiplying the MPCA emission factor by the storage area (in acres). Table 3-1 below provides a summary of the current and Year 2015 and 2025 built scenario storage pile acres. Note: the same size of storage piles is assumed for both projected scenarios (Year 2015 and 2025).

Table 3-1. Storage Pile Sizes

Mining Company	Year 2003 (Acres)	Year 2015 (Acres)	Year 2025 (Acres)
Aggregate Ind.	--	9.18	9.18
Cemstone	0.57	1.40	1.40
Fischer	--	6.48	6.48
McNamara	--	0.55	0.55
Tiller	0.54	0.90	0.90
Dakota Co.	--	0.12	0.12
Heikes	0.04	0	0
Total	**1.15**	**18.63**	**18.63**

For example, the annual emission rate for the Aggregate Industries storage pile for Year 2025 is computed as follows:

$$E_{annual} = 1.0 \text{ tons/acre} - \text{yr} * 9.18 \text{ acres} = 9.18 \text{ tons/yr}$$

3.6 Back-Up Power Generators

The proposed Mining Area is assumed to have one diesel fired generator for each operation on-site. AP-42 Section 3.3, Gasoline and Diesel Industrial Engines (10/96), emission factors were used to compute the emission rate for the proposed generator. The proposed generators will have PM, PM_{10}, SO_2, NO_x, CO and VOC emissions. Note: the generators will not be used as the main power source for the proposed Mining Area. They will be used mainly for emergency use or for remote mining operations not located next to a stationary power source. Therefore, emissions are calculated based on an assumption regarding maximum annual fuel use.

3.6.1. Required Inputs

The following inputs are required to calculate the emission rate for the generator using the AP-42 Section 3.3, Gasoline and Diesel Industrial Engines:

- Generator size (kW, horsepower (hp) or MM Btu/hr)
- Fuel type (Diesel, Natural Gas, etc.)
- Sulfur content (Only required for fuel oil)

3.6.2. AP-42 Methodology

As stated above, A AP-42 Section 3.3, Gasoline and Diesel Industrial Engines, emission factors were used to compute the generator emission rates. This section is applicable for all diesel generators less than 600 hp. The proposed generators will fire diesel fuel with 0.5% sulfur by weight. The sulfur content was used in the calculation of the SO_2 emission factor. The proposed Mining Area generators will be limited to 30,000 gallons per year each of diesel fuel. The emission calculations for the proposed generators were computed using the following method:

Annual Throughput (M gal/yr) * 140 MM Btu/M gal *
Emission Factor (lb/MM Btu) *1 ton/2000 lb =
Annual Emission Rate (tons of pollutant/yr)

3.7 Aggregate Heater

The proposed Mining Area will also include an aggregate heater or heaters. The aggregate heater is used to heat sand for the ready-mix and block operations. As noted in Section 3.1, the aggregate has a moisture content of 1.5% or greater. Even after heating the moisture content is greater than 1.5%. The aggregate heater will only remove a fraction of the moisture of the sand and aggregate from the operations. The process of heating the sand will create PM and PM_{10} emissions only. The aggregate heater itself will be fueled by natural gas, which will create PM, PM_{10}, NO_x, SO_2, CO and VOC emissions.

The emissions from the aggregate heater operations were computed using a PM_{10} Test (Method 201) completed by Aggregate Industries on November 22, 1993. The aggregate heater tested is representative of the proposed aggregate heater for the Mining Area.

Combustion emissions from the aggregate heater were computed from AP-42 Section 1.4, Natural Gas Combustion (07/98).

3.7.1. Required Inputs

The following inputs are required to calculate the emission rate for the aggregate heater operations at the proposed Mining area:

- Material Throughput (tons/yr)
- Emission Factor (lb/ton)

A proposed annual maximum of 600,000 tons of aggregate heated per year for all aggregate heating combined (for both Year 2015 and 2025 scenarios) was used in the annual emissions calculations. This is very conservative, since only approximately 20% of the total ready mix concrete and concrete block production will use heated aggregate. Assuming 20% of the aggregate needed for ready mix and block production is heated and assuming the projected block and ready mix production used elsewhere in this EIS, then the total projected need for heated aggregate is approximately 289,136 tons annually. The 600,000 tons was assumed to occur at the sites with ready mix operations – Aggregate Industries, Cemstone and Fischer. It was apportioned between those facilities based on ready mix production capacity.

The current scenario emissions were based on 200,000 tons of heated aggregate production apportioned to the Cemstone ready-mix production total for 2003.

The following inputs are required to calculate the emission rate for the aggregate heater combustion emissions:

- Annual Fuel Consumption Limit (MM Btu/yr)
- Emission Factor (lb/MM cf)

A proposed annual limit for the aggregate heater fuel consumption was used in the annual emissions calculations.

3.7.2. Emission Factor Methodology

As stated above, a PM_{10} Test (Method 201) completed by Aggregate Industries on November 22, 1993 was used to compute the PM and PM_{10} emissions from the aggregate heater. The emission calculations for the aggregate heater were computed using the following method:

Annual Throughput (tons/yr) * Emission Factor (lb/ton) *1 ton/2000 lb =
Annual Emission Rate (tons PM and PM_{10}/yr)

The combustion emissions were calculated using emission factors from AP-42 Section 1.4, Natural Gas Combustion. The emission calculations for the proposed aggregate heater combustion emissions were computed using the following method:

Fuel Consumption Limit (MM Btu/yr) * 1020 BTU/cf
Emission Factor (lb/MM cf) *1 ton/2000 lb =
Annual Emission Rate (tons per pollutant/yr)

4.0 EMISSION CALCULATION SUMMARY

4.1 Existing Year 2003 Conditions

Several mining operations currently exist within the proposed Mining Area; and therefore, are currently contributing to overall air quality in the area. Two mining companies, including Cemstone and Tiller, are currently in operation on properties within the Mining Area. Three other companies, Aggregate Industries, McNamara and Fischer, are in operation nearby, outside of the proposed Mining Area boundaries. Heikes, which is located east of Biscayne Avenue and south of 170th Street, is currently being mined by Aggregate Industries. Aggregate material mined from Heikes is trucked to the Aggregate Industries plant on the 160th Street/Pilot Knob Road intersection for processing and export. **Figure 2** graphically shows the locations of the existing mining sites and the location of their current entrance/exit access points.

To determine the emission rates for the existing conditions, the emission factors described in Section 3 were applied to the production estimates for the primary products generated from the Mining Area. The production estimates were available for 2003, as presented in Table 2-1, and were used to represent the existing conditions.

The emission calculation methods described in Section 3.0 were used to compute the emissions from each type of source at the current operations. Table 4-1 provides a summary of the emission calculations for the existing Year 2003 condition case for each mining company.

Table 4-1. Year 2003 Condition Emissions Summary

Mining Company	Emissions (tons/yr)					
	PM 50% Control	PM_{10} 50% Control	NO_x	SO_2	CO	VOC
Aggregate Ind.	--	--	--	--	--	--
Cemstone	26.0	8.5	9.4	0.6	2.1	0.8
Fischer	--	--	--	--	--	--
McNamara	--	--	--	--	--	--
Tiller	36.1	12.8	13.4	1.1	22.7	5.8
Heikes	1.7	1.0	9.3	0.6	2.0	0.8
Total	**63.8**	**22.3**	**32.0**	**2.4**	**26.7**	**7.4**

The majority of the existing condition PM and PM_{10} emissions are from internal haul road emissions. Approximately 71 % of the total PM emissions and 52 % of the total PM_{10} emissions are from haul road traffic, at 50% control. Haul roads are considered at 0 and 50 % control in Table 4-1. Table 4-4 at the end of this section provides additional detail on the Year 2003 emission calculation totals. This analysis did not consider 75% control for the existing conditions, since that level of dust control is not currently being employed.

4.2 Projected Year 2015 and 2025 Conditions

The proposed Mining operations will be a phased project; therefore, emissions from both Year 2015 and 2025 operations are presented below. The following assumptions were made to develop the proposed material export quantities provided in Table 2.2:

1. By Year 2015
   - Aggregate Industries, McNamara, and Fischer are expected to have exhausted all exports from their remote locations outside of the proposed Mining area.
   - All miners are operating in the Mining Area.
   - The current aggregate operation on the Heikes property is not longer being mined for material.
   - Tiller and Cemstone exports are expected to grow by two percent per year (from 2003 to 2015).

2. By Year 2025
   - All mining companies are expected to have exhausted all exports from their.
   - All miners are at full production
   - Cemstone is expected to be exporting approximately 300,000 tons of aggregate per year from their railroad off-loading operation. Assuming a similar ratio of ready-mix to aggregate as existing, Cemstone could be expected to also export 75,000 cubic yards of ready-mix per year.

The emission calculation methods described in Section 3 were used with the projected material export quantities in Table 2.2 to compute the total emissions from the proposed scenarios. Table 4-2 provides emissions totals for the Year 2015 and 2025 scenarios for PM and PM_{10}. There are three emissions totals presented below. They are inclusive of all emission sources and they include three different control factors for the unpaved internal haul road emissions; (1) uncontrolled, (2) 50 percent control and (3) 75 percent control.

Table 4-2. Year 2015 and 2025 Conditions
PM and PM_{10} Emissions Summary

Mining Company	Emissions (tons/yr)			
	50% Control		75% Control	
	PM	PM_{10}	PM	PM_{10}
Year 2015 Conditions				
Aggregate Industries	214.0	68.6	138.8	49.4
Cemstone	45.5	15.1	29.8	11.1
Fischer	187.3	60.6	122.0	43.9
McNamara	34.4	12.4	22.0	9.3
Tiller	45.2	16.1	28.9	11.9
Dakota Co.	3.1	1.4	2.2	1.2
Heikes	--	--	--	--
Total	**529.5**	**174.2**	**343.7**	**126.8**
Year 2025 Conditions				
Aggregate Industries	285.0	88.5	182.8	62.5
Cemstone	60.8	19.4	39.2	13.9
Fischer	251.4	78.7	161.3	55.7
McNamara	43.3	15.4	27.5	11.4
Tiller	57.5	20.0	36.5	14.7
Dakota Co.	3.9	1.7	2.7	1.4
Heikes	--	--	--	--
Total	**701.9**	**223.7**	**450.1**	**159.5**

The internal haul roads are the largest contributor to the overall PM and PM_{10} emissions for both Year 2015 and 2025 scenarios in all control options. There was a significant drop in the haul road emissions between the 50 and 75 percent control options. Additional discussion on haul road control is presented in Section 5.2. Tables 4-5 and 4-6 at the end of this section provide additional detail on the Year 2015 and 2025 emission calculation totals, respectively.

Table 4-3 provides the emissions summary for the NO_x, SO_2, CO and VOC emissions for the Year 2015 and 2025 scenarios.

Table 4-3. Year 2015 and 2025 Conditions
NO_x, SO_2, CO and VOC Emissions Summary

Operations Activity	Emissions (tons/yr)			
	NO_x	SO_2	CO	VOC
Year 2015 Conditions				
Aggregate Industries	9.7	0.6	2.3	0.8
Cemstone	9.5	0.6	2.2	0.8
Fischer	10.1	0.6	2.7	0.8
McNamara	13.8	1.2	24.5	6.3
Tiller	14.5	1.3	28.4	7.2
Dakota Co.	9.3	0.6	2.0	0.8
Heikes	--	--	--	--
Total	**66.8**	**4.9**	**62.1**	**16.7**
Year 2025 Conditions				
Aggregate Industries	9.7	0.6	2.3	0.8
Cemstone	9.5	0.6	2.2	0.8
Fischer	10.1	0.6	2.7	0.8
McNamara	14.8	1.3	29.6	7.5
Tiller	15.7	1.5	34.3	8.7
Dakota Co.	9.3	0.6	2.0	0.8
Heikes	--	--	--	--
Total	**69.0**	**5.2**	**73.1**	**19.4**

The power generators are the largest contributors to the overall NO_x and SO_2 emissions. Whereas, the asphalt operations are the largest contributor to the overall CO and VOC emissions. This is due to the fuel firing of the generators (diesel) versus the asphalt operations (natural gas). The aggregate heater emissions are not a significant contributor to the overall NO_x, SO_2, CO and VOC emissions due to the emission factors and natural gas fuel. Tables 4-5 and 4-6 at the end of this section provide additional detail on the Year 2015 and 2025 emission calculation totals, respectively.

Table 4-4. Year 2003 Condition Emissions Summary – Additional Detail

Mining Company	Operations Activity	Emissions (tons/yr)					
		PM – 50% Control	**PM_{10} – 50% Control**	**NO_x**	**SO_2**	**CO**	**VOC**
Cemstone	Aggregate Equipment	3.7	1.3	--	--	--	--
	Ready-Mix Operations	1.3	0.6	--	--	--	--
	Asphalt Operations	0	0	0	0	0	0
	Unpaved Haul Roads	18.5	4.7	--	--	--	--
	Storage Pile - Wind Erosion	0.6	0.6	--	--	--	--
	Generators	0.7	0.7	9.3	0.6	2.0	0.8
	Aggregate Heater	1.3	0.7	0.1	5.4E-05	0.1	0.005
	Total	**26.0**	**8.5**	**9.4**	**0.6**	**2.1**	**0.8**
Tiller	Aggregate Equipment	3.5	1.3	--	--	--	--
	Ready-Mix Operations	0	0	--	--	--	--
	Asphalt Operations	5.2	3.7	4.1	0.5	20.7	5.1
	Unpaved Haul Roads	26.1	6.7	--	--	--	--
	Storage Pile - Wind Erosion	0.5	0.5	--	--	--	--
	Generators	0.7	0.7	9.3	0.6	2.0	0.8
	Total	**36.1**	**12.8**	**13.4**	**1.1**	**22.7**	**5.8**
Heikes	Aggregate Equipment	0.3	0.1	--	--	--	--
	Ready-Mix Operations	0	0	--	--	--	--
	Asphalt Operations	0	0	0.0	0.0	0.0	0.0
	Unpaved Haul Roads	0.8	0.2	--	--	--	--
	Storage Pile - Wind Erosion	0.04	0.04	--	--	--	--
	Generators	0.7	0.7	9.3	0.6	2.0	0.8
	Total	**1.7**	**1.0**	**9.3**	**0.6**	**2.0**	**0.8**

Table 4-5. Year 2015 Condition Emissions Summary – Additional Detail

Mining Company	Operations Activity	Emissions (tons/yr)							
		PM – 50% Control	PM_{10} – 50% Control	PM – 75% Control	PM_{10} – 75% Control	NO_x	SO_2	CO	VOC
Aggregate Industries	Aggregate Equipment	44.1	15.7	44.1	15.7	--	--	--	--
	Ready-Mix Operations	3.5	1.7	3.5	1.7	--	--	--	--
	Asphalt Operations	0	0	0	0	0	0	0	0
	Unpaved Haul Roads	150.4	38.3	75.2	19.2	--	--	--	--
	Storage Pile - Wind Erosion	9.2	9.2	9.2	9.2	--	--	--	--
	Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
	Aggregate Heater	6.1	3.0	6.1	3.0	0.4	0.003	0.4	0.02
	Total	**214.0**	**68.6**	**138.8**	**49.4**	**9.7**	**0.6**	**2.3**	**0.8**
Cemstone	Aggregate Equipment	6.7	2.4	6.7	2.4	--	--	--	--
	Ready-Mix Operations	2.0	0.9	2.0	0.9	--	--	--	--
	Asphalt Operations	0	0	0	0	0	0	0	0
	Unpaved Haul Roads	31.3	8.0	15.6	4.0	--	--	--	--
	Storage Pile - Wind Erosion	1.4	1.4	1.4	1.4	--	--	--	--
	Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
	Aggregate Heater	3.4	1.7	3.4	1.7	0.2	0.001	0.2	0.01
	Total	**45.5**	**15.1**	**29.8**	**11.1**	**9.5**	**0.6**	**2.2**	**0.8**
Fischer	Aggregate Equipment	31.2	11.1	31.2	11.1	--	--	--	--
	Ready-Mix Operations	6.8	3.2	6.8	3.2	--	--	--	--
	Asphalt Operations	0	0	0	0	0	0	0	0
	Unpaved Haul Roads	130.6	33.3	65.3	16.6	--	--	--	--
	Storage Pile - Wind Erosion	6.5	6.5	6.5	6.5	--	--	--	--
	Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
	Aggregate Heater	11.6	5.8	11.6	5.8	0.8	0.005	0.7	0.04
	Total	**187.3**	**60.6**	**122.0**	**43.9**	**10.1**	**0.6**	**2.7**	**0.8**

McNamara	Aggregate Equipment	2.6	0.9	2.6	0.9	--	--	--	--
	Ready-Mix Operations	0	0	0	0	--	--	--	--
	Asphalt Operations	5.7	4.0	5.7	4.0	4.5	0.6	22.5	5.5
	Unpaved Haul Roads	24.8	6.3	12.4	3.2	--	--	--	--
	Storage Pile - Wind Erosion	0.5	0.5	0.5	0.5	--	--	--	--
	Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
	Total	**34.4**	**12.4**	**22.0**	**9.3**	**13.8**	**1.2**	**24.5**	**6.3**
Tiller	Aggregate Equipment	4.3	1.5	4.3	1.5	--	--	--	--
	Ready-Mix Operations	0	0	0	0	--	--	--	--
	Asphalt Operations	6.7	4.7	6.7	4.7	5.3	0.7	26.4	6.5
	Unpaved Haul Roads	32.7	8.3	16.4	4.2	--	--	--	--
	Storage Pile - Wind Erosion	0.9	0.9	0.9	0.9	--	--	--	--
	Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
	Total	**45.2**	**16.1**	**28.9**	**11.9**	**14.5**	**1.3**	**28.4**	**7.2**
Dakota Co.	Aggregate Equipment	0.6	0.2	0.6	0.2	--	--	--	--
	Ready-Mix Operations	0	0	0	0	--	--	--	--
	Asphalt Operations	0	0	0	0	0	0	0	0
	Unpaved Haul Roads	1.7	0.4	0.9	0.2	--	--	--	--
	Storage Pile - Wind Erosion	0.1	0.1	0.1	0.1	--	--	--	--
	Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
	Total	**3.1**	**1.4**	**2.2**	**1.2**	**9.3**	**0.6**	**2.0**	**0.8**

Table 4-6. Year 2025 Condition Emissions Summary – Additional Detail

Mining Company	Operations Activity	Emissions (tons/yr)							
		PM – 50% Control	PM_{10} – 50% Control	PM – 75% Control	PM_{10} – 75% Control	NO_x	SO_2	CO	VOC
Aggregate Industries	Aggregate Equipment	60.2	21.5	60.2	21.5	--	--	--	--
	Ready-Mix Operations	4.7	2.2	4.7	2.2	--	--	--	--
	Asphalt Operations	0	0	0	0	0	0	0	0
	Unpaved Haul Roads	204.4	52.1	102.2	26.1	--	--	--	--
	Storage Pile - Wind Erosion	9.2	9.2	9.2	9.2	--	--	--	--
	Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
	Aggregate Heater	5.8	2.9	5.8	2.9	0.4	0.002	0.3	0.02
	Total	**285.0**	**88.5**	**182.8**	**62.5**	**9.7**	**0.6**	**2.3**	**0.8**
Cemstone	Aggregate Equipment	9.2	3.3	9.2	3.3	--	--	--	--
	Ready-Mix Operations	2.8	1.3	2.8	1.3	--	--	--	--
	Asphalt Operations	0	0	0	0	0	0	0	0
	Unpaved Haul Roads	43.3	11.0	21.6	5.5	--	--	--	--
	Storage Pile - Wind Erosion	1.4	1.4	1.4	1.4	--	--	--	--
	Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
	Aggregate Heater	3.5	1.8	3.5	1.8	0.2	0.001	0.2	0.01
	Total	**60.8**	**19.4**	**39.2**	**13.9**	**9.5**	**0.6**	**2.2**	**0.8**
Fischer	Aggregate Equipment	42.5	15.1	42.5	15.1	--	--	--	--
	Ready-Mix Operations	9.6	4.5	9.6	4.5	--	--	--	--
	Asphalt Operations	0	0	0	0	0	0	0	0
	Unpaved Haul Roads	180.3	46.0	90.2	23.0	--	--	--	--
	Storage Pile - Wind Erosion	6.5	6.5	6.5	6.5	--	--	--	--
	Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
	Aggregate Heater	11.8	5.9	11.8	5.9	0.8	0.005	0.7	0.05
	Total	**251.4**	**78.7**	**161.3**	**55.7**	**10.1**	**0.6**	**2.7**	**0.8**

McNamara	Aggregate Equipment	3.6	1.3	3.6	1.3	--	--	--	--
	Ready-Mix Operations	0	0	0	0	--	--	--	--
	Asphalt Operations	7.0	4.9	7.0	4.9	5.5	0.7	27.6	6.8
	Unpaved Haul Roads	31.5	8.0	15.8	4.0	--	--	--	--
	Storage Pile - Wind Erosion	0.6	0.6	0.6	0.6	--	--	--	--
	Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
	Total	**43.3**	**15.4**	**27.5**	**11.4**	**14.8**	**1.3**	**29.6**	**7.5**
Tiller	Aggregate Equipment	5.9	2.1	5.9	2.1	--	--	--	--
	Ready-Mix Operations	0	0	0	0	--	--	--	--
	Asphalt Operations	8.2	5.7	8.2	5.7	6.5	0.8	32.3	8.0
	Unpaved Haul Roads	41.8	10.7	20.9	5.3	--	--	--	--
	Storage Pile - Wind Erosion	0.9	0.9	0.9	0.9	--	--	--	--
	Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
	Total	**57.5**	**20.0**	**36.5**	**14.7**	**15.7**	**1.5**	**34.3**	**8.7**
Dakota Co.	Aggregate Equipment	0.8	0.3	0.8	0.3	--	--	--	--
	Ready-Mix Operations	0	0	0	0	--	--	--	--
	Asphalt Operations	0	0	0	0	0	0	0	0
	Unpaved Haul Roads	2.3	0.6	1.2	0.3	--	--	--	--
	Storage Pile - Wind Erosion	0.1	0.1	0.1	0.1	--	--	--	--
	Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
	Total	**3.9**	**1.7**	**2.7**	**1.4**	**9.3**	**0.6**	**2.0**	**0.8**

5.0 MITIGATION OPTIONS

5.1 Aggregate Processing and Handling Operations

Mitigation of dust emissions from aggregate processing and handling operations includes two basic options – reducing the number of processing and/or handling operations, and dust control. With regards to the number of operations, the numbers used in this analysis are a worst case estimate. They assume a maximum production and a maximum number of pieces of equipment and further assume that 100% of the material passes through every operation. The calculations also assume that each operator, even the smallest, will use the same number of processes as the largest operator (refer to 3.1.1 above). In practice, each operation will be different and will employ the most efficient design (the smallest number of operations) for its specific needs. And the number of emission sources for Aggregate Industries, Fischer and Cemstone will be further reduced by the use of wash plants. It is likely that the actual number of operations (drop points or emissions sources) will be closer to half of the total number used in this analysis.

With respect to dust control, there are a number of dust control techniques that will be applied within each of the on-site mining facilities, including general operational techniques and specific applications:

- Use of conveyers to transport aggregate between mine facilities (mine face, sorting, concrete plant, asphalt plant) to the extent practical to limit the number in internal truck trips
- Maintain a perimeter berm to limit direct wind access or sight of the operations from adjacent roads or residences
- Seed graded areas to provide cover during interim operations and/or to stabilize overburden soils
- Use of water during sorting process
- Setbacks from the down wind receptors will also permit the particulates to settle out before crossing the property lines.

All of the above dust control techniques will reduce the particulate matter from the proposed Mining operations. The reductions due to the implementation of such techniques have not been quantified.

5.2 Internal Haul Road Emissions

As shown in Table 4.2 above, the haul roads contribute to a majority of the total current and proposed Year 2015 and 2025 Mining Area emissions. This is typical of such operations. With respect to internal haul roads, there are again two basic mitigation options – shorten the length of the haul roads or apply dust control. Again, each operator at the time of establishing operations over the life of the site will establish a haul road distance. Those will be based on site specific circumstances not available at the time of this writing. Internal haul road distances may be shorter than the ½ mile round trip distance used here. Any reduction in haul road distances will significantly reduce haul road emissions.

Therefore, two control options, 50 and 75 percent, were provided to demonstrate the difference in overall emissions totals and available control options. The following section outlines methods to obtain the 50 and 75 percent control efficiencies for the proposed Mining operations.

Typical unpaved haul road controls include:

- Wet suppression
- Chemical Stabilization
- Reduction of silt content by gravel surface application.

It is assumed that the operations in the proposed Mining Area will apply wet suppression (water application) to the unpaved haul roads. Water application keeps the road surface wet to control emissions. The control efficiency of unpaved road watering depends on: 1) the amount of water applied per unit area of road surface, 2) the time between reapplications, 3) traffic volume during that period, and 4) prevailing meteorological conditions during the period.

The following discussion outlines two methods to determine the required amount of water to achieve the 50 and 75 percent control efficiencies on the haul roads. The two methods are provided as information on how application rates are determined. Either method will provide the required control. Note that either method can consider the impact of natural rainfall on watering requirements, as natural rainfalls can be taken into account in watering requirements.

<u>Unpaved Haul Road Control Efficiency Determination Methods</u>

Control Method 1. An empirical model for the performance of water as a control technique has been developed. This model is taken from pages 141 through 144 of the Air Pollution Engineering Manual (Reference 2). The model is represented using the following equation.

$$C = 100 - (0.8pdt/i)$$

Where:

C	=	average control efficiency (%)
p	=	potential average hourly daytime evaporation rate (mm/h)
d	=	average hourly daytime traffic rate (h^{-1})
t	=	time since last application (hours)
i	=	application intensity (L/m^2)

Figure 13.2.2-2 in AP-42 Section 13.2.2 provides the mean annual average pan evaporation rate. The potential hourly evaporation rate (in mm per hour) was calculated by multiplying the annual rate by 0.0049.

The control efficiency calculated by the equation above is dependent on the application intensity and time since last application. This method was used to determine the necessary application intensity and application frequency for each proposed haul road.

The following example is for the Aggregate Industries internal haul road at the proposed Mining Area. The haul road is 1320 feet in length and 32.8 feet wide. Table 5-1 indicates that if a 2 hour watering frequency is used, 416 gallons of water are needed over the extent of the haul road to ensure 50 percent control; whereas if a 12 hour watering frequency is used 2,495 gallons of water are needed to ensure 50 percent control. Either combination of frequency and amount of water will achieve the required control efficiency.

Table 5-1. Typical Quantities and Watering Frequencies Example

C	p	d	WATER (GAL)	Area (M^2)	i	t (hours)
50%	0.196	62.3	416	4022.3	0.39	2
			1248		1.17	6
			2495		2.35	12
			4991		4.69	24

Control Method 2. A second control method analyzes the ratio of moisture content of the haul road under both controlled and uncontrolled conditions (References 3 and 4). This method outlines the controlled surface moisture content EKS would need to achieve to maintain appropriate control levels.

$$C = 75\ (M-1),\ \text{for } 1 \le M \le 2$$
$$C = 62 + 6.7M,\ \text{for } 2 \le M \le 5$$

Where:

C = Instantaneous control efficiency (%)

M = ratio of controlled to uncontrolled surface moisture contents

In order to obtain the necessary control measures, the haul road surface material to be controlled should first be sampled to determine the initial percent moisture content of the road. This value will be used to determine “M” in the equation above. Then, water the haul road utilizing a known application intensity (volume per area) and record the time of application. After waiting a predetermined time period, re-sample the haul road surface material to determine the residual percent moisture content. To determine “M,” divide the residual percent moisture content by the initial percent moisture content. “M” will then be inserted into the equation to determine the control efficiency. The amount of time between samples will be the same as the time necessary between water applications.

5.3 Asphalt Processing Emissions

The asphalt production will be fired using natural gas versus typical operators that use #6 waste oil. The natural gas firing will create significantly lower combustion emissions from the plants. In addition, fabric filters will be used to control PM and PM_{10} emissions from the asphalt operations. No specific additional mitigation measures are required. The previous haul road discussion (5.2) applies to product shipped out from these operations as well.

5.4 Ready-Mix Processing Emissions

The ready-mix operations will have particulate control for both PM and PM_{10} emissions. No specific additional mitigation measures are required. The previous haul road discussion (5.2) applies to product shipped out from these operations as well.

6.0 APPLICABLE REGULATIONS

6.1 MPCA Permit Requirements

The Minnesota Pollution Control Agency (MPCA) requires that facilities have air emissions permits based on the type and size of operations. The MPCA requirements base the permit decision on the 'potential to emit' of pollutants. That requires sources (of all types) to assume that operations occur 24 hours per day, 365 days per year regardless of any local restrictions. Also, for this determination, no controls can be considered. This basis is used ***only*** for the initial determination of whether or not a permit is needed. Once that decision is made ('yes' a permit is required or 'no' it is not), controls and limits can be considered in permitting documents as appropriate.

Table 6-1 provides a summary of the MPCA permit requirement thresholds for all pollutants. Again, these are not limitations on operations. They are thresholds for determining when a permit is required. The MPCA permit will then address specific requirements for the permitted operations. Emissions may be above these levels.

Table 6-1. MPCA Permitting Levels

Pollutant	MPCA Permit Requirement Thresholds (tons/yr)
PM	100
PM_{10}	25
SO_2	50
NO_x	100
CO	100
VOC	100
Lead	0.5

Based on the assumptions in this analysis and calculations assuming 0% control for fugitive dust emissions (see Appendices), permit requirements for operators are listed in Table 6-2 for aggregate operations. This table should be viewed with caution because the permit decision will need to be made on a site specific basis by each operator based on a final determination of the extent of proposed operations.

Table 6-2 Summary of Aggregate Permit Requirements

Mining Company	Permit Required? Year 2015 Conditions	Permit Required? Year 2025 Conditions
Aggregate Industries	Yes	Yes
Cemstone	No	Yes
Fischer	Yes	Yes
McNamara	No	No
Tiller	No	Yes
Dakota County	No	No
Heikes	NA	NA

The individual operations will have to obtain the proper permit from the MPCA prior to beginning construction or operation at a particular site. Since multiple operators and operations will occur, the Mining Area will be covered by multiple permits. The permitting options are discussed below.

Permitting Options

<u>Aggregate Operations</u>
There are multiple permit types available to aggregate operations at the proposed mining site. The two that are the most likely to be used in this case are:

- Site Specific Permit
- Non-Metallic Mineral Processing General Permit

A site-specific permit would be, as the name applies, a permit that is issued to a specific facility. It can include site-specific limitations and requirements.

The second option of the general permit is also available. The MPCA issues 'general' permits in cases where there are many types of similar operations in the state where requirements are similar. The Non-Metallic Mineral Processing General Permit is one of those permits. Many sand, gravel, and rock mining processes operate under the general permit. There are eligibility requirements for the permit and the proposed operations would have to qualify for the permit under those requirements.

Whichever permit is issued for each operation will need to reflect the final agreed upon control requirements for the internal haul roads. The general permit does include requirements for either 50% or 75% control credit for haul roads.

<u>Asphalt Operations</u>
Nearly all asphalt production operations in the state of Minnesota are permitted using the MPCA's Registration Permit system. This is available for facilities that have actual emissions less than 50% of the thresholds listed in Table 6-1.

Site specific permits may also be obtained for asphalt operations if site specific requirements are needed.

Ready Mix Operations

Ready mix operations in Minnesota that produce less than 300,000 tons per year (without haul road controls) or less than 360,000 tons per year (with haul road controls) are exempt from permitting requirements under Minn. Rules 7008.2200. That rule contains various recordkeeping, reporting and monitoring requirements that a company must comply with in order to be eligible for the permitting exemption.

6.2 Applicable State and Federal Requirements

The processing equipment (crushers, screens, conveyors, etc.) at the proposed Mining operations will likely be subject to a US EPA New Source Performance Standard (NSPS). That standard is 40 CFR Part 60, Subpart OOO – Standards of Performance for Nonmetallic Mineral Processing Plants. The applicability will vary with the particular equipment used. Equipment constructed, reconstructed or modified after August 31, 1983 is subject to the NSPS. The rule sets opacity limits for dust emissions from the equipment. Opacity is the amount of obstruction of light transmittance caused by a plume of dust or gases. Opacity is used as a limit in cases where emissions are not from a well defined stack, which is the case for these types of operations. Moisture content is generally used to control emissions to meet these requirements.

Haul Roads and Storage Piles

Fugitive dust from haul roads and storage piles is controlled by Minnesota Rule 7011.0151. This rule requires that reasonable measures to control fugitive dust be taken.

Power Generators

The power generators will be subject to Minnesota Rule 7011.2300 and may also be subject to future federal rules on engines. The final determination will depend on the type and size of the unit.

Asphalt Operations

Asphalt production is subject to federal NSPS, 40 CFR Part 60, Subpart I. That regulates particulate emissions and opacity.

Asphalt operations are also subject to state requirements in Minnesota Rules 7011.0900 – 7011.0922. These rules address various testing, and monitoring and operational requirements.

Ready Mix Operations

Ready mix operations are subject to state requirements in Minnesota Rules 7011.0850 – 7011.0859. These rules require controls on cement silos as well as other miscellaneous requirements.

7.0 CONCLUSIONS

The emission calculations for the proposed project show results typically expected for these types of operations. The pollutant of concern is particulate (PM and PM_{10}) with the largest emission contributor being fugitive dust from internal haul roads.

Haul road fugitive dust is the air quality impact most likely to be experienced by nearby residents. Haul road fugitive dust is typically controlled with water suppression or similar techniques discussed in Section 5.2. With adequate dust suppression, operations should not result in significant negative impacts on nearby residents.

With adequate moisture content in the aggregate, operations are able to meet the federal applicable requirements for aggregate operations discussed in Section 6.2.

The calculations show that the operations (other than exempt concrete batching operations) will require permitting by the MPCA, with the applicable permit options as discussed in Section 6.1. Each owner will be required to obtain the appropriate permits from the MPCA prior to beginning operations. Those permits will invoke the applicable requirements discussed in Section 6.0.

8.0 REFERENCES

1. MPCA Air Dispersion Modeling Guidance for Minnesota Title V Modeling Requirements and Federal Prevention of Significant Deterioration (PSD) Requirements (Version 2.1), January 6, 2004.
2. Air Pollution Control Manual, Third Edition, Pages 141-143. Cowherd, Jr., Chatten and John S., and John S. Kinsey, AWMA, 1992.
3. Revisions to AP-42 Section 13.2.2, “Unpaved Roads”, EPA Contract 68-D-002, Work Assignment No. 1 1-03 MRI Project No. 110130.1.003.
4. Control of Open Fugitive Dust Sources, EPA 450/3-88-008, September 1998.

APPENDIX A

Year 2003 Condition Emission Calculations

Existing Year 2003 Conditions

All Facilities Emissions

Emission Source Description	PM Emission Rate (tons/yr)	PM_{10} Emission Rate (tons/yr)	NO_x Emission Rate (tons/yr)	SO_2 Emission Rate (tons/yr)	CO Emission Rate (tons/yr)	VOC Emission Rate (tons/yr)
Aggregate Equipment	7.5	2.7	--	--	--	--
Ready-Mix Operations	1.3	0.6	--	--	--	--
Asphalt Operations	5.2	3.7	4.1	0.5	20.7	5.1
Unpaved Haul Roads	45.4	11.6	--	--	--	--
Storage Pile - Wind Erosion	1.1	1.1	--	--	--	--
Generators	2.0	2.0	27.8	1.8	6.0	2.3
Aggregate Heater	1.3	0.7	0.1	0.001	0.1	0.005
TOTAL EMISSIONS	**63.8**	**22.3**	**32.0**	**2.4**	**26.7**	**7.4**

Individual Operator Emissions

Emission Source Description	PM Emission Rate (tons/yr)	PM_{10} Emission Rate (tons/yr)	NO_x Emission Rate (tons/yr)	SO_2 Emission Rate (tons/yr)	CO Emission Rate (tons/yr)	VOC Emission Rate (tons/yr)
Cemstone						
Aggregate Equipment	3.7	1.3	--	--	--	--
Ready-Mix Operations	1.3	0.6	--	--	--	--
Asphalt Operations	0	0	0	0	0	0
Unpaved Haul Roads	18.5	4.7	--	--	--	--
Storage Pile - Wind Erosion	0.6	0.6	--	--	--	--
Generators	0.7	0.7	9.3	0.6	2.0	0.8
Aggregate Heater	0.6	0.3	0.04	2.7E-04	0.04	2.5E-03
TOTAL EMISSIONS	**25.4**	**8.2**	**9.3**	**0.6**	**2.0**	**0.8**
Tiller						
Aggregate Equipment	3.5	1.3	--	--	--	--
Ready-Mix Operations	0	0	--	--	--	--
Asphalt Operations	5.2	3.7	4.1	0.5	20.7	5.1
Unpaved Haul Roads	26.1	6.7	--	--	--	--
Storage Pile - Wind Erosion	0.5	0.5	--	--	--	--
Generators	0.7	0.7	9.3	0.6	2.0	0.8
Aggregate Heater	0.6	0.3	0.04	2.6E-04	0.04	2.3E-03
TOTAL EMISSIONS	**36.7**	**13.1**	**13.4**	**1.1**	**22.7**	**5.8**
Heikes						
Aggregate Equipment	0.3	0.1	--	--	--	--
Ready-Mix Operations	0	0	--	--	--	--
Asphalt Operations	0	0	0	0	0	0
Unpaved Haul Roads	0.8	0.2	--	--	--	--
Storage Pile - Wind Erosion	0.04	0.04	--	--	--	--
Generators	0.7	0.7	9.3	0.6	2.0	0.8
Aggregate Heater	0.0	0.0	3.1E-03	1.9E-05	2.6E-03	1.7E-04
TOTAL EMISSIONS	**1.8**	**1.0**	**9.3**	**0.6**	**2.0**	**0.8**

Existing Year 2003 Conditions

FUGITIVE DUST PM EMISSIONS FOR UNPAVED ROADS

Emission Factor Equation

E = k * (s/12)^a * (W/3)^b * [(365-P)/365] where:

- E = Emission factor (lb/VMT, vehicle miles traveled) from AP-42, Section 13.2.2, Equation 1a (unpaved roads at industrial sites), (12/03).
- k = Particle size multiplier (lb/VMT) from AP-42, Table 13.2.2-2.
- a,b,c = Empirical constants (a, b) from AP-42, Table 13.2.2-2.
- s = Road surface material silt content (%) is from AP-42 Table 13.2.2-1.
- W = Mean vehicle weight based on the "fleet" average weight of all vehicles traveling the road.
- P = Number of days in a year with at least 0.01 in of precipitation, P = 110 days

Activity	Particle Size Multiplier, k (lb/VMT)	Empirical Constants a	b	Silt Content (%)	Loaded Vehicle Weight, W (tons)	Unloaded Vehicle Weight, W (tons)	Mean Vehicle Weight, W (tons)	Uncontrolled Emission Factor, E (lb/VMT)	Control Efficiency (%)	Controlled Factor, E (lb/VMT)
Aggregate Industries										
Aggregate	4.9	0.7	0.45	4.8	40	20	30	6.10	50	3.05
Ready-Mix	4.9	0.7	0.45	4.8	34	20	27	5.81	50	2.91
Concrete Block	4.9	0.7	0.45	4.8	26	16	21	5.19	50	2.60
Cemstone										
Aggregate	4.9	0.7	0.45	4.8	40	20	30	6.10	50	3.05
Ready-Mix	4.9	0.7	0.45	4.8	34	20	27	5.81	50	2.91
Fischer										
Aggregate	4.9	0.7	0.45	4.8	40	20	30	6.10	50	3.05
Ready-Mix	4.9	0.7	0.45	4.8	34	20	27	5.81	50	2.91
McNamara										
Aggregate	4.9	0.7	0.45	4.8	40	20	30	6.10	50	3.05
Asphalt	4.9	0.7	0.45	4.8	27	14	21	5.14	50	2.57
Tiller										
Aggregate	4.9	0.7	0.45	4.8	40	20	30	6.10	50	3.05
Asphalt	4.9	0.7	0.45	4.8	27	14	21	5.14	50	2.57
Dakota Co.										
Aggregate	4.9	0.7	0.45	4.8	40	20	30	6.10	50	3.05
Heikes										
Aggregate	4.9	0.7	0.45	4.8	40	20	30	6.10	50	3.05

	Controlled Factor, E (lb/VMT)	Ave Daily Exports unit/day	units	Maximum Trips/day	Annual Exports unit/yr	units	Annual Trips/yr	Feet per Trip (Round Trip)	Vehicle Miles Traveled (VMT/hr)	Vehicle Miles Traveled (VMT/yr)	PM Emissions Hourly (lb/hr)	PM Emissions Annual (tons/yr)
Aggregate Industries												
Aggregate	3.05	0	tons	0.0	0	tons	0	2640	0.0	0.0	0.00	0.0
Ready-Mix	2.91	0	yd^3	0.0	0	yd^3	0	2640	0.0	0.0	0.00	0.0
Concrete Block	2.60	0	EIE	0.0	0	EIE	0	2640	0.0	0.0	0.00	0.0
Cemstone												
Aggregate	3.05	1,845	tons	92.3	286,000	tons	14,300	2640	1.9	7,150.0	5.86	10.9
Ready-Mix	2.91	386	yd^3	55.1	73,214	yd^3	10,459	2640	1.1	5,229.6	3.34	7.6
Fischer												
Aggregate	3.05	0	tons	0.0	0	tons	0	2640	0.0	0.0	0.00	0.0
Ready-Mix	2.91	0	yd^3	0.0	0	yd^3	0	2640	0.0	0.0	0.00	0.0
McNamara												
Aggregate	3.05	0	tons	0.0	0	tons	0	2640	0.0	0.0	0.00	0.0
Asphalt	2.57	0	tons	0.0	0	tons	0	2640	0.0	0.0	0.00	0.0
Tiller												
Aggregate	3.05	1,761	tons	88.1	273,000	tons	13,650	2640	1.8	6,825.0	5.59	10.4
Asphalt	2.57	2,682	tons	206.3	318,000	tons	24,462	2640	4.3	12,230.8	11.04	15.7
Dakota Co.												
Aggregate	3.05	0	tons	0.0	0	tons	0	2640	0.0	0.0	0.00	0.0
Heikes												
Aggregate	3.05	129	tons	6.5	20,000	tons	1,000	2640	0.1	500.0	0.41	0.8
	TOTAL =										26.24	45.37

Sample Calculations

Uncontrolled PM Emission Factor

E = k * (s/12)^a * (W/3)^b *(365 - P)/365 =

4.9 * (4.80/12)^0.7 * (30.00/3)^0.45 * (365 - 110)/365 = **6.10 lb PM10/VMT**

Controlled PM Emission Factor

(Uncontrolled PM Emission Factor) * (1-Control Efficiency) =

(6.10 lb PM10/VMT) * (100-50.00)/100 = **3.05 lb PM10/VMT**

Annual Controlled PM Emissions

(Vehicle Miles Traveled/yr) * (Controlled PM Emission Factor) * 1 ton/2000 lb =

(0.00 VMT/yr) * (3.05 lb PM10/VMT) = **0.00 lb PM10/hr**

APPENDIX B

Year 2015 Condition Emission Calculations

Projected Year 2015 Conditions

All Facilities Emissions

Emission Source Description	PM Emission Rate (tons/yr) (50% Control Scenario)	PM_{10} Emission Rate (tons/yr) (50% Control Scenario)	PM Emission Rate (tons/yr) (75% Control Scenario)	PM_{10} Emission Rate (tons/yr) (75% Control Scenario)	NO_x Emission Rate (tons/yr)	SO_2 Emission Rate (tons/yr)	CO Emission Rate (tons/yr)	VOC Emission Rate (tons/yr)
Aggregate Equipment	89.5	31.9	89.5	31.9	--	--	--	--
Ready-Mix Operations	12.3	5.8	12.3	5.8	--	--	--	--
Asphalt Operations	12.4	8.7	12.4	8.7	9.8	1.3	48.9	12.0
Unpaved Haul Roads	371.6	94.7	185.8	47.3	--	--	--	--
Storage Pile - Wind Erosion	18.6	18.6	18.6	18.6	--	--	--	--
Generators	3.9	3.9	3.9	3.9	55.6	3.7	12.0	4.5
Aggregate Heater	21.1	10.6	21.1	10.6	1.5	0.0	1.2	0.1
TOTAL EMISSIONS	**529.5**	**174.2**	**343.7**	**126.8**	**66.8**	**4.9**	**62.1**	**16.7**

Individual Operator Emissions

Emission Source Description	PM Emission Rate (tons/yr) (50% Control Scenario)	PM_{10} Emission Rate (tons/yr) (50% Control Scenario)	PM Emission Rate (tons/yr) (75% Control Scenario)	PM_{10} Emission Rate (tons/yr) (75% Control Scenario)	NO_x Emission Rate (tons/yr)	SO_2 Emission Rate (tons/yr)	CO Emission Rate (tons/yr)	VOC Emission Rate (tons/yr)
Aggregate Industries								
Aggregate Equipment	44.1	15.7	44.1	15.7	--	--	--	--
Ready-Mix Operations	3.5	1.7	3.5	1.7	--	--	--	--
Asphalt Operations	0	0	0	0	0	0	0	0
Unpaved Haul Roads	150.4	38.3	75.2	19.2	--	--	--	--
Storage Pile - Wind Erosion	9.2	9.2	9.2	9.2	--	--	--	--
Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
Aggregate Heater	10.4	5.2	10.4	5.2	0.7	0.004	0.6	0.04
TOTAL EMISSIONS	**218.4**	**70.8**	**143.1**	**51.6**	**10.0**	**0.6**	**2.6**	**0.8**
Cemstone								
Aggregate Equipment	6.7	2.4	6.7	2.4	--	--	--	--
Ready-Mix Operations	2.0	0.9	2.0	0.9	--	--	--	--
Asphalt Operations	0	0	0	0	0	0	0	0
Unpaved Haul Roads	31.3	8.0	15.6	4.0	--	--	--	--
Storage Pile - Wind Erosion	1.4	1.4	1.4	1.4	--	--	--	--
Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
Aggregate Heater	1.6	0.8	1.6	0.8	0.1	6.6E-04	0.09	6.1E-03
TOTAL EMISSIONS	**43.6**	**14.1**	**28.0**	**10.2**	**9.4**	**0.6**	**2.1**	**0.8**
Fischer								
Aggregate Equipment	31.2	11.1	31.2	11.1	--	--	--	--
Ready-Mix Operations	6.8	3.2	6.8	3.2	--	--	--	--
Asphalt Operations	0	0	0	0	0	0	0	0
Unpaved Haul Roads	130.6	33.3	65.3	16.6	--	--	--	--
Storage Pile - Wind Erosion	6.5	6.5	6.5	6.5	--	--	--	--
Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
Aggregate Heater	7.3	3.7	7.3	3.7	0.5	3.1E-03	0.4	0.03
TOTAL EMISSIONS	**183.0**	**58.4**	**117.7**	**41.8**	**9.8**	**0.6**	**2.4**	**0.8**
McNamara								
Aggregate Equipment	2.6	0.9	2.6	0.9	--	--	--	--
Ready-Mix Operations	0	0	0	0	--	--	--	--
Asphalt Operations	5.7	4.0	5.7	4.0	4.5	0.6	22.5	5.5
Unpaved Haul Roads	24.8	6.3	12.4	3.2	--	--	--	--
Storage Pile - Wind Erosion	0.5	0.5	0.5	0.5	--	--	--	--
Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
Aggregate Heater	0.6	0.3	0.6	0.3	0.04	2.6E-04	0.04	2.4E-03
TOTAL EMISSIONS	**35.0**	**12.8**	**22.6**	**9.6**	**13.8**	**1.2**	**24.6**	**6.3**
Tiller								
Aggregate Equipment	4.3	1.5	4.3	1.5	--	--	--	--
Ready-Mix Operations	0	0	0	0	--	--	--	--
Asphalt Operations	6.7	4.7	6.7	4.7	5.3	0.7	26.4	6.5
Unpaved Haul Roads	32.7	8.3	16.3	4.2	--	--	--	--
Storage Pile - Wind Erosion	0.9	0.9	0.9	0.9	--	--	--	--
Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
Aggregate Heater	1.0	0.5	1.0	0.5	0.07	4.2E-04	0.06	3.9E-03
TOTAL EMISSIONS	**46.3**	**16.6**	**29.9**	**12.4**	**14.6**	**1.3**	**28.4**	**7.3**
Dakota Co.								
Aggregate Equipment	0.6	0.2	0.6	0.2	--	--	--	--
Ready-Mix Operations	0	0	0	0	--	--	--	--
Asphalt Operations	0	0	0	0	0	0	0	0
Unpaved Haul Roads	1.7	0.4	0.9	0.2	--	--	--	--
Storage Pile - Wind Erosion	0.1	0.1	0.1	0.1	--	--	--	--
Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
Aggregate Heater	0.1	0.1	0.1	0.1	0.01	5.8E-05	0.01	5.3E-04
TOTAL EMISSIONS	**3.2**	**1.5**	**2.4**	**1.3**	**9.3**	**0.6**	**2.0**	**0.8**
Heikes								
Aggregate Equipment	0	0	0	0	0	0	0	0
Ready-Mix Operations	0	0	0	0	0	0	0	0
Asphalt Operations	0	0	0	0	0	0	0	0
Unpaved Haul Roads	0	0	0	0	0	0	0	0
Storage Pile - Wind Erosion	0	0	0	0	0	0	0	0
Generators	0	0	0	0	0	0	0	0
Aggregate Heater	0	0	0	0	0	0	0	0
TOTAL EMISSIONS	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

APPENDIX C

Year 2025 Condition Emission Calculations

Projected Year 2025 Conditions

All Facilities Emissions

Emission Source Description	50% Control Scenario		75% Control Scenario					
	PM Emission Rate (tons/yr)	PM_{10} Emission Rate (tons/yr)	PM Emission Rate (tons/yr)	PM_{10} Emission Rate (tons/yr)	NO_x Emission Rate (tons/yr)	SO_2 Emission Rate (tons/yr)	CO Emission Rate (tons/yr)	VOC Emission Rate (tons/yr)
Aggregate Equipment	122.2	43.5	122.2	43.5	--	--	--	--
Ready-Mix Operations	17.1	8.1	17.1	8.1	--	--	--	--
Asphalt Operations	15.2	10.6	15.2	10.6	12.0	1.6	59.9	14.8
Unpaved Haul Roads	503.7	128.4	251.9	64.2	--	--	--	--
Storage Pile - Wind Erosion	18.6	18.6	18.6	18.6	--	--	--	--
Generators	3.9	3.9	3.9	3.9	55.6	3.7	12.0	4.5
Aggregate Heater	21.1	10.6	21.1	10.6	1.5	0.01	1.2	0.1
TOTAL EMISSIONS	**701.9**	**223.7**	**450.1**	**159.5**	**69.0**	**5.2**	**73.1**	**19.4**

Individual Operator Emissions

Emission Source Description	50% Control Scenario		75% Control Scenario					
	PM Emission Rate (tons/yr)	PM_{10} Emission Rate (tons/yr)	PM Emission Rate (tons/yr)	PM_{10} Emission Rate (tons/yr)	NO_x Emission Rate (tons/yr)	SO_2 Emission Rate (tons/yr)	CO Emission Rate (tons/yr)	VOC Emission Rate (tons/yr)
Aggregate Industries								
Aggregate Equipment	60.2	21.5	60.2	21.5	--	--	--	--
Ready-Mix Operations	4.7	2.2	4.7	2.2	--	--	--	--
Asphalt Operations	0	0	0	0	0	0	0	0
Unpaved Haul Roads	204.4	52.1	102.2	26.1	--	--	--	--
Storage Pile - Wind Erosion	9.2	9.2	9.2	9.2	--	--	--	--
Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
Aggregate Heater	10.4	5.2	10.4	5.2	0.7	0.004	0.6	0.04
TOTAL EMISSIONS	**289.6**	**90.8**	**187.4**	**64.8**	**10.0**	**0.6**	**2.6**	**0.8**
Cemstone								
Aggregate Equipment	9.2	3.3	9.2	3.3	--	--	--	--
Ready-Mix Operations	2.8	1.3	2.8	1.3	--	--	--	--
Asphalt Operations	0	0	0	0	0	0	0	0
Unpaved Haul Roads	43.3	11.0	21.6	5.5	--	--	--	--
Storage Pile - Wind Erosion	1.4	1.4	1.4	1.4	--	--	--	--
Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
Aggregate Heater	1.6	0.8	1.6	0.8	0.1	6.6E-04	0.1	6.1E-03
TOTAL EMISSIONS	**58.9**	**18.5**	**37.3**	**13.0**	**9.4**	**0.6**	**2.1**	**0.8**
Fischer								
Aggregate Equipment	42.5	15.1	42.5	15.1	--	--	--	--
Ready-Mix Operations	9.6	4.5	9.6	4.5	--	--	--	--
Asphalt Operations	0	0	0	0	0	0	0	0
Unpaved Haul Roads	180.3	46.0	90.2	23.0	--	--	--	--
Storage Pile - Wind Erosion	6.5	6.5	6.5	6.5	--	--	--	--
Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
Aggregate Heater	7.3	3.7	7.3	3.7	0.5	3.1E-03	0.4	0.03
TOTAL EMISSIONS	**246.9**	**76.5**	**156.8**	**53.5**	**9.8**	**0.6**	**2.4**	**0.8**
McNamara								
Aggregate Equipment	3.6	1.3	3.6	1.3	--	--	--	--
Ready-Mix Operations	0	0	0	0	--	--	--	--
Asphalt Operations	7.0	4.9	7.0	4.9	5.5	0.7	27.6	6.8
Unpaved Haul Roads	31.5	8.0	15.8	4.0	--	--	--	--
Storage Pile - Wind Erosion	0.5	0.5	0.5	0.5	--	--	--	--
Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
Aggregate Heater	0.6	0.3	0.6	0.3	0.04	2.6E-04	0.04	2.4E-03
TOTAL EMISSIONS	**43.9**	**15.7**	**28.2**	**11.7**	**14.8**	**1.3**	**29.6**	**7.6**
Tiller								
Aggregate Equipment	5.9	2.1	5.9	2.1	--	--	--	--
Ready-Mix Operations	0	0	0	0	--	--	--	--
Asphalt Operations	8.2	5.7	8.2	5.7	6.5	0.8	32.3	8.0
Unpaved Haul Roads	41.8	10.7	20.9	5.3	--	--	--	--
Storage Pile - Wind Erosion	0.9	0.9	0.9	0.9	--	--	--	--
Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
Aggregate Heater	1.0	0.5	1.0	0.5	0.07	4.2E-04	0.06	3.9E-03
TOTAL EMISSIONS	**58.5**	**20.5**	**37.6**	**15.2**	**15.8**	**1.5**	**34.4**	**8.7**
Dakota Co.								
Aggregate Equipment	0.8	0.3	0.8	0.3	--	--	--	--
Ready-Mix Operations	0	0	0	0	--	--	--	--
Asphalt Operations	0	0	0	0	0	0	0	0
Unpaved Haul Roads	2.3	0.6	1.2	0.3	--	--	--	--
Storage Pile - Wind Erosion	0.1	0.1	0.1	0.1	--	--	--	--
Generators	0.7	0.7	0.7	0.7	9.3	0.6	2.0	0.8
Aggregate Heater	0.1	0.1	0.1	0.1	0.01	5.8E-05	0.01	5.3E-04
TOTAL EMISSIONS	**4.0**	**1.7**	**2.9**	**1.4**	**9.3**	**0.6**	**2.0**	**0.8**
Heikes								
Aggregate Equipment	0	0	0	0	0	0	0	0
Ready-Mix Operations	0	0	0	0	0	0	0	0
Asphalt Operations	0	0	0	0	0	0	0	0
Unpaved Haul Roads	0	0	0	0	0	0	0	0
Storage Pile - Wind Erosion	0	0	0	0	0	0	0	0
Generators	0	0	0	0	0	0	0	0
Aggregate Heater	0	0	0	0	0	0	0	0
TOTAL EMISSIONS	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**