State of Idaho
Department of Environmental Quality
Air Quality Division

AIR QUALITY PERMIT
STATEMENT OF BASIS

Permit to Construct No. P-2008.0106

Final

Knife River, Inc.

Dixie River Road Ready Mix Plant

Portable

Facility ID No. 777-00423

August 12, 2008

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Permit Writer

The purpose of this Statement of Basis is to satisfy the requirements of IDAPA 58.01.01.200, Rules for the Control of Air Pollution in Idaho, for issuing air permits.

Table of Contents

Acronyms, Units, and Chemical Nomenclature

AACC	acceptable ambient concentration for carcinogens
acfm	actual cubic feet per minute
AFS	AIRS Facility Subsystem
AIRS	Aerometric Information Retrieval System
BMP	best management practices
CAM	Compliance Assurance Monitoring
CFR	Code of Federal Regulations
CO	carbon monoxide
cy/day	cubic yards of concrete per calendar day
cy/h	cubic yards of concrete per hour
cy/yr	cubic yards of concrete per 12-calendar month period
DEQ	Department of Environmental Quality
EL	screening emissions levels
ft	feet
^{o}F	degrees Fahrenheit
HAP	Hazardous Air Pollutants
IDAPA	a numbering designation for all administrative rules in Idaho promulgated in accordance with the Idaho Administrative Procedures Act
lb/hr	pounds per hour
m	meters
MACT	Maximum Achievable Control Technology
$\mu g/m^3$	micrograms per cubic meter
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO_x	nitrogen oxides
NSPS	New Source Performance Standards
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
PSD	Prevention of Significant Deterioration
PTC	permit to construct
Rules	Rules for the Control of Air Pollution in Idaho
SIP	State Implementation Plan
SO_2	sulfur dioxide
TAP	toxic air pollutants
T/yr	tons per year
VOC	volatile organic compounds

1. FACILITY INFORMATION

1.1 Facility Description

Knife River, Inc. operates a portable concrete batch plant, referred to as the Dixie River Road Ready Mix Plant. The concrete batch plant's maximum capacity is 300 cubic yards of concrete per hour (cy/hr), with a maximum concrete production of 2,400 cy/day and 400,000 cy/yr at the Dixie River Road location, and a potential maximum production of 4,800 cy/day and 500,000 cy/yr if relocated. The concrete batch plant is connected to the electrical grid.

Concrete is produced by combining water, cement, sand (fine aggregate), and gravel (coarse aggregate). Supplementary cementitious materials, also called mineral admixtures or pozzolan minerals may be added to make the concrete mixtures more economical, reduce permeability, increase strength, or influence other concrete properties. Typical examples are natural pozzolans, fly ash, ground granulated blast-furnace slag, and silica fume, which can be used individually with Portland or blended cement or in different combinations. Chemical admixtures are usually liquid ingredients that are added to concrete to entrain air, reduce the water required to reach a required slump, retard or accelerate the setting rate, to make the concrete more flowable or other more specialized functions.[1]

A portable concrete batch plant consists of storage bins or stockpiles for the sand and gravel, storage silos for the cement and cement supplement, weigh bins that weigh each component, conveyors, a water supply, and a control panel. Typically, three or four different sizes of gravel and one or two different sizes of sand are stockpiled for varying job specifications. Cement and supplementary cementing materials are delivered by truck and pneumatically transferred to the appropriate storage silo. A baghouse/cartridge filter is mounted above each silo to capture cement or cement supplement as air is displaced in the silo. For this source category, the baghouse/cartridge filter is considered primarily as process equipment, with a secondary function as air pollution control equipment.

After the storage bins are filled, the production process begins when sand and gravel are drop-fed into their respective weigh bins. When a pre-determined amount of each is weighed, the aggregate is heavily wetted for better mixing and to minimize fugitive dust prior to being dropped onto a conveyor, which transfers the mixture into either a truck for in-transit mixing or a central mix drum for mixing onsite. A predetermined amount of cement and cement supplement is also weighed and drop-fed through a chute into the mixer. The chute provides a measure of dust control. A separate baghouse/cartridge filter is used to capture dust from the weigh bins and the truck loading. Water is then added to the truck mix or central mix drum.

1.2 Permitting History

This PTC is a revision of an existing PTC. The following information was derived from a review of the permit files available to DEQ. Permit status is noted as active and in effect (A) or superseded (S).

December 7, 2007 P-2007.0195, initial PTC. (S)

[1] AP-42 Section 11.12, June 2006.

2. APPLICATION SCOPE

This PTC is a revision to correct a typographical error. Knife River, Inc. has requested this correction be made in order to allow the flexibility to substitute equipment that is equivalent in size, capacity, and control efficiency to the equipment listed in the permit, without authorizing an increase in emissions or the operation of additional equipment not listed. No other revisions, corrections, or changes in operation have been proposed.

2.1 Application Chronology

July 9, 2008	DEQ received a PTC application requesting a typographical correction to PTC No. P-2007.0195.
August 4, 2008	Draft permit and statement of basis sent for peer and Boise Regional Office (BRO) review.
August 7, 2008	DEQ declared the application complete.
August 12, 2008	Final permit and statement of basis issued.

3. TECHNICAL ANALYSIS

3.1 Emission Units and Control Devices

Table 3.1 EMISSION UNIT AND CONTROL DEVICE INFORMATION

Emission Units / Processes	Description	Control Device
Concrete Batch Plant - Ready Mix	Manufacturer: CON-E-CO (or equivalent[a]) Model: Low-Pro 12 (or equivalent[a]) Maximum Capacity: 300 cy/hr Maximum Production: 4,800 cy/day and 500,000 cy/yr	None
Cement Storage Silo	(self-explanatory)	<u>Cement Storage Silo Baghouse/Cartridge Filter Stack</u> Manufacturer: CON-E-CO (or equivalent[a]) Model: PJC-300S (or equivalent[a]) Height: 45 ft Exit Diameter: 0.9 ft Exit air flow rate: 1,500 acfm Control Efficiency: 99.9%
Cement Supplement Storage Silo	(self-explanatory)	<u>Cement Supplement Storage Silo Baghouse/Cartridge Filter Stack</u> Manufacturer: CON-E-CO (or equivalent[a]) Model: PJC-300S (or equivalent[a]) Height: 56 ft Exit Diameter: 0.9 ft Exit air flow rate: 1,000 acfm Control Efficiency: 99.9%
Weigh Batcher	(self-explanatory)	<u>Weigh Batcher Baghouse/Cartridge Filter Stack</u> Manufacturer: CON-E-CO (or equivalent[a]) Model: BV-14 (or equivalent[a]) Height: 16 ft Exit Diameter: 0.7 ft Exit air flow rate: 180 acfm Control Efficiency: 99.9%
Truck Loading	Baghouse, boot, enclosure, or equivalent	<u>Truck Loadout Baghouse/Cartridge Filter Stack</u> Manufacturer: CON-E-CO (or equivalent[a]) Model: PJ-980 (or equivalent[a]) Height: 38.5 ft Exit Diameter: 1.7 ft Exit air flow rate: 5,880 acfm Control Efficiency: 99.9%
Materials Transfer (Fugitives)	Aggregate dump to ground, Sand dump to ground, Aggregate dump to conveyor, Sand dump to conveyor, Aggregate conveyor to elevator storage, and Sand conveyor to elevated storage	<u>Water Sprays or Equivalent</u> Estimated Control Efficiency: 75%

a. "or equivalent" is defined as portable equipment which has an equivalent or less maximum capacity (cy/hr) than listed in this table, has an equivalent or greater control efficiency than listed in Table 2.1, which does not result in an increase in emissions, and which does not result in the emission of a toxic air pollutant not previously emitted.

3.2 Emissions Inventory

The emissions inventory for this concrete batch plant was developed by DEQ based on AP-42 Section 11.12 emission factors for a truck-mix concrete batch plant, and the following assumptions: 300 cubic yard per hour (cy/hr) concrete production capacity, with maximum concrete production limited to 4,800 cy/day and 500,000 cy/yr. Baghouse/cartridge filter capture efficiencies were presumed to be 99.9% based on the information provided with the application. The emissions inventory has been reviewed by DEQ and appears to accurately reflect the potential emissions from the facility.

Refer to the statement of basis issued with PTC No. P-2007.0195 for a review of the development of the emission inventory and the ambient impact analysis, and for additional information. A summary of the uncontrolled emissions of criteria pollutants is reproduced in Table 3.2, and controlled emissions are reproduced in Table 3.3. The emissions inventory for this facility can be found in Appendix B.

This permit revision does not result in an increase in emissions or in the emission of a toxic air pollutant not previously emitted.

Table 3.2 EMISSIONS ESTIMATES OF CRITERIA POLLUTANTS – UNCONTROLLED EMISSIONS

Emissions Unit	PM_{10}		SO_2		NOx		CO		VOC		LEAD
	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr (quarterly avg)
Point Sources Affected by the Permitting Action											
Concrete Batch Plant		5.54									
Total, Point Sources		**5.54**									

Table 3.3 EMISSIONS ESTIMATES OF CRITERIA POLLUTANTS – CONTROLLED EMISSIONS

Emissions Unit	PM_{10}		SO_2		NOx		CO		VOC		LEAD
	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr (quarterly avg)
Point Sources Affected by the Permitting Action											
Concrete Batch Plant	0.10	0.09									4.34E-06
Total, Point Sources	**0.10**	**0.09**									**4.34E-06**
Process Fugitive/Volume Sources affected by the Permitting Action											
Concrete Batch Plant	0.86	0.71									2.04E-07
Stockpiles	0.70	3.10									
Paved Road Traffic	1.60	6.95									
Unpaved Road Traffic	2.80	12.17									
Total, Process Fugitives	**5.96**	**22.93**									**2.04E-07**

3.3 Ambient Air Quality Impact Analysis

Knife River, Inc. has demonstrated compliance to DEQ's satisfaction that emissions from the Dixie River Road Ready Mix Plant will not cause or significantly contribute to a violation of any ambient air quality standard. Knife River, Inc. has also demonstrated compliance to DEQ's satisfaction that emissions from the Dixie River Road Ready Mix Plant will not exceed any AAC or AACC for TAP. Compliance was demonstrated using DEQ's generic modeling analysis. A summary of the modeling analysis is included in Appendix C. The controlled TAP emissions that were compared to the EL and the AAC assumed the use of operational limitations, including throughput limits.

Refer to the statement of basis issued with PTC No. P-2007.0195 for a review of the development of the emission inventory and the ambient impact analysis, and for additional information.

A copy of the ambient impact analysis memorandum included in the statement of basis for PTC No. P-2007.0195 is included in Appendix C.

4. REGULATORY REVIEW

4.1 Attainment Designation (40 CFR 81.313)

The initial location for this concrete batch plant is in Canyon County, which is designated as attainment or unclassifiable for PM_{10}, $PM_{2.5}$, CO, NO_X, SO_2, and Ozone.

4.2 Permit to Construct (IDAPA 58.01.01.201)

The Dixie River Road Ready Mix Plant does not meet the permit to construct exemption criteria contained in Sections 220 through 223 of the Rules. Therefore, a PTC is required.

4.3 Tier II Operating Permit (IDAPA 58.01.01.401)

The application was submitted as a revision to a permit to construct in accordance with IDAPA 58.01.01.201. Therefore the procedures of IDAPA 58.01.01.401 are not applicable.

4.4 Title V Classification (IDAPA 58.01.01.300, 40 CFR Part 70)

The Dixie River Road Ready Mix Plant is classified as a natural minor facility because without limits on the potential to emit, the emissions of all regulated pollutants are less than major source thresholds. In making this determination, the baghouse/cartridge filters for the cement and cement supplement silos were considered to be process equipment, not air pollution control equipment, and—to be consistent with current permitting assumptions for similar facilities—the truck mix loadout and weigh batcher emissions were treated as fugitive sources. The AIRS classification is "B."

4.5 PSD Classification (40 CFR 52.21)

The Dixie River Road Ready Mix Plant is classified as a PSD minor facility because without limits on the potential to emit, potential emissions are less than PSD major source thresholds.

4.6 NSPS Applicability (40 CFR 60)

The Dixie River Road Ready Mix Plant is not subject to NSPS.

The provisions of Subpart OOO, Standards of Performance for Nonmetallic Mineral Processing Plants, do not apply to stand-alone screening operations at concrete batch plants without crushers or grinding mills. The concrete batch plant is therefore not subject to this NSPS.

The concrete batch plant will be powered by the electrical grid. The concrete batch plant is therefore not subject to 40 CFR 60, Subpart IIII – Standard of Performance for Stationary Compression Ignition Internal Combustion Engines.

4.7 NESHAP Applicability (40 CFR 61)

The Dixie River Road Ready Mix Plant is not subject to NESHAP.

4.8 MACT Applicability (40 CFR 63)

The Dixie River Road Ready Mix Plant is not subject to MACT standards.

4.9 CAM Applicability (40 CFR 64)

The Dixie River Road Ready Mix Plant is a natural minor Title V source, and is therefore not subject to CAM.

4.10 Permit Conditions Review

This section describes those permit conditions that have been revised as a result of this permit action.

Existing Permit Condition 1.3

Table 1.1 lists all sources of regulated emissions in this PTC.

Table 1.1 SUMMARY OF REGULATED SOURCES

Permit Section	Source Description	**Emissions Control(s)**
2	Concrete Batch Plant – Ready Mix Manufacturer: CON-E-CO Model: Lo-Pro 12 Serial Number: C-8261L Maximum capacity: 300 cy/hr Maximum production: 4,800 cy/day and 500,000 cy/yr	Cement Storage Silo Baghouse/Cartridge Filter Manufacturer: CON-E-CO Model: PJC-300S Cement Supplement Storage Silo Baghouse/Cartridge Filter Manufacturer: CON-E-CO Model: PJC-300S Weigh Batcher Baghouse/Cartridge Filter Manufacturer: CON-E-CO Model: BV-14 Truck Loadout Baghouse/Cartridge Filter Manufacturer: CON-E-CO Model: PJ-980 Material Transfer Point Water Sprays or Equivalent

Modified Permit Condition 1.3:

Table 1.1 lists all sources of regulated emissions in this PTC.

Table 1.1 SUMMARY OF REGULATED SOURCES

Permit Section	Source Description	**Emissions Control(s)**
2	Concrete Batch Plant – Ready Mix Manufacturer: CON-E-CO (or equivalent[a]) Model: Lo-Pro 12 (or equivalent[a]) Serial Number: C-8261L Maximum capacity: 300 cy/hr Maximum production: 4,800 cy/day and 500,000 cy/yr	Cement Storage Silo Baghouse/Cartridge Filter Manufacturer: CON-E-CO (or equivalent[a]) Model: PJC-300S (or equivalent[a]) Cement Supplement Storage Silo Baghouse/Cartridge Filter Manufacturer: CON-E-CO (or equivalent[a]) Model: PJC-300S (or equivalent[a]) Weigh Batcher Baghouse/Cartridge Filter Manufacturer: CON-E-CO (or equivalent[a]) Model: BV-14 (or equivalent[a]) Truck Loadout Baghouse/Cartridge Filter Manufacturer: CON-E-CO (or equivalent[a]) Model: PJ-980 (or equivalent[a]) Material Transfer Point Water Sprays or Equivalent

a. "or equivalent" is defined as portable equipment which has an equivalent or less maximum capacity (cy/hr) than listed in this table, has an equivalent or greater control efficiency than listed in Table 2.1, which does not result in an increase in emissions, and which does not result in the emission of a toxic air pollutant not previously emitted.

Permit condition 1.3 has been revised to correct the typographical error in the description associated with the omission of the term "or equivalent" in the description. Compliance is demonstrated by the recordkeeping requirement of permit condition 2.5.4.

Added Permit Condition 2.5.4:

The O&M manual shall include documentation for any equivalent equipment used in place of the equipment listed in Table 1.1. Documentation shall include the following information at a minimum: the manufacturer, the model, the maximum capacity (cy/hr), the PM_{10} control efficiency of the baghouses, and the stack parameters.

Permit condition 2.5.4 has been revised to include the requirement to document the equivalency of the substitute or replacement equipment in terms of maximum rated capacity (cy/hr), control efficiency, and stack parameters.

5. PERMIT FEES

The facility is not subject to an application fee in accordance with IDAPA 58.01.01.224 or a permit processing fee in accordance with IDAPA 58.01.01.225, because the application was submitted to correct a typographical error.

6. PUBLIC COMMENT

An opportunity for public comment period was not required or provided because this permit revision is a typographical correction and does not authorize an increase in emissions, in accordance with IDAPA 58.01.01.209.04.

Appendix A – AIRS Information

AIRS/AFS[a] FACILITY-WIDE CLASSIFICATION[b] DATA ENTRY FORM

Permittee/ Facility Name: Knife River, Inc.

Facility Location: Portable

AIRS Number: 777-00423

AIR PROGRAM POLLUTANT	SIP	PSD	NSPS (Part 60)	NESHAP (Part 61)	MACT (Part 63)	SM80	TITLE V	AREA CLASSIFICATION A-Attainment U-Unclassified N- Nonattainment
SO_2	--							U
NO_x	--							U
CO	--							U
PM_{10}	B							U
PT (Particulate)	B							U
VOC	--							U
THAP (Total HAP)	B							--
			APPLICABLE SUBPART					

[a] Aerometric Information Retrieval System (AIRS) Facility Subsystem (AFS)

[b] AIRS/AFS Classification Codes:

A = Actual or potential emissions of a pollutant are above the applicable major source threshold. For HAP only, class "A" is applied to each pollutant which is at or above the 10 T/yr threshold, **or** each pollutant that is below the 10 T/yr threshold, but contributes to a plant total in excess of 25 T/yr of all HAP.

SM = Potential emissions fall below applicable major source thresholds if and only if the source complies with federally enforceable regulations or limitations.

B = Actual and potential emissions below all applicable major source thresholds.

C = Class is unknown.

ND = Major source thresholds are not defined (e.g., radionuclides).

Appendix B – Emissions Inventory

CRITERIA POLLUTANT EMISSION INVENTORY for Truck Mix Portable Concrete Batch Plant

11/16/07 14:06

Facility Information

Company:	Knife River, Inc., Caldwell ID (Truck Mix Concrete Batch Plant)
Facility ID:	777-00423
Permit No.:	P-2007.0195
Source Type:	Portable Concrete Batch Plant
Manufacturer/Model:	CON-E-CO

Assumptions Implied or Stated in Application:

See control assumptions

Truck Mix (T) or Central Mix (C)? T

INCREASE IN Production[1]

Maximum Hourly Production Rate:	300	cy/hr		Per manufacturer
Proposed Daily Production Rate:	4,800	cy/day	16.00	Hours of operation per day at max capacity
Proposed Maximum Annual Production Rate:	500,000	cy/year		
Cement Storage Silo Capacity:	4640	ft³ of aerated cement		
Cement Storage Silo Large Compartment Capacity for cement only:	65%	of the silo capacity		
Cement Storage Silo small Compartment Capacity for cement or ash:	35%	of the silo capacity		

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Change in PM_{10} Emissions due to this PTC

Emissions Point	PM_{10} Emission Factor[1] (lb/cy)		Controlled Emission Rate, Max.	Controlled Emission Rate, 24-hour average		Controlled Emission Rate, annual average		Control Assumptions:	
	Controlled	Uncontrolled	lb/hr[2]	lb/hr[3]	lb/day[3]	lb/hr[4]	T/yr[4]		
Aggregate delivery to ground storage		0.0031	0.23	0.166	3.72	0.044	0.194	75%	Water Sprays at Operator's Discretion
Sand delivery to ground storage		0.0007	0.05	0.035	0.84	0.010	0.044	75%	Water Sprays at Operator's Discretion
Aggregate transfer to conveyor		0.0031	0.23	0.165	3.72	0.044	0.194	75%	Water Sprays at Operator's Discretion
Sand transfer to conveyor		0.0007.	0.05	0.035	0.84	0.010	0.044	75%	Water Sprays at Operator's Discretion
Aggregate transfer to elevated storage		0.0031	0.23	0.165	3.72	0.044	0.194	75%	Water Sprays at Operator's Discretion
Sand transfer to elevated storage		0.0007	0.05	0.035	0.84	0.010	0.044	75%	Water Sprays at Operator's Discretion
Cement delivery to Silo (controlled EF)	0.0001		2.50E-02	1.67E-02	4.01E-01	4.70E-03	2.09E-02	0.00%	Baghouse is process equipment
Cement supplement delivery to Silo (controlled EF)	0.0002		5.36E-02	3.60E-02	8.58E-01	1.02E-02	4.47E-02	0.00%	Baghouse is process equipment
Weigh hopper loading (sand & aggregate batcher loading)		0.0040	1.19E-03	7.90E-04	1.90E-02	2.26E-04	9.90E-04	99.9%	Baghouse control
Truck mix loading, Table 11.12-2, "0.278 lb/ton of cement+flyash" x ((491 lb cement + 73 lb flyash)/cy concrete) / 2000 lb = 0.0784 lb/cy		0.0784	0.02	0.02	0.38	0.00	0.02	99.9%	Baghouse control
Point Sources Total Emissions		8.26E-02	1.03E-01	6.89E-02	1.65E+00	1.97E-02	8.62E-02		
Process Fugitive Emissions		0.0114	0.86	0.57	13.69	0.16	0.71		
Facility Wide Total: Point Sources + Process Fugitives (Except for Road Dust and Windblown Dust)		0.0940	0.96	0.64	15.35	0.18	0.80		

POINT SOURCE EMISSIONS for FACILITY CLASSIFICATION[6]		Controlled EF	at 2,628,000 cy/yr	T/yr
Facility Classification Total PM[5]		8.40E-03		1.10E+01
Facility Classification Total PM10[5,7]		4.21E-03		5.54E+00

[1] The EFs were calculated using EFs in lb/ton of material handled from Table 11.12-2, typical composition per cubic yard of concrete (1865 lb aggregate, 1428 lbs sand, 491 lbs cement, 73 lbs cement supplement, and 20 gallons of water = 4024 lb/cy), and closely match Table 11.12-5 values (version 6/06) when rounded to the same number of figures. AP-42 lists the same EFs for uncontrolled and controlled emissions, so control estimates are based on the assumed control levels input on the right hand side of the table.

[2] Max. hourly rate includes reductions associated with control assumptions.

[3] Hourly emissions rate (24-hr average) = Max.hourly emissions rate x (hrs per day) / 24.
Daily emissions rate = max emissions rate (1-hr average) x proposed hrs/day.

[4] Annual average hourly emissions rate = EF (lb/cy) x proposed annual production rate (cy/yr) / (8760 hr/yr).
Annual emissions rate = EF (lb/cy) x proposed annual production rate (cy/yr) /(2000 lb/T)

[5] Controlled EFs for PM = 0.0002 (cement silo) + 0.0003 (flyash silo) +0.0079(weigh batcher)
for PM10 = 0.0001 (cement silo) + 0.0002 (flyash silo) +0.0040 (weigh batcher)

[6] Emissions for Facility Classification are based on baghouses as process equipment, 24-hr day, 8760 hr/yr = 7,200 cy/day, and 2,628,000 cy/yr

[7] Emissions for Facility Classification do not include truck mix loading emissions; this is typically considered a fugitive emission source for concrete batch plants.

Lead emissions			Increase in Emissions from this PTC				Emissions for Facility Classification	
Emissions Point	Lead Emission Factor[1] (lb/ton of material loaded)		Emission Rate, Max.	Emissions for Comparison with DEQ Modeling Threshold		Emission Rate, Quarterly		
	Controlled with fabric	Uncontrolled	lb/hr, 1-hr avg.[2]	lb/month[3]	T/yr[4]	lb/hr qtrly avg[5]		T/yr
Cement delivery to silo [2]	1.09E-08	7.36E-07	8.03E-07	3.91E-04	1.34E-03	5.35E-07	Point Source	3.52E-06
Cement supplement delivery to Silo [3]	5.20E-07	ND	5.69E-06	2.77E-03	9.49E-03	3.80E-06	Point Source	2.49E-05
Truck Loadout (with 99.9% control) [7]		3.62E-06	3.06E-07	1.49E-04	5.10E-04	2.04E-07	Fugitive	
Total			6.80E-06	3.31E-03	0.011		Point Sources	2.85E-05
DEQ Modeling Threshold				100	0.6			
Modeling Required?				No	No			

[1] The emissions factors are from AP-42, Table 11.12-8 (version 06/06)
[2] Max. hourly rate = EF x pound of cement/yd³ of concrete x max. hourly concrete production rate/(2000 lb/T)
[3] lb/mo = EF x pound of material/yd³ of concrete x max. daily concrete production rate x (365/12)/(2000 lb/T)
[4] T/yr = EF x pound of material/yd³ of concrete x max. annual concrete production rate/(2000 lb/T)
[5] lb/hr, qtrly avg = lb/mo x 3 months per qtr / (8760/4)hrs per qtr

Toxic Air Pollutant (TAPs) EMISSIONS INVENTORY, Truck Mix Concrete Batch Plant

11/16/2007 14:11

Facility Information

Company:	Knife River, Inc., Caldwell ID (Truck Mix Concrete Batch Plant)
Facility ID:	777-00423
Permit No.:	P-2007.0195
Source Type:	Portable Concrete Batch Plant
Manufacturer:	CON-E-CO

Emissions estimates are based on EFs in AP-42, Table 11.12-8 (version 06/06) and the following composition of one yard of concrete:

Coarse aggregate		1865 pounds
Sand		1428 pounds
Cement		491 pounds
Cement supplement		73 pounds
Water		20 gallons
Concrete		4024 pounds

Truck Mix Loadout Factor: 1

Central Mix Batching Factor: 0

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Increase in Production

Maximum Hourly Production Rate:	300	cy/hr
Proposed Daily Production Rate:	4,800	cy/day
Proposed Maximum Annual Production Rate:	500,000	cy/year

Uncontrolled (Unlimited Production Rate)

	24 hrs/day,
7,200 cy/day	7 day/wk,
2,628,000 cy/year	52 wks/year

TAP Emission Factors from AP-42, Table 11.12-8 (Version 06/06)

Emissions Point	Arsenic EF (lb/ton of material loaded)		Beryllium EF (lb/ton of material loaded)		Cadmium EF (lb/ton of material loaded)		Chromium EF (lb/ton of material loaded)		Manganese EF (lb/ton of material loaded)		Nickel EF (lb/ton of material loaded)		Phosphorus EF (lb/ton of material loaded)		Selenium EF (lb/ton of material loaded)		Chromium VI
	Controlled with Fabric filter	Uncontrolled	Controlled with Fabric filter	Uncontrolled	Controlled with Fabric filter	Uncontrolled	Controlled with Fabric filter	Uncontrolled	Controlled with Fabric filter	Uncontrolled	Controlled with Fabric filter	Uncontrolled	Controlled with Fabric filter	Uncontrolled	Controlled with Fabric filter	Uncontrolled	Percent of total Cr that is Cr+6
Cement delivery to silo (with baghouse)	4.24E-09	[illegible]	4.86E-10	[illegible]	4.86E-10	[illegible]	2.90E-08	[illegible]	1.17E-07	[illegible]	4.18E-08	[illegible]	ND	1.18E-05	ND	ND	20%
Cement supplement delivery to Silo (with baghouse)	1.00E-06	ND	9.04E-08	ND	1.98E-08	ND	1.22E-06	ND	2.56E-07	ND	2.28E-06	ND	3.54E-06	ND	7.24E-08	ND	30%
Truck Loadout (no boot or shroud)	[illegible]	3.04E-06	[illegible]	2.44E-07	[illegible]	3.42E-08	[illegible]	1.14E-05	[illegible]	6.12E-05	[illegible]	1.19E-05	[illegible]	3.84E-05	[illegible]	2.62E-06	21.29%
Central Mix Batching (NO boot or shroud)	[illegible]	0.00E+00	ND	ND	[illegible]	0.00E+00	[illegible]	0.00E+00	[illegible]	0.00E+00	[illegible]	0.00E+00	[illegible]	0.00E+00	ND	ND	21.29%

UNCONTROLLED TAP EMISSIONS Note: Includes baghouses as process equipment. 7,200 cy/day, and 2,628,000 cy/yr

Emissions Point	Arsenic		Beryllium		Cadmium		Chromium		Manganese		Nickel		Phosphorus		Selenium		Chromium VI		
	lb/hr annual avg.	T/yr[4]	lb/hr annual avg.	T/yr	lb/hr annual avg.	T/yr	lb/hr 24-hr avg.	T/yr[5]	lb/hr 24-hr avg.	T/yr	lb/hr annual avg.	T/yr	lb/hr 24-hr avg.	T/yr	lb/hr 24-hr avg.	T/yr	lb/hr annual avg.		
Cement delivery to silo (with baghouse)	3.12E-07	1.37E-06	3.58E-08	1.57E-07	3.58E-08	1.57E-07	2.14E-06	8.13E-05	8.62E-06	3.77E-05	3.08E-06	1.35E-05	8.69E-04	3.81E-03	ND	ND	4.27E-07		
Cement supplement delivery to Silo (with baghouse)	1.10E-05	4.80E-05	9.90E-07	4.34E-06	2.17E-07	9.50E-07	1.34E-05	5.85E-05	2.80E-06	1.23E-05	2.50E-05	1.09E-04	3.88E-05	1.70E-04	7.93E-07	3.47E-06	4.01E-06		
Truck Loadout (NO baghouse)	2.57E-04	1.13E-03	2.06E-05	9.04E-05	2.89E-06	1.27E-05	9.64E-04	4.22E-03	5.18E-03	2.27E-02	1.01E-03	4.41E-03	3.25E-03	1.42E-02	2.22E-04	9.71E-04	2.05E-04		
Sources Total	2.68E-04	1.18E-03	2.17E-05	9.49E-05	3.15E-06	1.38E-05	9.80E-04	4.36E-03	5.19E-03	2.27E-02	1.03E-03	4.53E-03	4.16E-03	1.82E-02	2.22E-04	9.74E-04	2.10E-04	5.21E-02	Tons per year
IDAPA Screening EL (lb/hr)	1.50E-06		2.80E-05		3.70E-06		3.30E-02		3.33E-01		2.70E-05		7.00E-03		1.30E-02		5.60E-07		
EXCEEDS EL?	Yes		No		No		No		No		Yes		No		No		Yes		

CONTROLLED TAP EMISSIONS Note: Includes baghouses as process equipment. 4,800 cy/day, and 500,000 cy/year

Emissions Point	Arsenic		Beryllium		Cadmium		Chromium		Manganese		Nickel		Phosphorus		Selenium		Chromium VI		
	lb/hr annual avg.	T/yr[4]	lb/hr annual avg.	T/yr	lb/hr annual avg.	T/yr	lb/hr 24-hr avg.	T/yr[5]	lb/hr 24-hr avg.	T/yr	lb/hr annual avg.	T/yr	lb/hr 24-hr avg.	T/yr	lb/hr 24-hr avg.	T/yr	lb/hr annual avg.		
Cement delivery to silo (with baghouse)[1]	5.94E-08	2.60E-07	6.81E-09	2.98E-08	6.81E-09	2.98E-08	1.42E-05	1.78E-05	5.74E-06	7.18E-06	5.86E-07	2.57E-06	ND	ND	ND	ND	8.13E-08		
Cement supplement delivery to Silo (with baghouse)2	2.08E-06	9.13E-06	1.88E-07	8.25E-07	4.13E-08	1.81E-07	5.99E-05	1.11E-05	1.26E-06	2.34E-06	4.75E-06	2.08E-05	1.74E-04	3.23E-05	5.29E-07	6.61E-07	7.63E-07		
Truck Loadout (with baghouse)	4.89E-08	2.14E-07	3.93E-09	1.72E-08	5.50E-10	2.41E-09	6.43E-07	8.04E-07	3.45E-06	4.31E-06	1.92E-07	8.39E-07	2.17E-06	2.71E-06	1.48E-07	1.85E-07	3.91E-08	99.90%	Baghouse control
Sources Total	2.19E-06	9.60E-06	1.99E-07	8.72E-07	4.86E-08	2.13E-07	6.20E-05	1.37E-05	2.18E-05	1.38E-05	5.53E-06	2.42E-05	1.76E-04	3.50E-05	6.76E-07	8.45E-07	8.83E-07	9.53E-05	Tons per year
IDAPA Screening EL (lb/hr)	1.50E-06		2.80E-05		3.70E-06		3.30E-02		3.33E-01		2.70E-05		7.00E-03		1.30E-02		5.60E-07		
Percent of EL	146.11%		0.71%		1.31%		0.19%		0.0065%		20.47%		2.51%		0.0052%		157.65%		
EXCEEDS EL?	Yes		No		No		No		No		No		No		No		Yes		

[1] lb/hr, annual average = EF x pound of cement / Yd[3] of concrete x annual concrete production rate / 2000lb/Ton / 8760 hr/yr; lb/hr, 24-hr = EF x pound of cement / Yd3 of concrete x daily concrete production rate / 2000lb/Ton / 24 hr/day

[2] lb/hr, annual average = EF x pound of cement supplement / Yd[3] of concrete x annual concrete production rate / 2000lb/Ton / 8760 hr/yr; lb/hr, 24-hr average = EF x pound of cement supplement / Yd3 of concrete x daily concrete production rate / 2000lb/Ton

[3] lb/hr, annual average = EF x pound of (cement + cement supplement) / Yd[3] of concrete x annual concrete production rate / 2000lb/Ton / 8760 hr/yr; lb/hr, 24-hr average = EF x pound of (cement + cement supplement) / Yd3 of concrete x daily concrete production

[4] T/yr = lb/hr, annual avg x 8760 hr/yr x (1T/2000 lb)

[5] T/yr = EF x pound of cement, or cement supplement, or cement + cement supplement x annual concrete production rate /2000 lb/ton / 2000 lb/ton

Knife River PTC Application for Redi-Mix Plant
Aggregate Handling and Storage Piles Potential to Emit Calculations

Assumptions:

Mean Wind Speed, U	10.00 mph
Moisture Content, M	2.5 % Coarse aggregate
	6 % Sand
Particle Size Multiplier (<10μm), k	0.35
Hours Operation	8760 hrs/yr
1 yd³ concrete[a]	4024 lbs
	46.4 % Coarse aggregate
	35.5 % Sand

Calculations

$$\text{PM-10 EF}^{b} = k*(0.0032)*(U/5)1.3/(M/2)1.4$$

= 0.002 lb / t coarse aggregate

= 0.001 lb / t sand

Emissions based on 300 yd³/hr concrete production rate:

agg. max rate	280.1	t/hr	sand max rate	214.3	t/hr
PM-10 =	**0.57**	**lb/hr**	**=**	**0.13**	**lb/hr**
PM-10 =	**2.83E-04**	**t/hr**	**=**	**6.35E-05**	**t/hr**

Emissions based on max year throughput rate and storage capacity:

agg. max rate	2,453,417	t/yr	sand max rate	1,877,075	t/yr
agg. storage	60,000	t	sand storage	22,000	t
total agg.	2,513,417	t/yr	total sand	1,899,075	t/yr
PM-10 =	**5,071.63**	**lb/yr**	**=**	**1124.94**	**lb/yr**
PM-10 =	**2.54**	**t/yr**	**=**	**0.56**	**t/yr**

[a] *EPA-AP-42, Table 11.12-2, definition of concrete mixture in footnote a, Final Section July 2007*

[b] *EPA AP-42, Equation 13.2.4-1, Final Section July 2007.*

Knife River PTC Application for Portable Ready Mix Plant
Paved Road Traffic Potential to Emit Calculations

Assumptions:

Emission Factors for 1980's Vehicle Fleet, C (PM-10)[a]	0.00047 lb/vehicle mile traveled (vmt)	
Particle Size Multiplier, k (PM-10)[b]	0.016 lb/vmt	
Silt Loading (sL)[c]	12.0 g/m2	
Average weight of vehicles traveling road,W	20 tons	
Amount of paved road at facility	0.1 miles	
Max hourly throughput	603.75 ton/hr	(concrete handling)
Number of trips per hour	18	(at max production)
Number of trips per year	157680	(at max production)

Calculations

$$PM\text{-}10\ EF^{d} = k(sL/2)^{0.65}x(W/3)^{1.5} - C$$
$$= 0.882\ \text{lb / vmt}$$

PM-10	0.088 lb
	4.4E-05 tons
PM-10 max hourly	**1.6 lb/hr**
	7.94E-04 t/hr
PM-10 yearly	**13,910 lb/yr**
	6.95 t/yr

[a] *EPA AP-42, Table 13.2.1-2, July 2007*
[b] *EPA AP-42, Table 13.2.1-1, July 2007*
[c] *EPA AP--42, Table 13.2.1-4, July 2007*
[d] *EPA AP-42, Equation 13.2.1-1, July 2007*

Knife River PTC Application for Portable Ready Mix Plant
Unpaved Road Traffic Potential to Emit Calculations

Assumptions:

Particle Size Multiplier, k (PM-10)[a]	1.5 lb/vmt	
Silt Content[b]	4.8 %	
a (PM-10)[a]	0.9	
b (PM-10)[a]	0.45	
Average weight of vehicles traveling road, W	20 tons	
Amount of unpaved road at facility	0.1 miles	
Max hourly throughput	273.9 ton/hr	(aggregate handling)
Number of trips per hour	18	(at max production)
Number of trips per year	157680	(at max production)

Calculations

$$PM\text{-}10\ EF^{c} = k(s/12)^{a} x (W/3)^{b}$$
$$= 1.544 \text{ lb / vmt}$$

PM-10	0.154	lb
	7.7E-05	tons
PM-10 max hourly	**2.8**	**lb/hr**
	1.39E-03	**t/hr**
PM-10 yearly	**24,349**	**lb/yr**
	12.17	**t/yr**

[a] *EPA AP-42, Table 13.2.2-2, July 2007*
[b] *EPA AP--42, Table 13.2.2-1, July 2007*
[c] *EPA AP-42, Equation 13.2.2-1a, July 2007*

Appendix C – Ambient Air Quality Impact Analysis

MEMORANDUM

DATE: September 18, 2007

Prepared by: Cheryl Robinson, P.E., Staff Engineer/Permit Writer, Air Quality Division

Reviewed by: Kevin Schilling, Modeling Coordinator, Air Quality Division

SUBJECT: Portable Concrete Batch Plants – Generic Modeling Results for Typical Plant

1. Summary

Most ready-mix concrete batch plants share many characteristics with each other such as equipment design, fugitive dust control practices, emissions quantities for a given processing rate, general facility layout, and emission release parameters. These shared characteristics allow the development of generic methods to assess the air quality impact of these batch plants. The appropriateness of using generic methods is particularly justifiable for ready-mix concrete batch plants because most are permitted as portable sources, and specific equipment configurations will change somewhat from site to site.

1.1 Generic Modeling Applicability

Use of this generic method to demonstrate preconstruction compliance with National Ambient Air Quality Standards (NAAQS) and Idaho toxic air pollutant (TAP) rules from operation of concrete batch plants is designed to generate reasonably conservative results, and may not be applicable to all batch plants.

The key criteria for determining the applicability of the generic modeling results are summarized in Table 1. In cases where the proposed operations differ from these assumptions (e.g., stack heights are lower, or emissions controls do not meet the minimum criteria), the applicant shall provide additional explanation in their modeling protocol to justify use of the generic modeling results. This information, along with DEQ's approval of the modeling protocol shall be included in the statement of basis for the permit.

The appropriateness of this method to specific conditions will be made on a case-by-case basis considering the following:

- Equipment used at the batch plant, especially considering the type and effectiveness of emissions control equipment and practices.
- Proposed location for the facility, considering the presence of any sensitive receptors near the property boundary and the distance from pollutant emitting equipment to the property boundary.
- The presence of other pollutant emitting activities occurring at the site, including collocation with another concrete batch plant, rock crushing equipment and/or hot mix asphalt plants.

Table 1. CRITERIA FOR USING DEQ's CONCRETE BATCH PLANT GENERIC MODELING RESULTS FOR AIR IMPACT ANALYSES

Parameter	DEQ Generic Modeling Assumptions			
Concrete batch plant type and capacity	Truck mix (redi-mix or dry mix) or Central mix Maximum 300 cy per hour capacity			
Operation in any PM_{10} nonattainment area	Not proposed.			
Presence of an electric generator.	No generator. Line power is available.			
No Collocation. Minimum distance from nearest edge of any emissions source to any other source of emissions, including another concrete batch plant, hot mix asphalt plant, or rock crushing plant.	200 meters (656 feet)			
Number of cement and/or cement supplement storage silos	Not limited. The model layout assumes all silo emissions are from the same point, and that cement/supplement is not transferred between storage silos.			
Maximum daily concrete production (cy/day)	1,500	2,400	3,600	4,800
Minimum Setback Distance. Minimum distance from nearest edge of any emissions source to any area outside of a building where the general public has access.[a]	**40 m (131 ft)**	**60 m (197 ft)**	**100 m (328 ft)**	**150 m (492 ft)**
Maximum annual concrete production (cy/year)	300,000	400,000	500,000	500,000
Cement and supplement storage silo baghouse(s) Minimum stack height (height above ground) Minimum PM/PM_{10} control	10 meters (32.8 ft) 99%			
Weigh hopper loading baghouse, or equivalent Minimum stack height (height above ground) Minimum PM/PM_{10} control	10 meters (32.8 ft) 99%			
Truck-mix loadout or Central Mix loading. Minimum PM/PM_{10} control.	95% Boot enclosure, shroud, water sprays, or baghouse/cartridge filter			
Transfer Point Fugitives. Minimum PM/PM_{10} control.	75% Water sprays, enclosures, shrouds, or aggregate/sand is damp on an as-received basis and used before significantly drying out.			

[a] The general public will be considered to have access to any facility area that is not fenced, posted with no trespassing signs and regularly patrolled or observable by facility staff during plant operations, or separated from the facility by a natural barrier such as a steep cliff. This distance shall be measured from the nearest edge of any storage pile, silo, weigh batcher, transfer point, or conveyor associated with this concrete batch plant.

1.2 Applicable Permit Conditions

The following permit conditions should be included in any permit using the generic modeling to demonstrate preconstruction compliance with NAAQS and TAPs:

- A prohibition on operating this plant in any PM_{10} nonattainment area. IDAPA 58.01.01.006 defines a PM_{10} impact increase of 5 µg/m3 (24-hour average) or 1 µg/m3 (annual average) as a "significant contribution." The predicted ambient impacts for each of the modeled daily and annual production rates exceed these thresholds.
- Daily concrete production limits based on the setback distance available that day. The setback for each modeled daily production rate is defined by the minimum distance needed to meet the 24-hour PM_{10} NAAQS standard.

- Annual concrete production limits based on the setback distance available at any location. Preconstruction compliance with state TAPs rules was demonstrated using controlled TAPs emissions, so per IDAPA 58.01.01.210.08, an emission limit must be imposed. The production limit inherently limits the TAPs emissions, so a pollutant-specific lb/yr limit is not needed.
- O & M manual and operational requirements that will ensure that a high level of control is consistently achieved and maintained for baghouse/cartridge filters and for control of fugitive emissions from material transfer points.

2. Background Information

2.1 Applicable Air Quality Impact Limits and Modeling Requirements

This section identifies applicable ambient air quality limits and analyses used to demonstrate compliance.

2.1.1 *Area Classification*

The concrete batch plant is a portable facility that may operate in any attainment or unclassifiable area anywhere in the State of Idaho.

2.1.2 *Significant and Full Impact Analyses*

If estimated maximum criteria pollutant impacts to ambient air from the emissions sources at this facility exceed the significant contribution levels (SCLs) of IDAPA 58.01.01.006, then a full impact analysis is necessary to demonstrate compliance with IDAPA 58.01.01.203.02. A full impact analysis for attainment area pollutants involves adding ambient impacts from facility-wide emissions to DEQ-approved background concentration values that are appropriate for the criteria pollutant/averaging time at the facility location and the area of significant impact. The resulting maximum pollutant concentrations in ambient air are then compared to the National Ambient Air Quality Standards (NAAQS) listed in Table 2. Table 2 also lists SCLs and specifies the modeled value that must be used for comparison to the NAAQS.

The generic modeling does not currently include emissions from any generators (line power is required to be available), so PM10 and lead are the only criteria pollutants emitted by this facility.

Table 2. CRITERIA AIR POLLUTANTS APPLICABLE REGULATORY LIMITS

Pollutant	Averaging Period	Significant Contribution Levels[a] (μg/m³)[b]	Regulatory Limit[c] (μg/m³)	Modeled Value Used[d]
PM_{10}[e]	Annual	1.0	50[f]	Maximum 1st highest[g]
	24-hour	5.0	150[h]	Maximum 6th highest[i]
Carbon Monoxide (CO)	8-hour	500	10,000[j]	Maximum 2nd highest[g]
	1-hour	2,000	40,000[j]	Maximum 2nd highest[g]
Sulfur Dioxide (SO_2)	Annual	1.0	80[f]	Maximum 1st highest[g]
	24-hour	5	365[j]	Maximum 2nd highest[g]
	3-hour	25	1,300[j]	Maximum 2nd highest[g]
Nitrogen Dioxide (NO_2)	Annual	1.0	100[f]	Maximum 1st highest[g]
Lead	Quarterly	NA	1.5[h]	Maximum 1st highest[g]

[a] IDAPA 58.01.01.006
[b] Micrograms per cubic meter
[c] IDAPA 58.01.01.577 for criteria pollutants
[d] The maximum 1st highest modeled value is always used for significant impact analysis
[e] Particulate matter with an aerodynamic diameter less than or equal to a nominal ten micrometers
[f] Never expected to be exceeded in any calendar year
[g] Concentration at any modeled receptor
[h] Never expected to be exceeded more than once in any calendar year
[i] Concentration at any modeled receptor when using five years of meteorological data
[j] Not to be exceeded more than once per year

2.1.3 *Toxic Air Pollutant Analyses*

Toxic Air Pollutant (TAP) requirements for PTCs are specified in IDAPA 58.01.01.210. If the increase associated with a new source or modification exceeds screening emission levels (ELs) contained in IDAPA 58.01.01.585 or 586, then the ambient impact of the emissions increase must be estimated. If ambient impacts are less than applicable Acceptable Ambient Concentrations (AACs) for non-carcinogens listed in IDAPA 58.01.01.585 and Acceptable Ambient Concentrations for Carcinogens (AACCs) listed in IDAPA 58.01.01.586, then compliance with TAP requirements has been demonstrated.

2.2 Background Concentrations

Ambient background concentrations were revised for all areas of Idaho by DEQ in March 2003[1]. Background concentrations in areas where no monitoring data are available were based on monitoring data from areas with similar population density, meteorology, and emissions sources. Background concentrations used in these analyses are listed in Table 3. These are the default rural/agricultural background concentrations, which were used because concrete batch plants are typically located outside of urban areas.

Table 3. BACKGROUND CONCENTRATIONS

Pollutant	Averaging Period	Background Concentration (µg/m3)[a]
PM_{10}[b]	24-hour	73
	annual	26
Carbon monoxide (CO)	1-hour	3,600
	8-hour	2,300
Sulfur dioxide (SO2)	3-hour	34
	24-hour	26
	Annual	8
Nitrogen dioxide (NO2)	Annual	17

[a] Micrograms per cubic meter
[b] Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers

3. Modeling Impact Assessment

3.1 Modeling Methodology

3.1.1 *Model Selection and Key Parameters*

Atmospheric dispersion modeling was used to evaluate the air quality impacts from point sources and process fugitive sources. Table 4 provides a summary of the model selection and modeling parameters used in the modeling analyses.

Table 4. MODELING PARAMETERS

Parameter	Description/ Values	Documentation/Additional Description
Model	AERMOD, Version 04300	The Gaussian dispersion model AMS/EPA Regulatory Model (AERMOD) was run for a single case (3,600 cy/day, 500,000 cy/year, with a 100-meter ambient air boundary). This case was used to demonstrate that ambient impacts predicted using AERMOD are lower than impacts predicted using ISCST3 for the same emission points and parameters. This is consistent with results reported by the EPA, which found that AERMOD typically predicted lower concentrations than ISCST3 for rural, low-level stacks; and short term urban, low-level stacks.[2]

[1] Hardy, Rick and Schilling, Kevin. *Background Concentrations for Use in New Source Review Dispersion Modeling*. Memorandum to Mary Anderson, March 14, 2003.
[2] U.S. EPA, Comparison of Regulatory Design Concentrations, AERMOD vs. ISCST3, CTDMPLUS, ISC-PRIME, Staff Report, EPA-454/R-03-002, June 2003 (see page 29).

Table 4. MODELING PARAMETERS		
Parameter	Description/ Values	Documentation/Additional Description
Model	ISCST3, Version 02035	Due to DEQ schedule and resource constraints, and because ISCST3 results are generally higher (conservative) than AERMOD for these types of near-field analyses, DEQ determined that the Industrial Source Complex Short Term (ISCST3), air dispersion model was acceptable at this time for predicting ambient impacts for all cases.
Meteorological data	Surface Data & Upper Air Data Boise, Idaho 1988-1992 (AERMOD) 1987-1991 (ISCST3)	Previous DEQ analyses showed that using Boise meteorological data generated the highest modeled values at typical concrete batch plant "fenceline" distances, in part because of the well-defined prevailing wind direction at the Boise monitoring location. For the AERMOD run, AERMET pulled the station anemometer height of 6.1 meters directly from the met data files. For the ISCST3 runs, the station anemometer height of 6.1 meters was used.
Land Use (urban or rural)	Rural	Urban area surface heating was not used in this analysis based on typical land use at concrete batch plant locations.
Terrain	Flat/Level	Flat (level) terrain was used because the results must be reasonably applicable to all locations for this portable facility. Maximum impacts from near ground-level emissions sources, such as those at typical concrete batch plants, are very near the emissions source. This assumption was deemed to be appropriate and is not a substantial limitation of this method.
Building downwash	Considered	To account for plume downwash effects from any buildings present, or equipment that may cause downwash, a 20-meter square building, 10 meters tall and positioned at the center of the plant layout, was used as a representation of structures associated with this concrete batch plant. For ISCST3, the building profile input program (BPIP) was used. The PRIME algorithm was not used because building cavity effects are not expected to be significant.
Receptor grid	Grid 1	10-meter spacing along a "fenceline" described by a circle with a radius of 40, 60, 100, or 150 meters.
	Grid 2	25-meter spacing for distances between the "fenceline" and 200 meters.
	Grid 3	50 meter spacing for distances between 200 meters and 500 meters.

3.1.2 Facility Layout and Ambient Air Boundary ("Fenceline")

Portable concrete batch plants are somewhat unique compared to other stationary sources in that the equipment layout may change at each new location. Because of this, a generic approach that reflects a typical batch plant layout is appropriate. The layout used for the modeling is shown in Figure 3-1.

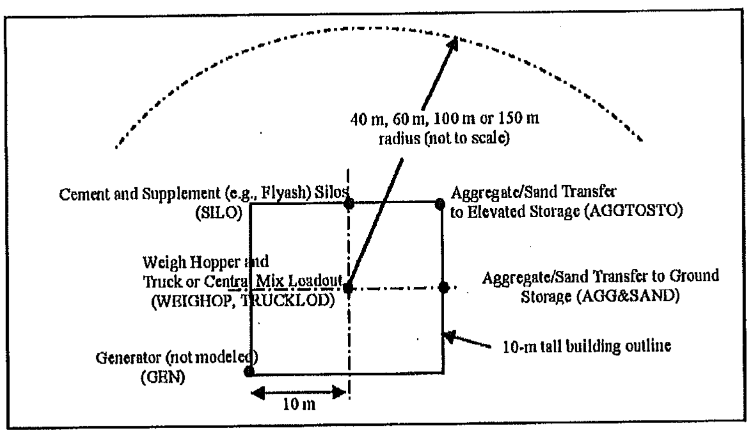

Figure 3-1. Typical Concrete Batch Plant Modeling Layout

5

For the generic modeling, the ambient air boundary or "fenceline" was taken to be along the perimeter of a circle with a radius of 40, 60, 100, and 150 meters from the center of a 20 meter by 20 meter "typical" plant layout shown in Figure 3-1. The boundaries of the 10-meter tall building added to the model to account for plume downwash effects are also defined by this 20 meter by 20 meter square.

3.1.3 Emissions Release Parameters

Emissions from the handling of aggregate/sand and tuck loading were each modeled as volume sources. Table 5 provides parameters used for modeling these sources as well as point source parameters.

Emissions from the handling of aggregate and sand to ground storage and from ground storage to a ground-level conveyor were modeled together as a volume source in a 20-meter square area at the center of the plant. A 2-meter release height was used to represent the average transfer height. Emissions from conveyor transfer to elevated storage were modeled as an elevated volume source on the 20-meter square building, using a 5-meter release height.

Standard modeling guidance for volume sources on or adjacent to structures suggests setting initial dispersion coefficients as follows:

$$\sigma_{y0} = \text{horizontal dimension} / 4.3$$
$$\sigma_{z0} = \text{vertical dimension} / 2.15$$

Miscellaneous ground-level aggregate and sand handling was assumed to occur from activities in a 20-meter square area. Standard modeling guidance for volume sources not on or adjacent to structures suggests setting initial dispersion coefficients as follows:

$$\sigma_{y0} = \text{horizontal dimension} / 4.3$$
$$\sigma_{z0} = \text{vertical dimension} / 4.3$$

Point sources were conservatively modeled in the generic analyses assuming a horizontal release or a rain-capped stack. A stack gas exit velocity of 0.001 meters per second was used to eliminate momentum-induced plume rise, which would only occur from an uninterrupted vertical release.

Table 5. EMISSIONS RELEASE PARAMETERS FOR SOURCES

Point Sources						
Source	**UTM Coord. (m)**		**Stack Height (m)[a]**	**Stack Gas Temp. (K)[b]**	**Stack Dia. (m)**	**Flow Rate (m/sec)[c]**
	Easting	**Northing**				
Silo baghouse(s) stack	0	10	10	0, 298.15[d]	1.0	0.001[e]
Weigh hopper baghouse stack	0	0	10	0, 298.15[d]	1.0	0.001[e]
Volume Sources						
Source	**UTM Coord. (m)**		**Release Height (m)**	**Initial Horizontal Coefficient σ_{y0} (m)**	**Initial Vertical Coefficient σ_{z0} (m)**	
	Easting	**Northing**				
Aggregate/sand transfers at ground level	10	10	2	4.65	0.70	
Aggregate/sand transfers at elevated level	10	0	5	4.65	4.65	
Truck loading	0	0	5	4.65	4.65	

a. Meters
b. Kelvin
c. Meters per second
d. When a value of 0 K is used, the AERMOD model uses the ambient air temperature. This value was set to 77 degrees Fahrenheit (298.15 K) for the ISCST3 runs. This is not expected to result in a measurable difference in the ambient impact results.
e. Set to 0.001 m/sec for a horizontal release or release from a rain-capped vertical stack.

3.1.4 Wind Speed Adjustments for Fugitive Emissions

The dispersion model AERMOD has an option by which emissions can be varied as a function of wind speed. There are six wind speed categories, and adjustment factors can be assigned for each category. Emissions for each hour modeled are calculated by multiplying the base rate by the appropriate adjustment factor, as determined by the wind speed specified for the hour within the meteorological data file.

For the AERMOD run, base emissions rates were calculated using a wind speed of 10 miles per hour. Wind speed adjustment factors were then developed for each of the six wind speed categories corresponding to the default wind speed categories within the model. The mean wind speed of each category was calculated, and emissions associated with that mean wind speed were calculated. An adjustment factor was calculated for each wind speed category by dividing the emissions rate for that category by the base emissions rate calculated at a 10 mile per hour wind speed. Table 6 summarizes the wind speed categories and the calculated adjustment factors.

Table 6. WIND SPEED ADJUSTMENT FACTORS FOR MATERIAL HANDLING EMISSIONS

Wind Speed Category	ISCST3 Default Upper Wind Speed for Category (m/sec[a])	Median Wind Speed for Category (m/sec (mph[b]))	Emissions Rate for Category (lb/ton[c])	Adjustment Factor[d]
1	1.54	0.77 (1.72)	3.32E-4	0.101
2	3.09	2.32 (5.18)	1.39E-3	0.425
3	5.14	4.12(9.20)	2.94E-3	0.897
4	8.23	6.69 (14.95)	5.52E-3	1.69
5	10.8	9.52 (21.28)	8.73E-3	2.67
6	Not Defined	12.4[e] (27.74)	1.23E-2	3.77

[a] Meters per second
[b] Miles per hour
[c] Pounds of emissions per ton of material handled
[d] Calculated by dividing the emissions rate for the category by the emissions rate for a 10 mph wind (3.27E-3 lb/ton)
[e] An upper value wind speed of 14 m/sec was used, based on highest values observed in the meteorological files used in the modeling analyses.

3.2 Emission Rates

The emissions inventories (EIs) used for the generic modeling were based on AP-42 Section 11.12 (dated 06/06) emission factors for a truck-mix concrete batch plant. Based on AP-42 factors, estimated emissions from central mix plants would be the same, except that emissions from loadout to a central mixer are expected to be lower.

Hexavalent chromium [Cr+6 or Cr(VI)] was presumed to comprise 20% of the total chromium emissions from cement silo filling, 30% of the total chromium emissions from cement supplement (e.g., flyash) silo filling, and 21.3% of the total chromium emissions from truck loadout.

Point source emissions from the cement and flyash storage silos were presumed to be controlled by baghouses or cartridge filters with minimum capture efficiencies of 99%.

Uncontrolled fugitive emissions of PM_{10} from material transfer points were based on minimum moisture contents taken from AP-42 Table 11.12-2 of 1.77% for aggregate and 4.17% for sand. Fugitive emissions from material transfer points were assumed to be further controlled by 1) receiving sand and aggregate in a wetted condition and using the stockpile before significant drying out occurs, and/or 2) using manual water sprays or water spray bars to control fugitive emissions that reduce the uncontrolled emissions by an estimated 75%.

Fugitive emissions from truck mix loadout or central mixer loading are controlled by a boot, shroud, or water sprays that reduce the uncontrolled emissions by an estimated 95%.

Fugitive emissions resulting from vehicle traffic and wind erosion from storage piles were excluded from the analysis.

Uncontrolled emissions of TAPs from cement and flyash silo filling and truck mix loadout were based on operation of a 300 cy per hour concrete batch plant for 8,760 hours per year. Cement and flyash silo baghouses/cartridge filters were treated as process equipment, i.e., the uncontrolled TAPs emissions from these sources have been reduced by the capture efficiency associated with the baghouse/cartridge filters.

Emissions were estimated for each of the four daily and annual production combinations (described above in Table 1). The 24-hour and annual average PM_{10} emission rates for each case, and the values used for the modeled source input are summarized in Tables 6A and 6B. The emission rates used for the AERMOD analysis were developed using the equations contained in Section 11.12 of AP-42, rather than using the emission factors from Table 11.12-5, so differ slightly due to rounding or as noted in the table. A sample detailed emissions calculation worksheet is included as Attachment 1 to this memorandum.

Table 6A. EMISSIONS RATES FOR SOURCES - PM_{10}

Source	Emission Factor	Control	ISCST3 1,500 cy/day [b] 300,000 cy/yr [b]		ISCST3 2,400 cy/day 400,000 cy/yr	
	lb/cy [a]		lb/hr_{24} [c]	lb/hr_{YR} [c]	lb/hr_{24}	lb/hr_{YR}
Aggregate to ground	0.0031	75%	0.048	0.027	0.078	0.035
Sand to ground	0.0007	75%	0.011	0.006	0.018	0.008
Aggregate to conveyor	0.0031	75%	0.048	0.027	0.078	0.035
Sand to conveyor	0.0007	75%	0.011	0.006	0.018	0.008
AGG&SAND			**0.119**	**0.065**	**0.190**	**0.086**
Aggregate to elevated storage	0.0031	75%	0.048	0.027	0.078	0.035
Sand to elevated storage	0.0007	75%	0.011	0.006	0.018	0.008
AGGTOSTO			**0.059**	**0.033**	**0.095**	**0.043**
Cement to silo (controlled)	0.0001	--	5.22E-03	2.86E-03	8.35E-03	3.81E-03
Flyash to silo (controlled)	0.0002	--	1.12E-02	6.12E-03	1.79E-02	8.16E-03
SILO			**1.64E-02**	**8.98E-03**	**2.62E-02**	**1.20E-02**
Weigh hopper baghouse stack	0.0040	99%	2.47E-03	1.35E-03	3.95E-03	1.80E-03
WEIGHOP			**2.47E-03**	**1.35E-03**	**3.95E-03**	**1.80E-03**
Truck loadout	0.0784	95%	0.24	0.13	0.39	0.18
TRUCKLOD			**0.24**	**0.13**	**0.39**	**0.18**

[a] Pounds per cubic yard of concrete.
[b] Cubic yards of concrete per day and per year.
[c] Pounds per hour on a 24-hour average and annual average.

Table 6B. EMISSIONS RATES FOR SOURCES - PM_{10}

Source	Emission Factor	Control	AERMOD 3,600 cy/day[b]	ISCST3 3,600 cy/day	ISCST3 4,800 cy/day	AERMOD 500,000 cy/yr[b]	ISCST3 500,000 cy/yr[b]
	lb/cy[a]		lb/hr_{24}	lb/hr_{24}[c]	lb/hr_{24}[c]	lb/hr_{YR}	lb/hr_{YR}
Aggregate to ground	0.0031	75%		0.116	0.155		0.044
Sand to ground	0.0007	75%		0.026	0.035		0.010
Aggregate to conveyor	0.0031	75%		0.116	0.155		0.044
Sand to conveyor	0.0007	75%		0.026	0.035		0.010
AGG&SAND			**0.2814**	**0.285**	**0.380**	**0.1071**	**0.109**
Aggregate to elevated storage	0.0031	75%		0.116	0.155		0.044
Sand to elevated storage	0.0007	75%		0.026	0.035		0.010
AGGTOSTO			**0.1407**	**0.143**	**0.190**	**0.0535**	**0.054**
Cement to silo (controlled)	0.0001	--		1.25E-02	1.67E-02		4.76E-03
Flyash to silo (controlled)	0.0002	--		2.68E-02	3.58E-02		1.02E-02
SILO			**3.939E-02[g]**	**3.93E-02**	**5.25E-02**	**1.497E-02[g]**	**1.50E-02**
Weigh hopper baghouse stack **WEIGHOP**	0.0040	99%	**2.964E-02[h]**	**5.93E-03**	**7.90E-03**	**1.128E-02[h]**	**2.26E-03**
Truck loadout **TRUCKLOD**	0.0784	95%	**0.588**	**0.59**	**0.78**	**0.2234**	**0.22**

[a] Pounds per cubic yard of concrete.
[b] Cubic yards of concrete per day and per year.
[c] Pounds per hour on a 24-hour average and annual average.

The AERMOD analysis for a 300 cy/hr concrete batch plant demonstrated preconstruction compliance for TAPs using uncontrolled emissions and a 100-meter fenceline radius. The uncontrolled emissions, however, were estimated using an older version of AP-42 Table 11.12-8. Using AP-42 factors from the most recent 06/06 edition, uncontrolled emissions of all TAPs for a 300 cy/hr plant were below the applicable screening emission level except for arsenic, nickel, and hexavalent chromium (see page 2 of the example calculation in Attachment 1. Each of these TAPs is a carcinogen, and is subject to an annual AACC. For the ISCST3 analyses, dispersion modeling was done for the controlled emissions of each of these three TAPs. The controlled TAPs emissions used in the ISCST3 analyses are summarized in Tables 7A and 7B.

Table 7A. EMISSIONS RATES FOR SOURCES – CONTROLLED TAPs EMISSIONS

Modeling Case	ISCST3 300,000 cy/yr			ISCST3 400,000 cy/yr		
Pollutant	**Arsenic**	**Nickel**	**Cr (VI)**	**Arsenic**	**Nickel**	**Cr (VI)**
Source	lb/hr_{YR}[a]	lb/hr_{YR}	lb/hr_{YR}	lb/hr_{YR}	lb/hr_{YR}	lb/hr_{YR}
Cement delivery to silo (with baghouse)	3.56E-08	3.51E-07	4.88E-08	4.75E-08	4.69E-07	6.50E-08
Supplement delivery to silo (with baghouse)	1.25E-06	2.85E-06	4.58E-07	1.67E-06	3.80E-06	6.10E-07
SILO	**1.286E-06**	**3.004E-06**	**5.068E-07**	**1.718E-06**	**4.269E-06**	**6.75E-07**
Truck loadout: Cement and supplement delivery to silo (no controls) **TRUCKLOD**	**1.47E-06**	**5.75E-06**	**1.17E-06**	**1.96E-06**	**7.66E-06**	**1.56E-06**

[a.] Pounds per hour, annual average.

Table 7B. EMISSIONS RATES FOR SOURCES – CONTROLLED TAPs EMISSIONS

Modeling Case	ISCST3 500,000 cy/yr			[Reserved]		
Pollutant	**Arsenic**	**Nickel**	**Cr (VI)**	**Arsenic**	**Nickel**	**Cr (VI)**
Source	lb/hr_{YR} [a]	lb/hr_{YR}	lb/hr_{YR}	lb/hr_{YR}	lb/hr_{YR}	lb/hr_{YR}
Cement delivery to silo (with baghouse)	5.94E-08	5.86E-07	8.13E-08			
Supplement delivery to silo (with baghouse)	2.08E-06	4.75E-06	7.63E-07			
SILO	**2.139E-06**	**5.33E-06**	**8.443E-07**			
Truck loadout: Cement and supplement delivery to silo (no controls) **TRUCKLOD**	**2.45E-06**	**9.58E-06**	**1.95E-06**			

a. Pounds per hour, annual average.

3.3 *Results for Significant and Full Impact Analyses*

A significant contribution analysis was not submitted for this application. Aspen submitted a full impact analysis for the proposed modification project. The results of the facility-wide modeling for criteria pollutants are shown in Table 8.

Table 8. RESULTS OF FULL IMPACT ANALYSES – PM_{10}

Pollutant	Averaging Period	Modeled Design Concentration[a] ($\mu g/m^3$)[b]	Background Concentration ($\mu g/m^3$)	Total Ambient Impact[a] ($\mu g/m^3$)	NAAQS[c] ($\mu g/m^3$)	Percent of NAAQS
ISCST3 Case 1. Low Production:			1,500 cy/day, 300,000 cy/yr, Fenceline at radius of 40 meters			
PM_{10}[d]	24-hour	63.2	73	136.2	150	90.8% (73.2%)[e]
	Annual	11.2	26	37.2	50	74.4%
ISCST3 Case 2. Moderate Production:			2,400 cy/day, 400,000 cy/yr, Fenceline at radius of 60 meters			
PM_{10}[d]	24-hour	79.8	73	152.8	150	102% (82.1%)[e]
	Annual	10.8	26	36.8	50	73.4%
AERMOD Case 3. Moderate Production:			**3,600 cy/day, 500,000 cy/yr, Fenceline at radius of 100 meters**			
PM_{10}[d]	24-hour	53.3	73	126	150	**84.2%**
	Annual	5.53	26	31.5	50	**63.1%**
ISCST3 Case 3. Moderate Production:			**3,600 cy/day, 500,000 cy/yr, Fenceline at radius of 100 meters**			
PM_{10}[d]	24-hour	83.8	73	156.8	150	**104.5% (84.2%)**[e]
	Annual	7.91	26	33.9	50	**67.8%**
ISCST3 Case 4. High Production:			4,800 cy/day, 500,000 cy/yr, Fenceline at radius of 150 meters			
PM_{10}[d]	24-hour	73.8	73	146.8	150	97.9% (78.9%)[e]
	Annual	4.86	26	30.9	50	61.7%

a. Maximum 6th highest value (24-hour standard) for five years of meteorological data.
b. Micrograms per cubic meter
c. National ambient air quality standards
d. Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
e. AERMOD results for Case 3 indicate that using the currently approved AERMOD model would result in significantly lower predicted ambient impact than the ISCST3 analysis (about 20% lower, based on Case No.3 results). The estimated ambient impact for this case had AERMOD been run instead of ISCST3 is shown in brackets. This result was deemed acceptable to demonstrate preconstruction compliance with the 24-hr PM_{10} NAAQS standard.

The results of the ISCST3 results for the controlled ambient impact for TAPs emissions are shown in Table 9.

Table 9. RESULTS OF TAPs ANALYSIS - CONTROLLED EMISSIONS				
TAP	**Averaging Period**	**Modeled Design Concentration[a] (µg/m³)[b]**	**AACC[c] (µg/m³)**	**Percent of AACC**
Case 1	**1,500 cy/day**	**300,000 cy/year**	**40 meters**	
Arsenic	Annual	7.51E-05	2.3E-04	32.7%
Chromium (VI)	Annual	4.54E-05	8.3E-05	54.7%
Nickel	Annual	2.67E-04	4.23E-03	6.4%
Case 2	**2,400 cy/day**	**400,000 cy/year**	**60 meters**	
Arsenic	Annual	8.79E-05	2.3E-04	38.2%
Chromium (VI)	Annual	6.10E-05	8.3E-05	73.5%
Nickel	Annual	3.12E-04	4.23E-03	7.4%
Case 3	**3,600 cy/day**	**500,000 cy/year**	**100 meters**	
Arsenic	Annual	6.78E-05	2.3E-04	29.5%
Chromium (VI)	Annual	4.63E-05	8.3E-05	55.8%
Nickel	Annual	2.38E-04	4.23E-03	5.6%
Case 4	**4,800 cy/day**	**500,000 cy/year**	**150 meters**	
Arsenic	Annual	4.38E-05	2.3E-04	39.1%
Nickel	Annual	2.98E-05	8.3E-05	35.9%
Chromium (VI)	Annual	1.53E-04	4.23E-03	3.6%

a. Maximum 1st highest value for five years of meteorological data.
b. Micrograms per cubic meter
c. Acceptable ambient concentration for carcinogens

4.0 Conclusions

The ambient air impact analysis conducted by DEQ demonstrated to DEQ's satisfaction that emissions from a concrete batch plant facility that meets the criteria specified in Table 1 will not cause or significantly contribute to a violation of any air quality standard.

Attachment 1.
Sample Emissions Calculation – 3,600 cy/day and 500,000 cy/year

CRITERIA POLLUTANT EMISSION INVENTORY for Truck Mix Portable Concrete Batch Plant

3/20/07 17:37

Facility Information

Company:	DEQ GENERIC MODEL - 3,600 cy/day and 500,000 cy/year
Facility ID:	777-xxxxxx
Permit No.:	P-2007.xxxx
Source Type:	Portable Concrete Batch Plant
Manufacturer/Model:	

Assumptions Implied or Stated in Application:
Presumes this is an initial permit, not a modification
See control assumptions

Truck Mix (T) or Central Mix (C)? T

INCREASE IN Production[1]

Maximum Hourly Production Rate:	300	cy/hr		
Proposed Daily Production Rate:	3,600	cy/day	12.00	Hours of operation per day at max capacity
Proposed Maximum Annual Production Rate:	500,000	cy/year		
Cement Storage Silo Capacity:		ft³ of aerated cement		
Cement Storage Silo Large Compartment Capacity for cement only:		of the silo capacity		
Cement Storage Silo small Compartment Capacity for cement or ash:		of the silo capacity		

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Change in PM_{10} Emissions due to this PTC

Emissions Point	PM_{10} Emission Factor[1] (lb/cy)		Controlled Emission Rate, Max	Controlled Emission Rate, 24-hour average		Controlled Emission Rate, annual average		Control Assumptions:	
	Controlled	Uncontrolled	lb/hr[2]	lb/hr[3]	lb/day[3]	lb/hr[4]	T/yr[4]		
Aggregate delivery to ground storage		0.0031	0.23	0.116	2.79	0.044	0.194	75%	Control: Water sprays
Sand delivery to ground storage		0.0007	0.05	0.026	0.63	0.010	0.044	75%	Control: Water sprays
Aggregate transfer to conveyor		0.0031	0.23	0.116	2.79	0.044	0.194	75%	Control: Water sprays
Sand transfer to conveyor		0.0007	0.05	0.026	0.63	0.010	0.044	75%	Control: Water sprays
Aggregate transfer to elevated storage		0.0031	0.23	0.116	2.79	0.044	0.194	75%	Control: Water sprays
Sand transfer to elevated storage		0.0007	0.05	0.026	0.63	0.010	0.044	75%	Control: Water sprays
Cement delivery to Silo (controlled EF)	0.0001		2.50E-02	1.25E-02	3.00E-01	4.76E-03	2.09E-02	0.00%	Baghouse is process equipment
Cement supplement delivery to Silo (controlled EF)	0.0002		5.38E-02	2.68E-02	6.44E-01	1.02E-02	4.47E-02	0.00%	Baghouse is process equipment
Weigh hopper loading (sand & aggregate batcher loading)		0.0040	1.10E-02	6.03E-03	1.42E-01	2.26E-03	9.88E-03	99.00%	Baghouse is process equipment
Truck mix loading, Table 11.12-2, "0.278 lb/ton of cement/flyash" x ((491 lb cement + 73 lb flyash)/cy concrete) / 2000 lb = 0.0784 lb/cy		0.0784	1.18	0.59	14.11	0.22	0.98	95.00%	Control: Automatic boot or equivalent
Central mix loading, Table 11.12-2, "0.134 lb/ton of cement/flyash" x ((491 lb cement + 73 lb flyash)/cy concrete) / 2000 lb = 0.0378 lb/cy		0.0000	0.00	0.00	0.00	0.00	0.00	95.00%	Control: Automatic boot or equivalent
Point Sources Total Emissions		4.21E-03	9.05E-02	4.53E-02	1.09E+00	1.72E-02	7.54E-02		
Process Fugitive Emissions		0.0898	2.03	1.02	24.38	0.39	1.69		
Facility Wide Total: Point Sources + Process Fugitives (Except for Road Dust and Windblown Dust)		0.0940	2.12	1.06	25.47	0.40	1.77		

POINT SOURCE EMISSIONS for FACILITY CLASSIFICATION[6] Controlled EF at 2,628,000 cy/yr T/yr

Facility Classification Total PM[5]		6.08E-03		6.97E+00
Facility Classification Total PM10[5]		3.02E-04		3.97E-01

[1] The EFs were calculated using EFs in lb/ton of material handled from Table 11.12-2, typical composition per cubic yard of concrete (1865 lb aggregate, 1420 lbs sand, 491 lbs cement, 73 lbs cement supplement, and 20 gallons of water = 4024 lb/cy), and closely match Table 11.12-5 values (version 6/06) when rounded to the same number of figures. AP-42 lists the same EFs for uncontrolled and controlled emissions, so control estimates are based on the assumed control levels input on the right hand side of the table.

[2] Max. hourly rate includes reductions associated with control assumptions

[3] Hourly emissions rate (24-hr average) = Max hourly emissions rate x (hrs per day) / 24
Daily emissions rate = max emissions rate (1-hr average) x proposed hrs/day.

[4] Annual average hourly emissions rate = EF (lb/cy) x proposed annual production rate (cy/yr) / (8760 hr/yr)
Annual emissions rate = EF (lb/cy) x proposed annual production rate (cy/yr) /(2000 lb/T)

[5] Controlled EFs for PM = 0.0002 (cement silo) + 0.0003 (flyash silo) + 0.0079(weigh batcher)*(1-control/WB)
for PM10 = 0.0001 (cement silo) + 0.0002 (flyash silo) + 0.0040 (weigh batcher)*(1-control/WB)

[6] Emissions for Facility Classification are based on baghouses as process equipment, 24-hr day, 8760 hr/yr = 7,200 cy/day, and 2,628,000 cy/yr

Lead emissions Emissions Point	Lead Emission Factor[1] (lb/ton of material loaded)		Increase in Emissions from this PTC: Emission Rate, Max.	Emissions for Comparison with DEQ Modeling Threshold		Emission Rate, Quarterly	Emissions for Facility Classification	
	Controlled with fabric	Uncontrolled	lb/hr, 1-hr avg[2]	lb/month[3]	T/yr[4]	lb/hr qtrly avg[5]		T/yr
Cement delivery to silo [2]	1.09E-08	[illegible]	8.03E-07	2.93E-04	1.34E-03	4.01E-07	Point Source	3.62E-06
Cement supplement delivery to Silo [2]	5.20E-07	[illegible]	5.59E-08	2.08E-03	9.49E-03	2.85E-06	Point Source	2.40E-05
Truck Loadout (with 125% control)		3.62E-06	1.53E-05	5.50E-03	2.55E-02	7.66E-06	Fugitive	
Central Mix (with 130% control)		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Fugitive	
Total			2.18E-05	7.98E-03	0.036		Point Sources	2.88E-05
DEQ Modeling Threshold				100	0.6			
Modeling Required?				No	No			

[1] The emissions factors are from AP-42, Table 11.12-8 (version 06/06)
[2] Max. hourly rate = EF x pound of cement/yd³ of concrete x max. hourly concrete production rate/(2000 lb/T)
[3] lb/mo = EF x pound of material/yd³ of concrete x max. daily concrete production rate x (365/12)/(2000 lb/T)
[4] T/yr = EF x pound of material/yd³ of concrete x max. annual concrete production rate/(2000 lb/T)
[5] lb/hr, qtrly avg = lb/mo x 3 months per qtr / (8760/4)hrs per qtr

Toxic Air Pollutant (TAPs) EMISSIONS INVENTORY, Truck Mix Concrete Batch Plant

3/22/2007 17:37

Facility Information

Company:	DEQ GENERIC MODEL - 3,600 cy/day and 500,000 cy/year
Facility ID:	777-xxxxx
Permit No.:	P-2007.xxxx
Source Type:	Portable Concrete Batch Plant
Manufacturer:	0

Emissions estimates are based on EFs in AP-42, Table 11.12-8 (version 06/06) and the following composition of one yard of concrete

Coarse aggregate	1865	pounds
Sand	1428	pounds
Cement	491	pounds
Cement supplement	73	pounds
Water	20	gallons
Concrete	4024	pounds

Truck Mix Loadout Factor: 1

Central Mix Batching Factor: 0

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Review these before you change them.

Increase in Production

Maximum Hourly Production Rate	300	cy/hr
Proposed Daily Production Rate:	3,600	cy/day
Proposed Maximum Annual Production Rate	500,000	cy/year

Uncontrolled (Unlimited Production Rate)

	24 hrs/day,
7,200 cy/day	7 day/wk,
2,628,000 cy/year	52 wks/year

TAP Emission Factors from AP-42, Table 11.12-8 (Version 06/06)

Emissions Point	Arsenic EF (lb/ton of material loaded)		Beryllium EF (lb/ton of material loaded)		Cadmium EF (lb/ton of material loaded)		Chromium EF (lb/ton of material loaded)		Manganese EF (lb/ton of material loaded)		Nickel EF (lb/ton of material loaded)		Phosphorus EF (lb/ton of material loaded)		Selenium EF (lb/ton of material loaded)		Chromium VI
	Controlled with Fabric Filter	Uncontrolled	Controlled with Fabric Filter	Uncontrolled	Controlled with Fabric Filter	Uncontrolled	Controlled with Fabric Filter	Uncontrolled	Controlled with Fabric Filter	Uncontrolled	Controlled with Fabric Filter	Uncontrolled	Controlled with Fabric Filter	Uncontrolled	Controlled with Fabric Filter	Uncontrolled	Percent of total Cr that is Cr+6
Cement delivery to silo (with baghouse)	4.24E-09	[illegible]	4.86E-10	[illegible]	4.86E-10	[illegible]	2.90E-08	[illegible]	1.17E-07	[illegible]	4.18E-08	[illegible]	[illegible]	1.18E-05	[illegible]	[illegible]	20%
Cement supplement delivery to silo (with baghouse)	1.00E-06	[illegible]	9.04E-08	[illegible]	1.98E-08	[illegible]	1.22E-06	[illegible]	2.56E-07	[illegible]	2.28E-06	[illegible]	3.54E-06	[illegible]	7.24E-08	[illegible]	30%
Truck Loadout (no boot on spout)	[illegible]	3.04E-06	[illegible]	2.44E-07	[illegible]	3.42E-08	[illegible]	1.14E-05	[illegible]	6.12E-05	[illegible]	1.15E-05	[illegible]	3.84E-05	[illegible]	2.62E-06	21.25%
Central Mix Batching (NO boot on spout)	[illegible]	0.00E+00	[illegible]	[illegible]	[illegible]	0.00E+00	[illegible]	0.00E+00	[illegible]	0.00E+00	[illegible]	0.00E+00	[illegible]	0.00E+00	[illegible]	[illegible]	21.25%

UNCONTROLLED TAP EMISSIONS Note: Includes baghouses as process equipment. 7,200 cy/day, and 2,628,000 cy/yr

Emissions Point	Arsenic		Beryllium		Cadmium		Chromium		Manganese		Nickel		Phosphorus		Selenium		Chromium VI		
	lb/hr annual avg	T/yr[4]	lb/hr annual avg	T/yr	lb/hr annual avg	T/yr	lb/hr 24-hr avg	T/yr[5]	lb/hr 24-hr avg	T/yr	lb/hr annual avg	T/yr	lb/hr 24-hr avg	T/yr	lb/hr 24-hr avg	T/yr	lb/hr annual avg		
Cement delivery to silo (with baghouse)	3.12E-07	1.37E-06	3.58E-08	1.57E-07	3.58E-08	1.57E-07	2.14E-06	8.13E-05	8.62E-06	3.77E-05	3.08E-06	1.35E-05	8.69E-04	3.81E-03	ND	ND	4.27E-07		
Cement supplement delivery to silo (with baghouse)	1.10E-05	4.83E-05	9.90E-07	4.34E-06	2.17E-07	9.50E-07	1.34E-05	5.85E-05	2.80E-06	1.23E-05	2.50E-05	1.09E-04	3.88E-05	1.70E-04	7.93E-07	3.47E-06	4.07E-06		
Truck Loadout (NO boot on spout)	2.57E-04	1.13E-03	2.06E-05	9.34E-05	2.83E-06	1.27E-05	9.64E-04	4.22E-03	5.15E-03	2.27E-02	1.01E-03	4.41E-03	3.25E-03	1.42E-02	2.22E-04	9.71E-04	2.05E-04		
Central Mix Batching (NO boot on spout)	0.00E+00	0.00E+00	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	[illegible]	[illegible]	0.00E+00	Facility Classification: Total Annual HAPs Emissions	
Sources Total	2.68E-04	1.18E-03	2.17E-05	9.49E-05	3.15E-06	1.38E-05	9.80E-04	4.30E-03	5.15E-03	2.27E-02	1.03E-03	4.53E-03	4.16E-03	1.82E-02	2.22E-04	9.74E-04	2.10E-04	5.21E-02	Tons per year
IDAPA Screening EL (lb/hr)	1.50E-06		2.80E-05		3.70E-06		3.33E-02		3.33E-01		2.70E-05		7.00E-03		1.30E-02		5.60E-07		
EXCEEDS EL?	Yes		No		No		No		No		Yes		No		No		Yes		

2.13742E-06 5.52E-06 5.442E-07

CONTROLLED TAP EMISSIONS Note: Includes baghouses as process equipment. 3,600 cy/day, and 500,000 cy/year

Emissions Point	Arsenic		Beryllium		Cadmium		Chromium		Manganese		Nickel		Phosphorus		Selenium		Chromium VI		
	lb/hr annual avg	T/yr[4]	lb/hr annual avg	T/yr	lb/hr annual avg	T/yr	lb/hr 24-hr avg	T/yr[5]	lb/hr 24-hr avg	T/yr	lb/hr annual avg	T/yr	lb/hr 24-hr avg	T/yr	lb/hr 24-hr avg	T/yr	lb/hr annual avg		
Cement delivery to silo (with baghouse)[1]	5.94E-08	2.60E-07	6.81E-09	2.98E-08	6.81E-09	2.98E-08	1.07E-06	1.75E-06	4.31E-06	7.16E-06	5.86E-07	2.57E-06	ND	ND	ND	ND	8.13E-08		
Cement supplement delivery to silo (with baghouse)[2]	2.08E-06	9.13E-06	1.88E-07	8.25E-07	4.13E-08	1.81E-07	4.49E-06	1.11E-05	9.43E-06	2.34E-06	4.75E-06	2.08E-05	1.30E-04	3.25E-05	3.56E-07	5.61E-07	7.63E-07		
Truck Loadout (With boot on spout)	2.45E-06	1.07E-05	1.96E-07	8.60E-07	2.75E-08	1.21E-07	2.41E-05	4.02E-05	1.25E-04	2.16E-04	9.58E-06	4.19E-05	8.12E-05	1.25E-04	5.54E-06	9.24E-06	1.95E-06	95.00%	Control Automatic boot or equivalent
Central Mix Batching (WITH boot on spout)	0.00E+00	0.00E+00	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	0.00E+00	95.00%	Control Automatic boot or equivalent
Sources Total	4.59E-06	2.01E-05	3.82E-07	1.71E-06	7.50E-08	3.31E-07	7.01E-05	5.31E-05	1.43E-04	2.25E-04	1.49E-05	6.53E-05	2.12E-04	1.88E-04	5.94E-06	9.90E-06	2.80E-06	5.43E-04	Tons per year
IDAPA Screening EL (lb/hr)	1.50E-06		2.80E-05		3.70E-06		3.30E-02		3.33E-01		2.70E-05		7.00E-03		1.30E-02		5.60E-07		
Percent of EL	305.95%		1.40%		2.04%		0.21%		0.043%		55.23%		3.02%		0.046%		499.55%		
EXCEEDS EL?	Yes		No		No		No		No		No		No		No		Yes		

[1] lb/hr, annual average = EF x pound of cement / Yd³ of concrete x annual concrete production rate / 2000lb/Ton / 8760 hr/yr; lb/hr, 24-hr = EF x pound of cement / Yd3 of concrete x daily concrete production rate / 2000lb/Ton / 24 hr/day
[2] lb/hr, annual average = EF x pound of cement supplement / Yd³ of concrete x annual concrete production rate / 2000lb/Ton / 8760 hr/yr; lb/hr, 24-hr average = EF x pound of cement supplement / Yd3 of concrete x daily concrete production rate / 2000lb/Ton
[3] lb/hr, annual average = EF x pound of (cement + cement supplement) / Yd³ of concrete x annual concrete production rate / 2000lb/Ton / 8760 hr/yr; lb/hr, 24-hr average = EF x pound of (cement + cement supplement) / Yd3 of concrete x daily concrete production
[4] T/yr = lb/hr, annual avg x 8760 hr/yr x (1T/2000 lb)
[5] T/yr = EF x pound of cement, or cement supplement, or cement + cement supplement x annual concrete production rate /2000 lb/ton / 2000 lb/ton

Attachment 2.
"Fenceline" Radius Calculations

Concrete Batch Plant - Typical Plant Layout Modeling 3/9/2007

"Fenceline" or Ambient Air Boundary Coordinates

Radians = deg * PI/180
x = Xoffset + c cos (Angle)
y= Yoffset + c sin(Angle)

CASE 1, 40 meter RADIUS
Radius c 40 (meters)
Origin Offset 0 (meters)
Origin Offset 0 (meters)

Angle (degrees)	EAST (x)	NORTH (y)
10	39.39	6.95
20	37.59	13.68
30	34.64	20.00
40	30.64	25.71
50	25.71	30.64
60	20.00	34.64
70	13.68	37.59
80	6.95	39.39
90	0.00	40.00
100	-6.95	39.39
110	-13.68	37.59
120	-20.00	34.64
130	-25.71	30.64
140	-30.64	25.71
150	-34.64	20.00
160	-37.59	13.68
170	-39.39	6.95
180	-40.00	0.00
190	-39.39	-6.95
200	-37.59	-13.68
210	-34.64	-20.00
220	-30.64	-25.71
230	-25.71	-30.64
240	-20.00	-34.64
250	-13.68	-37.59
260	-6.95	-39.39
270	0.00	-40.00
280	6.95	-39.39
290	13.68	-37.59
300	20.00	-34.64
310	25.71	-30.64
320	30.64	-25.71
330	34.64	-20.00
340	37.59	-13.68
350	39.39	-6.95
360	40.00	0.00

CASE 2, 60 meter RADIUS
Radius c 60 (meters)
Origin Offset 0 (meters)
Origin Offset 0 (meters)

Angle (degrees)	EAST (x)	NORTH (y)
10	59.09	10.42
20	56.38	20.52
30	51.96	30.00
40	45.96	38.57
50	38.57	45.96
60	30.00	51.96
70	20.52	56.38
80	10.42	59.09
90	0.00	60.00
100	-10.42	59.09
110	-20.52	56.38
120	-30.00	51.96
130	-38.57	45.96
140	-45.96	38.57
150	-51.96	30.00
160	-56.38	20.52
170	-59.09	10.42
180	-60.00	0.00
190	-59.09	-10.42
200	-56.38	-20.52
210	-51.96	-30.00
220	-45.96	-38.57
230	-38.57	-45.96
240	-30.00	-51.96
250	-20.52	-56.38
260	-10.42	-59.09
270	0.00	-60.00
280	10.42	-59.09
290	20.52	-56.38
300	30.00	-51.96
310	38.57	-45.96
320	45.96	-38.57
330	51.96	-30.00
340	56.38	-20.52
350	59.09	-10.42
360	60.00	0.00

CASE 3, 100 meter RADIUS
Radius c 75 (meters)
Origin Offset 0 (meters)
Origin Offset 0 (meters)

Angle (degrees)	EAST (x)	NORTH (y)
10	73.86	13.02
20	70.48	25.65
30	64.95	37.50
40	57.45	48.21
50	48.21	57.45
60	37.50	64.95
70	25.65	70.48
80	13.02	73.86
90	0.00	75.00
100	-13.02	73.86
110	-25.65	70.48
120	-37.50	64.95
130	-48.21	57.45
140	-57.45	48.21
150	-64.95	37.50
160	-70.48	25.65
170	-73.86	13.02
180	-75.00	0.00
190	-73.86	-13.02
200	-70.48	-25.65
210	-64.95	-37.50
220	-57.45	-48.21
230	-48.21	-57.45
240	-37.50	-64.95
250	-25.65	-70.48
260	-13.02	-73.86
270	0.00	-75.00
280	13.02	-73.86
290	25.65	-70.48
300	37.50	-64.95
310	48.21	-57.45
320	57.45	-48.21
330	64.95	-37.50
340	70.48	-25.65
350	73.86	-13.02
360	75.00	0.00

CASE 4, 125 meter RADIUS
Radius c 125 (meters)
Origin Offset : 0 (meters)
Origin Offset 0 (meters)

Angle (degrees)	EAST (x)	NORTH (y)
10	123.10	21.71
20	117.46	42.75
30	108.25	62.50
40	95.76	80.35
50	80.35	95.76
60	62.50	108.25
70	42.75	117.46
80	21.71	123.10
90	0.00	125.00
100	-21.71	123.10
110	-42.75	117.46
120	-62.50	108.25
130	-80.35	95.76
140	-95.76	80.35
150	-108.25	62.50
160	-117.46	42.75
170	-123.10	21.71
180	-125.00	0.00
190	-123.10	-21.71
200	-117.46	-42.75
210	-108.25	-62.50
220	-95.76	-80.35
230	-80.35	-95.76
240	-62.50	-108.25
250	-42.75	-117.46
260	-21.71	-123.10
270	0.00	-125.00
280	21.71	-123.10
290	42.75	-117.46
300	62.50	-108.25
310	80.35	-95.76
320	95.76	-80.35
330	108.25	-62.50
340	117.46	-42.75
350	123.10	-21.71
360	125.00	0.00