AIR QUALITY DISPERSION MODELING REPORT
CONCRETE BATCH PLANT CLUSTER – GUNTER, TX

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EXECUTIVE SUMMARY

A dispersion modeling study has been conducted for emissions of particulate matter less than 2.5 microns ($PM_{2.5}$), particulate matter less than 10 microns (PM_{10}), and nitrogen oxides (NOx) associated with a cluster of five adjacent concrete batch plants located near Gunter, TX. The dispersion modeling analysis has been prepared by Air Resource Specialists, Inc. (ARS) of Fort Collins, Colorado.

Each concrete batch plant considered in the dispersion modeling analysis has been granted or has applied for approval under the Texas Air Quality Standard Permit for Concrete Batch Plants (Effective September 22, 2021). Under the Standard Permit, concrete production at a single site is limited to no more than 300 cubic yards per hour or 6,000 cubic yards per day. ARS understands that each of the five concrete batch plants considered in this analysis has been considered a separate "site" by the Texas Commission on Environmental Quality (TCEQ) and as such, each plant has been granted or has applied for the Standard Permit. Under the Standard Permit, the term "site" is defined as follows: *The total of all stationary sources located on one or more contiguous or adjacent properties, which are under common control of the same person (or persons under common control).*

In this situation, each Standard Permit has been issued to a separate company. However, the five concrete batch plants are located on contiguous and adjacent properties and have a common plant access road from the closest public road (Wall Street Road). The permit applications have represented that each plant was a single site, but the applications submitted to TCEQ did not acknowledge the presence of any adjacent concrete batch plants. In the opinion of Clean Air Gunter, the five concrete batch plants are functionally a single plant and the separate ownership for each plant appears to be an attempt to circumvent the Standard Permit capacity restriction for concrete production at a single site.

Dispersion modeling was conducted using the AMS/EPA Regulatory Model (AERMOD) Version 21112. AERMOD was executed as per 40 CFR 51 Appendix W and used all regulatory default model inputs.

Modeling results are summarized in Table ES-1. The modeling results indicate exceedances of the applicable National Ambient Air Quality Standards (NAAQS). Therefore, the dispersion modeling study concludes that the Texas Air Quality Standard Permit for Concrete Batch Plants (Effective Date September 22, 2021) is not protective of the NAAQS when multiple concrete batch plants are located in close proximity to one another.

Table ES-1

SUMMARY OF MODELING RESULTS
WALL STREET ROAD CONCRETE BATCH PLANT CLUSTER: GUNTER, TX
SOURCE IMPACT ONLY (NO BACKGROUND ADDED)

Pollutant	Averaging Time	Rank	Maximum Air Quality Impact	NAAQS
$PM_{2.5}$	24-Hour	H8H	129.4 $\mu g/m^3$	35.0 $\mu g/m^3$
PM_{10}	24-Hour	H2H	1509.4 $\mu g/m^3$	150 $\mu g/m^3$
NO_2	1-Hour	H8H	208.4 $\mu g/m^3$	188 $\mu g/m^3$

1.0 INTRODUCTION AND BACKGROUND

1.1 Overview

A dispersion modeling study has been conducted for emissions of particulate matter less than 2.5 microns ($PM_{2.5}$), particulate matter less than 10 microns (PM_{10}), and nitrogen oxides (NOx) associated with a cluster of five adjacent concrete batch plants located near Gunter, TX. The dispersion modeling analysis has been prepared by Air Resource Specialists, Inc. (ARS) of Fort Collins, Colorado.

Each concrete batch plant considered in the dispersion modeling analysis has been granted or has applied for approval under the Texas Air Quality Standard Permit for Concrete Batch Plants, (Effective September 22, 2021). Under the Standard Permit, concrete production at a single site is limited to no more than 300 cubic yards per hour or 6,000 cubic yards per day. ARS understands that each of the five concrete batch plants in this modeling analysis has been considered a separate “site” by the Texas Commission on Environmental Quality (TCEQ) and as such, each plant has been granted or has applied for a separate Standard Permit. Under the Standard Permit, the term “site” is defined as follows: *The total of all stationary sources located on one or more contiguous or adjacent properties, which are under common control of the same person (or persons under common control).*

In this situation, separate companies have applied for the Standard Permits. However, the five concrete batch plants are all located on contiguous and adjacent properties and have a common plant access road from the closest public road (Wall Street Road). The permit application for the various concrete batch plants have represented that each plant is a single site, but the applications submitted to TCEQ did not referenceor acknowledge the presence of any adjacent concrete batch plants. In the opinion of Clean Air Gunter, the five concrete batch plants are functionally a single plant and the separate ownership for each plant appears to be an attempt to circumvent the Standard Permit capacity restriction for concrete production at a single site.

Dispersion modeling was conducted using the AMS/EPA Regulatory Model (AERMOD) Version 21112. AERMOD was executed as per 40 CFR 51 Appendix W and used all regulatory default model inputs.

1.2 Site Description

Permit applications have been submitted for five separate concrete batch plants to be located at or near 873 Wall Street Road. Gunter, TX. The five companies are listed below:

- Nelson Brothers
- Wildcatter Redi Mix
- Terra Enterprise
- Preferred Materials LLC
- Metroplex Gunite

The Standard Permit applications submitted by each company to TCEQ have conflicting information in that the individual properties described under each application appear to overlap. None of the permit applications reference or acknowledge the adjacent concrete batch plant facilities nor do any of the application materials show the proposed concrete batch plant locations in reference to one another. Because the permitapplications lack reliable site information for each concrete batch plant, an idealized siteplan was developed by ARS for the modeling study. The expected location of the five plants as used for the modeling study has been presented in Figure 1.

Figure 1: Concrete Batch Plant Locations Assumed for Dispersion Modeling Idealized Locations Based on Application Data Submitted to TCEQ

The Google Earth image used for the base map (Figure 1) showed one existing concrete batch plant (Nelson Brothers). In order to develop the idealized configuration for the concrete batch plant cluster, each adjacent plant was assumed to mimic the size and equipment configuration of the Nelson Brothers plant shown on Google Earth. The five plants were arranged in an "L" shape on properties adjacent to the Nelson Brothers site. Wildcatter Redi Mix was assumed to be located directly north of Nelson Brothers and Preferred Materials was then assumed to be directly north of Wildcatter. Terra Enterprise was assumed to be located directly east of Nelson Brothers and Metroplex Gunite was assumed to be directly east of Terra.

All five plants share a common access road to reach the nearest public roadway (Wall Street Road). ARS' information is that the common access road connecting the concrete batch plant cluster to Wall Street Road is not a public road. The access road is visible on Figure 1.

2.0 EMISSIONS INVENTORY

In order to simplify the dispersion modeling analysis, only the most significant emission sources associated with each concrete batch plant were considered. Smaller minor sources of emissions were not evaluated. The emissions considered were as follows:

- Concrete Batch Plant Truck Loading
- Truck Traffic Fugitive Dust Emissions
- Diesel-Fired Electric Generator

The details for these emission calculations are presented in the sections below. The modeling and associated emissions addressed the maximum daily emissions as allowed under the Standard Permit for Concrete Batch Plants (Effective Date: September 22, 2021), unless the permit application for an individual site listed a lower production rate. A printed copy of the emission calculation spreadsheets has been provided in Attachment 1.

2.1 Concrete Batch Plant Emissions

The concrete batch plant emissions were derived using EPA's Compilation of Air Pollution Emission Factors (AP-42), Section 11.12 (Concrete Batching).

Under AP-42, emission estimates for PM_{10} are presented for a range of activities associate with concrete batch plant operations. However, the greatest magnitude of PM_{10} emissions occurs from concrete truck loading. As such, only the concrete truck loading emissions were considered in this analysis.

The concrete truck loading emissions are presented below (Table 1).

As per AP-42, emissions are calculated based on the weight of the cement and cement supplement[1]. Using information in AP-42, this is estimated at 564 lb/cu yard, consisting of 491 lb/cu yd for cement and 73 lb/cu yd for cement supplement.

Two concrete batch plant sizes were considered. The larger plant size used the maximum allowable production in the Standard Permit, or 6,000 cu yd per day. The Standard Permit daily production restriction is limiting as the hourly production restriction of 300 cu yd per day would exceed 6,000 cu yd per day if the plant operated continuously over 24 hours. The larger plant size was applied at three plants (Nelson Brothers, Wildcatter, and Preferred Materials). The smaller plant size of 150 cu yd per hour was used for two of the concrete batch plants (Terra Enterprises and Metroplex Gunite) based on the plant production data presented in the permit applications.

[1] AP-42, Table 11.12-2, Footnote g

$PM_{2.5}$ emissions are not explicitly identified in AP-42 Table 11.12-2 for concrete truck loading. As such, the $PM_{2.5}$ emissions factor was estimated using the $PM_{2.5}$ to PM_{10} ratios as taken from AP-42, Table 11.12-3.

Table 1
PM-10 & PM-2.5 Emissions from Concrete Truck Loading

		AP-42 Factor[2]	Larger Plant 6,000 cu yd/day		Smaller Plant 150 cu yd/hr	
		lb/ton	lb/day	g/sec	lb/hr	g/sec
PM_{10}	Uncontrolled	0.31	524.53	2.76	13.11	1.65
	Controlled	0.0263	44.50	0.23	1.11	0.14
$PM_{2.5}$	Uncontrolled	0.05	84.60	0.44	2.12	0.27
	Controlled	0.003945	6.67	0.035	0.17	0.021

For the modeling, the controlled PM_{10} and $PM_{2.5}$ emissions were used for input to AERMOD based on the emissions control requirements imposed in the TCEQ Standard Permit. Emissions were input to AERMOD as a volume source located at the center of each concrete batch plant property with an assigned a release height of 3.0 meters and assumed volume dimensions of 1 meter x 1 meter x 1 meter. These assumptions yielded an estimate of 0.465 meters for both the initial horizontal dimension (sigma y_o) and initial vertical dimension (sigma z_o).

2.2 Truck Traffic Fugitive Dust

The concrete batch plant cluster modeling also considered fugitive dust emissions released from truck traffic entering and exiting the different facilities. Truck traffic considered included both the concrete trucks carrying product to customers as well as trucks bringing raw materials to the site. Fugitive dust emissions from truck traffic are not normally considered in TCEQ permit analyses but were considered in the ARS concrete batch plant cluster modeling because the associated fugitive emissions are significant and have a real impact on local air quality.

[2] AP-42, Table 11.12-2

For concrete trucks, the truck capacity was assumed to be 7.85 cu yd per truck based on concrete mixer truck specifications found from an internet search.[3] This assumption yielded 765 trucks per day for the larger plants (6,000 cu yd/day) and 459 trucks per day for the smaller plants (150 cu yd/hr). For the raw materials, the calculations used 564 lb/cu yd for cement and cement supplement as described previously and an average load size of 25 tons, which is typical load for over the road trucks. With these assumptions, the raw material deliveries were calculated to be 68 trucks per day for the larger plants (6,000 cu yd/day) and 41 trucks per day for the smaller plants (150 cu yd/hr).

The five concrete batch plants considered in this modeling analysis have the potential to generate a combined total of almost 3,500 truck trips per day, which is approximately one truck every minute on average. All of the associated truck traffic would enter/exit along a common access road segment to reach the nearest public roadway, i.e., Wall Street Road.

The AP-42 calculations for truck traffic fugitive dust require the average vehicle weight. These calculations were based upon data for the cement mixer trucks since the mixer trucks generate the majority of the traffic. Using the concrete mixer truck specification data described previously, the estimated truck empty weight was 18 tons. The loaded weight was estimated to be 33.7 tons based on the average truck load of 7.85 cu yd per truck described previously (equal to 15.7 ton/truck). The average of 25.85 tons was then applied for the vehicle weight in the AP-42 calculations, which represents the average vehicle weight for trucks making a round trip to/from the batch plants.

The PM_{10} and $PM_{2.5}$ emissions were calculated using the emissions factor equation presented in AP-42, Section 13.2.2 (Unpaved Roads), Equation 1a, as documented below:

$E = k * (s/12)^a * (w/3)^b$, where:

k = constant, 1.5 for PM_{10} and 0.15 for $PM_{2.5}$
s = silt content (4.8% assumed)[4]
w = average vehicle weight (25.85 tons, as described above)
a = constant, 0.9
b = constant, 0.45

Using the above data, the calculated emission factors are:

PM_{10} = 1.73 lb/VMT
$PM_{2.5}$ = 0.17 lb/VMT

[3] https://www.readymix2go.co.uk
[4] AP-4, Table 13.2.2-1, Average road silt content for sand and gravel processing

For the AERMOD modeling, truck traffic fugitive dust emissions were assigned to one of eleven (11) road segments. The road segments and other source locations are illustrated in Figure 2. Road segment #1 is the entry/exit at Wall Street Road and the segments are numbered sequentially as one moves east and north from the Wall Street Road entry/exit point. The assumed access roads for each individual concrete batch plant were assumed to intersect the common access road at the southeast corner of each individual batch plant property and were aligned north/south just outside the east boundary of each individual facility. At the midpoint of the eastern boundary for each facility, the truck traffic was assumed to turn 90 degrees to enter each facility. The internal roads within each facility were assumed to run from this point to the truck loading station at the center of each facility. The details for the truck traffic fugitive dust calculations for each road segment are provided in the calculation spreadsheet (See Attachment 1).

Based on the Standard Permit, fugitive dust controls are required to mitigate dust generated from vehicle traffic. A control factor of 75% was applied to account for fugitive dust mitigation on road segments internal to each plant site. However, because the Standard Permit requires fugitive dust mitigation only within the identified batch plant boundary, no dust mitigation was assumed for road segments outside of the plant properties, such as the common access road.

Figure 2
AERMOD Source Input Locations

For AERMOD, the truck traffic fugitive dust was modeled using current US Environmental Protection Agency (EPA) recommendations for haul road truck traffic[5]. The "area source" approach listed by EPA was followed. The road width was assumed to be 8.0 meters, which would represent a standard two-lane roadway and the truck heightfrom the specification data described earlier was 12 feet.

Following the EPA "area source" haul road modeling recommendations, the plume width was calculated using the roadway width plus 6 meters, which for this modeling study was 14.0 meters (6 + 8 = 14). For the vertical plume dimension, the top of the plume was assumed to be 1.7 * truck height or 20.4 feet (6.2 meters). The emissions release height would be the midpoint of the vertical dimension, or 3.1 meters. The initial vertical dimension (sigma z_o) was calculated to be 2.88 meters (sigma z_o = Plume height / 2.15).

[5] Haul Road Workgroup Final Report to EPA-OAQPS, March 12, 2012.

2.3 Diesel-Fired Generator Engines

Under the TCEQ Standard Permit for Concrete Batch Plants, each plant is allowed a generator engine up to 1,000 horsepower (hp) is size. The nitrogen oxide (NOx) emissions associated with a 1,000 hp diesel-fired engine was included in the modeling.

The Standard Permit requires that any generator engine meet the New Source Performance Standards (NSPS) as applicable, codified at 40 CFR 60 Subpart IIII. Under Subpart IIII, the emission limitations are variable based on the age and size of the engine.

For the purpose of this modeling study, the engine NOx emissions were calculated using the applicable Subpart IIII emissions limit for certain Tier 1 engines, or 9.8 g/KW-hr (equal to 7.3 g/hp-hr). At this emission rate, a 1,000 hp generator engine would have NOx emissions of 16.08 lb/hr (2.028 g/sec). A newer engine would have lower emissionsthan assumed by the modeling. However, an older engine that predates Subpart IIII would have no maximum allowable NOx emissions.

The TCEQ Standard Permit sets 8 feet as minimum stack height for any associated generator engine, and this stack height was used for the engine NOx modeling. For the other engine parameters, ARS used data describing a 750 hp engine located in our archives from a prior modeling study, as itemized below:

- Exhaust Temperature = 915 deg F
- Stack Diameter = 0.75 ft
- Stack Velocity = 240 ft/sec

3.0 DISPERSION MODELING INPUT DATA

3.1 Model Selection and Technical Inputs

Dispersion modeling was conducted using the AMS/EPA Regulatory Model (AERMOD) Version 21112. All AERMOD technical options selected followed the regulatory default option. Model inputs also specified rural conditions for dispersion coefficients and other variables. ARS uses the BEEST interface for AERMOD developed by Providence Engineering.

The application of AERMOD followed applicable guidance from the *EPA Guideline for Air Quality Models* (40 CFR 51, Appendix W). For the conversion of generator engine NOx emissions to the regulated form, e.g., nitrogen dioxide (NO_2), ARS applied the ambient ratio method (ARM2) as recommended in Appendix W. ARM2 data inputs used the EPA-recommended default values (max = 0.9, min = 0.5).

All modeling used the Universal Transverse Mercator (UTM) grid coordinates. Electronic copies of the various AERMOD input/output files are available upon request.

The design concentrations for comparison to the NAAQS were based on the form of the NAAQS. For PM_{10}, ARS used the highest-second highest (H2H) predicted 24-hour PM_{10} concentration because the NAAQS allows one exceedance per year. For $PM_{2.5}$ and NO_2, the modeling used the highest-eighth-highest (H8H) concentration because both the $PM_{2.5}$ and NO_2 NAAQS are based on the 98^{th} percentile concentration.

3.2 Receptor Inputs

For this modeling study, ARS calculated the modeled concentrations for locations in the immediate vicinity of the concrete batch plant cluster, where the concentrations are expected to the at or close to the maximum impact levels. Receptors surrounding the concrete batch plant cluster at a resolution of 100 meters were input to AERMOD. Any receptor falling within the property boundary for any individual concrete batch plant was excluded from the modeling.

Terrain elevations for receptors were determined using the 3D Elevation Program (3DEP), formerly the National Elevation Dataset (NED). The 3DEP elevation data at a resolution of 1-arcsecond were downloaded from EPA at https://gaftp.epa.gov/Air/aqmg/3dep/. Terrain heights for emissions sources and receptors and were then calculated using the 3DEP elevation data and the most recent version of AERMAP (Version 18081), which is supplied with the BEEST AERMOD modeling software. The EPA website provides the 3DEP elevation data in a format compatible with AERMAP without any additional manipulation/formatting by the user.

3.3 Meteorological Data Inputs

The dispersion modeling study used meteorological data downloaded from TCEQ. ARS used the calendar year 2016 preprocessed meteorological data file recommended by TCEQ for the Gunter location (Grayson County).

The Grayson County meteorological data were generated by TCEQ using surface meteorological data from Denton (TX) Municipal Airport (WBAN = 3991) and corresponding upper air data collected at Fort Worth TX (WBAN = 3990). Based on the TCEQ documentation, the meteorological data were processed by TCEQ using AERMET Version 19191 and applied the U-Star option as recommended by Appendix W.

On the TCEQ website, preprocessed meteorological data are available for different surface roughness heights. ARS selected preprocessed TCEQ data calculated using the "medium" surface roughness height (0.1 to 0.7 meters).

4.0 RESULTS AND DISCUSSION

4.1 Particulate Matter (PM_{10} & $PM_{2.5}$)

Table 2 summarizes the concrete batch plant cluster AERMOD dispersion modeling results for PM_{10} and $PM_{2.5}$ and compares the results to the applicable NAAQS. Dispersion modeling results are presented for the 24-hour average using the highest 2nd highest (H2H) modeled concentration for PM_{10} and the highest 8th highest (H8H) modeled concentration for $PM_{2.5}$. This approach for selecting the design value matches the form of the NAAQS. The PM_{10} NAAQS allows for once exceedance per year, so the H2H concentration is the appropriate design value. The $PM_{2.5}$ NAAQS is based on the 98th percentile concentration and the H8H concentration represents the 98th percentile when a one-year period is considered.

The modeled impacts in Table 2 are for the modeled emission sources, which include the concrete mixer truck loading operations plus fugitive dust from truck traffic entering and exiting each batch plant. No other PM_{10} and $PM_{2.5}$ emission sources at the concrete batch plant were considered, such as material stockpiles, loading and handling of raw materials, equipment traffic (e.g., front end loader) on unpaved areas within the plant. Also, a background concentration has not been added to these results.

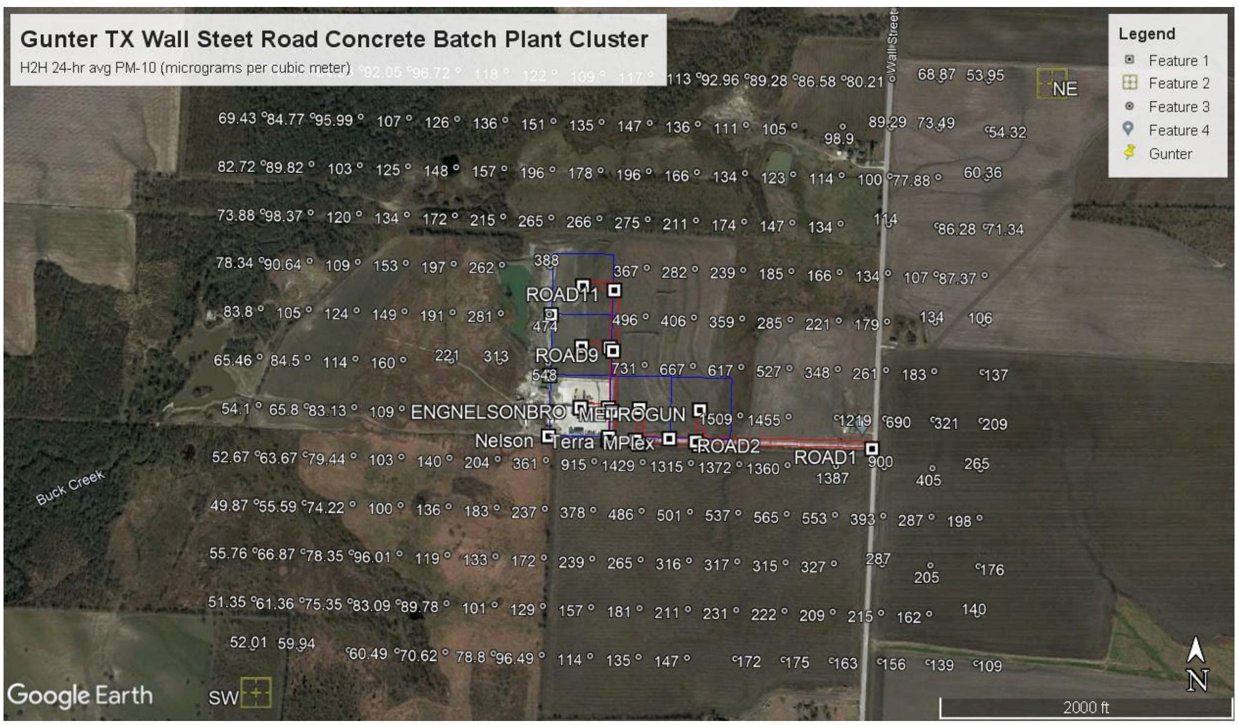
Only the 24-hour average concentrations have been reported from the modeling because the emission calculations were representative of the worst-case emissions day with all plants operating at the maximum capacity identified in the respective applications for the TCEQ Standard Permit.

Table 2
Predicted PM_{10} and $PM_{2.5}$ Concentrations
Gunter TX Wall Street Road Concrete Batch Plant Cluster

Pollutant	Averaging Period	Rank	Model Concentration Prediction	PRIMARY NAAQS
			($\mu g/m^3$)	($\mu g/m^3$)
$PM_{2.5}$	24-Hour Average	H2H	17.23	35
PM_{10}	24-Hour Average	H8H	44.24	150

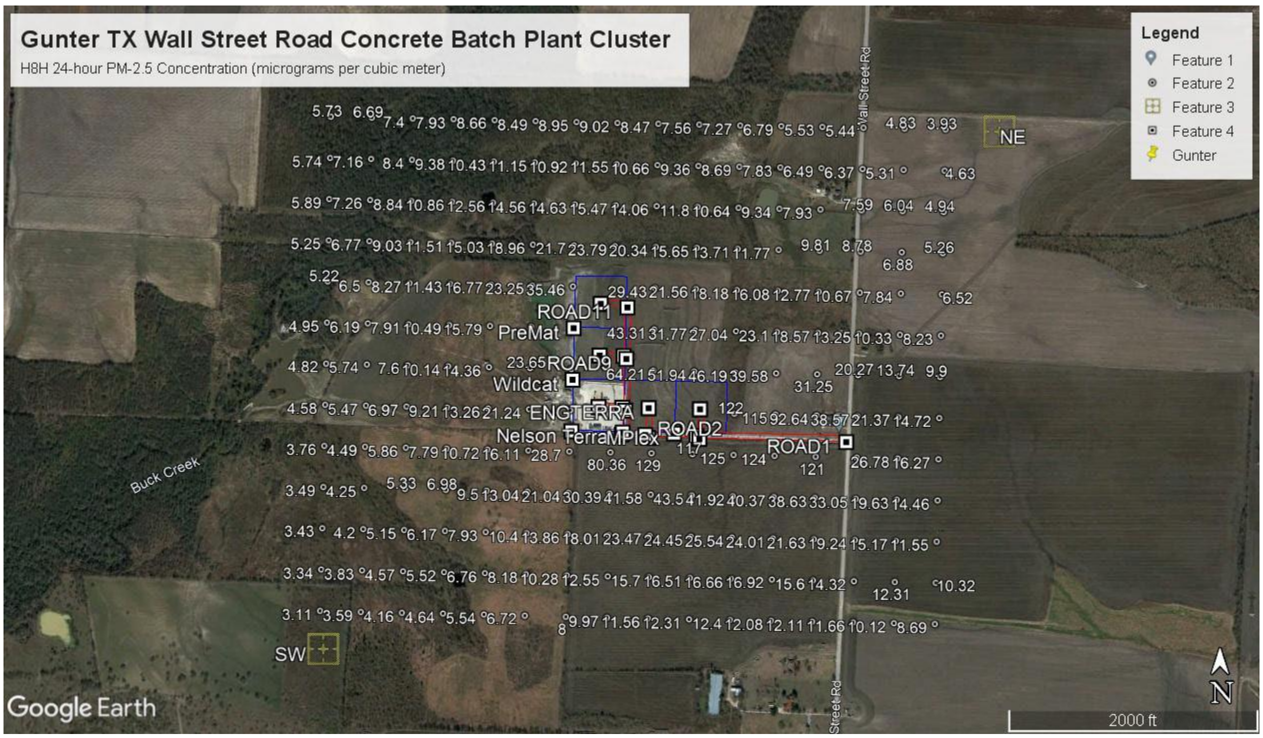
Dispersion modeling predicted that the H2H 24-hour average PM_{10} concentration would be 1509.4 $\mu g/m^3$. For comparison, PM_{10} NAAQS for the 24-hour averaging period is 150 $\mu g/m^3$. The geographic distribution of PM_{10} concentrations overlayed on Google Earth has been provided in Figure 3. The figure shows the modeled H2H 24-hour average PM_{10} concentration plotted at each receptor. Readers with an electronic copy of the document may zoom in on the image to provide greater clarity.

Figure 3
Wall Street Road Concrete Batch Plant Cluster
H2H 24-hour PM_{10} Concentrations ($\mu g/m^3$)



Dispersion modeling predicted that the H8H 24-hour average $PM_{2.5}$ concentration would be 129.4 $\mu g/m^3$. For comparison, $PM_{2.5}$ NAAQS for the 24-hour averaging period is 35 $\mu g/m^3$. The geographic distribution of $PM_{2.5}$ concentrations overlayed on Google Earth has been provided in Figure 4. The figure shows the modeled H8H $PM_{2.5}$ 24-hour average concentration plotted at each receptor. Readers with an electronic copy of the document may zoom in on the image to provide greater clarity.

Figure 4
Wall Street Road Concrete Batch Plant Cluster
H8H 24-hour PM_{10} Concentrations ($\mu g/m^3$)



The modeling predicted that both the PM_{10} and $PM_{2.5}$ NAAQS in the vicinity of the concrete batch plant cluster would be exceeded by a very wide margin. The modeled PM_{10} concentration exceeded the NAAQS by about a factor of 10 and the modeled $PM_{2.5}$ concentration exceeds the NAAQS by about a factor of 3 to 4. The modeling results also suggested that the fugitive dust from truck traffic along the access road from Wall Street Road would be the primary cause of the predicted NAAQS violations.

4.2 Nitrogen Dioxide (NO_2)

Table 3 summarizes the concrete batch plant cluster AERMOD dispersion modeling results for NO_2 and compares the results to the applicable NAAQS. Dispersion modeling results are presented for the 1-hour average using the highest 8th highest (H8H) modeled concentration. This approach for selecting the design value matches the form of the NAAQS. The NO_2 1-hour average NAAQS is based on the 98th percentile of the daily maximum concentration and the H8H concentration represents the 98th percentile when a one-year period is considered.

The modeled impacts in Table 3 were for the modeled emission sources, which included only the 1,000 hp diesel-fired generator engine allowed under the Standard Permit. No other NOx emission sources at the concrete batch plant were considered, such as NOx combustion emissions from the large number of trucks entering/leaving the batch plat cluster. All of the truck traffic would be concentrated along the access road from Wall Street Road. Also, a background concentration has not been added to these results.

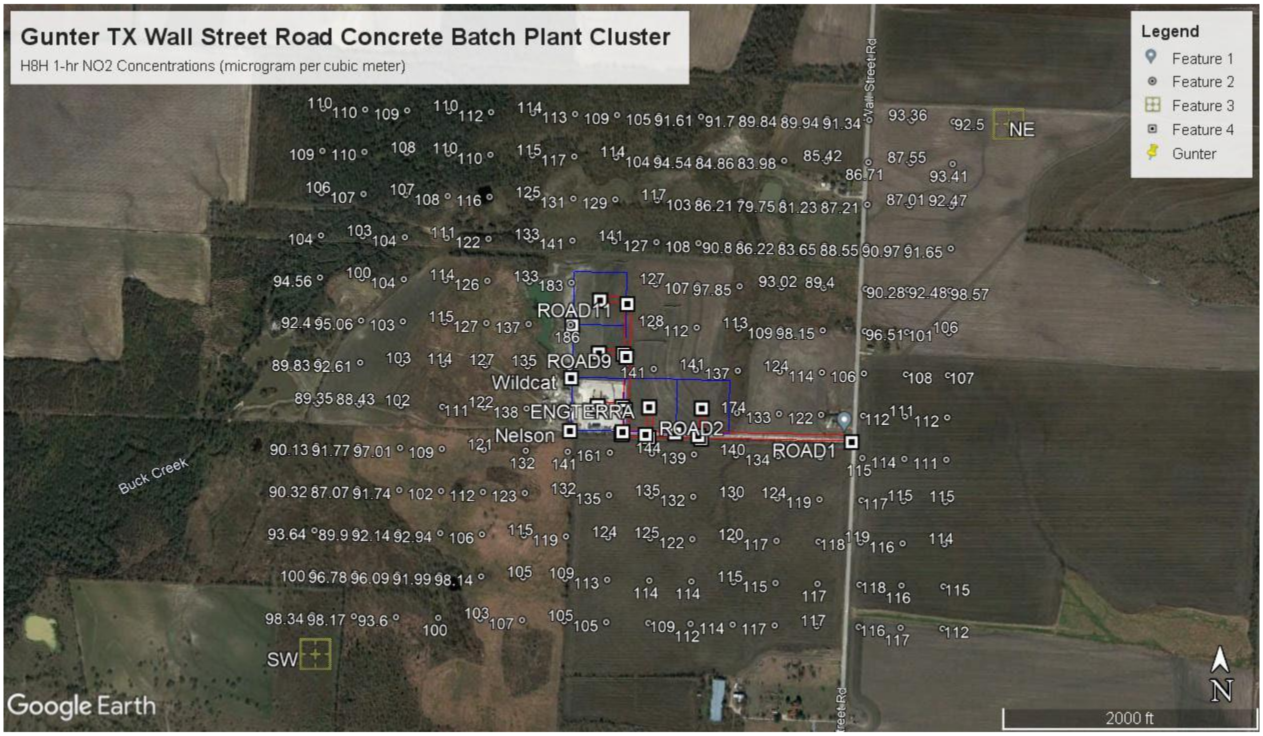
Only the 1-hour average NO_2 concentrations have been reported because the emission calculations were representative of the worst-case emissions with all engines operating at the maximum capacity identified the TCEQ Standard Permit, e.g.,1,000 hp.

Table 3
Predicted NO_2 Concentrations
Gunter TX Wall Street Road Concrete Batch Plant Cluster

Pollutant	Averaging Period	Rank	Model Concentration Prediction	PRIMARY NAAQS
			(μg/m^3)	(μg/m^3)
NO_2	1-Hour Average	H8H	208.4	188

Dispersion modeling predicted that the H8H 1-hour average NO_2 concentration would be 208.4.4 μg/m^3. For comparison, NO_2 NAAQS for the 1-hour averaging period is 188 μg/m^3. The geographic distribution of NO_2 concentrations overlayed on Google Earth is provided in Figure 5. The figure shows the modeled H8H NO_2 1-hour average concentration plotted at each receptor. Readers with an electronic copy of the document may zoom in on the image to provide greater clarity.

Figure 5
Wall Street Road Concrete Batch Plant Cluster
H8H 1-hour NO_2 Concentrations ($\mu g/m^3$)



4.3 Discussion/Conclusions

A dispersion modeling study has been conducted for emissions associated with a cluster of five adjacent concrete batch plants located near Gunter, TX. Dispersion modeling was conducted using the AMS/EPA Regulatory Model (AERMOD) Version 21112. AERMOD was executed as per 40 CFR 51 Appendix W and used all regulatory default model inputs. The dispersion modeling analysis was prepared by Air Resource Specialists, Inc. (ARS) of Fort Collins, Colorado.

The modeling results indicated exceedances of the applicable National Ambient Air Quality Standards (NAAQS) for all pollutants (PM_{10}, $PM_{2.5}$ and NO_2). Therefore, the dispersion modeling study concludes that the Texas Air Quality Standard Permit for Concrete Batch Plants (Effective Date September 22, 2021) is not protective of the NAAQS when multiple concrete batch plants are located in close proximity to one another.

ATTACHMENT 1

Emission Information

Gunter Concrete Batch Plant Cluster Modeling

Concrete Batch Plant Data

Plant Size			300	6,000	150	6,000
			cu yd/hr	cu yd/day	cu yd/hr	cu yd/day
Average Delivery	7.85	cu yd/truck	38.22	trucks/hr	19.11	trucks/hr
	15.7	ton/truck	764.33	trucks/day	458.60	trucks/day

Truck Empty Wt	18	ton
Truck Wt Full	33.7	ton
Average	25.85	ton

Raw Materials						
Cement	491	lb/cu yd				
Cement Supplement	73	lb/cu yd				
SUM	564	lb/cu yd	169200	lbs/hr	84600	lbs/hr
			84.6	ton/hr	42.3	ton/hr
			1692	ton/day	1015.2	ton/day
Raw Material Deliveries @ 25 ton/load			67.68	trucks/day	40.608	trucks/day

Emissions Data — AP-42 Section 11.12, Concrete Truck Loading

				300 cu yd/hr	6,000 cu yd/day		150 cu yd/hr	
				lb/hr	lb/day	g/sec	lb/hr	g/sec
PM_{10} (lb/hr or lb/day)	Uncontrolled	0.31	lb/ton	26.23	524.52	2.76	13.11	1.65
	Controlled	0.0263	lb/ton	2.22	44.50	0.23	1.11	0.14
$PM_{2.5}$ (lb/hr or lb/day)	Uncontrolled	0.05	lb/ton	4.23	84.60	0.44	2.12	0.27
	Controlled	0.003945	lb/ton	0.33	6.67	0.035	0.17	0.021

Emissions based on weight of cement and cement supplement as per AP-42

$PM_{2.5}$ calculated from $PM_{2.5}$-to-PM_{10} ratios taken from AP-42, Table 11.12-3

Gunter Concrete Batch Plant Cluster Modeling

Access Roads

Segment	Segment Length			Traffic (Trucks/Day)				Emissions (lb/day)		Control	PM_{10} Model Input (lb/hr)		$PM_{2.5}$ Model Input (lb/hr)	
	meters	ft	miles	Concrete	Raw Materials	Total	VMT/day	Uncontrolled	Controlled	Factor	lb/hr	grams/sec	lb/hr	grams/sec
1	357	1171	0.22	3208	281	3489	774.0	1341	1341.43	0	55.89	7.05	5.59	0.70
2	62	203	0.04	458	40	498	19.2	33	8.31	75	0.35	0.04	0.03	0.004
3	125	410	0.08	2750	241	2991	232.3	403	402.65	0	16.78	2.12	1.68	0.21
4	62	203	0.04	458	40	498	19.2	33	8.31	75	0.35	0.04	0.03	0.004
5	62	203	0.04	2292	201	2493	96.0	166	166.46	0	6.94	0.87	0.69	0.09
6	125	410	0.08	2292	201	2493	193.6	336	335.61	0	13.98	1.76	1.40	0.18
7	62	203	0.04	764	67	831	32.0	55	13.87	75	0.58	0.07	0.06	0.007
8	125	410	0.08	1528	134	1662	129.1	224	223.74	0	9.32	1.18	0.93	0.12
9	62	203	0.04	764	67	831	32.0	55	13.87	75	0.58	0.07	0.06	0.007
10	125	410	0.08	764	67	831	64.5	112	111.87	0	4.66	0.59	0.47	0.06
11	62	203	0.04	764	67	831	32.0	55	13.87	75	0.58	0.07	0.06	0.007

Emissions Factor - AP42

Control Factor 75% applied to traffic on-site (Segments 2, 4, 7, 9 & 11)

Equation E = k * (s/12)^a * (w/3)^b

Constant (k)	1.5	AP-42 PM-10 Factor
Constant (k)	0.15	AP-42 PM-2.5 Factor
Silt Content (s)	4.8	%
Vehicle Wt	25.85	tons
Constant (a)	0.9	AP-42 PM-10 Factor
Constant (b)	0.45	AP-42 PM-10 Factor
E Factor (PM_{10}) E	1.733197	lb/VMT
Factor ($PM_{2.5}$)	0.17332	lb/VMT