

**Air Products LLC
Cedar Bayou Hydrogen Facility
Permit No. TBA
Initial Application Modeling
Supplemental Information**

Appendix A:

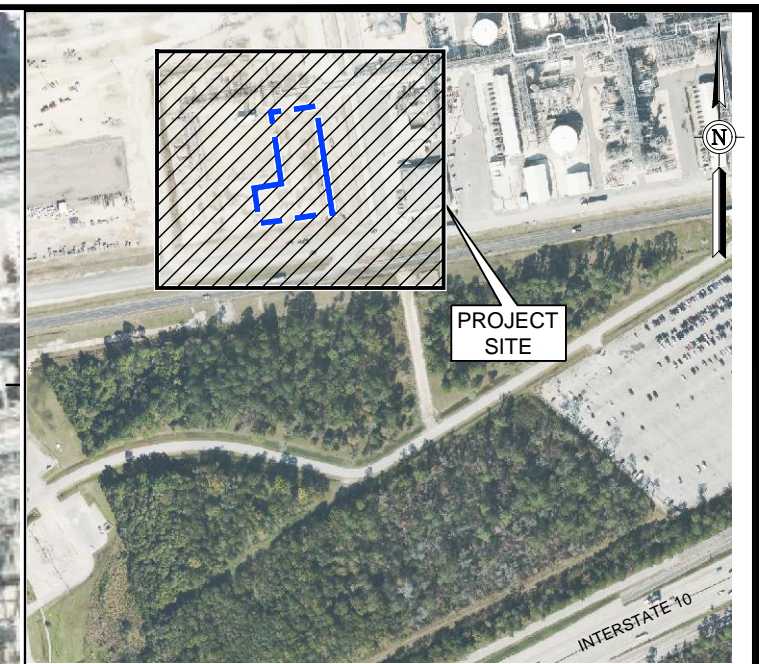
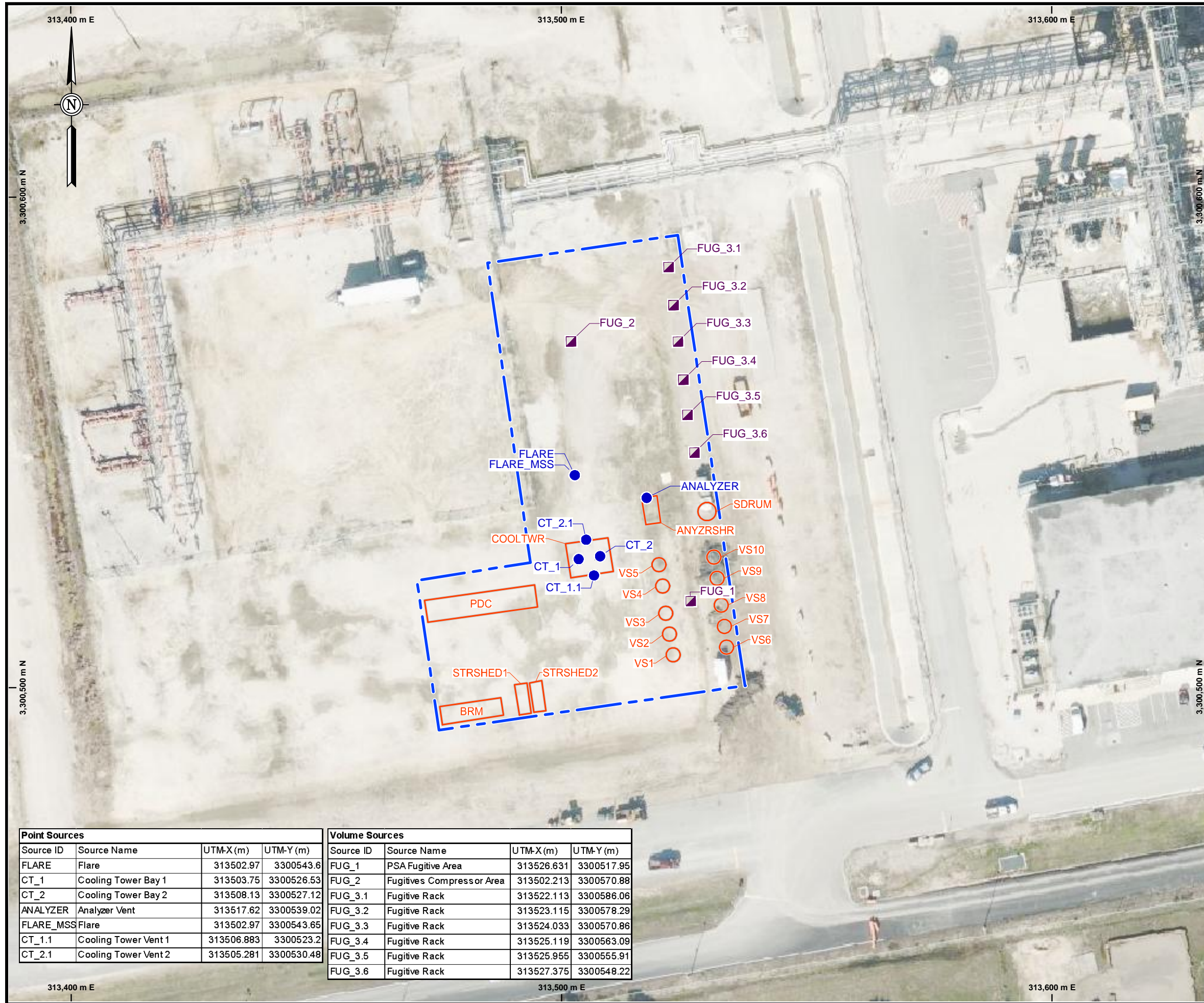
- **Appendix A-1. Plot Plan**
- **Appendix A-2. Source Location Map**
- **Appendix A-3. Area Map**
- **Appendix A-4. Building Downwash Map**

Appendix B:

- **Appendix B-1. Modeling and Effects Review Applicability Table**
- **Appendix B-2. Modeled Emission Rates**
- **Appendix B-3. Project Stack Parameters**
- **Appendix B-4. AERMOD Unit Impact Screening Modeling Analysis**

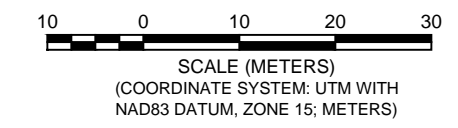
Appendix A:

- **Appendix A-1. Plot Plan**
- **Appendix A-2. Source Location Map**
- **Appendix A-3. Area Map**
- **Appendix A-4. Building Downwash Map**



LEGEND:

- - - PROPERTY BOUNDARY
- SOURCE ID — CT_1 ● POINT SOURCE
- SOURCE ID — FUG_1 ■ VOLUME SOURCE
- BUILDING / TANK ID — BRM / VS1 ▭ BUILDING / TANK STRUCTURES

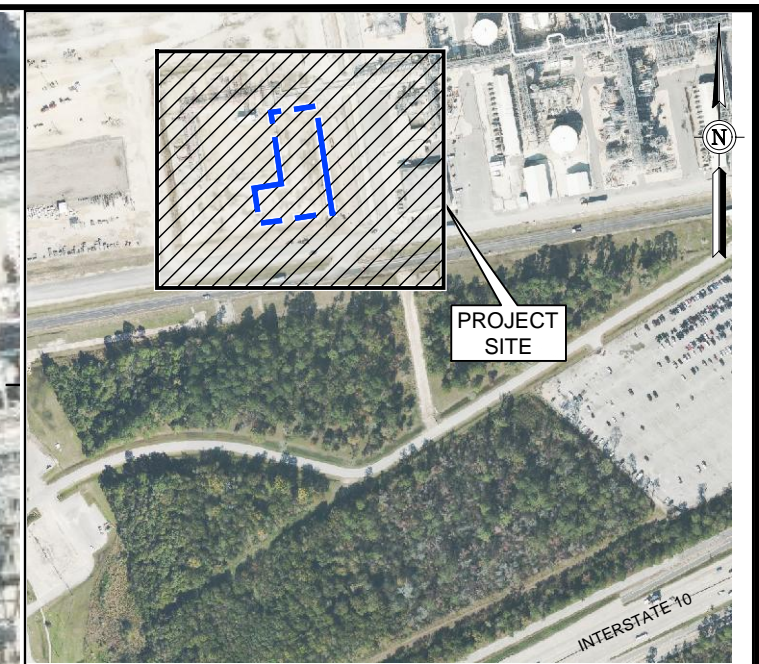
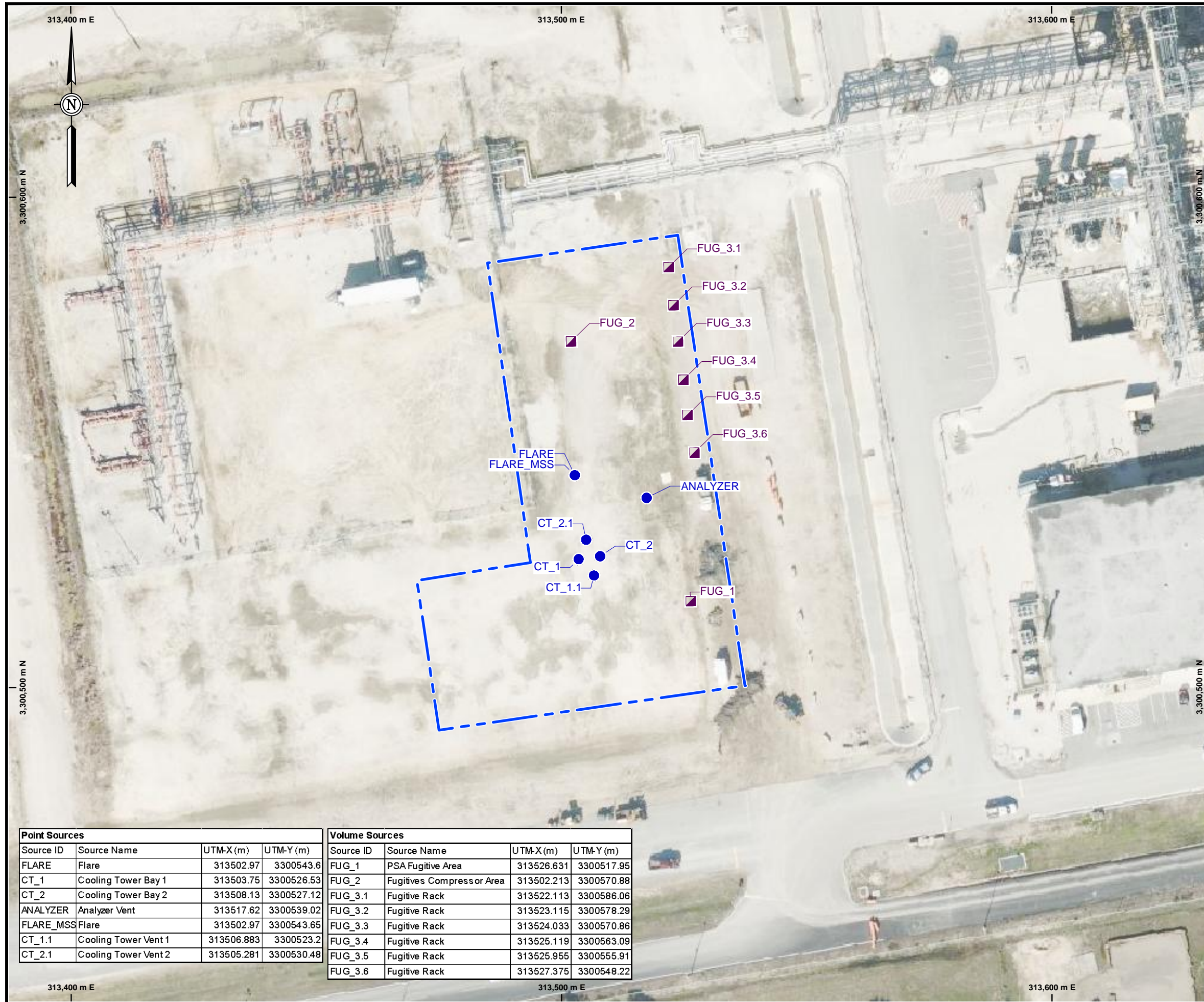


NOTES: 1. COORDINATE SYSTEM IS UTM WITH NAD83 DATUM, ZONE 15, METERS; CENTRAL MERIDIAN.
 2. 100-METER GRID BASED ON UTM ZONE 15, NAD83.
 3. AERIAL IMAGES PROVIDED BY BING IMAGERY SREVICE

Point Sources			
Source ID	Source Name	UTM-X (m)	UTM-Y (m)
FLARE	Flare	313502.97	3300543.6
CT_1	Cooling Tower Bay 1	313503.75	3300526.53
CT_2	Cooling Tower Bay 2	313508.13	3300527.12
ANALYZER	Analyzer Vent	313517.62	3300539.02
FLARE_MSS	Flare	313502.97	3300543.65
CT_1.1	Cooling Tower Vent 1	313506.883	3300523.2
CT_2.1	Cooling Tower Vent 2	313505.281	3300530.48

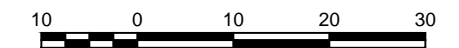
Volume Sources			
Source ID	Source Name	UTM-X (m)	UTM-Y (m)
FUG_1	PSA Fugitive Area	313526.631	3300517.95
FUG_2	Fugitives Compressor Area	313502.213	3300570.88
FUG_3.1	Fugitive Rack	313522.113	3300586.06
FUG_3.2	Fugitive Rack	313523.115	3300578.29
FUG_3.3	Fugitive Rack	313524.033	3300570.86
FUG_3.4	Fugitive Rack	313525.119	3300563.09
FUG_3.5	Fugitive Rack	313525.955	3300555.91
FUG_3.6	Fugitive Rack	313527.375	3300548.22

AECOM 19219 KATY FREEWAY, SUITE 100 HOUSTON, TEXAS 77094 PH: (281) 646-2400 FAX: (281) 646-2401	PLOT PLAN	
	Project: AIR PRODUCTS LLC CEDAR BAYOU HYDROGEN FACILITY BAYTOWN, HARRIS COUNTY, TEXAS	
Scale: AS NOTED	Drawn by: DB	Date: 5/26/2022
Chk'd by: NS	Date: 5/26/2022	Client: AIR PRODUCTS LLC
	Project No.: 60661326	File Name: PLOT PLAN - C BAYOU HYD FAC-20220525.DWG-Cedar Bayou Hydrogen-ALL
		Figure No.:



LEGEND:

- - - PROPERTY BOUNDARY
- SOURCE ID — CT_1 ● POINT SOURCE
- SOURCE ID — FUG_1 ■ VOLUME SOURCE



SCALE (METERS)
 (COORDINATE SYSTEM: UTM WITH NAD83 DATUM, ZONE 15; METERS)

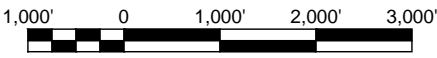
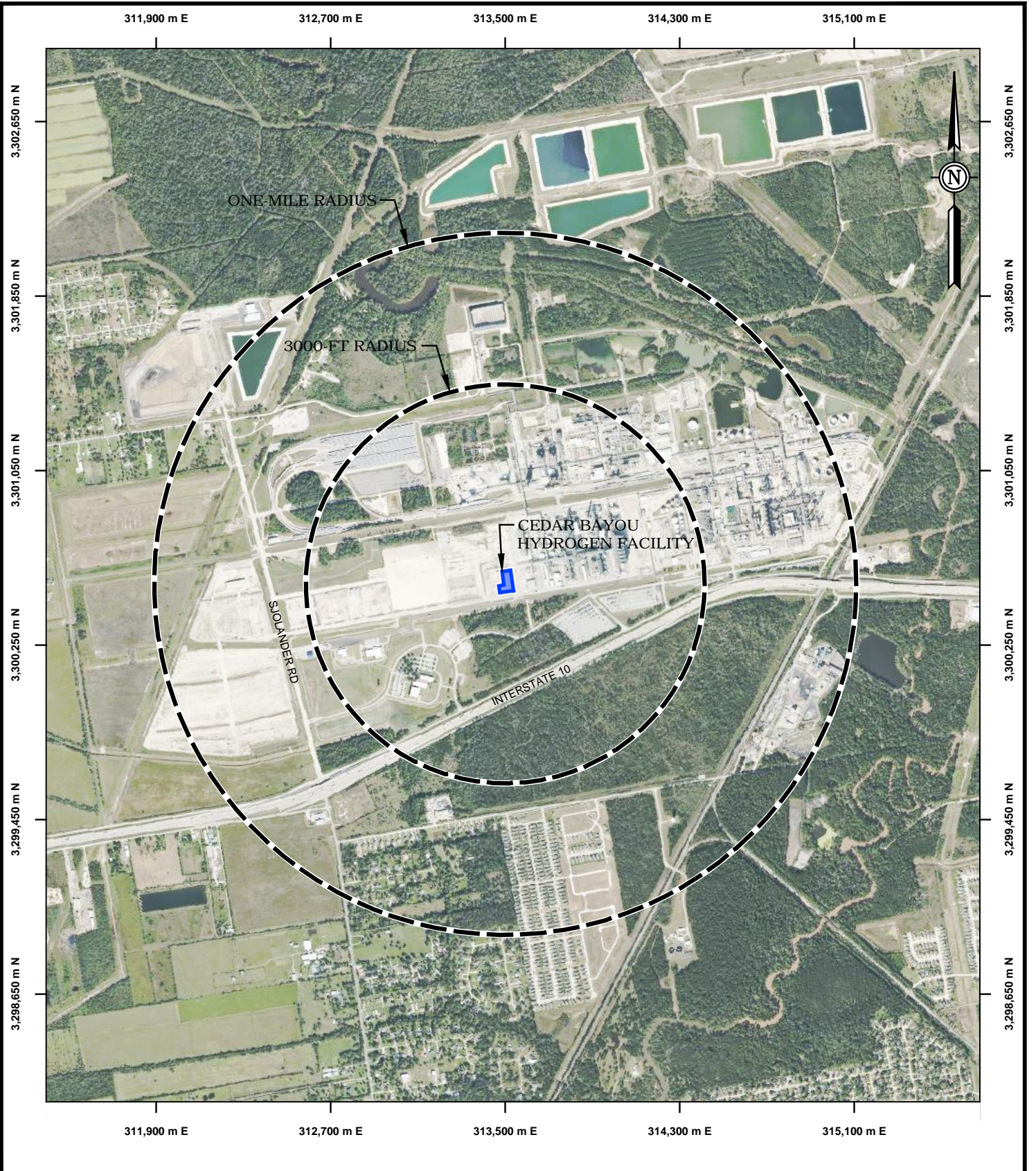
- NOTES:**
- COORDINATE SYSTEM IS UTM WITH NAD83 DATUM, ZONE 15, METERS; CENTRAL MERIDIAN.
 - 100-METER GRID BASED ON UTM ZONE 15, NAD83.
 - AERIAL IMAGES PROVIDED BY BING IMAGERY SREVICE

Point Sources			
Source ID	Source Name	UTM-X (m)	UTM-Y (m)
FLARE	Flare	313502.97	3300543.6
CT_1	Cooling Tower Bay 1	313503.75	3300526.53
CT_2	Cooling Tower Bay 2	313508.13	3300527.12
ANALYZER	Analyzer Vent	313517.62	3300539.02
FLARE_MSS	Flare	313502.97	3300543.65
CT_1.1	Cooling Tower Vent 1	313506.883	3300523.2
CT_2.1	Cooling Tower Vent 2	313505.281	3300530.48

Volume Sources			
Source ID	Source Name	UTM-X (m)	UTM-Y (m)
FUG_1	PSA Fugitive Area	313526.631	3300517.95
FUG_2	Fugitives Compressor Area	313502.213	3300570.88
FUG_3.1	Fugitive Rack	313522.113	3300586.06
FUG_3.2	Fugitive Rack	313523.115	3300578.29
FUG_3.3	Fugitive Rack	313524.033	3300570.86
FUG_3.4	Fugitive Rack	313525.119	3300563.09
FUG_3.5	Fugitive Rack	313525.955	3300555.91
FUG_3.6	Fugitive Rack	313527.375	3300548.22

		Title: SOURCE LOCATION	
		Project: AIR PRODUCTS LLC CEDAR BAYOU HYDROGEN FACILITY BAYTOWN, HARRIS COUNTY, TEXAS	
Scale: AS NOTED	Drawn by: DB	Date: 5/26/2022	Client: AIR PRODUCTS LLC
	Chk'd by: NS	Date: 5/26/2022	Project No.: 60661326
			File Name: PLOT PLAN - C BAYOU HYD FAC-20220525.DWG-Cedar Bayou Hydrogen SOURCES
			Figure No. :

FILE: Z:\Houston-US\HOU\JDCS\Projects\AirMod\Air_modeling_data\07\Drawings\Acad\Blocks\AirProducts_Baytown\Cedar Bayou Hydrogen Facility\Area Map - C Bayou Hyd Fac-20220525.dwg ; PLOTTED: Thursday, May 26, 2022 1:45:52 PM ;
 SAVVED: Wednesday, May 25, 2022 4:19:03 PM ;



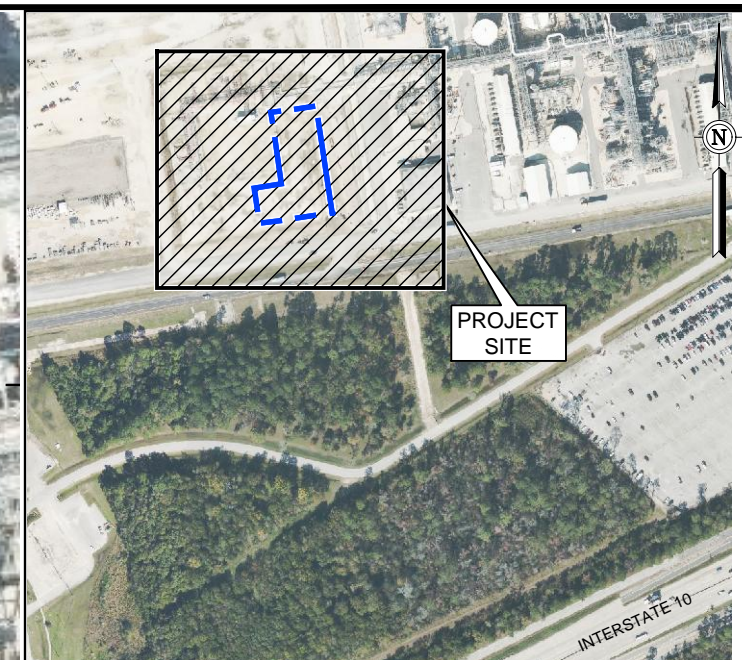
Source:
 BING Imagery services Background.
 Coordinate system UTM with NAD83 Datum, Zone 15, meters, Central Meridian.



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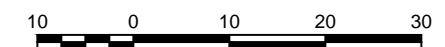
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		Chk'd by:	NS	Date:	5/26/2022

Title:			AREA MAP		
Project:			AIR PRODUCTS LLC CEDAR BAYOU HYDROGEN FACILITY BAYTOWN, HARRIS COUNTY, TEXAS		
Client:			AIR PRODUCTS LLC		
Project No.:	60661326	File Name:	AREA MAP - C BAYOU HYD FAC-20220525.DWG-AREA MAP	Figure No.:	



LEGEND:

- - - - PROPERTY BOUNDARY
- BUILDING / TANK ID. — ○ BUILDING / TANK STRUCTURES



SCALE (METERS)
 (COORDINATE SYSTEM: UTM WITH NAD83 DATUM, ZONE 15; METERS)

- NOTES:**
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 - 100-METER GRID BASED ON UTM ZONE 15, NAD83.
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BUILDING DOWNWASH

Project: AIR PRODUCTS LLC
 CEDAR BAYOU HYDROGEN FACILITY
 BAYTOWN, HARRIS COUNTY, TEXAS

Scale:	Drawn by:	Date:	Client:
AS NOTED	DB	5/26/2022	AIR PRODUCTS LLC
	Chk'd by:	Date:	Project No.:
	NS	5/26/2022	60661326
			File Name:
			PLOT PLAN - C BAYOU HYD FAC-20220526.DWG-Cedar Bayou Hydrogen-2W
			Figure No.:

Appendix B:

- **Appendix B-1. Modeling and Effects Review Applicability Table**
- **Appendix B-2. Modeled Emission Rates - Project Increases**
- **Appendix B-3. Project Stack Parameters**
- **Appendix B-4. AERMOD Unit Impact Screening Modeling Analysis**

Air Products - Cedar Bayou Hydrogen Facility
CN - 602299257, RN - TBA
Permit Number - TBA

B-1. MERA Flowchart

CAS#	106-97-8	74-85-1	109-66-0
Air Contaminant	Butane	Ethylene	Pentane
Short-Term (ST) ESL (ug/m3)	66000	1400	59000
Long Term (LT) ESL (ug/m3)	7100	34	7100
Is LT-ESL >= 10% of ST-ESL? If "No", Include Long Term Emissions in analysis.	YES	NO	YES
Routine Net Hourly Change	0.01	0.24	0.01
Routine Hourly Increases	0.01	0.24	0.01
Routine Hourly Decreases	-	-	-
MSS Net Hourly Change	-	26.34	-
MSS Hourly Increases	-	26.34	-
MSS Hourly Decreases	-	-	-
Routine Net Annual Change	0.03	0.66	0.03
Routine Annual Increases	0.03	0.66	0.03
Routine Annual Decreases	-	-	-
MSS Net Annual Change	-	0.26	-
MSS Annual Increases	-	0.26	-
MSS Annual Decreases	-	-	-
Annual Dec : Inc Ratio	-	-	-

TCEQ Modeling and Effects Applicability

Flow Chart	MERA Flowchart Requirement	Butane	Ethylene	Pentane
Step 1	Is the net change in emissions less than or equal to zero?	Continue	Continue	Continue
Step 2	Is the long-term ESL >= 10% of the short-term ESL? AND...	Continue	NO => STEP 3	Continue
	Routine increases <= 0.04 lb/hr OR MSS Emissions Increase <=0.1, and the ESL is >=2 ESL < 500	Continue		Continue
	Routine increases <= 0.1 lb/hr OR MSS increases <=0.1, and the ESL is >=500 ESL < 3500	Continue		Continue
	Routine increases <= 0.4 lb/hr OR MSS Emissions Increase <=0.4, and the ESL is >=3500	Modeling Not Required		Modeling Not Required
Step 3	Is the GLCmax <= 10% of ESL?		See B-4 UIM Modeling	

Air Products - Cedar Bayou Hydrogen Facility
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B-2 Modeled Emission Rates

Volume Sources

	EPN	Model ID	Description	CO (lb/hr)	Carbon Monoxide (CO) for 8-hour (lb/hr)	NOx (lb/hr)	NOx (tpy)	PM10 (lb/hr)	PM2.5 (lb/hr)	PM2.5 (tpy)	SO2 for State Property line (lb/hr)	SO2 for 1-hr SIL (lb/hr)	SO2 for 3-hr SIL (lb/hr)
Routine	FUG	FUG_1	PSA Fugitive Area	-	-	-	-	-	-	-	-	-	-
Routine	FUG	FUG_2	Fugitive Compressor Area	-	-	-	-	-	-	-	-	-	-
Routine	FUG	FUG_3.1	Fugitive Rack	-	-	-	-	-	-	-	-	-	-
Routine	FUG	FUG_3.2	Fugitive Rack	-	-	-	-	-	-	-	-	-	-
Routine	FUG	FUG_3.3	Fugitive Rack	-	-	-	-	-	-	-	-	-	-
Routine	FUG	FUG_3.4	Fugitive Rack	-	-	-	-	-	-	-	-	-	-
Routine	FUG	FUG_3.5	Fugitive Rack	-	-	-	-	-	-	-	-	-	-
Routine	FUG	FUG_3.6	Fugitive Rack	-	-	-	-	-	-	-	-	-	-

Point Source

	EPN	Model ID	Description	CO (lb/hr)	Carbon Monoxide (CO) for 8-hour (lb/hr)	NOx (lb/hr)	NOx (tpy)	PM10 (lb/hr)	PM2.5 (lb/hr)	PM2.5 (tpy)	SO2 for State Property line (lb/hr)	SO2 for 1-hr SIL (lb/hr)	SO2 for 3-hr SIL (lb/hr)
Routine	FL	FLARE	Flare	0.17	0.17	0.02	0.09	0.00	0.00	0.00	9.43E-04	9.43E-04	9.43E-04
Routine	CT	CT_1	Cooling Tower	3.91E-03	3.91E-03	-	-	4.23E-03	1.28E-04	5.10E-04	-	-	-
Routine	CT	CT_2	Cooling Tower	3.91E-03	3.91E-03	-	-	4.23E-03	1.28E-04	5.10E-04	-	-	-
Routine	ANALYZER	ANALYZER	Analyzers	2.27E-03	2.27E-03	-	-	-	-	-	-	-	-
MSS	FL	FLARE_MSS	Flare_MSS	370.67	370.67	92.99	0.93	-	-	-	-	-	-

Notes:

Cooling tower emissions are equally distributed between 2 vents. Therefore, the total emission rate is divided by 2 for each Model ID CT_1 and CT_2.

Air Products - Cedar Bayou Hydrogen Facility
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B-3 Modeled Stack Parameters

Volume Sources

Routine/MSS	EPN	Model ID	Description	UTM-X (m)	UTM-Y (m)	Base (m)	Release height (ft)	Initial Horizontal Dimension (ft)	Initial Vertical Dimension (ft)	Equivalent Length (ft)
Routine	FUG	FUG_1	PSA Fugitive Area	313526.631	3300517.95	8.00	15.00	14.71	13.95	63.25
Routine	FUG	FUG_2	Fugitive Compressor Area	313502.213	3300570.88	8.00	15.00	12.99	13.95	55.86
Routine	FUG	FUG_3.1	Fugitive Rack	313522.113	3300586.06	8.00	15.00	9.01	13.95	19.36
Routine	FUG	FUG_3.2	Fugitive Rack	313523.115	3300578.29	8.00	15.00	9.01	13.95	19.36
Routine	FUG	FUG_3.3	Fugitive Rack	313524.033	3300570.86	8.00	15.00	9.01	13.95	19.36
Routine	FUG	FUG_3.4	Fugitive Rack	313525.119	3300563.09	8.00	15.00	9.01	13.95	19.36
Routine	FUG	FUG_3.5	Fugitive Rack	313525.955	3300555.91	8.00	15.00	9.01	13.95	19.36
Routine	FUG	FUG_3.6	Fugitive Rack	313527.375	3300548.22	8.00	15.00	9.01	13.95	19.36

Notes:

Three scenarios were considered for modeling impact of fugitive emission sources. Each scenario modeled the fugitive emissions and maximum impact out of the three scenarios was used for estimating the maximum predicted modeled concentration.

Point Sources

Routine/MSS	EPN	Model ID	Description	UTM-X (m)	UTM-Y (m)	Base (m)	Stack height (ft)	Temp (F)	Exit Velocity (fps)	Diameter (ft)
Routine	FL	FLARE	Flare	313502.97	3300543.60	8.00	160.00	1832.00	65.62	0.43
Routine	CT	CT_1	Cooling Tower	313506.88	3300523.20	8.00	27.00	-469.75	63.80	10.00
Routine	CT	CT_2	Cooling Tower	313505.28	3300530.48	8.00	27.00	-469.75	63.80	10.00
Routine	ANALYZER	ANALYZER	Analyzers	313517.62	3300539.02	8.00	27.00	-459.67	25.00	0.08
MSS	FL	FLARE_MSS	Flare_MSS	313502.97	3300543.60	8.00	160.00	1832.00	65.62	31.24

Note:

Air Products - Cedar Bayou Hydrogen Facility
CN - 602299257, RN - TBA
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B-4. Unit Impact Screening Analysis

Impacts Evaluation Summary - Air Products Baytown

Emission Source Parameters

The following lists stack parameters for the facility:

Point Sources

EPN	Model ID	Name	Zone	UTM-X (m)	UTM_Y (m)	Base (m)	Height (ft)	Temp. (F)	Vel. (fps)	Dia. (ft)
FL	FLARE	Flare	15	313,502.97	3,300,543.60	8.00	160.00	1,832.00	65.62	0.43
CT	CT_1	Cooling Tower	15	313,506.88	3,300,523.20	8.00	27.00	-469.75	63.80	10.00
	CT_2		15	313,505.28	3,300,530.48	8.00	27.00	-469.75	63.80	10.00
ANALYZER	ANALYZER	Analyzers	15	313,517.62	3,300,539.02	8.00	27.00	-459.67	25.00	0.08
FL	FLARE_MSS	Flare_MSS	15	313,502.97	3,300,543.60	8.00	160.00	1,832.00	65.62	31.24

Volume Sources

EPN	Model ID	Name	Zone	UTM-X (m)	UTM_Y (m)	Base (m)	Height (ft)	Sigma Y (ft)	Sigma Z (ft)	Equivalent Length (ft)
FUG	FUG_1	PSA Fugitive Area	14	313,526.63	3,300,517.95	8.00	15.00	14.71	13.95	63.25
FUG	FUG_2	Fugitive Compressor Area	15	313,502.21	3,300,570.88	8.00	15.00	12.99	13.95	55.86
FUG	FUG_3.1	Fugitive Rack	15	313,522.11	3,300,586.06	8.00	15.00	9.01	13.95	19.36
FUG	FUG_3.2	Fugitive Rack	15	313,523.12	3,300,578.29	8.00	15.00	9.01	13.95	19.36
FUG	FUG_3.3	Fugitive Rack	15	313,524.03	3,300,570.86	8.00	15.00	9.01	13.95	19.36
FUG	FUG_3.4	Fugitive Rack	15	313,525.12	3,300,563.09	8.00	15.00	9.01	13.95	19.36
FUG	FUG_3.5	Fugitive Rack	15	313,525.96	3,300,555.91	8.00	15.00	9.01	13.95	19.36
FUG	FUG_3.6	Fugitive Rack	16	313,527.38	3,300,548.22	8.00	15.00	9.01	13.95	19.36

Individual Model Results

The following model results represent dilution factors determined for each source:

EPN	Model ID	Name	Type	1-Hour AERMOD Generic Unit Model @ 1 lb/hr ¹ (ug/m ³)	Annual AERMOD Generic Unit Model @ 1 lb/hr ¹ (ug/m ³)
FL	FLARE	Flare	POINT	2.29	0.10
CT	CT_1	Cooling Tower	POINT	13.99	0.49
CT	CT_2	Cooling Tower	POINT	13.93	0.51
ANALYZER	ANALYZER	Analyzers	POINT	1,066.10	35.11
FL	FLARE_MSS	Flare_MSS	POINT	0.04	0.0004
FUG	FUG_1	PSA Fugitive Area	VOLUME	494.31	71.84
FUG	FUG_2	Fugitive Compressor Area	VOLUME	683.06	121.24
FUG	FUG_3.1	Fugitive Rack	VOLUME	793.21	134.61
FUG	FUG_3.2	Fugitive Rack	VOLUME	1,017.56	173.14
FUG	FUG_3.3	Fugitive Rack	VOLUME	500.07	83.78
FUG	FUG_3.4	Fugitive Rack	VOLUME	586.24	89.98
FUG	FUG_3.5	Fugitive Rack	VOLUME	952.39	159.06
FUG	FUG_3.6	Fugitive Rack	VOLUME	509.58	85.36

Footnotes

1. Generic Unit model results. Model uses 1 pound per hour (lb/hr) emission rate and AERMOD Model and Default Met Data.

Screen Model per Compound

Screening Analysis for Ethylene Emissions

EPN	Model ID	Name	Hourly Increased Emission Rate ¹ (lb/hr)	1-Hour AERMOD Generic Unit Model @ 1 lb/hr ² (ug/m ³)	Predicted 1-hr Maximum ^{3,6} (ug/m ³)	Annual Increased Emission Rate ¹ (tpy)	Annual AERMOD Generic Unit Model @ 1 lb/hr ² (ug/m ³)	Predicted Annual Maximum ^{4,6} (ug/m ³)
FL	FLARE	Flare	-	2.295	-	-	0.099	-
CT	CT_1	Cooling Tower	0.0555	13.986	0.78	0.0486	0.491	0.01
CT	CT_2	Cooling Tower	0.0555	13.935	0.77	0.0486	0.510	0.01
ANALYZER	ANALYZER	Analyzers	0.0356	1,066.097	37.98	0.1560	35.106	1.25
FL	FLARE_MSS	Flare_MSS	26.3384	0.042	1.10	0.2634	0.000	0.00
FUG	FUG_1	PSA Fugitive Area	0.0924	494.311	45.68	0.4048	71.839	6.64
FUG	FUG_2	Fugitive Compressor Area	0.0924	683.062	63.12	0.4048	121.239	11.20
FUG	FUG_3.1	Fugitive Rack	0.0154	793.213	12.22	0.0675	134.610	2.07
FUG	FUG_3.2	Fugitive Rack	0.0154	1,017.560	15.67	0.0675	173.138	2.67
FUG	FUG_3.3	Fugitive Rack	0.0154	500.066	7.70	0.0675	83.785	1.29
FUG	FUG_3.4	Fugitive Rack	0.0154	586.237	9.03	0.0675	89.979	1.39
FUG	FUG_3.5	Fugitive Rack	0.0154	952.388	14.67	0.0675	159.057	2.45
FUG	FUG_3.6	Fugitive Rack	0.0154	509.581	7.85	0.0675	85.359	1.31
GLC_{max} (ug/m³)⁵ =					107.76	GLC_{max} (ug/m³)⁵ =		12.47
Short Term ESL (ug/m³) =					1,400	Long Term ESL (ug/m³) =		34.0
Is GLC_{max} < 10% of ESL?					YES	Is GLC_{max} < 10% of ESL?		NO
Is GLC_{max} < ESL?					YES	Is GLC_{max} < ESL?		YES

Notes:

1. Emissions increased rate.
2. Generic Unit model results. Model uses 1 pound per hour (lb/hr) emission rate and AERMOD Model and Default Met Data.
3. 1-Hr Conc. = Modeled Rate (lb/hr) x AERMOD Generic Unit Model
4. Annual Conc. = Modeled Rate (tpy) / (8760 hour/year) x (2000 lb/ton) x AERMOD Generic Unit Model
5. Maximum, ground-level concentration predicted by Unit Impact screening model.
6. Fugitive predicted impact is estimated as maximum impact amongst PSA Fugitive Area (Model ID FUG_1), Fugitive Compressor Area (Model ID FUG_2) and Fugitive Rack (Model ID FUG_3.1 - 3.6).