

From: Kai Greywall <Kai.Greywall@trinityconsultants.com>
Sent: Sunday, March 2, 2025 9:27 AM
To: Briannah Spooner
Cc: Joshua Wheatley; Colt Sommers; Carruthers, Blake
Subject: RE: Project 388567 ALE60

Follow Up Flag: Follow up
Flag Status: Completed

Hey Briannah,

Detailed emission calculations for both diesel storage tanks (EPNs TK-16 and TK-17) are located on PDF pages 2-3 in the document I sent you via email on 2/13/25. Annual losses from the tanks are located in the "Total Losses, tpy" row and hourly losses are located in the "Max. Hourly Total Losses, lb/hr" row in page 3 of the PDF document (which includes two sub-tables totaling emissions per tank and total emissions).

If you need this data visualized in another way, please let me know.

Thanks,

Kai Greywall
Consultant- Houston

M 469.396.8936
1800 West Loop South, Suite 1000 | Houston, TX 77027
Email: kai.greywall@trinityconsultants.com



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From: Briannah Spooner <Briannah.Spooner@tceq.texas.gov>
Sent: Friday, February 28, 2025 3:30 PM
To: Kai Greywall <Kai.Greywall@trinityconsultants.com>
Cc: Joshua Wheatley <Joshua.Wheatley@tceq.texas.gov>
Subject: RE: Project 388567 ALE60

Hi Kai,

Thank you for those updated calculations. Please see below for another inquiry I have about the project.

The application provides potential emissions for both of the engines on site, but not the two diesel storage tanks that are being added.

- Please send an updated emission summary representing separated emissions for both of the new diesel storage tanks (EPNs TK-16 and TK-17).

Failure to submit all of the requested information by **March 5, 2025** may result in the TCEQ closing the application with a deficiency. After TCEQ closes the application, you may re-apply through STEERS by filing a new application Form PI-7/PI-7 CERT (General Application for Registration for Permits by Rule) and any additional information necessary to demonstrate compliance with the requirements in 30 TAC Chapter 106. TCEQ will retain the original permit fee for six months and you will not need to submit additional fees with the new application if the original fee was paid correctly.

Thank you,

Ms. Briannah Spooner
Rule Registration Team
Air Permits Division, Office of Air, TCEQ
(512) 239-4961
Briannah.Spooner@tceq.texas.gov

From: Kai Greywall <Kai.Greywall@trinityconsultants.com>
Sent: Thursday, February 13, 2025 12:06 PM
To: Briannah Spooner <Briannah.Spooner@tceq.texas.gov>
Cc: Carruthers, Blake <bcarrut@amazon.com>
Subject: Project 388567 ALE60

Hey Briannah,

We have recently submitted Project 388567 for Amazon's ALE60 facility. Upon review of ALE61 by Jana, it was noticed that there was a typo for the TK 16-17 calcs. I am attaching the corrected calcs for ALE60 to this email.

Please let me know if you have any comments or questions.

Thanks,

Kai Greywall
Consultant- Houston

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From: Kai Greywall <Kai.Greywall@trinityconsultants.com>
Sent: Thursday, February 13, 2025 12:06 PM
To: Briannah Spooner
Cc: Carruthers, Blake
Subject: Project 388567 ALE60
Attachments: Amazon SAT PBR Workbook 2025-0212 ALE 60.pdf

Follow Up Flag: Follow up
Flag Status: Completed

Hey Briannah,

We have recently submitted Project 388567 for Amazon's ALE60 facility. Upon review of ALE61 by Jana, it was noticed that there was a typo for the TK 16-17 calcs. I am attaching the corrected calcs for ALE60 to this email.

Please let me know if you have any comments or questions.

Thanks,

Kai Greywall
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Table A-1. Site-Wide Emissions

Parameter	PM	PM ₁₀	PM _{2.5}	NO _x	VOC	CO	SO ₂	Total HAPs	Max HAPs
Emergency Generators	0.39	0.39	0.39	49.66	1.18	5.95	0.04	0.04	0.018
Diesel Tanks	-	-	-	-	2.00E-02	-	-	-	-
Other PBR Sources ¹	0.42	0.20	0.03	-	0.10	-	-	-	-
Total Emissions	0.81	0.59	0.42	49.66	1.30	5.95	0.04	0.04	0.018
Regulatory Thresholds (tpy)									
PBR 106.4 Thresholds ²	25	15	10	250	25	250	25	25	10
NNSR Major Source - Thresholds ³	-	-	-	50	50	-	-	-	-
Title V Major Source - Thresholds ⁴	100	100	100	100	100	100	100	25	10
Exceeding Regulatory Thresholds?									
PBR 106.4 - Exceed Thresholds?	No	No	No	No	No	No	No	No	No
NNSR Major Source - Exceed Thresholds?	-	-	-	No	No	-	-	-	-
Title V Major Source - Exceed Thresholds?	No	No	No	No	No	No	No	No	No

¹ PBR registration number 172554

² Per 30 Texas Administrative Code (30 TAC) §106.4(a)(1).

³ Per 30 TAC §116.12(20)(A). Bexar County is serious nonattainment for ozone (NO_x and VOC limitations).

⁴ Per 30 TAC 122.10(13).

Table A-2. Diesel Storage Tanks Emissions

Tank Properties

Tank Properties	Input	Input	Input
Tank Identification	TK-1 - TK-14	TK-15	TK 16-17
CIN	N/A	N/A	N/A
Tank Description	Diesel Fuel Storage Belly Tank	Diesel Fuel Storage Belly Tank	Diesel Fuel AST
Tank Contents	Diesel Fuel	Diesel Fuel	Diesel Fuel
Discharging to	Atmosphere	Atmosphere	Atmosphere
EPN	TK-1 - TK-14	TK-15	TK 16-17
Location for Calculation Purposes	San Antonio, TX	San Antonio, TX	San Antonio, TX
Tank/Roof Type	Horizontal	Horizontal	Horizontal
Underground?	Aboveground	Aboveground	Aboveground
Breather Vent Type	Combination Vent Valve	Combination Vent Valve	Combination Vent Valve
Breather Vent Pressure Setting, psig	0.03	0.03	0.03
Breather Vent Vacuum Setting, psig	-0.03	-0.03	-0.03
Pressure of Vapor Space at Normal Condition, psig	0	0	0
Tank Vapor Balanced and Flashing Occurs?	No	No	No
Emission Control Method	None	None	None
Emission Control Efficiency	0	0	0

Tank Parameters	TK-1 - TK-14	TK-15	TK 16-17
Diameter, ft	7	6	28
Shell Height or Length, ft	30	17	9
Nominal Capacity, gal	5,000	1,500	40,000
Shell Paint Color	Black	Black	White
Shell Paint Condition	Average	Average	Average
Shell Insulated?	No	No	No
Roof Paint Color	Black	Black	White
Roof Paint Condition	Average	Average	Average
Roof Insulated?	No	No	No
Maximum Filling Rate, gal/hr	5,000	1,500	14,400
Maximum Liquid Loading Temperature, F	69.65	69.65	69.65
Maximum Liquid Loading Temperature, R	529.32	529.32	529.32
Vapor Pressure at Liquid Loading Temp., psia	8.86E-03	8.86E-03	8.86E-03

Emission Calculation - Calculation performed in accordance with AP-42, June 2020, Section 7.1.3.1.

Parameter	Symbol	Reference/Equation	TK-1 - TK-14	TK-15	TK 16-17
Product Stored		Input	Diesel Fuel	Diesel Fuel	Diesel Fuel
Type of Substance		Select One	Crude Oil	Crude Oil	Crude Oil
Throughput, gallons/yr	Q	Input	48,000	13,000	171,250
Vapor Molecular Weight, lb/lbmol	MV	Input	130.00	130.00	130.00
Vapor Pressure Coefficient A	A	Input	12.10	12.10	12.10
Vapor Pressure Coefficient B	B	Input	8907.00	8907.00	8907.00
Vapor Pressure Coefficient C	C	Input			
Effective Diameter, ft	DE	Equation 1-14	7.06	5.74	28.20
Effective Height, ft	HE	Equation 1-15	5.55	4.51	22.15
Maximum Liquid Height, ft	HLX	Equation 1-37	5.55	4.51	22.15
Minimum Liquid Height, ft	HLN	Equation 1-37	0.00	0.00	0.00
Average Liquid Height, ft	HL	Equation 1-16	2.77	2.25	11.07
Cone Tank Roof Slope, ft/ft	SR	Equation 1-18	N/A	N/A	N/A
Dome Tank Roof Radius, ft	RR	Equation 1-20	N/A	N/A	N/A
Dome Tank Roof Height, ft	HR	Equation 1-20	N/A	N/A	N/A
Roof Outage, ft	HRO	Equation 1-17 ~ 1-19	N/A	N/A	N/A
Vapor Space Outage, ft	HVO	Equation 1-16	2.77	2.25	11.07
Vapor Space Volume, ft ³	VV	Equation 1-3	108.62	58.35	6916.67
Average Daily Minimum Ambient Temperature, R	TAN	Table 7.1-7	519.17	519.17	519.17
Average Daily Maximum Ambient Temperature, R	TAX	Table 7.1-7	539.47	539.47	539.47
Average Daily Ambient Temperature Range, R	ΔTA	Equation 1-11	20.30	20.30	20.30
Average Daily Total Solar Insolation Factor, Btu/ft ² -day	I	Table 7.1-7	1477	1477	1477
Average Daily Ambient Temperature, R	TAA	Equation 1-30	529.32	529.32	529.32
Tank Roof Solar Absorptance, dimensionless	αR	Table 7.1-6	0.97	0.97	0.25
Tank Shell Solar Absorptance, dimensionless	αS	Table 7.1-6	0.97	0.97	0.25
Average Daily Vapor Temperature Range, R	ΔTV	Equation 1-7, 1-8, 8-1	42.86	42.86	21.60
Average Daily Liquid Surface Temperature, R	TLA	Equation 1-27, 1-29, 8-2	538.11	538.11	531.58
Average Daily Minimum Liquid Surface Temperature, R	TLN	Figure 7-1.17	527.39	527.39	526.19
Average Daily Maximum Liquid Surface Temperature, R	TLX	Figure 7-1.17	548.82	548.82	536.98
Liquid Bulk Temperature, R	TB	Equation 1-31, 8-2	533.62	533.62	530.43
Average Vapor Temperature, R	TV	Equation 1-32, 1-34	542.59	542.59	532.74
Vapor Pressure at Avg. Daily Liquid Surf. Temp., psia	PVA	Equation 1-25, 1-26	0.0117	0.0117	0.0095
Vapor Pressure at Avg. Daily Min. Liquid Surf. Temp., psia	PVN	Equation 1-25, 1-26	0.0083	0.0083	0.0080
Vapor Pressure at Avg. Daily Max. Liquid Surf. Temp., psia	PVX	Equation 1-25, 1-26	0.0161	0.0161	0.0113
Vapor Density, lb/ft ³	WV	Equation 1-22	0.0003	0.0003	0.0002
Daily Vapor Pressure range, psi	ΔPV	Equation 1-9	0.0078	0.0078	0.0032
Breather Vent Pressure Setting, psig	PBP	N/A	0.03	0.03	0.03
Breather Vent Vacuum Setting, psig	PBV	N/A	-0.03	-0.03	-0.03
Pressure of Vapor Space at Normal Condition, psig	PI	Equation 1-41	0	0	0
Breather Vent Pressure Setting Range, psi	ΔPB	Equation 1-10	0.06	0.06	0.06
Ambient Pressure, psia	PA	Table 7.1-7	14.27	14.27	14.27

Vapor Space Expansion Factor	KE	Equation 1-5, 1-12	0.0772	0.0772	0.0389
Vented Vapor Saturation Factor	KS	Equation 1-21	0.9983	0.9986	0.9944
Net Working Loss Throughput, ft ³	VQ	Equation 1-39	6416.00	1737.67	22890.42
Sum of Increases in Liquid Level, ft	Σ HQI	Equation 1-37	163.81	67.14	36.65
Annual Turnovers	N	Equation 1-36	29.54	14.89	1.65
Working Loss Turnover Factor	KN	Equation 1-35	1.00	1.00	1.00
Working Loss Product Factor	KP	Equation 1-35	0.75	0.75	0.75
Vent Setting Correction Factor	KB	Equation 1-40, 1-41	1.00	1.00	1.00
Emissions per Tank					
Standing Storage Loss, lb/yr	LS	Equation 1-2	0.7950	0.4272	21.1217
Working Loss, lb/yr	LW	Equation 1-35	1.2528	0.3393	3.7158
Total Losses, lb/yr	LT	Equation 1-1	2.0478	0.7665	24.8374
Total Losses, tpy	LT	N/A	0.0010	3.83E-04	1.24E-02
Max. Hourly Total Losses, lb/hr	LMAX	TCEQ Method	0.1355	0.0407	0.3903
Emissions Total					
Number of Tanks			14	1	2
Standing Storage Loss, lb/yr			11.1299	0.4272	9.0234
Working Loss, lb/yr			17.5394	0.3393	1.5874
Total Losses, lb/yr			28.6693	0.7665	10.6108
Total Losses, tpy			0.0143	3.83E-04	5.31E-03
Max. Hourly Total Losses, lb/hr			1.8974	0.0407	0.1668

Sample Calculations

A sample calculation has been provided for TK-1. All Input data and intermediate calculation information has been provided.

Estimating Annual Emissions from Fixed Roof Tanks

$$[LT] = [LS] + [LW]$$

$$[LS] = 365 \times [VV] \times [WV] \times [KE] \times [KS]$$

$$[LW] = [VQ] \times [KN] \times [KP] \times [WV] \times [KB]$$

$$[LT] = [0.7950] + [1.2528] = 2.0478 \text{ lb}$$

$$[LS] = 365 \times [108.6150] \times [0.0003] \times [0.0772] \times [0.9983] = 0.7950 \text{ lb}$$

$$[LW] = [6416.00] \times [1.0000] \times [0.75] \times [0.0003] \times [1.00] = 1.2528 \text{ lb}$$

Symbol	Description	Value
LT	Total Losses, lb/yr	2.0478
LS	Standing Storage Loss, lb/yr	7.95E-01
VV	Vapor Space Volume, ft ³	108.6150
WV	Vapor Density, lb/ft ³	0.0003
KE	Vapor Space Expansion Factor	0.0772
KS	Vented Vapor Saturation Factor	0.9983
LW	Working Loss, lb/yr	1.2528
VQ	Net Working Loss Throughput, ft ³	6416.00
KN	Working Loss Turnover Factor	1.0000
KP	Working Loss Product Factor	0.75
WV	Vapor Density, lb/ft ³	2.60E-04
KB	Vent Setting Correction Factor	1.00

Table A-3a. Site-Wide Engine Potential Emissions

Emission Unit	Description	Hours of Operation per Engine (hr/yr)	Potential Annual Emissions (tpy)								
			CO	NO _x	VOC	SO ₂	PM	PM ₁₀	PM _{2.5}	Single HAP	Combined HAP
EG1-14	Caterpillar Model 3516C-HD Engines	137	5.8	49.0	1.2	0.04	0.38	0.38	0.38	1.78E-02	3.61E-02
EG15	Caterpillar Model C18 Engine	137	0.1	0.66	0.02	7.56E-04	0.01	0.01	0.01	3.30E-04	6.70E-04
Total Annual Potential Emissions¹:			5.9	49.7	1.2	0.04	0.39	0.39	0.39	1.81E-02	3.68E-02

1. Amazon is requesting a site-wide 12-month rolling total NO_x emission limit < 50 tpy.

Table A-3b. Emergency Generator Maximum Emissions - per Unit

Pollutant	Units	CO	NO _x	VOC	SO ₂	PM	PM ₁₀	PM _{2.5}
3516C-HD Stationary Emergency Engine-Generators	lb/hr	6.09	51.10	1.21	0.044	0.40	0.40	0.40
	lb/gal	0.149	0.295	0.031	2.5E-04	0.010	0.010	0.010
C18 Stationary Emergency Engine-Generator	lb/hr	1.59	9.58	0.32	0.105	0.11	0.11	0.11
	lb/gal	0.110	0.213	0.017	2.5E-04	0.007	0.007	0.007

Table A-3c. 3516C-HD Stationary Generators Potential to Emit		
Source Designation:	Engine	Generator
Number of Emergency Generators ¹ :	14	
Year Manufactured:	≥ 2019	
Manufacturer ¹ :	Caterpillar	
Model No. ² :	3516C-HD	
Engine Tier ² :	2	--
Stroke Cycle ² :	4-Stroke	--
Fuel Used ² :	Diesel	--
Fuel Sulfur Content (%) ³ :	0.0015	--
Displacement (L per cylinder):	4.9	
Fuel Heating Value (Btu [HHV]/gal) ⁴ :	138,000	--
Rated Horsepower at Specified Load (bhp @ 1,800 rpm) ² :	--	--
100%	3,633	--
75%	2,760	--
50%	1,889	--
25%	1,029	--
10%	497	--
Generating Capacity (kW) ² :	--	2,500
Maximum Fuel Consumption at Specified Load (gal/hr) ² :	--	--
100%	173.5	--
75%	134.9	--
50%	98.4	--
25%	57.9	--
10%	31.3	--
Heat Input (MMBtu [HHV]/hr) ⁵ :	--	--
100%	23.9	--
75%	18.6	--
50%	13.6	--
25%	8.0	--
10%	4.3	--

Criteria and Greenhouse Gas Emission Factors:

Pollutant	Emission Factors 100% Load	Emission Factors 75% Load	Emission Factors 50% Load	Emission Factors 25% Load	Emission Factors 10 % Load	Units	Notes
CO	0.76	0.48	0.58	1.47	4.26	g/hp-hr	6
NO _x	6.38	5.15	3.74	3.50	6.47	g/hp-hr	6
VOC	0.14	0.18	0.29	0.40	0.89	g/hp-hr	6, 7
SO ₂	1.21E-05	1.21E-05	1.21E-05	1.21E-05	1.21E-05	lb/bhp-hr	8
PM	0.05	0.05	0.07	0.14	0.29	g/hp-hr	6, 9
PM ₁₀	0.05	0.05	0.07	0.14	0.29	g/hp-hr	6, 9
PM _{2.5}	0.05	0.05	0.07	0.14	0.29	g/hp-hr	6, 9
CO ₂	73.96	73.96	73.96	73.96	73.96	kg/MMBtu	10
CH ₄	3.0E-03	3.0E-03	3.0E-03	3.0E-03	3.0E-03	kg/MMBtu	10
N ₂ O	6.0E-04	6.0E-04	6.0E-04	6.0E-04	6.0E-04	kg/MMBtu	10
CO ₂ e	74.2	74.2	74.2	74.2	74.2	kg/MMBtu	11

Operational Details:

Max Operating Hours (hr/yr) ¹² :	137
---	-----

Table A-3c. 3516C-HD Stationary Generators Potential to Emit, Continued

Criteria and Greenhouse Gas Potential Emissions:

Pollutant	Potential Emissions ¹³ 100% Load (lb/hr)	Potential Emissions ¹³ 75% Load (lb/hr)	Potential Emissions ¹³ 50% Load (lb/hr)	Potential Emissions ¹³ 25% Load (lb/hr)	Potential Emissions ¹³ 10% Load (lb/hr)	Maximum Hourly Emissions ¹⁴ (lb/hr)	Potential Emissions All Units (tpy) ¹⁶
CO	6.09	2.92	2.42	3.33	4.67	6.09	5.8
NO _x	51.10	31.34	15.58	7.94	7.09	51.10	49.0
VOC	1.12	1.10	1.21	0.91	0.98	1.21	1.2
SO ₂	4.4E-02	3.3E-02	2.3E-02	1.2E-02	6.0E-03	4.4E-02	0.04
PM	0.40	0.30	0.29	0.32	0.32	0.40	0.4
PM ₁₀	0.40	0.30	0.29	0.32	0.32	0.40	0.4
PM _{2.5}	0.40	0.30	0.29	0.32	0.32	0.40	0.4
CO ₂	3,904	3,035	2,214	1,303	704.3	3,904	3,744
CH ₄	1.6E-01	1.2E-01	9.0E-02	5.3E-02	2.9E-02	1.58E-01	0.2
N ₂ O	3.2E-02	2.5E-02	1.8E-02	1.1E-02	5.7E-03	3.2E-02	0.03
CO ₂ e	3,917	3,046	2,222	1,307	707	3,917	3,757

Hazardous Air Pollutant (HAP) Potential Emissions:

Pollutant	Emission Factor ¹⁵ (lb/MMBtu)	Potential Emissions ¹³ 100% Load (lb/hr)	Potential Emissions ¹³ 75% Load (lb/hr)	Potential Emissions ¹³ 50% Load (lb/hr)	Potential Emissions ¹³ 25% Load (lb/hr)	Potential Emissions ¹³ 10% Load (lb/hr)	Maximum Hourly Emissions ¹⁴ (lb/hr)	Potential Emissions All Units (tpy) ¹⁶
Benzene	7.76E-04	1.9E-02	1.4E-02	1.1E-02	6.2E-03	3.4E-03	1.9E-02	1.8E-02
Toluene	2.81E-04	6.7E-03	5.2E-03	3.8E-03	2.2E-03	1.2E-03	6.7E-03	6.5E-03
Xylenes	1.93E-04	4.6E-03	3.6E-03	2.6E-03	1.5E-03	8.3E-04	4.6E-03	4.4E-03
Formaldehyde	7.89E-05	1.9E-03	1.5E-03	1.1E-03	6.3E-04	3.4E-04	1.9E-03	1.8E-03
Acetaldehyde	2.52E-05	6.0E-04	4.7E-04	3.4E-04	2.0E-04	1.1E-04	6.0E-04	5.8E-04
Acrolein	7.88E-06	1.9E-04	1.5E-04	1.1E-04	6.3E-05	3.4E-05	1.9E-04	1.8E-04
Polycyclic Aromatic Hydrocarbons (PAH)	2.12E-04	5.1E-03	3.9E-03	2.9E-03	1.7E-03	9.2E-04	5.1E-03	4.9E-03
Total HAP		3.8E-02	2.9E-02	2.1E-02	1.3E-02	6.8E-03	3.8E-02	3.6E-02

¹ Engine specification sheet.

² Values come from the engine's spec sheet. Engine rating and fuel consumption on a per unit basis.

³ Per 40 CFR 80 Subpart I, maximum sulfur content of ULSD is 15 ppm (i.e. 0.0015%).

⁴ Diesel heat content is from 40 CFR 98, Subpart C, Table C-1 - Default CO2 Emission Factors and High Heat Values for Various Types of Fuel.

⁵ Value is calculated from the fuel's heating value and engine's hourly fuel consumption rate and is on an individual unit basis.

⁶ CO, NO_x, HC (VOC), and PM emission factors are based on "worst case" performance data at specified load from the unit's emission data sheet. Emissions data accounts for potential site variation.

⁷ AP-42 Table 3.4-1 indicates that as much as three-fourths of total organic compounds are methane emissions for dual fuel engines. To conservatively over-estimate emissions, all hydrocarbon (HC) emissions are assumed to be VOC.

⁸ Sulfur dioxide emission factor is from AP-42 Table 3.4-1. SO2 (lb/bhp-hr) = 8.09E-03 x (sulfur content of fuel, %). Emission factor in lb/bhp-hr.

⁹ All particulates are assumed to be <1 micron in size, consistent with AP-42 Section 3.3, Table 3.3-1 "Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines," Supplement B, October 1996; includes both filterable and condensable particulate.

¹⁰ GHG emission factors from Tables C-1 and C-2, 40 CFR 98, Subpart C.

¹¹ CO₂e is the sum of GHG constituents multiplied by their respective global warming potential (i.e. 1 for CO₂, 25 for CH₄, and 298 for N₂O), per Table A-1, 40 CFR 98, Subpart A.

¹² Emissions are calculated using 2,025 hours per year site-wide (average of 135 hours per year per engine).

¹³ Emission Rate (lb/hr) = Rated Capacity (MMBtu/hr or bhp at specified load) × Emission Factor (lb/MMBtu, kg/MMBtu, g/hp-hr or lb/bhp-hr). 453.592 g per lb and 2.20462 lb per kg used for conversions.

¹⁴ Maximum hourly emission rate is determined across all engine loads. Emission rates for different pollutants may be used to select the highest emissions for each individual pollutant.

¹⁵ Emission factors from AP-42 Section 3.4, Table 3.4-3 "Speciated Organic Compound Emission Factors for Large Uncontrolled Stationary Diesel Engines" and Table 3.4.-4 "PAH Emission Factors for Large Uncontrolled Stationary Diesel Engines," Supplement B, October 1996.

¹⁶ Potential Emissions (tpy) are based on annual operating limit and highest hourly emission factor.

Table A-3d. C18 Stationary Generators Potential to Emit

Source Designation:	Engine	Generator
Number of Emergency Generators ¹ :	1	
Year Manufactured:	≥ 2019	
Manufacturer ¹ :	Caterpillar	
Model No. ² :	C18	
Engine Tier ² :	2	--
Stroke Cycle ² :	4-Stroke	--
Fuel Used ² :	Diesel	--
Fuel Sulfur Content (%) ³ :	0.0015	--
Displacement (L per cylinder) ² :	3.0	--
Fuel Heating Value (Btu [HHV]/gal) ⁴ :	138,000	--
Rated Horsepower at Specified Load (bhp @ 1,800 rpm) ² :	--	--
100%	909	--
75%	686	--
50%	473	--
25%	265	--
Generating Capacity (kW) ² :	--	600
Maximum Fuel Consumption at Specified Load (gal/hr) ² :	--	--
100%	45.0	--
75%	33.8	--
50%	24.0	--
25%	14.4	--
Heat Input (MMBtu [HHV]/hr) ⁵ :	--	--
100%	6.2	--
75%	4.7	--
50%	3.3	--
25%	2.0	--

Criteria and Greenhouse Gas Emission Factors:

Pollutant	Emission Factors 100% Load	Emission Factors 75% Load	Emission Factors 50% Load	Emission Factors 25% Load	Units	Notes
CO	0.29	0.20	0.41	2.72	g/hp-hr	6
NO _x	4.78	4.24	3.92	4.95	g/hp-hr	6
VOC	0.16	0.17	0.19	0.43	g/hp-hr	6, 7
SO ₂	1.21E-05	1.21E-05	1.21E-05	1.21E-05	lb/bhp-hr	8
PM	0.05	0.04	0.09	0.18	g/hp-hr	6, 9
PM ₁₀	0.05	0.04	0.09	0.18	g/hp-hr	6, 9
PM _{2.5}	0.05	0.04	0.09	0.18	g/hp-hr	6, 9
CO ₂	73.96	73.96	73.96	73.96	kg/MMBtu	10
CH ₄	3.0E-03	3.0E-03	3.0E-03	3.0E-03	kg/MMBtu	10
N ₂ O	6.0E-04	6.0E-04	6.0E-04	6.0E-04	kg/MMBtu	10
CO ₂ e	74.2	74.2	74.2	74.2	kg/MMBtu	11

Operational Details:

Max Operating Hours (hr/yr) ¹² :	137
---	-----

Table C-4. C18 Stationary Generators Potential to Emit, Continued

Criteria and Greenhouse Gas Potential Emissions:

Pollutant	Potential Emissions ¹³ 100% Load (lb/hr)	Potential Emissions ¹³ 75% Load (lb/hr)	Potential Emissions ¹³ 50% Load (lb/hr)	Potential Emissions ¹³ 25% Load (lb/hr)	Maximum Hourly Emissions ¹⁴ (lb/hr)	Potential Emissions All Units (tpy) ¹⁶
CO	0.58	0.30	0.43	1.59	1.59	0.1
NO _x	9.58	6.41	4.09	2.89	9.58	0.7
VOC	0.32	0.26	0.20	0.25	0.32	0.02
SO ₂	1.1E-02	8.3E-03	5.7E-03	3.2E-03	1.1E-02	0.001
PM	0.10	0.06	0.09	0.11	0.11	0.01
PM ₁₀	0.10	0.06	0.09	0.11	0.11	0.01
PM _{2.5}	0.10	0.06	0.09	0.11	0.11	0.01
CO ₂	1,013	761	540	324	1,013	69
CH ₄	4.1E-02	3.1E-02	2.2E-02	1.3E-02	4.11E-02	2.81E-03
N ₂ O	8.2E-03	6.2E-03	4.4E-03	2.6E-03	8.2E-03	5.63E-04
CO ₂ e	1,016	763	542	325	1,016	70

Hazardous Air Pollutant (HAP) Potential Emissions:

Pollutant	Emission Factor ¹⁵ (lb/MMBtu)	Potential Emissions ¹³ 100% Load (lb/hr)	Potential Emissions ¹³ 75% Load (lb/hr)	Potential Emissions ¹³ 50% Load (lb/hr)	Potential Emissions ¹³ 25% Load (lb/hr)	Maximum Hourly Emissions ¹⁴ (lb/hr)	Potential Emissions ¹⁶ All Units - (tpy)
Benzene	7.76E-04	4.8E-03	3.6E-03	2.6E-03	1.5E-03	4.8E-03	3.3E-04
Toluene	2.81E-04	1.7E-03	1.3E-03	9.3E-04	5.6E-04	1.7E-03	1.2E-04
Xylenes	1.93E-04	1.2E-03	9.0E-04	6.4E-04	3.8E-04	1.2E-03	8.2E-05
Formaldehyde	7.89E-05	4.9E-04	3.7E-04	2.6E-04	1.6E-04	4.9E-04	3.4E-05
Acetaldehyde	2.52E-05	1.6E-04	1.2E-04	8.3E-05	5.0E-05	1.6E-04	1.1E-05
Acrolein	7.88E-06	4.9E-05	3.7E-05	2.6E-05	1.6E-05	4.9E-05	3.4E-06
Polycyclic Aromatic Hydrocarbons (PAH)	2.12E-04	1.3E-03	9.9E-04	7.0E-04	4.2E-04	1.3E-03	9.0E-05
Total HAP		9.8E-03	7.3E-03	5.2E-03	3.1E-03	9.8E-03	6.7E-04

¹ Engine specification sheet.

² Values come from the engine's spec sheet. Engine rating and fuel consumption on a per unit basis.

³ Per 40 CFR 80 Subpart I, maximum sulfur content of ULSD is 15 ppm (i.e. 0.0015%).

⁴ Diesel heat content is from 40 CFR 98, Subpart C, Table C-1 - Default CO2 Emission Factors and High Heat Values for Various Types of Fuel.

⁵ Value is calculated from the fuel's heating value and engine's hourly fuel consumption rate and is on an individual unit basis.

⁶ CO, NO_x, HC (VOC), and PM emission factors are based on "worst case" performance data at specified load from the unit's emission data sheet. Emissions data accounts for potential site variation.

⁷ AP-42 Table 3.4-1 indicates that as much as three-fourths of total organic compounds are methane emissions for dual fuel engines. To conservatively over-estimate emissions, all hydrocarbon (HC) emissions are assumed to be VOC.

⁸ Sulfur dioxide emission factor is from AP-42 Table 3.4-1. SO2 (lb/bhp-hr) = 8.09E-03 x (sulfur content of fuel, %). Emission factor in lb/bhp-hr.

⁹ All particulates are assumed to be <1 micron in size, consistent with AP-42 Section 3.3, Table 3.3-1 "Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines," Supplement B, October 1996; includes both filterable and condensable particulate.

¹⁰ GHG emission factors from Tables C-1 and C-2, 40 CFR 98, Subpart C.

¹¹ CO₂e is the sum of GHG constituents multiplied by their respective global warming potential (i.e. 1 for CO₂, 25 for CH₄, and 298 for N₂O), per Table A-1, 40 CFR 98, Subpart A.

¹² Emissions are calculated using 2,025 hours per year site-wide (average of 135 hours per year per engine).

¹³ Emission Rate (lb/hr) = Rated Capacity (MMBtu/hr or bhp at specified load) × Emission Factor (lb/MMBtu, kg/MMBtu, g/hp-hr or lb/bhp-hr). 453.592 g per lb and 2.20462 lb per kg used for conversions.

¹⁴ Maximum hourly emission rate is determined across all engine loads. Emission rates for different pollutants may be used to select the highest emissions for each individual pollutant.

¹⁵ Emission factors from AP-42 Section 3.4, Table 3.4-3 "Speciated Organic Compound Emission Factors for Large Uncontrolled Stationary Diesel Engines" and Table 3.4.-4 "PAH Emission Factors for Large Uncontrolled Stationary Diesel Engines," Supplement B, October 1996.

¹⁶ Potential Emissions (tpy) are based on annual operating limit and highest hourly emission factor.

From: Jana Banigo
Sent: Wednesday, February 12, 2025 6:39 PM
To: Kai Greywall
Cc: BCARRUT@AMAZON.COM; Dan Sims; Briannah Spooner
Subject: RE: TCEQ Air Permit No. 164140 / Project No. 388568 at Amazon Data Services, Inc.'s Ale61 site

Follow Up Flag: Follow up
Flag Status: Completed

Hi Kai:

Project 388567 was assigned to Briannah (Briannah.Spooner@tceq.texas.gov) - ALE60
Project 388569 was assigned to Dan (Dan.Sims@tceq.texas.gov) - ALE62

Let me know if you need anything else.

Thanks,

Jana Banigo

Environmental Permit Specialist

Rule and Registrations Section | Air Permits Division | TCEQ Office of Air

Phone: (512) 239-3112

Email: jana.banigo@tceq.texas.gov

Mail: MC-161, P.O. Box 13087, Austin TX 78711-3087



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From: Kai Greywall <Kai.Greywall@trinityconsultants.com>
Sent: Wednesday, February 12, 2025 5:26 PM
To: Jana Banigo <Jana.Banigo@tceq.texas.gov>
Cc: Carruthers, Blake <bcarrut@amazon.com>
Subject: RE: TCEQ Air Permit No. 164140 / Project No. 388568 at Amazon Data Services, Inc.'s Ale61 site

Hey Jana,

Do you know which facility is 388569 and which facility is 388567?

Thanks,

Kai Greywall
Consultant- Houston

M 469.396.8936
1800 West Loop South, Suite 1000 | Houston, TX 77027
Email: kai.greywall@trinityconsultants.com



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From: Jana Banigo <Jana.Banigo@tceq.texas.gov>
Sent: Wednesday, February 12, 2025 10:15 AM
To: Carruthers, Blake <bcarrut@amazon.com>
Cc: Kai Greywall <Kai.Greywall@trinityconsultants.com>
Subject: RE: TCEQ Air Permit No. 164140 / Project No. 388568 at Amazon Data Services, Inc.'s Ale61 site

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You may also forward the updates directly to them if you've already made the corrections:

Project 388569 was assigned to Dan (Dan.Sims@tceq.texas.gov)
Project 388567 was assigned to Briannah (Briannah.Spooner@tceq.texas.gov)

Note that they may have additional project specific questions.

Thanks again,

Jana Banigo

Environmental Permit Specialist

Rule and Registrations Section | Air Permits Division | TCEQ Office of Air

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Email: jana.banigo@tceq.texas.gov

Mail: MC-161, P.O. Box 13087, Austin TX 78711-3087



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From: Carruthers, Blake <bcarrut@amazon.com>
Sent: Wednesday, February 12, 2025 9:18 AM

To: Jana Banigo <Jana.Banigo@tceq.texas.gov>; Kai Greywall <Kai.Greywall@trinityconsultants.com>
Subject: RE: TCEQ Air Permit No. 164140 / Project No. 388568 at Amazon Data Services, Inc.'s Ale61 site

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Thank you for helping us catch this oversight. Are you also handling the other two project applications? They are ALE060 (Permit No. 164110) and ALE062 (Permit No. 164139)? All are identical and will likely need the same updates.

Thank you,



Blake Carruthers

Air Quality Engineer

AWS Environmental | AMER

e: bcarrut@amazon.com | p: +1 (940) 704-1439 | Check out our [Wiki](#)



Environmental

From: Jana Banigo <Jana.Banigo@tceq.texas.gov>
Sent: Wednesday, February 12, 2025 8:54 AM
To: Kai Greywall <Kai.Greywall@trinityconsultants.com>
Cc: Carruthers, Blake <bcarrut@amazon.com>
Subject: RE: [EXTERNAL] TCEQ Air Permit No. 164140 / Project No. 388568 at Amazon Data Services, Inc.'s Ale61 site

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Hi Kai,

I hope that all is well. Thank you for responding so promptly, very much appreciated! 😊 I should be able to complete this review fairly quickly now.

Best,

Jana Banigo

Environmental Permit Specialist

Rule and Registrations Section | Air Permits Division | TCEQ Office of Air

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Email: jana.banigo@tceq.texas.gov

Mail: MC-161, P.O. Box 13087, Austin TX 78711-3087



How are we doing? Fill out our online customer satisfaction survey at www.tceq.texas.gov/customersurvey

From: Kai Greywall <Kai.Greywall@trinityconsultants.com>

Sent: Wednesday, February 12, 2025 8:50 AM

To: Jana Banigo <Jana.Banigo@tceq.texas.gov>

Cc: BCARRUT@AMAZON.COM

Subject: RE: TCEQ Air Permit No. 164140 / Project No. 388568 at Amazon Data Services, Inc.'s Ale61 site

Hey Jana,

I am copying your questions for ALE61 in this email and writing our responses in **red text**:

- According to the project description, two additional 40,000-gallon storage tanks will be constructed at the site. However, the table below indicates that the new tanks are approximately 14,400 gallons and that the filling rate is 5,000 gallons/hr. Please clarify if the information in the table below is accurate. If not, please update the table and any other data, such as the tank emission calculations accordingly.

Tank Parameters	TK-1 - TK-14	TK-15	TK 16-17
Diameter, ft	7	6	28
Shell Height or Length, ft	30	17	9
Nominal Capacity, gal	5,000	1,500	14,400
Shell Paint Color	Black	Black	White
Shell Paint Condition	Average	Average	Average
Shell Insulated?	No	No	No
Roof Paint Color	Black	Black	White
Roof Paint Condition	Average	Average	Average
Roof Insulated?	No	No	No
Maximum Filling Rate, gal/hr	5,000	1,500	5,000
Maximum Liquid Loading Temperature, F	69.65	69.65	69.65
Maximum Liquid Loading Temperature, R	529.32	529.32	529.32
Vapor Pressure at Liquid Loading Temp., psia	8.86E-03	8.86E-03	8.86E-03

TK 16-17 are supposed to have a 40,000 gal nominal capacity and 14,400 gal/hr filling rate. The calculations have been updated and are attached to this email.

- Provide a [Table 1\(a\)](#) or similar and include the short term and long-term emissions for all facilities.

A table 1(a) showing short-term and long-term emissions has been completed and is attached to this email.

Please let me know if you have any comments or questions.

Thanks,

Kai Greywall

Consultant- Houston

M 469.396.8936

1800 West Loop South, Suite 1000 | Houston, TX 77027

Email: kai.greywall@trinityconsultants.com



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From: Jana Banigo <Jana.Banigo@tceq.texas.gov>
Sent: Tuesday, February 11, 2025 5:00 PM
To: BCARRUT@AMAZON.COM
Cc: Kai Greywall <Kai.Greywall@trinityconsultants.com>
Subject: TCEQ Air Permit No. 164140 / Project No. 388568 at Amazon Data Services, Inc.'s Ale61 site
Importance: High

Good afternoon Mr. Carruthers,

I am the TCEQ Air Permit Reviewer assigned to the PBR Permit No. 164140 / Project No. 388568 at Amazon Data Services, Inc. in Bexar County, Texas. You have been identified as a Technical Contact.

I have completed my initial review for this project and will need additional information/clarification before I can proceed with my review. Please address the following:

- According to the project description, two additional 40,000-gallon storage tanks will be constructed at the site. However, the table below indicates that the new tanks are approximately 14,400 gallons and that the filling rate is 5,000 gallons/hr. Please clarify if the information in the table below is accurate. If not, please update the table and any other data, such as the tank emission calculations accordingly.

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Failure to submit all of the requested information by February 18, 2025 may result in the TCEQ closing the application with a deficiency. After TCEQ closes the application, you may re-apply through STEERS by filing a new application Form PI-7/PI-7 CERT (General Application for Registration for Permits by Rule) and any additional information necessary to demonstrate compliance with the requirements in 30 TAC Chapter 106. TCEQ will retain the original permit fee for six months and you will not need to submit additional fees with the new application if the original fee was paid correctly.

If you have questions or would like to discuss this project over the phone, feel free to contact me.

Ms. Jana Banigo
Rule Registration Team
Air Permits Division, Office of Air, TCEQ
(512) 239-3112
Jana.Banigo@tceq.texas.gov

How are we doing? Fill out our online customer satisfaction survey at
www.tceq.texas.gov/customersurvey

From: Jana Banigo
Sent: Wednesday, February 12, 2025 10:16 AM
To: Dan Sims; Briannah Spooner
Subject: FW: TCEQ Air Permit No. 164140 / Project No. 388568 at Amazon Data Services, Inc.'s Ale61 site

Follow Up Flag: Follow up
Flag Status: Completed

FYI – see the email below.

Jana Banigo

Environmental Permit Specialist

Rule and Registrations Section | Air Permits Division | TCEQ Office of Air

Phone: (512) 239-3112

Email: jana.banigo@tceq.texas.gov

Mail: MC-161, P.O. Box 13087, Austin TX 78711-3087



How are we doing? Fill out our online customer satisfaction survey
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From: Jana Banigo
Sent: Wednesday, February 12, 2025 10:15 AM
To: 'Carruthers, Blake' <bcarrut@amazon.com>
Cc: Kai Greywall <Kai.Greywall@trinityconsultants.com>
Subject: RE: TCEQ Air Permit No. 164140 / Project No. 388568 at Amazon Data Services, Inc.'s Ale61 site

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Air Quality Engineer

AWS Environmental | AMER

e: bcarrut@amazon.com | p: +1 (940) 704-1439 | Check out our [Wiki](#)



Environmental

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Subject: RE: [EXTERNAL] TCEQ Air Permit No. 164140 / Project No. 388568 at Amazon Data Services, Inc.'s Ale61 site

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Kai Greywall
Consultant- Houston

M 469.396.8936
1800 West Loop South, Suite 1000 | Houston, TX 77027
Email: kai.greywall@trinityconsultants.com



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