TECHNICAL REVIEW AND EVALUATION
OF THE CONCRETE BATCH PLANT GENERAL PERMIT 2015 RENEWAL

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.

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

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 of 2,000 cubic yards per day (yds^3/day) of concrete. This 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.

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 and Limited Prohibition Areas

1. Prohibited Operating Area

Operations within a portion of Pinal County identified on the map shown in Appendix "A" of the general permit are prohibited: T4S, R3E – R4E, T5S, R3E – R4E (excluding sections 12, 13, 24, and 25).

2. Limited Prohibition Area

Between October 1st and March 31st the permittee shall not operate in portions of the Nogales area located in the southern part of Santa Cruz County identified on the map shown in Appendix "B" of the general permit. The portions of the following Townships which are within the State of Arizona and lie east of 111 degrees longitude: T23S, R13E, T23S, R14E, T24S, R13E, T24S, R14E, on any day that the Nogales particle pollution risk forecast at http://www.azdeq.gov/environ/air/ozone/nogales.pdf shows the risk of unhealthy particulate matter concentration to be "High" or if the Air Quality Index (AQI) for$PM_{2.5}$ is forecast as "Unhealthy for Sensitive Groups".

D. Additional Operating Limits for All Areas

The Permittee is not allowed to collocate the concrete batch plant with a hot mix asphalt plant, a crushing and screening plant, or another concrete batch plant.

IV. APPLICABLE REGULATIONS

The Department has identified the applicable regulations that apply to each unit at a concrete batch plant facility. Tables 1, 2, 3 and 4 summarize the findings of the Department with respect to the regulations that are applicable to each emissions unit.

Table 1: Applicable Requirements

Unit ID	Control Equipment	Applicable Regulations	Verification
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.

Unit ID	Control Equipment	Applicable Regulations	Verification
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.
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	Control Measures	A.A.C. R18-2-604 through R18-2-607.	Emissions from Fugitive Dust Sources.
Mobile Sources	None	A.A.C. R18-2-801 through A.A.C R18-2-806	Emissions from Mobile Source
Spray Painting Operations	Not Applicable	A.A.C. R18-2-727	This standard is applicable to any spray-painting operation.
Demolition/ Renovation Operations	Not Applicable	A.A.C. R18-2-1101.A.8	This standard is applicable to any asbestos related demolition or renovation operations.
Abrasive Blasting	Not Applicable	A.A.C. R18-2-726 A.A.C. R18-2-702.B	This standard is applicable to any activity related to abrasive blasting operations.

Table 2: Applicable Regulations for Maricopa County

Unit ID	Applicability	Control Equipment	Applicable Regulations	Verification
Facility Wide Requirements	Not Applicable	None	Rule 320 Rule 316	Air Pollution Control Requirements Emission Control System Requirements and Dust Control Plans
Concrete Batch Plants	Not Applicable	Baghouses, Rubber Sleeves and Wet Suppressants	Rule 316	Maricopa County Rule 316-Nonmetallic Mineral Processing.
Internal Combustion Engines	Not Applicable	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	Not Applicable	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	Not Applicable	Rule 315	This standard is applicable to any spray-painting operation.
Abrasive Blasting	Not Applicable	Not Applicable	Rule 312	This standard is applicable to any activity related to abrasive blasting operations.

Table 3: Applicable Requirements for Pima County

Unit ID	Control Equipment	Applicable Regulations	Verification
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.
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: Applicable Requirements for Pinal County

Unit ID	Control Equipment	Applicable Regulations	Verification
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..

VI. PERIODIC MONITORING, RECORDKEEPING AND REPORTING (STATEWIDE)

A. Facility wide General Requirements

1. The Permittee must 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 must 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 must keep on-site records of maintenance performed on all emission related equipment.

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

5. The Permittee must 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.

V. 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.

Compared to the previous modeling efforts for the general permit dated June 2010, this modeling analysis has incorporated the following:

1. The updated methods for the CBP emission inventory that the Arizona Department of Environmental Quality (ADEQ) has developed;

2. The most recent meteorological database ADEQ has created; and

3. The United States Environmental Protect Agency (EPA)'s Modeling Guidance Regarding the implementation of the NAAQS for particulate matter (PM) with a size up to 2.5 µm ($PM_{2.5}$), one-hour nitrogen dioxide (NO_2) and one-hour sulfur dioxide (SO_2).

Based on the modeled results, the following operating limits/conditions for the CBP were

developed:

- A maximum daily throughput of 2,000 yd^3/day;
- 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 a portion of the West Central Pinal $PM_{2.5}$ nonattainment area; and
- Operations in the Nogales PM_{10} /$PM_{2.5}$ nonattainment area in the southern part of Santa Cruz County should comply with the regulations of ADEQ's PM risk forecasts for Nogales and vicinity.

B. Modeling Specifications

1. Model Inputs

The most recent version of the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD, version 14134) 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 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 14337) was used to generate hourly average winds for input to AERMET in Stage 2. Please refer to Table 7 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, and internal combustion engines (generator). Fugitive PM is the primary pollutant emitted from a CBP.

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:

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

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 5 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 and generator;
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.

Tables 6 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)

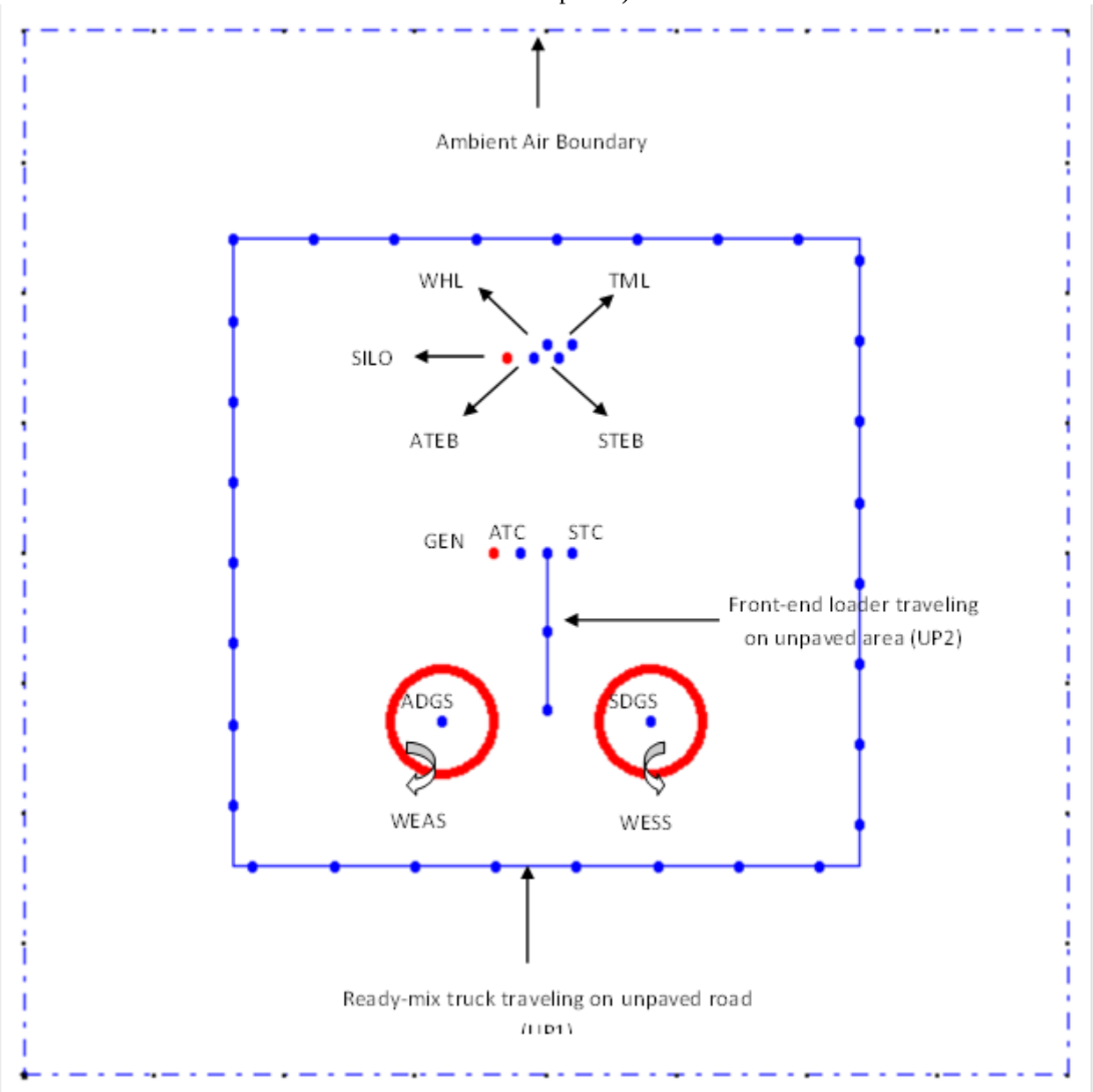


Table 5: Modeled Emission Rates for the CBP[1]

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	1000 HP Generator[2]	2.77E-01	2.77E-01	3.905	7.56E-02	3.281
GEN	750 HP Generator[3]	2.08E-01	2.08E-01	2.936	5.67E-02	2.461
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	7.79E-04
WESS	Sand Storage Pile	7.79E-04	7.79E-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 (controlled)	3.68E-03	7.57E-04
UP1 (1-33)	Truck traveling on paved/unpaved road	9.32E-04	1.33E-04
UP2 (1-3)	Front-end loader traveling on unpaved area	6.10E-03	6.00E-04

1 *Based Upon a Throughput of 2,000 yd^3/day*
2 *Used for all areas except Maricopa County;*
3 *Used for Maricopa County.*

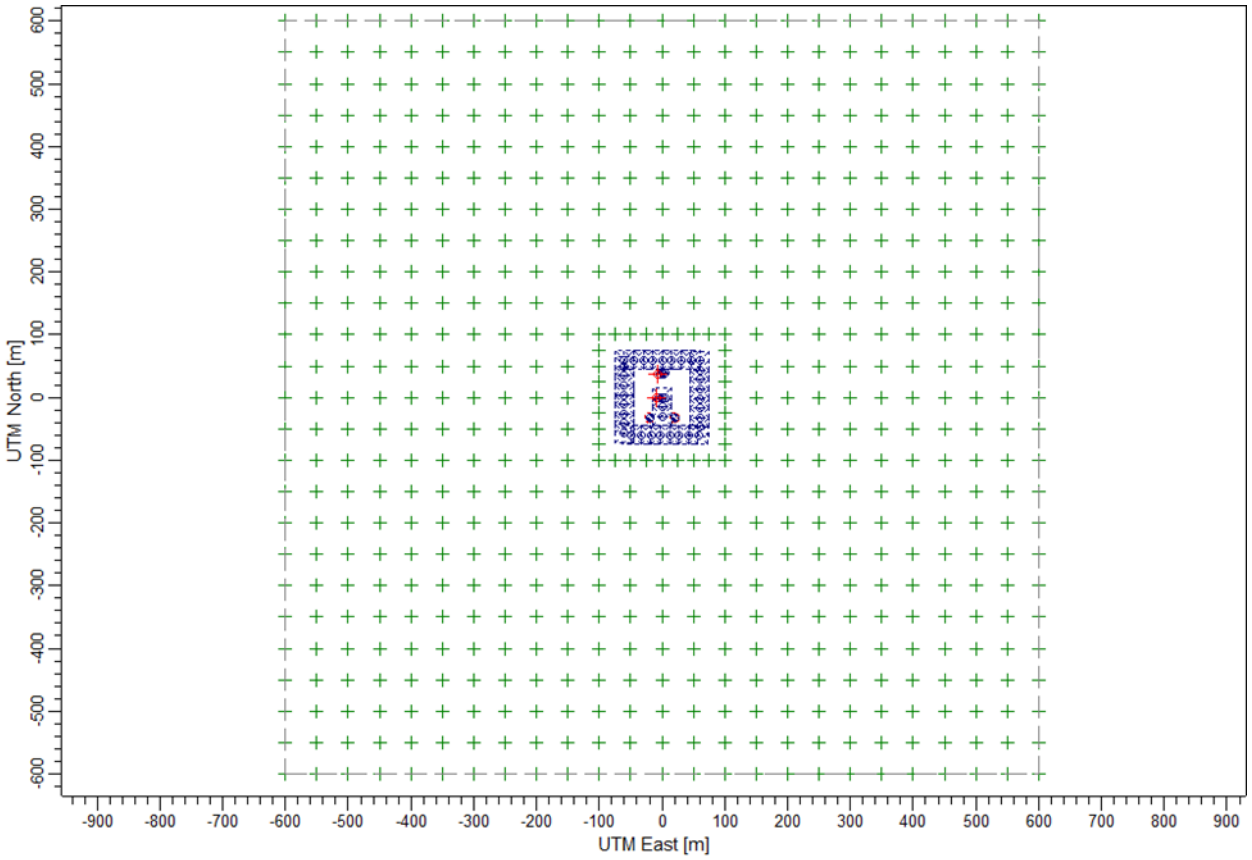
Table 6: Modeled Source Parameters for the CBP

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	Truck Mix Loading (controlled)	3.1	0.25	0.50	
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 500 meters. Since the emission sources modeled are mainly ground level sources, the receptor network beginning at AAB and extending outward to 500 m is sufficiently large to identify the maximum impacts. Figure 2 shows the receptor grid.

Figure 2: Receptor Grid



6. Meteorological Data

As shown in Table 7, 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 also 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.

Table 7: 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)	01/01/2009-12/31/2013	Coconino	Attainment
Kingman	Kingman Airport	Desert Rock (DRA) /Las Vegas (KVEF)	01/01/2009-12/31/2013	Mohave	Attainment
Tucson	Tucson International Airport	Tucson (KTUS)	01/01/2009-12/31/2013	Pima	Attainment
Page	Page municipal Airport	Flagstaff (KFGZ)	01/01/2009-12/31/2013	Coconino	Attainment
Prescott	Prescott Municipal Airport	Flagstaff (KFGZ)	01/01/2009-12/31/2013	Yavapai	Attainment
Safford	Safford Regional Airport	Tucson (KTUS)	01/01/2009-12/31/2013	Graham	Attainment
Springerville	TEP-Springerville[4]	Albuquerque (KABQ)	01/01/1995-12/31/1999	Apache	Attainment
Winslow	Winslow–Lindbergh Regional Airport	Albuquerque (KABQ)	01/01/2009-12/31/2013	Navajo	Attainment
Phoenix	Phoenix Sky Harbor International Airport	Tucson(KTUS)	01/01/2009-12/31/2013	Maricopa	Non-attainment
Casa Grande	Casa Grande Municipal Airport [5]	Tucson (KTUS)	01/01/2009-12/31/2013	Pinal	Non-attainment
Yuma	Yuma Marine Corps Air Station	Tucson (KTUS)	01/01/2009-12/31/2013	Yuma	Non-attainment

7. Background Concentrations

State-level background concentrations for criteria pollutants except PM_{10} were determined according to the 2013 ADEQ Ambient Air Assessment Report and the EPA's Air Quality System (AQS) Data Mart. The PM_{10} background concentrations used in this modeling analysis were identical to those previously used in the 2010 general permit. The background determinations for $PM_{2.5}$ and 1-hour NO_2 are discussed as follows.

a. Background Concentrations for $PM_{2.5}$

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.

4 Site-specific data

5 Not an ASOS station (no AERMINUTE data are available)

To determine state-level background concentrations for $PM_{2.5}$, this modeling analysis first excluded the monitors in the West Central Pinal $PM_{2.5}$ Non-Attainment Area (NAA) as well as the Nogales $PM_{2.5}$ NAA:

Based on the available monitoring data, this modeling analysis further classified the State into four different zones:

- Maricopa County;
- Pinal County (excluding the West Central Pinal $PM_{2.5}$ NAA);
- Yuma County; And
- Remaining Areas

The monitoring data show that the $PM_{2.5}$ concentrations in Maricopa, Pinal and Yuma are significantly higher than other attainment areas. Therefore, the background concentrations were determined individually for each of these three counties. For the remaining areas, the background concentrations were determined by averaging the monitoring concentrations obtained from the monitors in Tucson, Flagstaff and Prescott.

Table 8 summarizes the $PM_{2.5}$ background concentrations used in the CBP modeling analysis.

Table 8: 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
Nogales $PM_{2.5}$ NAA	--	--	--	Limited Prohibition: Comply with the regulations of ADEQ's PM risk forecasts
Maricopa County	24-hour	22	2013 ADEQ Ambient Air Assessment Report (JLG Supersite Monitor)	Average of the 98th percentile 24-hour values over 2011-2013
	Annual	8.5		Average of the annual values over 2011-2013
Pinal County (excluding the GP banned area)	24-hour	19	EPA's Air Quality System (AQS) Data Mart (Casa Grande Monitor)	Average of the 98th percentile 24-hour values over 2011-2013
	Annual	9.1		Average of the annual values over 2011-2013
Yuma County	24-hour	16	2013 ADEQ Ambient Air Assessment Report (Yuma Supersite monitor)	Average of the 98th percentile 24-hour values over 2011-2013
	Annual	7.8		Average of the annual values over 2011-2013

Areas	Averaging Period	Background Concentration (µg/m3)	Source of Data	Note
Other Areas	24-hour	11	2013 ADEQ Ambient Air Assessment Report (Flagstaff Middle school and Prescott Valley monitors) and EPA's Air Quality System (AQS) Data Mart (Orange Grove and Children's Park Monitors)	Average of the 98th percentile 24-hour values over 2011-2013
	Annual	5.1		Average of the annual values over 2011-2013

b. Background Concentrations for 1-Hr NO_2

There are very limited NO_2 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 NO_2, 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 Greenwood, Central Phoenix, JLG Supersite, West Phoenix and Buckeye during 2011-2013 were used to determine the background concentrations for the Phoenix metropolitan area. The monitoring data collected from Children's Park and 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.

The modeling analysis used hour-of-day monitored background concentrations, which were determined as follows:

- For each of the three years (2011-2013) under review, compiled all of the NO_2 concentrations by hour of day (1AM, 2AM, 3AM, etc) and calculated the 98 percentile of NO_2 concentrations for each hour of the day;
- Calculated the background concentrations as the 3 year average of the 98 percentile of concentrations for each hour of the day.

Table 9 provides the background concentrations for modeling 1-hour NO_2.

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

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

Table 9: 1-Hour NO_2 Background Concentrations ($\mu g/m^3$)

	Phoenix Metropolitan Area	Tucson Metropolitan Area	Remaining Areas
HOUR 1	82.3	60.4	35.4
HOUR 2	77.6	53.7	31.8
HOUR 3	73.8	51.1	32.0
HOUR 4	70.6	50.0	32.0
HOUR 5	70.0	48.9	34.4
HOUR 6	71.4	52.6	36.3
HOUR 7	73.3	59.5	36.8
HOUR 8	78.5	62.9	35.1
HOUR 9	82.3	60.7	33.2
HOUR 10	79.6	56.5	25.1
HOUR 11	69.2	48.3	12.0
HOUR 12	62.3	39.6	7.6
HOUR 13	55.5	32.2	6.3
HOUR 14	49.3	25.1	5.0
HOUR 15	46.2	22.8	5.0
HOUR 16	48.0	26.6	4.5
HOUR 17	54.8	36.0	5.7
HOUR 18	76.5	59.4	15.7
HOUR 19	92.2	72.3	34.7
HOUR 20	94.8	76.0	46.9
HOUR 21	95.3	76.1	48.3
HOUR 22	94.1	76.2	47.6
HOUR 23	91.2	74.2	45.4
HOUR 24	87.1	66.5	40.0

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

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)	Source of Data	Note
PM_{10}	24-hour	PM_{10} Attainment Areas: 26 PM_{10} Non-Attainment Areas: 58	--	Used in the 2010 GP
SO_2	3-hour	16	2013 ADEQ Ambient Air Assessment Report (JLG Supersite Monitor)	Highest concentration during 2011-2013
	1-hour	16		99th percentile of the annual distribution of daily maximum 1-hours values averaged across 2011-2013
NO_2	Annual	33	2013 ADEQ Ambient Air Assessment Report (JLG Supersite Monitor)	Highest annual concentration during 2011-2013
CO	8-hour	2,290	2013 ADEQ Ambient Air Assessment Report (JLG Supersite Monitor)	Highest concentration during 2012-2013
	1-hour	3,430		Highest concentration during 2012-2013

8. NO_2 Modeling Methodology

The recent EPA's guidance[6] recommends three-tiered screening approach for modeling NO_2:

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

- Tier 2 Ambient Ratio Method (ARM) – multiply Tier 1 result by empirically-derived NO_2/NO_X ratio, with 0.8 as default ambient ratio for the 1-hour NO_2 standard and 0.75 for annual NO_2 standard. The Ambient Ratio Method 2 (ARM2), which is based on an evaluation of the ratios of NO_2/NO_X from the EPA's Air Quality System (AQS) record of ambient air quality data, may also be used under certain circumstances.

- Tier 3 - Plume Volume Molar Ratio Method (PVMRM)/ Ozone Limiting Method (OLM) – both methods account for ambient conversion of NO to NO_2 in the presence of ozone, namely the ozone titration mechanism. Two key model inputs are needed, namely in-stack ratios of NO_2/NO_X emissions and background ozone concentrations.

The CBP modeling analysis employed the following approach for modeling NO_2:

- ARM with the default ambient ratio of 0.75 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 Central Phoenix 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 the Phoenix/Tucson metropolitan areas while the Rural Dispersion option for other areas;
    - NO_2 background concentrations as listed in Table 9 were directly input to the model with the HROFDY option.

9. Modeled Results

The modeled results are summarized in Tables 11, 12, 13, 14, 15. 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

6 http://www.epa.gov/ttn/scram/guidance/clarification/NO2_Clarification_Memo-20140930.pdf

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 11: Modeled Results for $PM_{2.5}$

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	3.8	11	5.1	19.5	8.9	24-hour: 35 Annual: 12
Kingman	13.3	4.1	11	5.1	24.3	9.2	
Tucson	12.4	3.5	11	5.1	23.4	8.6	
Page	7.4	3.2	11	5.1	18.4	8.3	
Prescott	12.1	5.9	11	5.1	23.1	11.0	
Safford	12.5	4.1	11	5.1	23.5	9.2	
Springerville	10.8	3.2	11	5.1	21.8	8.3	
Winslow	11.2	3.7	11	5.1	22.2	8.8	
Phoenix	6.9	3.1	22	8.5	28.9	11.6	
Casa Grande	12.3	2.5	19	9.1	31.3	11.6	
Yuma	12.7	3.3	16	7.8	28.7	11.1	

Table 12: Modeled Results for 24-hour PM_{10}

Meteorological data sets	Modeled concentration ($\mu g/m^3$)	Background concentration ($\mu g/m^3$)	Total concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
Flagstaff	37	26	63	150
Kingman	42	26	68	
Tucson	39	26	65	
Page	49	26	75	
Prescott	68	26	94	
Safford	43	26	69	
Springerville	46	26	72	
Winslow	46	26	72	
Phoenix	46	58	104	
Casa Grande	36	58	94	
Yuma	54	58	112	

Table 13: Modeled Results for NO_2

Meteorological data sets	Modeled concentration ($\mu g/m^3$)		Background concentration ($\mu g/m^3$)		Total concentration ($\mu g/m^3$)		NAAQS ($\mu g/m^3$)
	1-hour[7]	Annual	1-hour[8]	Annual	1-hour	Annual	
Flagstaff	107	22	-	33	107	55	
Kingman	184	32	-	33	184	65	
Tucson	159	17	-	33	159	50	
Page	158	11	-	33	158	44	
Prescott	152	19	-	33	152	52	1-hour: 189
Safford	180	35	-	33	180	68	
Springerville	174	20	-	33	174	53	Annual: 100
Winslow	185	23	-	33	185	56	
Phoenix	188	10	-	33	188	43	
Casa Grande	159	17	-	33	159	50	
Yuma	171	16	-	33	171	49	

Table 14: Modeled Results for SO_2

Meteorological data sets	Modeled concentration ($\mu g/m^3$)		Background concentration ($\mu g/m^3$)		Total concentration ($\mu g/m^3$)		NAAQS ($\mu g/m^3$)
	1-hour	3-hour	1-hour	3-hour	1-hour	3-hour	
Flagstaff	8.6	7.5	16	16	24.6	23.5	
Kingman	12.1	11.2	16	16	28.1	27.2	
Tucson	11.8	10.7	16	16	27.8	26.7	
Page	12.4	11.9	16	16	28.4	27.9	
Prescott	11.7	11.2	16	16	27.7	27.2	1-hour: 196
Safford	12.0	10.9	16	16	28.0	26.9	3-hour:
Springerville	11.7	11.2	16	16	27.7	27.2	1,300
Winslow	12.0	11.0	16	16	28.0	27.0	
Phoenix	12.0	11.2	16	16	28.0	27.2	
Casa Grande	11.9	10.6	16	16	27.9	26.6	
Yuma	11.9	11.5	16	16	27.9	27.5	

7 Background concentrations have been included in the model runs. Therefore, the reported concentrations reflect the total concentrations of modeled concentrations plus background concentrations.
8 See Table 5

Table 15 Modeled Results for CO

Meteorological data sets	Modeled concentration ($\mu g/m^3$)		Background concentration ($\mu g/m^3$)		Total concentration ($\mu g/m^3$)		NAAQS ($\mu g/m^3$)
	1-hour	8-hour	1-hour	8-hour	1-hour	8-hour	
Flagstaff	444	306	3,430	2,290	3,874	2,596	
Kingman	566	443	3,430	2,290	3,996	2,733	
Tucson	558	437	3,430	2,290	3,988	2,727	
Page	588	423	3,430	2,290	4,018	2,713	1-hour: 40,000
Prescott	579	420	3,430	2,290	4,009	2,710	
Safford	567	390	3,430	2,290	3,997	2,680	
Springerville	553	459	3,430	2,290	3,983	2,749	8-hour: 10,000
Winslow	568	407	3,430	2,290	3,998	2,697	
Phoenix	594	336	3,430	2,290	4,024	2,626	
Casa Grande	572	443	3,430	2,290	4,002	2,733	
Yuma	563	514	3,430	2,290	3,993	2,804	

VI. LIST OF ABBREVIATIONS

A.A.C. ..... Arizona Administrative Code
ADEQ ..... Arizona Department of Environmental Quality
ATO ..... Authorization to Operate
CFR ..... Code of Federal Regulations
CO ..... Carbon Monoxide
EPA ..... Environmental Protection Agency
g ..... Gram
HAP ..... Hazardous Air Pollutant
K ..... Kelvin
lb/hr ..... Pound per Hour
m ..... Meter
Met ..... Meteorological Data
MMBtu/hr ..... Million British Thermal Units per Cubic Foot
NAAQS ..... National Ambient Air Quality Standards
NO_x ..... Nitrogen Oxides
NSPS ..... New Source Performance Standards
PAB ..... Process Area Boundary
P.C.C. ..... Pima County Code
PM ..... Particulate Matter
PM_{10} ..... Particulate Matter Nominally less than 10 Micrometers
$PM_{2.5}$ ..... Particulate Matter Nominally less than 2.5 Micrometers
PTE ..... Permanent Total Enclosure
s ..... Second
SO_2 ..... Sulfur Dioxide
tph ..... Ton per Hour
VOC ..... Volatile Organic Compound
yd^3 ..... Cubic Yards
$\mu g/m^3$ ..... Microgram per Meter Cubed