TECHNICAL REVIEW AND EVALUATION
OF APPLICATION FOR
GENERAL PERMIT FOR CONCRETE BATCH PLANTS

I. INTRODUCTION

The Concrete Batch Plant (CBP) General Permit is a permit for a facility class (Concrete Batch Plants) that contains 10 or more facilities that are similar in nature, have substantially similar emissions, and would be subject to the same or substantially similar requirements. The General Permit will last for 5 years from the date of its issuance. Equipment that is covered under the general permit will be required to have an "Authorization to Operate" (ATO). The ATO will identify the piece of equipment by having the name of manufacturer, date of manufacture, maximum capacity, and serial number or equipment number along with the hours of operation limitation.

This General Permit allows portable concrete batch plants to move to other locations statewide.

The Department will notify the Permittee and other affected stakeholders if there is a change in attainment status affecting an area.

The Permittee that applies for an ATO under the general permit shall pay the Department a flat application fee of $500 with the submittal of the permit application. Permit applications and all transactions must be conducted through the web portal, myDEQ. The Permittee must also continue to pay, for each calendar year, the applicable administrative or inspection fees as described in the Arizona Administrative Code Title 18, Chapter 2, Article 5, Section 511 (A.A.C. R18-2-511).

II. PROCESS DESCRIPTION

A. Process Description

At most of these plants, sand, aggregate, cement and water are all gravity fed from the weigh hopper into the mixer trucks. The concrete is mixed on the way to the site where the concrete is to be poured. At some of these plants, the concrete may also be manufactured in a central mix drum and transferred to a transport truck. Most of the remaining concrete manufactured are products cast in a factory setting. Precast products range from concrete bricks and paving stones to bridge girders, structural components, and panels for cladding. In a few cases, concrete is dry batched or prepared at a building construction site. The raw materials can be delivered to a plant by rail, truck or barge. The cement is transferred to elevated storage silos pneumatically or by bucket elevator. The sand and coarse aggregate are transferred to elevated bins by front end loader, clam shell crane, belt conveyor, or bucket elevator. From these elevated bins, the constituents are fed by gravity or screw conveyor to weigh hoppers, which combine the proper amounts of each material.

B. Air Pollution Control Equipment

Particulate matter, consisting primarily of cement and pozzolan dust but including some aggregate and sand dust emissions, is the primary pollutant of concern. In addition, there are emissions of metals that are associated with this particulate matter. Fugitive sources include the transfer of sand and aggregate, truck loading, mixer loading, vehicle traffic, and wind erosion from sand and aggregate storage piles. The amount of fugitive emissions generated during the transfer of sand and aggregate depends primarily on the surface moisture content of these materials. The extent of fugitive emission control varies widely from plant to plant.

The product loading point is a potential source significant source emissions. This emission point is required install and maintain a rubber sleeve to limit emissions. In addition, a baghouse may be required depending on the facility operations as listed in the operating limits section.

Types of controls used may include water sprays, enclosures, hoods, curtains, shrouds, movable and telescoping chutes, and the like. A major source of potential emissions, the movement of heavy trucks over unpaved or dusty surfaces in and around the plant, can be controlled by good maintenance and stabilization of the road surface.

III. OPERATING LIMITS

A. Production Throughput Limit

The CBP General Permit allows for the statewide production limitations for the operating scenarios listed below. These throughput limitation is based upon the results of a refined air dispersion modeling analysis conducted in order to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS). A detailed description of the modeling analysis is presented in Section V of this document.

1. The following scenarios are limited to 2,000 yards per day of concrete production:

   a. Central Mix with pollution control equipment (baghouse) on truck loading transfer point;

   b. Central Mix with no pollution control equipment (baghouse) on truck loading transfer point; and

   c. Truck Mix with pollution control equipment (baghouse) on the truck loading transfer point.

2. The following scenario is limited to 500 yards per day of concrete production:

   Truck mix with no pollution control equipment (baghouse) on the truck loading transfer point.

B. Generator Horsepower Limitation for Maricopa County

When operating under generator power within Maricopa County, the permittee is limited to a generator rated at 750 horsepower or less if that generator is not certified to at least an EPA Tier 1 emission standard or better in accordance with 40 CFR 89.112(a).

C. Prohibited Areas

The Permittee is not authorized to operate in areas of Pinal County identified as non-attainment for $PM_{2.5}$. The Prohibited Area can be found at http://gisweb.azdeq.gov/arcgis/emaps/?topic=nonattain and filtering for $PM_{2.5}$

D. Additional Operating Limits for All Areas

The Permittee is not authorized to collocate the concrete batch plant with another concrete batch plant.

IV. APPLICABLE REGULATIONS

Table 1 identifies state-wide regulations applicable at all times and verification as to why that standard applies.

Table 1: State-Wide Applicable Regulations

Unit	Control Device	Rule	Discussion
Concrete Batch Plants	Baghouses, Sleeves and Wet Suppressants	Arizona Administrative Code (A.A.C). R18-2-702.B.3 R18-2-723	Standards of performance for concrete batch plants and fugitive dust sources.
Boilers < 10 MMBtu/hr	None	A.A.C. R18-2-724 40 CFR 63 Subpart JJJJJJ	Standards of performance for fossil-fuel fired industrial and commercial equipment National Emissions Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers. This requirement is applicable to oil fired boilers.
Unclassified Sources, Vapor Generators and Direct Fuel Fired Equipment	None	A.A.C. R18-2 702.B.3 A.A.C. R18-2-730.A.1.a	Standards of performance for unclassified sources. This Section is for direct-fired equipment such as vapor generators and other unclassified emission sources.
Internal Combustion Engines Subject to NSPS 40 CFR 60 Subpart IIII	None	Code of Federal Regulations (CFR) 40 CFR 60 Subpart IIII	New Source Performance Standards (NSPS) as defined in Code of Federal Regulations Subsection IIII. This Section is for stationary compression ignition internal combustion engines that are manufactured after April 1, 2006.
Internal Combustion Engines Subject to NSPS 40 CFR 60 Subpart JJJJ	None	40 CFR 60 Subpart JJJJ	New Source Performance Standards as defined in Code of Federal Regulations Subsection JJJJ. This Section is for stationary spark ignition internal combustion engines.

Unit	Control Device	Rule	Discussion
Internal Combustion Engines not Subject to NSPS	None	A.A.C. R18-2-719 40 CFR 63 Subpart ZZZZ	Standards of Performance for Existing Stationary Rotating Machinery National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines as defined in Code of Federal Regulations Subpart ZZZZ.
Fugitive dust sources	Water Trucks Dust Suppressants	A.A.C. R18-2 Article 6 A.A.C. R18-2-702	These standards are applicable to all fugitive dust sources at the facility.
Abrasive Blasting	Wet blasting; Dust collecting equipment; Other approved methods	A.A.C. R-18-2-702 A.A.C. R-18-2-726	These standards are applicable to any abrasive blasting operation.
Spray Painting	Enclosures	A.A.C. R18-2-702 A.A.C. R-18-2-727	This standard is applicable to any spray painting operation.
Demolition/renovation operations	N/A	A.A.C. R18-2-1101.A.8	This standard is applicable to any asbestos related demolition or renovation operations.

Table 2 identifies regulations applicable at all times when operating in Maricopa County and verification as to why that standard applies.

Table 2: Applicable Regulations for Maricopa County

Unit	Control Device	Rule	Discussion
Facility Wide Requirements	None	Rule 320 Rule 316	Air Pollution Control Requirements Emission Control System Requirements and Dust Control Plans
Concrete Batch Plants	Baghouses, Rubber Sleeves and Wet Suppressants	Rule 316	Maricopa County Rule 316-Nonmetallic Mineral Processing.

Unit	Control Device	Rule	Discussion
Internal Combustion Engines	None	Rule 324	Maricopa County Rule 324- Establishes limits for the emissions of carbon monoxide, nitrogen oxides, sulfur oxides, volatile organic compounds, and particulate matter from stationary internal combustion engines.
Fugitive Dust	Water trucks, and wet suppressants	Rule 300 Rule 316	Maricopa County Rule 300- Visible Emissions describe standards for visible emissions and opacity. Maricopa County Rule 316- Nonmetallic Mineral Processing establishes limits for the emissions of particulate matter into the ambient air from any nonmetallic mining operating or rock product processing plant.
Spray Painting Operations	Not Applicable	Rule 315	This standard is applicable to any spray-painting operation.
Abrasive Blasting	Not Applicable	Rule 312	This standard is applicable to any activity related to abrasive blasting operations.

Table 3 identifies regulations applicable at all times when operating in Pima County and verification as to why that standard applies.

Table 3: Applicable Regulations for Pima County

Unit	Control Device	Rule	Discussion
Concrete Batch Plants	Emissions from silos are controlled by baghouses. Fugitive sources controlled by water spray and other reasonable precautions.	Pima County Code (P.C.C.) 17.16.380	The regulations listed are applicable to Concrete batch plants located in Pima County.

Unit	Control Device	Rule	Discussion
Internal Combustion Engines	None	P.C.C. 17.16.340 P.C.C. 17.16.490	The regulation listed is applicable to all stationary gas turbines, oil-fired turbines and internal combustion engines. The regulations are identical to A.A.C. R18-2-719 so they have been streamlined into the statewide conditions.
Fugitive Dust/Other Specific Requirements	Water trucks, and wet suppressants	P.C.C. 17.16.060 P.C.C. 17.16.080 P.C.C. 17.16.090 P.C.C. 17.16.070 P.C.C. 17.16.100 P.C.C. 17.16.040 P.C.C. 17.16.050 Pima County State Implementation Plan Rule 343	The regulations listed are applicable to emissions produced from fugitive dust producing activities, vacant lots, open spaces, roads, streets, particulate materials and storage piles. Visibility Limiting Standard

Table 4 identifies regulations applicable at all times when operating in Pina; County and verification as to why that standard applies.

Table 4: Applicable Regulations for Pinal County

Unit	Control Device	Rule	Discussion
Fugitive Dust	Water trucks, and wet suppressants	Pinal Code 4-7-230.N Pinal Code 4-2-040 Pinal Code 4-2-050	The regulations listed are applicable to sources of fugitive dust emissions.

V. PREVIOUS PERMIT AND CONDITIONS

A. Previous Permit Conditions

Table 5 compares the sections in the previous Concrete Batch Plant General Permit with the conditions in this renewal permit.

Table 5: Previous Permit Conditions

Section No.	Determination			Comments
	Revised	Added	Deleted	
Att. “A”	X			General Provisions: Revised to represent the most recent template language.
Att. “B” Section II		X		Conditions for Coverage: Added section for consistency with other rock product general permits and include co-location limits.

Section No.	Determination			Comments
	Revised	Added	Deleted	
				Included requirements for conducting permitting services and transactions through the myDEQ online portal.
Att. "B" Section III Condition A	X			Facility-Wide Requirements: Updated section numbering from section II to section III. Updated operating scenarios with throughput limitations. Truck mix without a baghouse on the product loading point is limited to 500 cubic yards per day.
Att. "B" Section III Condition B	X			Facility-Wide Requirements: Updated non-attainment map for $PM_{2.5}$ the reference AZDEQ GIS map for non-attainment areas.
Att. "B" Section XI	X			Fugitive Dust Requirements: Revised to represent the most recent template language.
Att. "B" Section XI	X			Portable Sources: This section was moved to Attachment "A" to align with rock product general permits.
Att. "B" Section XII	X			Other Periodic Activities: Revised to represent the most recent template language.
Att. "C"	X			Additional Conditions For Operations Inside Maricopa County: Updated to reflect current county rules.
Att. "D"	X			Additional Conditions For Operations Inside Pima County: Updated to reflect current county rules.
Att. "E"	X			Additional Conditions For Operations Inside Pinal County: Updated to reflect current county rules.
Appendix "A"	X			Map of the Pinal County Prohibited Area: Updated the map of the Pinal County prohibited area.
Appendix "B"		X		Opacity Survey Recordkeeping Form: Added an opacity survey recordkeeping form for permittees to reference as an additional resource.

VI. UPDATES TO PRODUCTION THROUGHPUT LIMIATATIONS

The throughputs for the Concrete Batch Plant General Permit were updated to include various operations associated with these types of facilities. In the previous general permit, only a controlled central mix was evaluated as it was assumed to be the predominate type of facility. All four scenarios described below were evaluated to ensure compliance with maintaining a Class II status and comply with the National Ambient Air Quality Standards (NAAQS). All scenarios fell below trigging the PTE requirements for a Class I permit based on continuous operation. However, when the worst case scenario was modeled for NAAQS compliance, the truck mix without baghouse controls failed at the current throughput limitations. After evaluating this worst case scenario, a throughput limitation of 500 cubic yards per day ensure compliance with NAAQS.

This limit of 500 cubic yards per day is much lower than the current 2,000 yards per day, and would hinder facilities ability to operate. To address this, the scenarios were addressed individually with separate throughput limits versus applying the worst case scenario restriction to all cases. Table 6 shows the four scenarios and their associated throughput limitations.

Table 6: Concrete Batch Plant Scenarios Throughput Limitations

Scenario	Throughput Limitation (Yards per Day)
Truck Mix with No Baghouse on the Loading Point	500
Truck Mix with a Baghouse on the Loading Point	2,000
Central Mix with No Baghouse on the Loading Point	2,000
Central Mix with a Baghouse on the Loading Point	2,000

VII. MONITORING, RECORDKEEPING, AND REPORTING REQUIREMENTS

A. Facility wide General Requirements

1. The Permittee is required to maintain daily records of the operating hours of the equipment covered under the General Permit which are subject to an hourly restriction.

2. The Permittee is required to maintain records of the total daily throughput of material for the concrete batch plant (in cubic yards per day) covered under this General Permit.

3. The Permittee is required to keep on-site records of maintenance performed on all emission related equipment.

4. At the time the compliance certifications are submitted, the Permittee is required to submit reports of all monitoring, recordkeeping, and testing activities required by the permit within during that period.

5. The Permittee is required to conduct a monthly visual survey on all process equipment and all fugitive dust sources. If the source appears to exceed the standard, the Permittee must conduct an EPA Reference Method 9 observation as specified in the general permit. The Permittee must keep records of all surveys and EPA Reference Method 9 observations performed. These records must include the emission point observed, location of observer, name of observer, date and time of observation, and the results of the observation. If the observation shows a Method 9 opacity reading in excess of the opacity standard, the Permittee must initiate appropriate corrective action to reduce the opacity below the standard. The Permittee must keep a record of the corrective action performed. These logs must be maintained on-site and be available to ADEQ representative upon request.

B. Concrete Batch Plant

1. The Permittee is required conduct monthly opacity monitoring for all emission units

2. The Permittee is required maintain logs of all maintenance activities performed on the baghouse.

C. Fugitive Dust

1. The Permittee is required to keep record of the dates and types of dust control measures employed.

2. The Permittee is required to show compliance with the opacity standards by having a Method 9 certified observer perform a monthly survey of visible emission from fugitive dust sources. The observer is required to conduct a 6-minute Method 9 observation if the results of the initial survey appear on an instantaneous basis to exceed the applicable standard.

3. The Permittee is required to keep records of the name of the observer, the time, date, and location of the observation and the results of all surveys and observations.

4. The Permittee is required to keep records of any corrective action taken to lower the opacity of any emission point and any excess emission reports.

D. Periodic Activities

1. The Permittee is required to record the date, duration and pollution control measures of any abrasive blasting project.

2. The Permittee is required to record the date, duration, quantity of paint used, any applicable SDS, and pollution control measures of any spray painting project.

3. The Permittee is required to maintain records of all asbestos related demolition or renovation projects. The required records include the "NESHAP Notification for Renovation and Demolition Activities" form and all supporting documents.

VIII. MODELING ANALYSIS

A. Introduction

The modeling analysis presented here was conducted in order to determine throughput limits for the CBP under which compliance with the NAAQS can be demonstrated using regulatory air quality models. Based on the previous modeling efforts for the 2015 renewal, ADEQ specifically examined four different operating scenarios at the loading point in this round renewal:

- Central mixing loading – Controlled;
- Central mixing loading – Uncontrolled;
- Truck mixing loading – Controlled; and
- Truck mixing loading – Uncontrolled.

It should be addressed that "Controlled" means that the plant has fugitive dust capture systems and baghouse to control the emissions from the loading point. The use of a boot or skirt that surrounds the opening at the loading point only does not fall into the category of "Controlled".

Based on the modeled results, ADEQ retains the existing maximum daily throughput of 2,000 yd^3/day for central mixing loading regardless of whether the emissions are controlled or uncontrolled. ADEQ also retains this limit for controlled truck mixing loading. For uncontrolled truck mixing loading, ADEQ sets up a new emission limit – maximum daily throughout of 500 yd^3/day. Additionally, ADEQ retains the following conditions or requirements:

- If operating in Maricopa County, the size of non-certified generator shall not exceed 750 horsepower (HP). A non-certified engine is any engine that does not meet at least a Tier 1 emission standard in accordance with 40 CFR 89.112(a);

- The applicable operating area shall exclude the West Central Pinal $PM_{2.5}$ nonattainment area; and

B. Modeling Specifications

1. Model Inputs

The most recent version of the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD, version 19191) was used in this modeling analysis. AERMOD is the EPA's preferred near-field dispersion modeling system for a wide range of regulatory applications. The AERMOD modeling system includes four regulatory components:

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BRIPPRIME: the building input processor

The terrain processor (AERMAP) and the building input processor (BRIPPRIME) were not used in this analysis because both of them require site-specific information. Moreover, an assumption of "flat terrain" was believed to be reasonable, since the emission sources of a concrete batch plant are mainly ground level sources and the worst-case impacts are expected to occur in or near the ambient area boundary.

AERMET was used to process the meteorological data collected from ten metrological sites across the State of Arizona. The tool AERSURFACE (version 13016) was used to estimate the surface characteristics for input to AERMET. Additionally, AERMINUTE (version 15272) was used to generate hourly average winds for input to AERMET in Stage 2. Please refer to Table 9 for detailed meteorological data sets used in the modeling analysis.

2. Emission Rates

The most significant emission sources in a CBP include batch drop/material transfer points, unpaved roads, storage piles, generator and boiler. Fugitive PM is the primary pollutant emitted from a CBP.

The four operating scenarios used the same emissions rates for all emissions points except the product loading point on the CBP. Latest AP-42 emission factors were used for the concrete batching operations. The emissions from the product loading point and control device, if applicable, varied depending on the scenario. All scenarios require a rubber sleeve or equivalent at the product loading point. This rubber sleeve accounts for a 75% reduction in emissions at product loading point based on Western Regional Air Partnership's Fugitive Dust Handbook. Uncontrolled scenarios only had emissions at the loading point from product loading operations. Controlled emissions were assumed to have emissions from the loading point as well as release from the baghouse. For controlled scenarios, the total emissions determined from AP-42 emission factors were assumed to be 50% from baghouse emissions and 50% from the non-captured emissions from the loading point based on AP-42 background documentation.

Generally the emissions were estimated according to latest AP-42 emission factors for concrete batching, internal combustion engines, wind erosion and unpaved roads. In Particular, a consistent approach was developed for estimating $PM_{2.5}$ and PM_{10} emissions for batch drop operations and material transfer operations. This approach was based on AP-42 Section 13.2.4 Equation 1:

$$E = k(0.032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \qquad \text{(Equation 1)}$$

Where:

E = emission factor (lb/ton)

k = particle size multiplier (dimensionless), 0.35 for PM_{10} and 0.053 for $PM_{2.5}$ U = mean wind speed (miles per hour)

M = material moisture content (%)

State-wide meteorological data sets were reviewed and a mean wind speed of 7.5 miles per hour was determined. Due to very limited data available for the parameter M, the moisture content was conservatively set as 5% for controlled emissions.

Table 7 provides a comprehensive emission inventory for a CBP with an assumed operating capacity of 2,000 yd^3/day. Many batch drop/material transfer operations in a CBP are not continuous and the emission sources are typically characterized as intermittent sources. To address this, the emission rates of PM_{10} and $PM_{2.5}$ listed in Table 5 represent the maximum 24-hour average emission rates, which are matched to the averaging time being assessed for the 24-hour $PM_{10}/PM_{2.5}$ NAAQS.

For gaseous pollutants, maximum hourly emission rates were modeled for comparisons to their short-term NAAQS. Maximum hourly emission rates were also used to provide a conservative estimation for annual impacts. To model annual average NO_2 concentrations, the NO_2/NO_X ratio was set as 0.75, the national annual default value.

3. Sources Layout

The layout of a CBP generally differs from one site to another. To simplify the modeling analysis, a generic site plan was developed, as shown in Figure 1 on the following page. The layout of sources was determined according to the site plans of several existing plants with necessary simplifications for modeling purposes.

4. Source Release Parameters

The emission sources, categorized by source type (release characteristics), are as follows:

Point Sources: cement silo, generator, and boiler;

Area Sources: aggregate storage pile wind erosion and sand storage pile wind erosion;

Volume Sources: batch drop operations, material transfer operations, and truck /front-end loaders traveling on unpaved roads

Table 8 summarize the source release parameters used in the modeling analysis. These parameters were determined following the ADEQ air modeling guidelines as well as the methodology for modeling fugitive dust sources developed by National Stone, Sand & Gravel Association. The representative physical dimensions for storage piles, hoppers, bins, silos, trucks, and front-end loaders were determined on the basis of actual measurements or testing data from three facilities in Maricopa County.

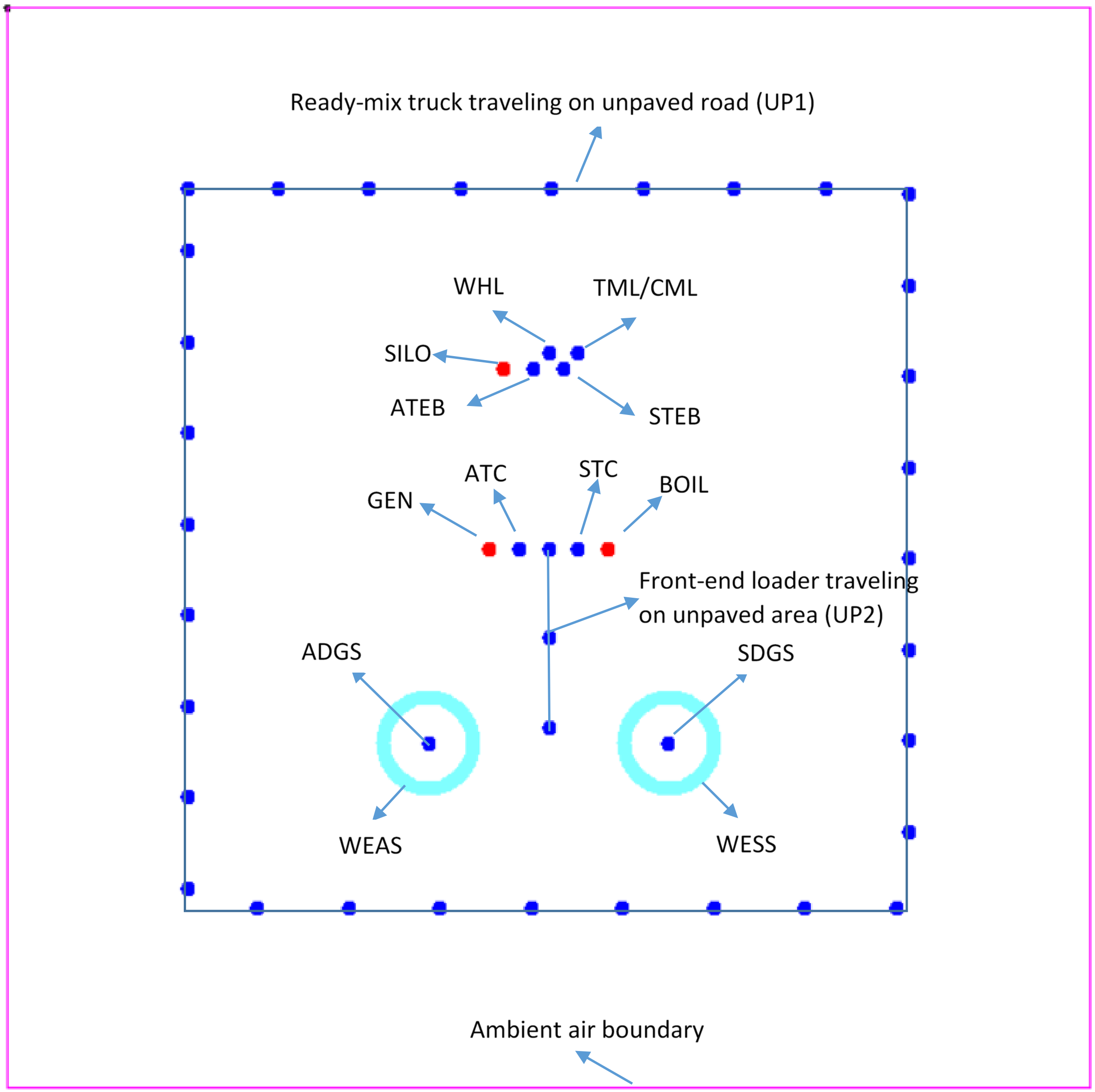

Figure 1: Sources Layout of Generic Concrete Batch Plant (refer to Table 5 for detailed source descriptions)

Table 7: Modeled Emission Rates for the CBP[1]

Point Sources						
Source ID	Source Description	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	NOx (g/s)	SO_2 (g/s)	CO (g/s)
GEN	Generator	8.84E-02	8.84E-02	2.271/3.032	1.53E-03	6.95E-01
BOIL	10.0 MMBtu/hr Diesel Boiler	1.17E-02	1.17E-02	1.80E-01	1.92E-03	4.51E-02
SILO	Cement / Cement Supplement Transfer to Cement Silo	2.75E-03	4.13E-04	-	-	-
Area Sources						
Source ID	Source Description	PM_{10} (g/s)		$PM_{2.5}$ (g/s)		
WEAS	Aggregate Storage Pile	7.79E-04		3.43E-04		
WESS	Sand Storage Pile	7.79E-04		3.43E-04		
Volume Sources						
Source ID	Source Description	PM_{10} (g/s)		$PM_{2.5}$ (g/s)		
ADGS	Aggregate Delivery to Ground Storage	5.15E-03		7.80E-04		
SDGS	Sand Delivery to Ground Storage	3.94E-03		5.97E-04		
ATC	Aggregate Transfer to Conveyor	5.15E-03		7.80E-04		
STC	Sand Transfer to Conveyor	3.94E-03		5.97E-04		
ATEB	Aggregate Transfer to Elevation Bins	5.15E-03		7.80E-04		
STEB	Sand Transfer to Elevation Bins	3.94E-03		5.97E-04		
WHL	Weigh Hopper Loading	4.15E-03		6.22E-04		
TML	Truck Mix Loading (Uncontrolled)	2.29E-01		3.70E-02		
CML	Central Mix Loading (Uncontrolled)	3.09E-02		2.49E-04		
UP1 (1-33)	Truck traveling on paved/unpaved road	9.7E-04		9.7E-05		
UP2 (1-3)	Front-end loader traveling on unpaved area	7.44E-03		7.44E-04		

[1] Used for Maricopa County based on 750 hp engine;
[2] Used for other areas based on 1000 hp engine.
[3] Used for other areas based on 1000 hp engine.

Table 8: Modeled Source Parameters for the CBP

Point Sources					
Source ID	Source Description	Release Height (m)	Stack Temperature (K)	Stack Velocity (m/s)	Stack Diameter (m)
GEN	Generator	5.0	750	75.0	0.22
SILO	Cement/Cement Supplement Transfer to Cement Silo	12.2	408	4.0	0.32

Area Sources			
Source ID	Source Description	Release Height (m)	Radius of Circle (m)
WEAS	Aggregate Storage Pile	3.8	10.0
WESS	Sand Storage Pile	3.8	10.0

Volume Sources				
Source ID	*Source Description*	*Release Height (m)*	*Initial Horizontal Dimensions (m)*	*Initial Vertical Dimensions (m)*
ADGS	Aggregate Delivery to Ground Storage	6.2	1.60	2.20
SDGS	Sand Delivery to Ground Storage	6.2	1.60	2.20
ATC	Aggregate Transfer to Conveyor	3.5	0.85	0.43
STC	Sand Transfer to Conveyor	3.5	0.85	0.43
ATEB	Aggregate Transfer to Elevation Bins	8.1	0.71	0.43
STEB	Sand Transfer to Elevation Bins	8.1	0.71	0.43
WHL	Weigh Hopper Loading	4.7	0.85	0.14
TML/CML	Truck/Central Mix Loading (uncontrolled)	3.75	0.45	0.93
UP1 (1-32)	Truck traveling on paved/unpaved road	3.00	7.00	2.80
UP2 (1-3)	Front-end loader traveling on unpaved road	3.00	7.00	2.80

5. Receptor Grid

Receptors were spaced 25 meters along ambient air boundary (AAB) and 50 meters from PAB to 100 meters. Since the emission sources modeled are mainly ground level sources, the receptor network beginning at AAB and extending outward to 100 m is sufficiently large to identify the maximum impacts.

6. Meteorological Data

ADEQ obtained meteorological data through the Automated Surface Observing System (ASOS) network. The ASOS station can utilize AERMINUTE to significantly reduce calm or missing hours, which is critical for modeling one-hour standards. As shown in Table 9, eight meteorological data sets were used to represent the meteorological conditions for PM_{10} attainment areas and three meteorological data sets for PM_{10} non-attainment areas, respectively.

All meteorological data were processed by AERMET along with AERSURFACE. The AERMINUTE tool was used to process 1-minute wind data collected from the Automated Surface Observing Stations (ASOS). Based on EPA's recommendations, a minimum wind speed threshold of 0.5 m/s was used to treat winds below the threshold as calms. Based on the EPA's Appendix W, using the ADJ_U* option is appropriate when standard National Weather Service (NWS) airport meteorological data are used. Therefore, the ADJ_U* option was used to process all NWS meteorological data. The AERMET pre-processed meteorological datasets are available from the ADEQ modeling website:

http://www.azdeq.gov/aermet-data-files

Table 9: Meteorological Data Sets used for the CBP Modeling Analysis

Data Name	Surface Data	Upper Air Data	Data Period	County	For PM_{10} attainment areas or non-attainment areas?
Flagstaff	Flagstaff Pulliam Airport	Flagstaff (KFGZ)	01/01/2014-12/31/2018	Coconino	Attainment
Kingman	Kingman Airport	Reno (KREV) /Las Vegas (KVEF)	01/01/2014-12/31/2018	Mohave	Attainment
Nogales	Nogales International Airport	Tucson (KTUS)	01/01/2014-12/31/2018	Santa Cruz	Non-attainment
Tucson	Tucson International Airport	Tucson (KTUS)	01/01/2014-12/31/2018	Pima	Attainment
Page	Page Municipal Airport	Flagstaff (KFGZ)	01/01/2014-12/31/2018	Coconino	Attainment
Phoenix	Phoenix Sky Harbor International Airport	Tucson(KTUS)	01/01/2014-12/31/2018	Maricopa	Non-attainment
Prescott	Prescott Municipal Airport	Flagstaff (KFGZ)	01/01/2014-12/31/2018	Yavapai	Attainment
Safford	Safford Regional Airport	Tucson (KTUS)	01/01/2014-12/31/2018	Graham	Attainment
St Johns	St. Johns Industrial Air Park	Albuquerque (KABQ)	01/01/2014-12/31/2018	Apache	Attainment
Winslow	Winslow–Lindbergh Regional Airport	Albuquerque (KABQ)	01/01/2014-12/31/2018	Navajo	Attainment
Yuma	Yuma Marine Corps Air Station	Tucson (KTUS)	01/01/2014-12/31/2018	Yuma	Non-attainment

7. Background Concentrations

Background Concentrations for $PM_{2.5}$

a. To determine state-level background concentrations for $PM_{2.5}$, this modeling analysis first excluded the Hidden Valley monitor in the West Central Pinal $PM_{2.5}$ Non- Attainment Area (NAA). The monitoring data shown that the $PM_{2.5}$ concentrations in Maricopa, Yuma and Santa Cruz are significantly higher than other areas, ADEQ further classified the state into two different zones:

- Maricopa, Yuma, and Santa Cruz - the background concentrations were determined by averaging the monitoring concentrations obtained from 13 monitors (see Table 8);
- Other areas - the background concentrations were determined by averaging the monitoring concentrations obtained from 4 monitors (see Table 8).

The background concentrations of $PM_{2.5}$ were determined in accordance with language in EPA's May 20, 2014 memorandum, "Guidance for $PM_{2.5}$ Permit Modeling". For annual averaging period, the 3-year average of the annual average $PM_{2.5}$ concentrations was used as the background concentration. For 24-hour averaging period, the 3-year average of the 98th percentile 24-hour average $PM_{2.5}$ concentrations was used as the background concentration.

Table 10 summarizes the $PM_{2.5}$ background concentrations used in the CBP modeling analysis.

Table 10: Background Concentrations for $PM_{2.5}$

Areas	Averaging Period	Background Concentration (µg/m3)	Source of Data	Note
West Central Pinal $PM_{2.5}$ NAA				Prohibited
Maricopa County Santa Cruz County Yuma County	24-hour	22	https://www.epa.gov/outdoor-air-quality-data Monitors: Casa Grande Downtown Diablo Durango Complex Glendale JLG Supersite Mesa Nogales Post Office North Phoenix South Phoenix Tempe West Phoenix Yuma Supersite	Average of the 98th percentile 24-hour values over 2016-2018
	Annual	8.5		Average of the annual values over 2016-2018
Other Areas	24-hour	13.0	https://www.epa.gov/outdoor-air-quality-data Monitors: Apache Junction Orange Grove Children's Park Douglas Red Cross	Average of the 98th percentile 24-hour values over 2016-2018
	Annual	5.5		Average of the annual values over 2016-2018

b. Background Concentrations for 1-Hr NO_2

There are very limited NO2 monitoring sites in Arizona and nearly all monitoring sites are located in the Phoenix/Tucson metropolitan areas. To determine representative background concentrations for 1-hour NO2, the modeling analysis has classified the state of Arizona into three areas: the Phoenix metropolitan area; the Tucson metropolitan area; and the remaining areas. Based on this classification, background concentrations were determined for the three areas separately. The monitoring data collected from JLG Supersite were used to determine the background concentrations for the Phoenix metropolitan area. The monitoring data collected from 22nd and Craycroft were used to determine the background concentrations for the Tucson metropolitan area. The monitoring data collected from Deming, New Mexico were used for the background concentrations for the remaining areas, considering that the data should provide a representative and conservative estimate.

ADEQ used the season and hour-of-day methodology (SEASHR) to estimate 1-hour NO_2 background concentrations, which are available from the ADEQ modeling website:

http://www.azdeq.gov/one-hour-no2-modeling-data

c. Background Concentrations for PM_{10}, SO_2, CO and Annual NO_2

Table 11 lists the background concentrations for PM_{10}, SO_2, CO and annual NO_2.

Table 11: Background Concentrations for PM_{10}, SO_2, CO and Annual NO_2

Pollutant	Averaging Period	Background Concentration (µg/m³)	Source of Data	Note
PM_{10}	24-hour	PM_{10} Attainment Areas: 26 PM_{10} Non-Attainment Areas: 58	---	Used in the 2010 GP,2015 Renewal; for justification, see http://static.azdeq.gov/permits/gncstsd.pdf Section G
SO_2	1-hour	15.3	https://www.epa.gov/outdoor-air-quality-data JLG Supersite	99th percentile of the annual distribution of daily maximum 1-hours values averaged across 2016-2018
NO_2	Annual	29	https://www.epa.gov/outdoor-air-quality-data JLG Supersite	Highest annual concentration during 2016-2018
CO	1-hour	2,857	https://www.epa.gov/outdoor-air-quality-data JLG Supersite	Highest concentration during 2016-2018
	8-hour	2,222		

8. NO_2 Modeling Methodology

The recent EPA's guidance recommends three-tiered screening approach for modeling NO2:

- Tier 1 Total Conversion - assuming full conversion of NO to NO2 without any additional justification.

- Tier 2 Ambient Ratio Method (ARM2) - multiply Tier 1 result by representative equilibrium ratios of NO2/NOx value that are based on ambient levels of NO2 and NOx derived from national data from the EPA's Air Quality System (AQS). The national default for ARM2 includes a minimum ambient NO2/NOx ratio of 0.5 and a maximum ambient ratio of 0.9. The Permittee may use alternative minimum ambient NO2/NOx ratios based on source-specific data from manufacturer testing, state or local agency guidance, or peer-reviewed literature.

- Tier 3 - Plume Volume Molar Ratio Method (PVMRM)/ Ozone Limiting Method (OLM) - the two approaches are available as regulatory options in AERMOD as preferred Tier 3 screening methods for NO2 modeling. Both of these options account for ambient conversion of NO to NO2 in the presence of ozone, namely the ozone titration mechanism. Two key model inputs are needed, namely in-stack ratios of NO2/NOX emissions and background ozone concentrations.

ADEQ used the following approach for modeling NO2:

- Tier 1 was used to assess compliance with the annual NAAQS;
- PVMRM was used to access compliance with the 1-hour NAAQS
  - The in-stack ratio of NO_2/NO_X for a generator was assumed to be 10%;
  - Hourly background ozone concentrations from the JLG Supersite monitor were used across the State, considering that the Phoenix ozone data should provide conservative estimate for areas other than the Phoenix Metropolitan Area;
  - The Urban Dispersion option was used for modeling Phoenix Metropolitan Areas while the Rural Dispersion option for other areas;
  - NO_2 background concentrations were directly input to the model with the SEASHA option.

9. Modeled Results

The modeled results are summarized in Tables 12-18. As shown in the tables, emissions from a CBP will not cause or contribute to a violation of the NAAQS under the operation limits/conditions proposed in the permit.

The AERMOD modeling analysis also revealed that the modeled impacts from a CBP were limited to near-field areas. All modeled maximum concentrations for all pollutants under varied meteorological conditions occurred in the ambient area boundary.

Table 12: Modeled Results for PM2.5 (Central Mix Loading – Uncontrolled-2000 yd^3/day)

Meteorological data sets	Modeled concentration ($\mu g/m^3$)		Background concentration ($\mu g/m^3$)		Total concentration ($\mu g/m^3$)		NAAQS ($\mu g/m^3$)
	24-hour	Annual	24-hour	Annual	24-hour	Annual	
Flagstaff	10.5	3.9	13	5.5	23.5	9.4	24-hour: 35 Annual: 12
Kingman	9.3	2.8	13	5.5	22.3	8.3	
Nogales	6.2	2.5	22	8.5	28.2	11	
Page	5.2	2.2	13	5.5	18.2	7.7	
Phoenix	5.7	2.5	22	8.5	27.7	11	
Prescott	6.7	3.7	13	5.5	19.7	9.2	
Safford	9.3	2.8	13	5.5	22.3	8.3	
St Johns	8.2	2.8	13	5.5	21.2	8.3	
Tucson	8.7	2.4	13	5.5	21.7	7.9	
Winslow	6.6	2.4	13	5.5	19.6	7.9	
Yuma	10.5	2.2	22	8.5	32.5	10.7	

Table 13: Modeled Results for PM2.5 (Truck Mix Loading – Uncontrolled-500 yd^3/day)

Meteorological data sets	Modeled concentration ($\mu g/m^3$)		Background concentration ($\mu g/m^3$)		Total concentration ($\mu g/m^3$)		NAAQS ($\mu g/m^3$)
	24-hour	Annual	24-hour	Annual	24-hour	Annual	
Flagstaff	8.5	3.7	13	5.5	21.5	9.2	24-hour: 35 Annual: 12
Kingman	7.4	2.6	13	5.5	20.4	8.1	
Nogales	7.4	2.9	22	8.5	29.4	11.4	
Page	6.5	2.7	13	5.5	19.5	8.2	
Phoenix	6.4	2.7	22	8.5	28.4	11.2	
Prescott	12.7	6.1	13	5.5	25.7	11.6	
Safford	5.5	2.1	13	5.5	18.5	7.6	
St Johns	9.1	3.9	13	5.5	22.1	9.4	
Tucson	7.5	3.7	13	5.5	20.5	9.2	
Winslow	6.9	2.6	13	5.5	19.9	8.1	
Yuma	7.2	2.6	22	8.5	29.2	11.1	

Table 14: Modeled Results for 24-hour PM10 (Central Mix Loading – Uncontrolled-2000 yd³/day)

Meteorological data sets	Modeled concentration (µg/m³)	Background concentration (µg/m³)	Total concentration (µg/m³)	NAAQS (µg/m³)
Flagstaff	67.8	26	93.8	150
Kingman	68.4	26	94.4	
Nogales	56.4	58	114.4	
Page	58.5	26	84.5	
Phoenix	57.3	58	115.3	
Prescott	93.2	26	119.2	
Safford	44.5	26	70.5	
St Johns	72.3	26	98.3	
Tucson	55.6	26	81.6	
Winslow	59.5	26	85.5	
Yuma	57.7	58	115.7	

Table 15: Modeled Results for 24-hour PM10 (Truck Mix Loading – Uncontrolled-500 yd³/day)

Meteorological data sets	Modeled concentration (µg/m³)	Background concentration (µg/m³)	Total concentration (µg/m³)	NAAQS (µg/m³)
Flagstaff	69.7	26	95.7	150
Kingman	72.7	26	98.7	
Nogales	57.4	58	115.4	
Page	58.2	26	84.2	
Phoenix	51.4	58	109.4	
Prescott	97.3	26	123.3	
Safford	42.2	26	68.2	
St Johns	71.7	26	97.7	
Tucson	59.6	26	85.6	
Winslow	60.5	26	86.5	
Yuma	61.4	58	119.4	

Table 16: Modeled Results for NO_2

Meteorological data sets	Modeled concentration (µg/m³)		Background concentration (µg/m³)		Total concentration (µg/m³)		NAAQS (µg/m³)
	1-hour3	Annual	1-hour	Annual	1-hour	Annual	
Flagstaff	132	42	-	29	132	71	1-hour: 189 Annual: 100
Kingman	169	33	-	29	169	62	
Nogales	134	19	-	29	134	48	
Page	136	12	-	29	136	41	
Phoenix	176	18	-	29	176	47	
Prescott	125	16	-	29	125	45	
Safford	159	37	-	29	159	66	
St Johns	148	30	-	29	148	59	
Tucson	160	16	-	29	160	45	
Winslow	164	22	-	29	164	51	
Yuma	157	24	-	29	157	53	

Table 17: Modeled Results for 1-hour SO_2

Meteorological data sets	Modeled concentration (µg/m³)	Background concentration (µg/m³)	Total concentration (µg/m³)	NAAQS (µg/m³)
Flagstaff	0.38	15.3	15.68	1-hour: 196
Kingman	0.40	15.3	15.70	
Nogales	0.35	15.3	15.65	
Page	0.35	15.3	15.65	
Phoenix	0.33	15.3	15.63	
Prescott	0.35	15.3	15.65	
Safford	0.41	15.3	15.71	
St Johns	0.35	15.3	15.65	
Tucson	0.40	15.3	15.70	
Winslow	0.33	15.3	15.63	
Yuma	0.38	15.3	15.68	

4 Background concentrations have been included in the model runs. Therefore, the reported concentrations have reflected the combination of modeled concentrations and background concentrations.

Table 18: Modeled Results for CO

Meteorological data sets	Modeled concentration (µg/m³)		Background concentration (µg/m³)		Total concentration (µg/m³)		NAAQS (µg/m³)
	1-hour	8-hour	1-hour	8-hour	1-hour	8-hour	
Flagstaff	126	101	2857	2222	2983	2323	1-hour: 40,000 8-hour: 10,000
Kingman	139	109	2857	2222	2996	2331	
Nogales	138	98	2857	2222	2995	2320	
Page	124	90	2857	2222	2981	2312	
Phoenix	136	89	2857	2222	2993	2311	
Prescott	126	93	2857	2222	2983	2315	
Safford	138	90	2857	2222	2995	2312	
St Johns	136	112	2857	2222	2993	2334	
Tucson	134	115	2857	2222	2991	2337	
Winslow	134	107	2857	2222	2991	2329	
Yuma	138	103	2857	2222	2995	2325	

IX. LIST OF ABBREVIATIONS

A.A.C. .... Arizona Administrative Code
ADEQ .... Arizona Department of Environmental Quality
Btu/ft^3 .... British Thermal Units per Cubic Foot
Btu/hr .... British Thermal Units per Hour
CBP .... Concrete Batch Plant
CFR .... Code of Federal Regulations
CO .... Carbon Monoxide
CBP .... Concrete Batch Plant
FERC .... Federal Energy Regulatory Commissions
HAP .... Hazardous Air Pollutant
hp .... Horsepower
lb/hr .... Pound per Hour
NAAQS .... National Ambient Air Quality Standards
NO_x .... Nitrogen Oxides
PM .... Particulate Matter
PM_{10} .... Particulate Matter Nominally less than 10 Micrometers
SO_x .... Sulfur Oxides
VOC .... Volatile Organic Compound
Yd^3 .... Cubic Yard