

**Compressor Station
Atmospheric Vent Stack Dispersion Analysis**

December 2024



Findings Summary

Both the H₂S dispersion and flammability of three scenarios were evaluated for the Atmospheric Vent Stack under a variety of weather conditions. In general, during any significant discharge to the vent the vapor cloud will stay above the 30' height of the stack which is acceptable. In the low flow (packing vents) the cloud may dip a few feet but only within less than 20' of the stack exit. The cases and results are summarized below.

Evaluation Methodology

The suction header relief valve, compressor relief valves and packing vents discharge to a 8" vent header that directs the gas to the Vent Scrubber (V-107) which will have a 20' tall vent to atmosphere resulting in an overall vent location of 30' above grade. The dispersion analysis reviewed the dispersion of H₂S downwind of the vent stack as well as flammability limits. The Tank Battery represents the closest accessible equipment (about 81') with a tank height of 20' accessible by stairs and walkways. The Plot Plan is shown in Appendix A.

Three cases were identified to represent the expected possible discharge conditions.

1. Suction Header PSV-100 discharge – high flow case
2. Compressor PSV discharge – medium flow
3. Packing vents – low flow, normal operating case

These cases were defined in the PHAST User-Defined Source (UDS) module for evaluation based on calm (2 mph wind), stable (G Class) as well as windy (20 mph wind), unstable (Class A) weather conditions. The humidity was found not to have a significant impact on the results and set to 50%. A low ambient temperature of 10° F and high ambient temperature of 110° F were used.

The PHAST UDS module represents the overall release composition as an averaged pseudo component, therefore the overall gas composition was simplified to 8 components, the H₂S composition was conservatively adjusted up from 0.6 mole% to 2.0 mole% and then the gas was normalized. The resulting composition results in a similar molecular weight to the full gas composition (Appendix B). The H₂S concentrations of interest were defined as the IDLH, Maximum Peak Exposure Limit (10 minutes) and PEL which are 100 ppm, 50 ppm and 20 ppm, respectively. Plots of the UFL, LFL, 50% LFL and 20% LFL are also presented below.

Cases

PSV-100 Discharge – High Flow Scenario

PSV-100 is present on the suction header and designed to provide overpressure protection in the event that the facility recycle PV-C100 fails open. The dispersion and flammability analysis was based on the calculated required relief rate of 72.5 MMSCFD (23.15 kg/sec) at the predicted outlet temperature of 14° F. The flow at the vent exit is sonic for this scenario resulting in an exit velocity of 1,138 ft/sec (347 m/sec). As the graphs below detail, toxic concentrations of H₂S and flammable concentrations are not present below the 30' height of the vent stack based on the boundary weather conditions selected.

Stable, Low Wind, Warm Ambient

Discharge data

Material
 MAESTRO VENT GAS ✓ ▾ 🔍

Mass flow rate
 23.15 ✓ kg/s Ⓞ

Release duration
 900 ✓ s Ⓞ

Velocity
 347 ✓ m/s Ⓞ

Phase to be released
 Vapour ✓ ▾

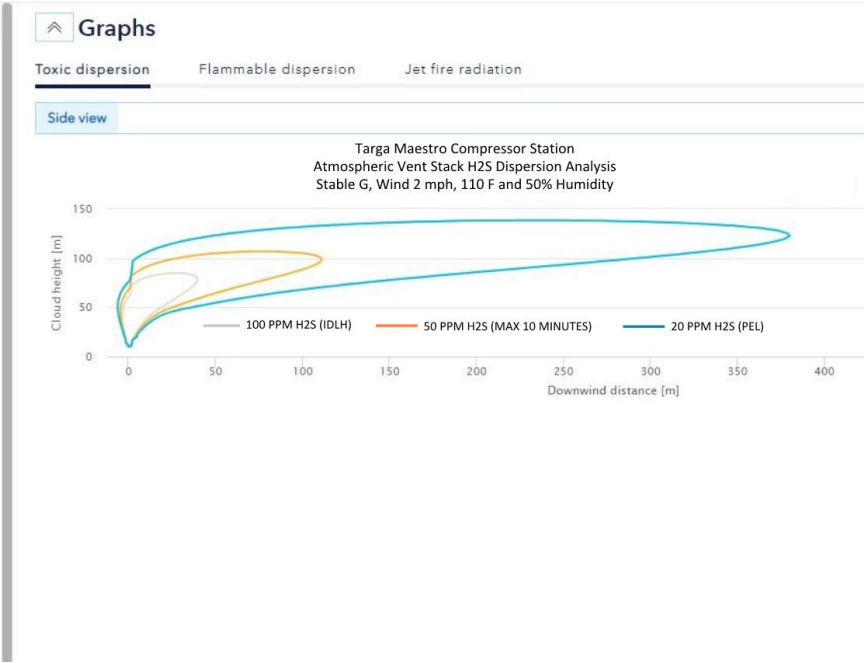
Temperature
 -10 ✓ degC Ⓞ

Liquid mole fraction
 0 ✓ fraction Ⓞ

Droplet diameter
 0 ✓ um Ⓞ

Release elevation
 9.144 ✓ m Ⓞ

Release angle (from horizontal)
 90 ✓ deg Ⓞ



Discharge data

Material
 MAESTRO VENT GAS ✓ ▾ 🔍

Mass flow rate
 23.15 ✓ kg/s Ⓞ

Release duration
 900 ✓ s Ⓞ

Velocity
 347 ✓ m/s Ⓞ

Phase to be released
 Vapour ✓ ▾

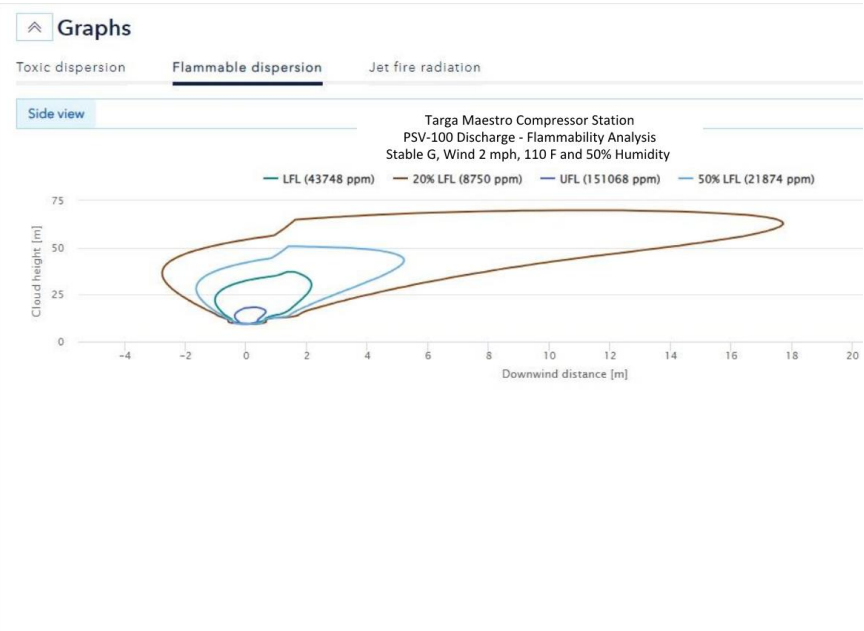
Temperature
 -10 ✓ degC Ⓞ

Liquid mole fraction
 0 ✓ fraction Ⓞ

Droplet diameter
 0 ✓ um Ⓞ

Release elevation
 9.144 ✓ m Ⓞ

Release angle (from horizontal)
 90 ✓ deg Ⓞ



Unstable, High Wind, Warm Ambient

Discharge data

Material
 MAESTRO VENT GAS ✓

Mass flow rate
 23.15 ✓ kg/s

Release duration
 900 ✓ s

Velocity
 347 ✓ m/s

Phase to be released
 Vapour ✓

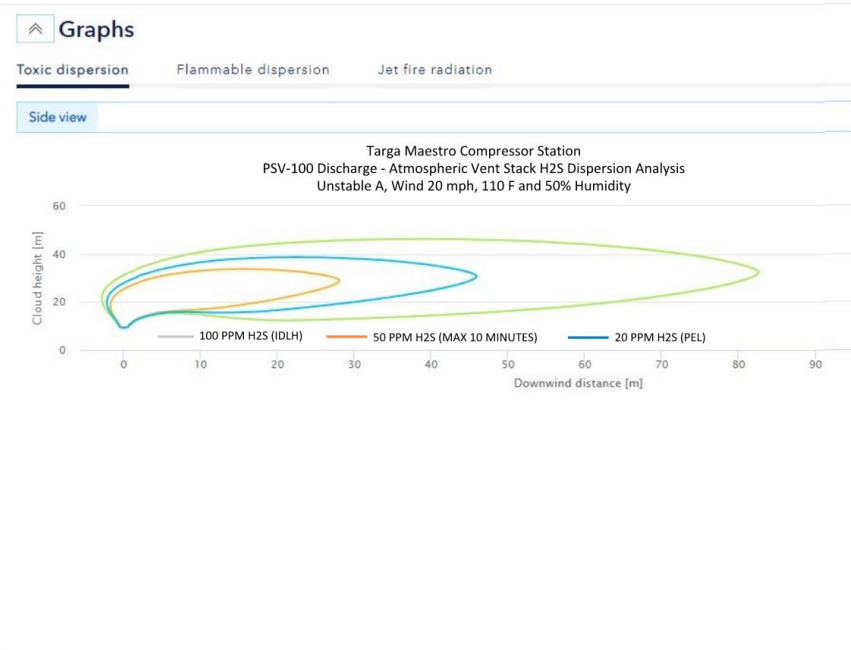
Temperature
 -10 ✓ degC

Liquid mole fraction
 0 ✓ fraction

Droplet diameter
 0 ✓ um

Release elevation
 9.144 ✓ m

Release angle (from horizontal)
 90 ✓ deg



Discharge data

Material
 MAESTRO VENT GAS ✓

Mass flow rate
 23.15 ✓ kg/s

Release duration
 900 ✓ s

Velocity
 347 ✓ m/s

Phase to be released
 Vapour ✓

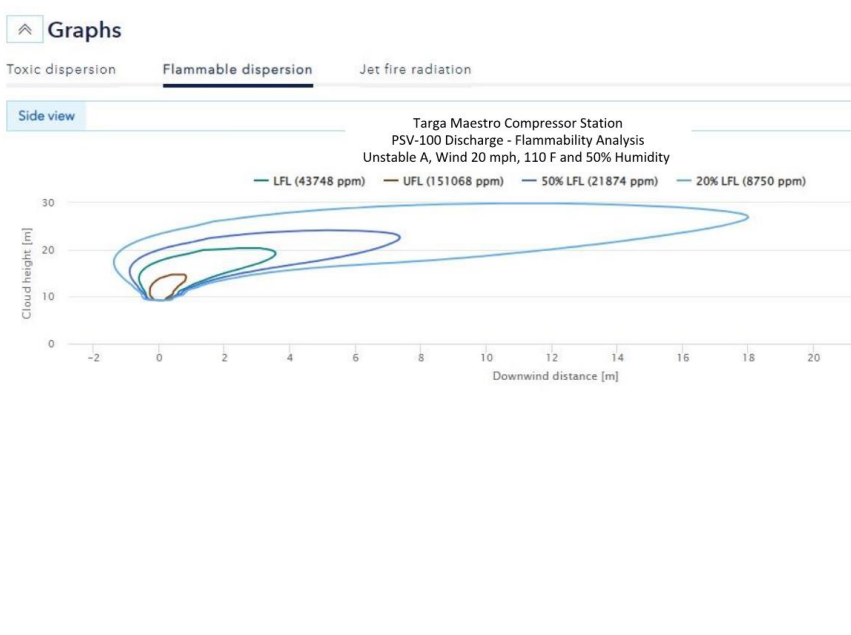
Temperature
 -10 ✓ degC

Liquid mole fraction
 0 ✓ fraction

Droplet diameter
 0 ✓ um

Release elevation
 9.144 ✓ m

Release angle (from horizontal)
 90 ✓ deg



Stable, Low Wind, Cold Ambient

Discharge data

Material
 MAESTRO VENT GAS ✓

Mass flow rate
 23.15 ✓ kg/s

Release duration
 900 ✓ s

Velocity
 347 ✓ m/s

Phase to be released
 Vapour ✓

Temperature
 -10 ✓ degC

Liquid mole fraction
 0 ✓ fraction

Droplet diameter
 0 ✓ um

Release elevation
 9.144 ✓ m

Release angle (from horizontal)
 90 ✓ deg



Discharge data

Material
 MAESTRO VENT GAS ✓

Mass flow rate
 23.15 ✓ kg/s

Release duration
 900 ✓ s

Velocity
 347 ✓ m/s

Phase to be released
 Vapour ✓

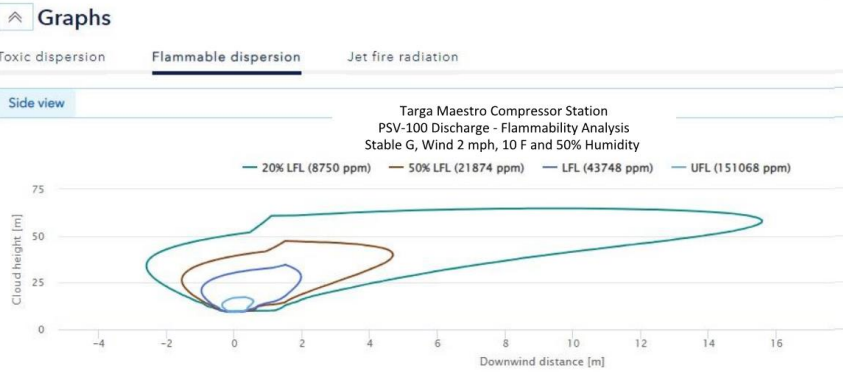
Temperature
 -10 ✓ degC

Liquid mole fraction
 0 ✓ fraction

Droplet diameter
 0 ✓ um

Release elevation
 9.144 ✓ m

Release angle (from horizontal)
 90 ✓ deg



Unstable, High Wind, Cold Ambient

Discharge data

Material
MAESTRO VENT GAS ✓

Mass flow rate
23.15 ✓ kg/s

Release duration
900 ✓ s

Velocity
347 ✓ m/s

Phase to be released
Vapour ✓

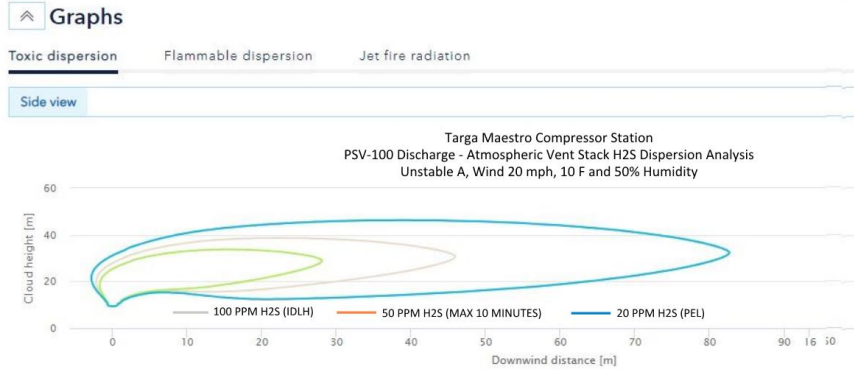
Temperature
-10 ✓ degC

Liquid mole fraction
0 ✓ fraction

Droplet diameter
0 ✓ um

Release elevation
9.144 ✓ m

Release angle (from horizontal)
90 ✓ deg



Discharge data

Material
MAESTRO VENT GAS ✓

Mass flow rate
23.15 ✓ kg/s

Release duration
900 ✓ s

Velocity
347 ✓ m/s

Phase to be released
Vapour ✓

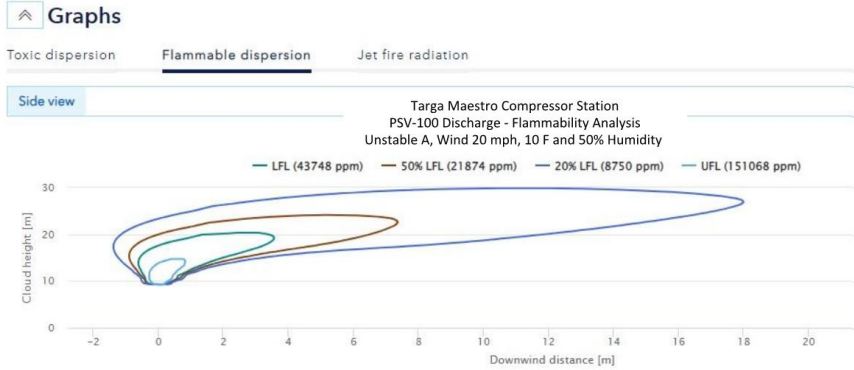
Temperature
-10 ✓ degC

Liquid mole fraction
0 ✓ fraction

Droplet diameter
0 ✓ um

Release elevation
9.144 ✓ m

Release angle (from horizontal)
90 ✓ deg



Compressor 3rd Stage PSV Discharge - Medium Flow Scenario

In the event of a blocked discharge a compressor may relieve to the atmospheric vent system. The dispersion analysis was based on the provided actual capacity of one third stage discharge relief valve which is 14.2 MMSCFD (4.4 kg/sec) at the predicted outlet temperature of 300° F. The exit velocity for this scenario is 779 ft/sec (237 m/sec). As the graphs below detail, toxic concentrations of H₂S and flammable concentrations are not present below the 30' height of the vent stack based on the boundary weather conditions selected.

Stable, Low Wind, Warm Ambient

Discharge data

Material
 MAESTRO VENT GAS ✓

Mass flow rate
 4.4 ✓ kg/s

Release duration
 900 ✓ s

Velocity
 237 ✓ m/s

Phase to be released
 Vapour ✓

Temperature
 148.889 ✓ degC

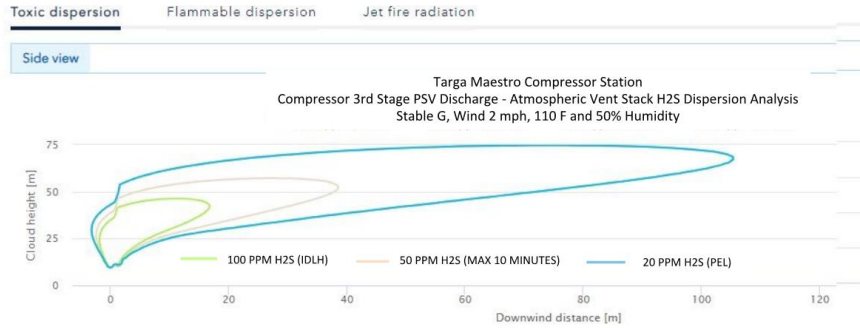
Liquid mole fraction
 0 ✓ fraction

Droplet diameter
 0 ✓ um

Release elevation
 9.144 ✓ m

Release angle (from horizontal)
 90 ✓ deg

Graphs



Discharge data

Material
 MAESTRO VENT GAS ✓

Mass flow rate
 4.4 ✓ kg/s

Release duration
 900 ✓ s

Velocity
 237 ✓ m/s

Phase to be released
 Vapour ✓

Temperature
 148.889 ✓ degC

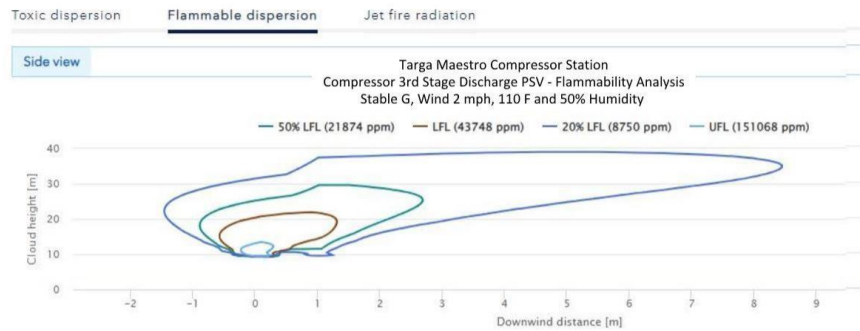
Liquid mole fraction
 0 ✓ fraction

Droplet diameter
 0 ✓ um

Release elevation
 9.144 ✓ m

Release angle (from horizontal)
 90 ✓ deg

Graphs



Unstable, High Wind, Warm Ambient

Discharge data

Material
 MAESTRO VENT GAS ✓

Mass flow rate
 4.4 ✓ kg/s

Release duration
 900 ✓ s

Velocity
 237 ✓ m/s

Phase to be released
 Vapour ✓

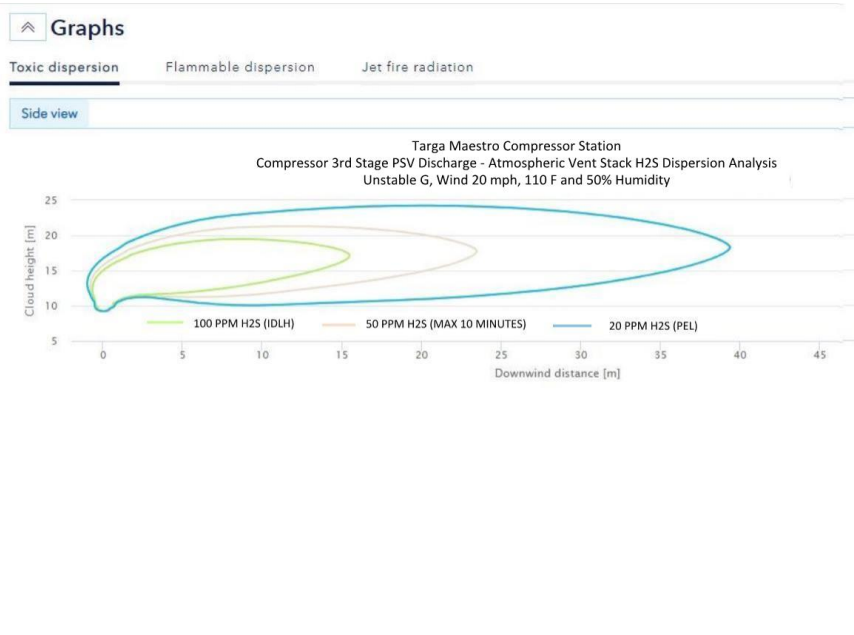
Temperature
 148.889 ✓ degC

Liquid mole fraction
 0 ✓ fraction

Droplet diameter
 0 ✓ um

Release elevation
 9.144 ✓ m

Release angle (from horizontal)
 90 ✓ deg



Discharge data

Material
 MAESTRO VENT GAS ✓

Mass flow rate
 4.4 ✓ kg/s

Release duration
 900 ✓ s

Velocity
 237 ✓ m/s

Phase to be released
 Vapour ✓

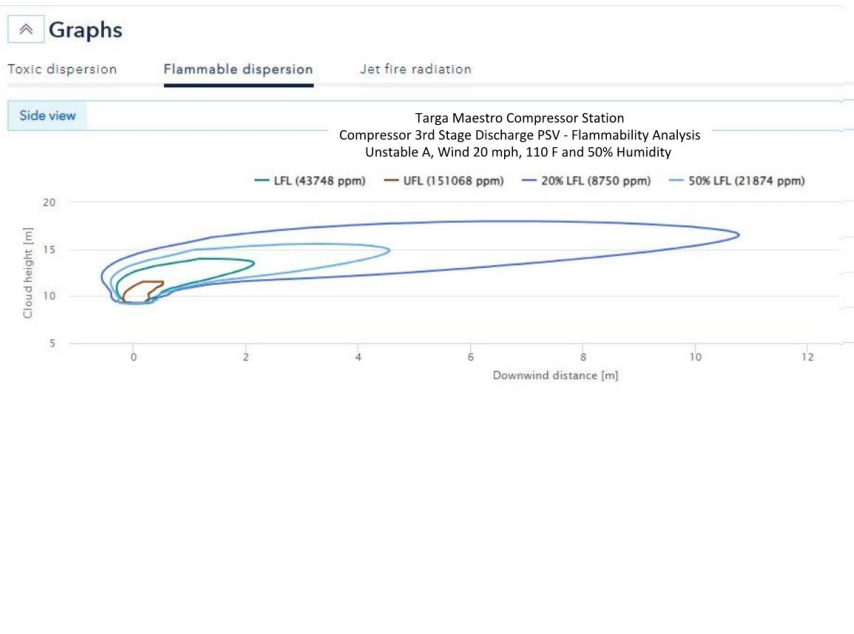
Temperature
 148.889 ✓ degC

Liquid mole fraction
 0 ✓ fraction

Droplet diameter
 0 ✓ um

Release elevation
 9.144 ✓ m

Release angle (from horizontal)
 90 ✓ deg



Stable, Low Wind, Cold Ambient

Discharge data

Material
 MAESTRO VENT GAS ✓ ▾ 🔍

Mass flow rate
 4.4 ✓ kg/s Ⓞ

Release duration
 900 ✓ s Ⓞ

Velocity
 237 ✓ m/s Ⓞ

Phase to be released
 Vapour ✓ ▾

Temperature
 148.889 ✓ degC Ⓞ

Liquid mole fraction
 0 ✓ fraction Ⓞ

Droplet diameter
 0 ✓ um Ⓞ

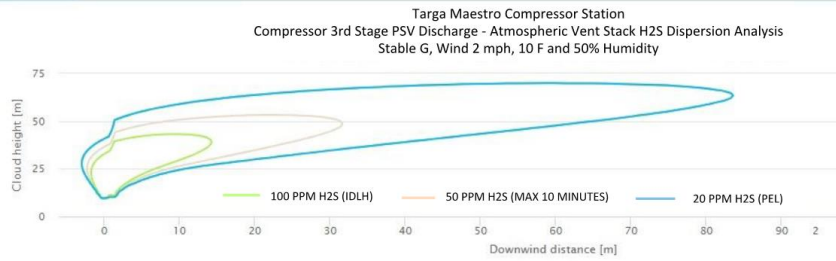
Release elevation
 9.144 ✓ m Ⓞ

Release angle (from horizontal)
 90 ✓ deg Ⓞ

Graphs

Toxic dispersion Flammable dispersion Jet fire radiation

Side view



Discharge data

Material
 MAESTRO VENT GAS ✓ ▾ 🔍

Mass flow rate
 4.4 ✓ kg/s Ⓞ

Release duration
 900 ✓ s Ⓞ

Velocity
 237 ✓ m/s Ⓞ

Phase to be released
 Vapour ✓ ▾

Temperature
 148.889 ✓ degC Ⓞ

Liquid mole fraction
 0 ✓ fraction Ⓞ

Droplet diameter
 0 ✓ um Ⓞ

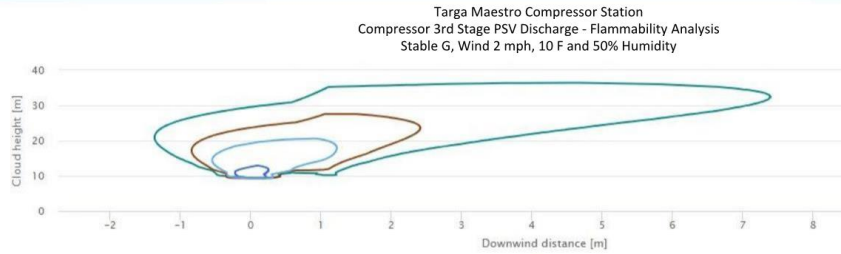
Release elevation
 9.144 ✓ m Ⓞ

Release angle (from horizontal)
 90 ✓ deg Ⓞ

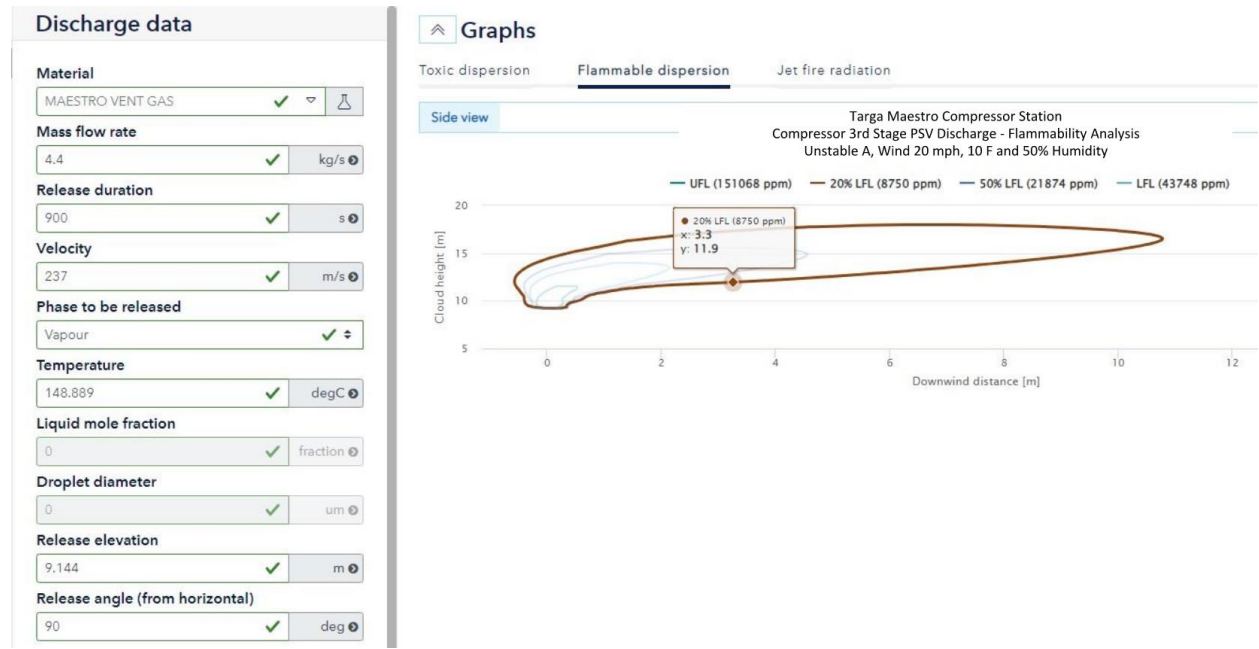
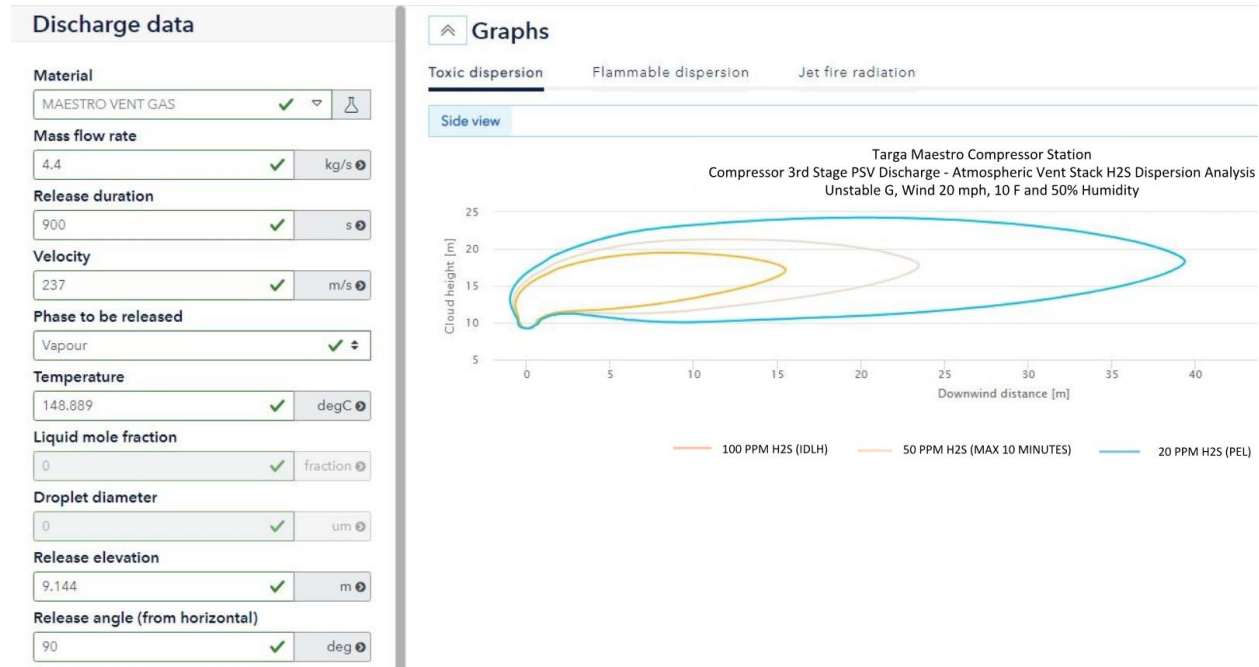
Graphs

Toxic dispersion Flammable dispersion Jet fire radiation

Side view



Unstable, High Wind, Cold Ambient



Compressor Packing Vents - Low Flow Scenario

The packing vents from the compressors are routed to the atmospheric vent system. The packing vent rate is variable due to wear but for the purposes of dispersion analysis was based on 0.1 MMSCFD (0.03 kg/sec) at the predicted release temperature of 200° F. The exit velocity for this scenario is 5 ft/sec (1.5 m/sec). As the graphs below detail, toxic concentrations of H₂S and flammable concentrations may sink a few feet in areas 10'-20' from the vent stack based on the boundary weather conditions selected which does not present a potential safety concern due to both the close proximity to the stack exit for these conditions.

Stable, Low Wind, Warm Ambient

Discharge data

Material
 MAESTRO VENT GAS ✓ ▾ 🔍

Mass flow rate
 0.03 ✓ kg/s Ⓞ

Release duration
 900 ✓ s Ⓞ

Velocity
 1.5 ✓ m/s Ⓞ

Phase to be released
 Vapour ✓ ▾

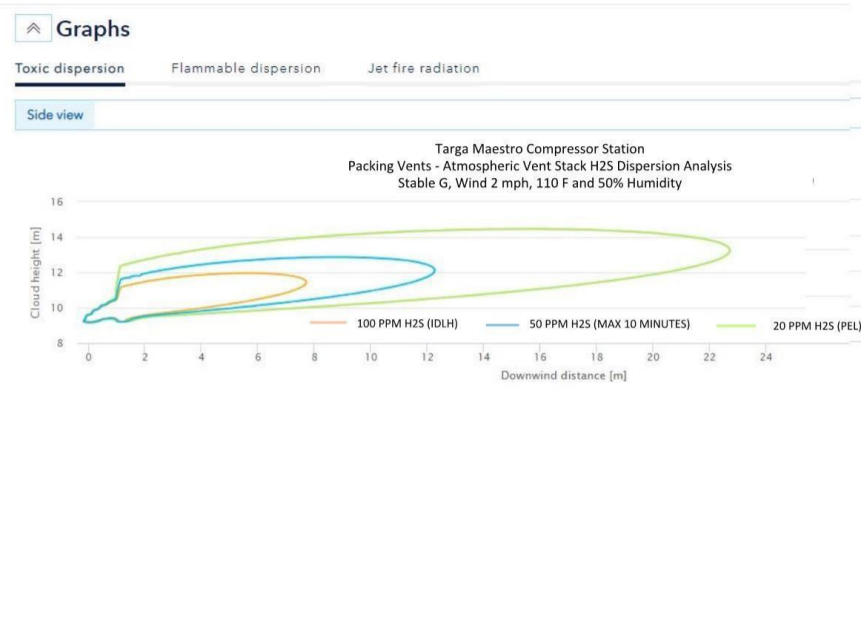
Temperature
 93.333 ✓ degC Ⓞ

Liquid mole fraction
 0 ✓ fraction Ⓞ

Droplet diameter
 0 ✓ um Ⓞ

Release elevation
 9.144 ✓ m Ⓞ

Release angle (from horizontal)
 90 ✓ deg Ⓞ



Discharge data

Material
 MAESTRO VENT GAS ✓ ▾ 🔍

Mass flow rate
 0.03 ✓ kg/s Ⓞ

Release duration
 900 ✓ s Ⓞ

Velocity
 1.5 ✓ m/s Ⓞ

Phase to be released
 Vapour ✓ ▾

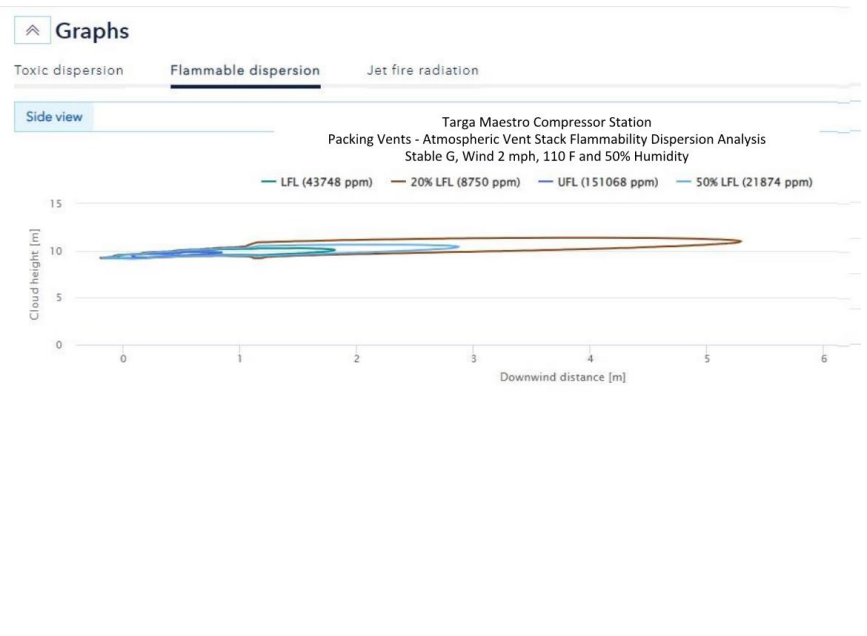
Temperature
 93.333 ✓ degC Ⓞ

Liquid mole fraction
 0 ✓ fraction Ⓞ

Droplet diameter
 0 ✓ um Ⓞ

Release elevation
 9.144 ✓ m Ⓞ

Release angle (from horizontal)
 90 ✓ deg Ⓞ



Unstable, High Wind, Warm Ambient

Discharge data

Material
 MAESTRO VENT GAS ✓

Mass flow rate
 0.03 ✓ kg/s

Release duration
 900 ✓ s

Velocity
 1.5 ✓ m/s

Phase to be released
 Vapour ✓

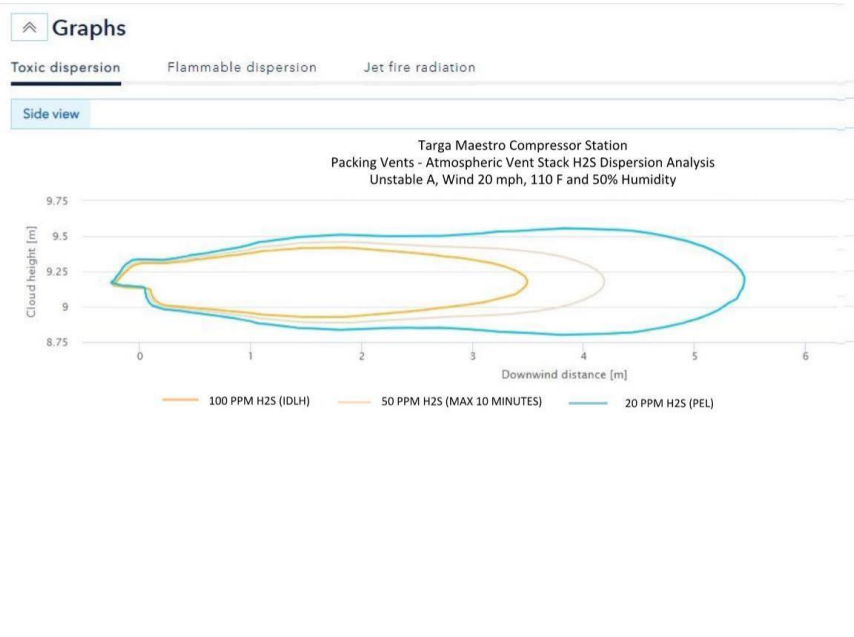
Temperature
 93.333 ✓ degC

Liquid mole fraction
 0 ✓ fraction

Droplet diameter
 0 ✓ um

Release elevation
 9.144 ✓ m

Release angle (from horizontal)
 90 ✓ deg



Discharge data

Material
 MAESTRO VENT GAS ✓

Mass flow rate
 0.03 ✓ kg/s

Release duration
 900 ✓ s

Velocity
 1.5 ✓ m/s

Phase to be released
 Vapour ✓

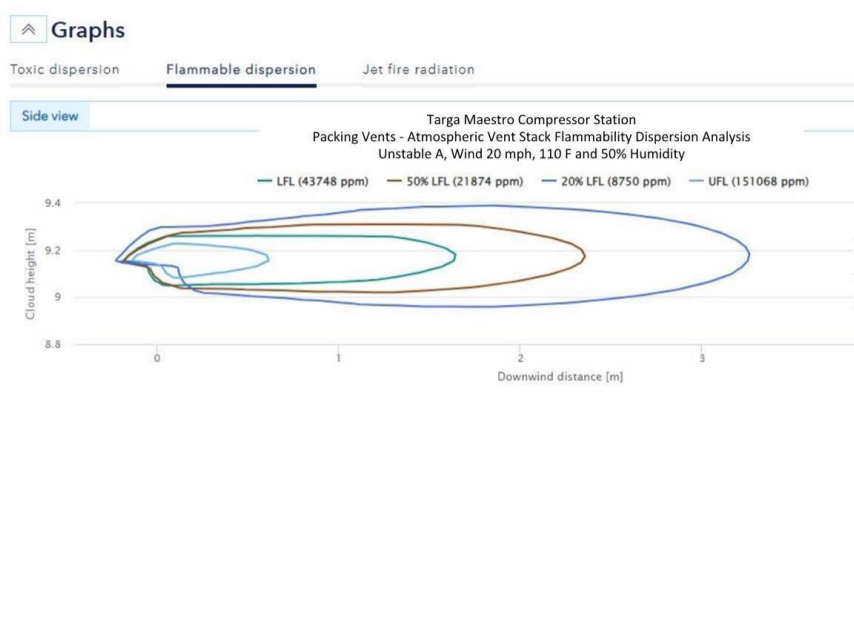
Temperature
 93.333 ✓ degC

Liquid mole fraction
 0 ✓ fraction

Droplet diameter
 0 ✓ um

Release elevation
 9.144 ✓ m

Release angle (from horizontal)
 90 ✓ deg



Stable, Low Wind, Cold Ambient

Discharge data

Material
 MAESTRO VENT GAS ✓ ▾ 🔍

Mass flow rate
 0.03 ✓ kg/s Ⓞ

Release duration
 900 ✓ s Ⓞ

Velocity
 1.5 ✓ m/s Ⓞ

Phase to be released
 Vapour ✓ ▾

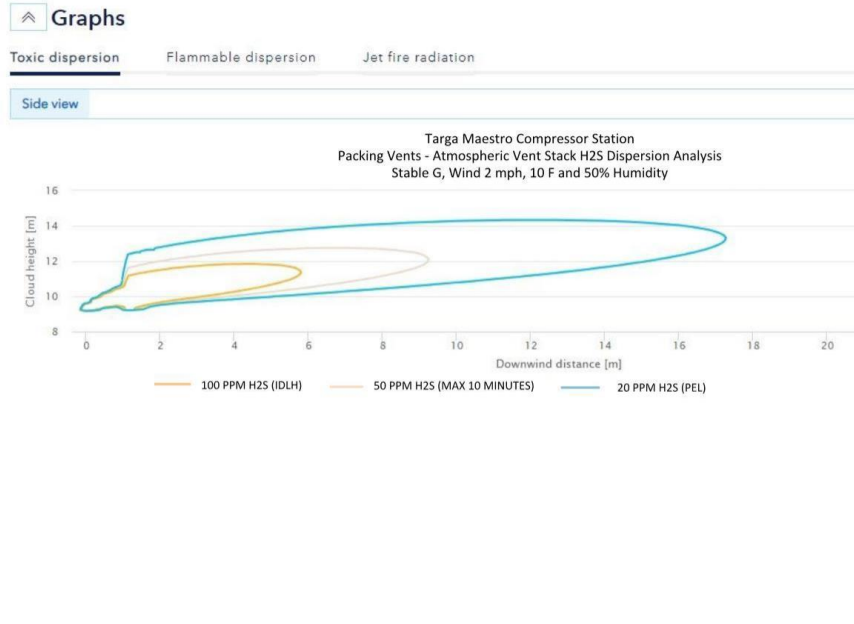
Temperature
 93.333 ✓ degC Ⓞ

Liquid mole fraction
 0 ✓ fraction Ⓞ

Droplet diameter
 0 ✓ um Ⓞ

Release elevation
 9.144 ✓ m Ⓞ

Release angle (from horizontal)
 90 ✓ deg Ⓞ



Discharge data

Material
 MAESTRO VENT GAS ✓ ▾ 🔍

Mass flow rate
 0.03 ✓ kg/s Ⓞ

Release duration
 900 ✓ s Ⓞ

Velocity
 1.5 ✓ m/s Ⓞ

Phase to be released
 Vapour ✓ ▾

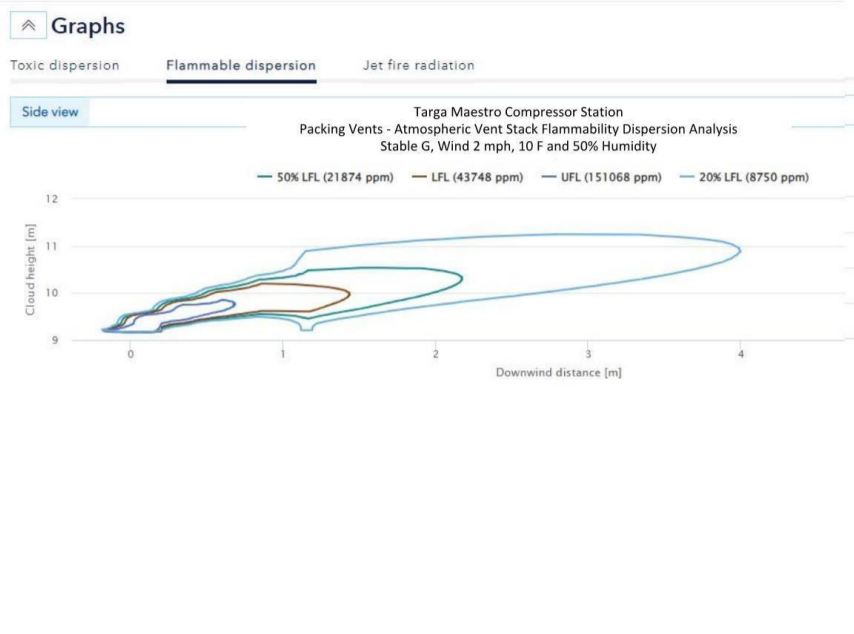
Temperature
 93.333 ✓ degC Ⓞ

Liquid mole fraction
 0 ✓ fraction Ⓞ

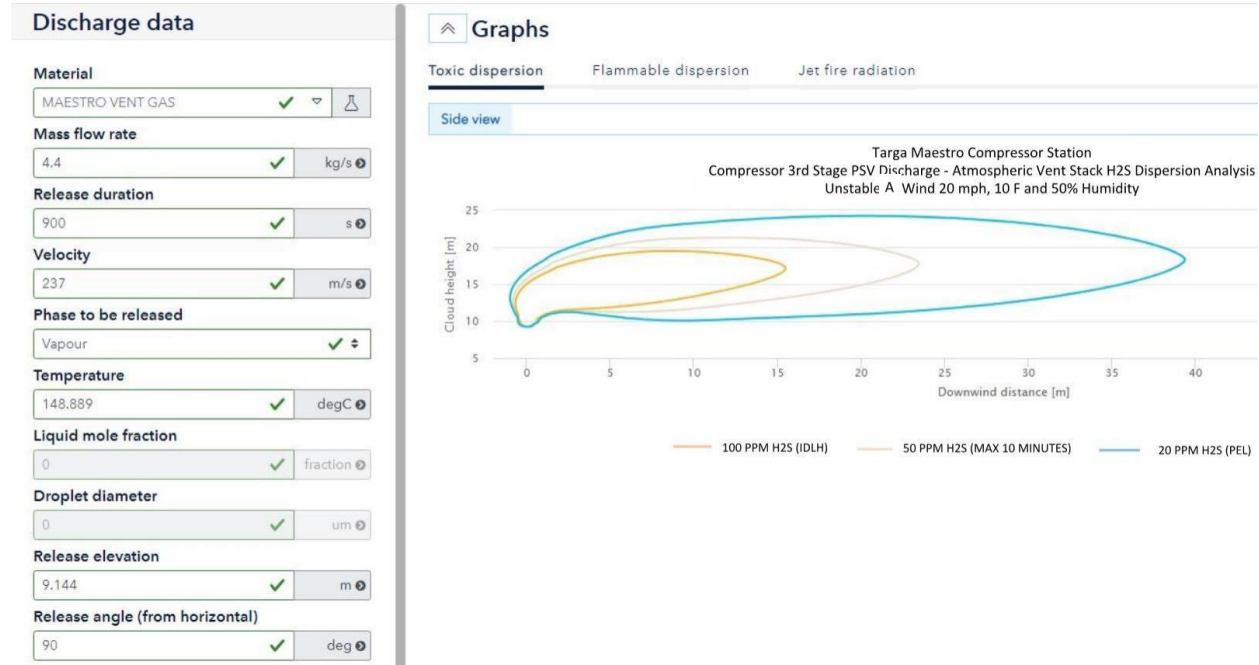
Droplet diameter
 0 ✓ um Ⓞ

Release elevation
 9.144 ✓ m Ⓞ

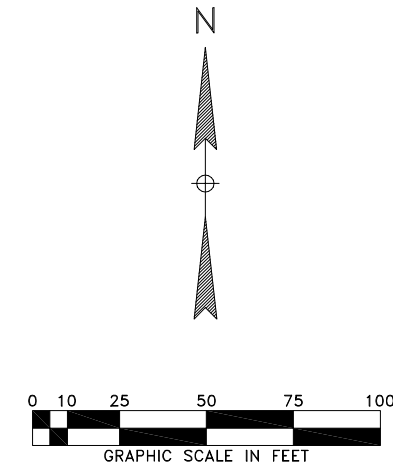
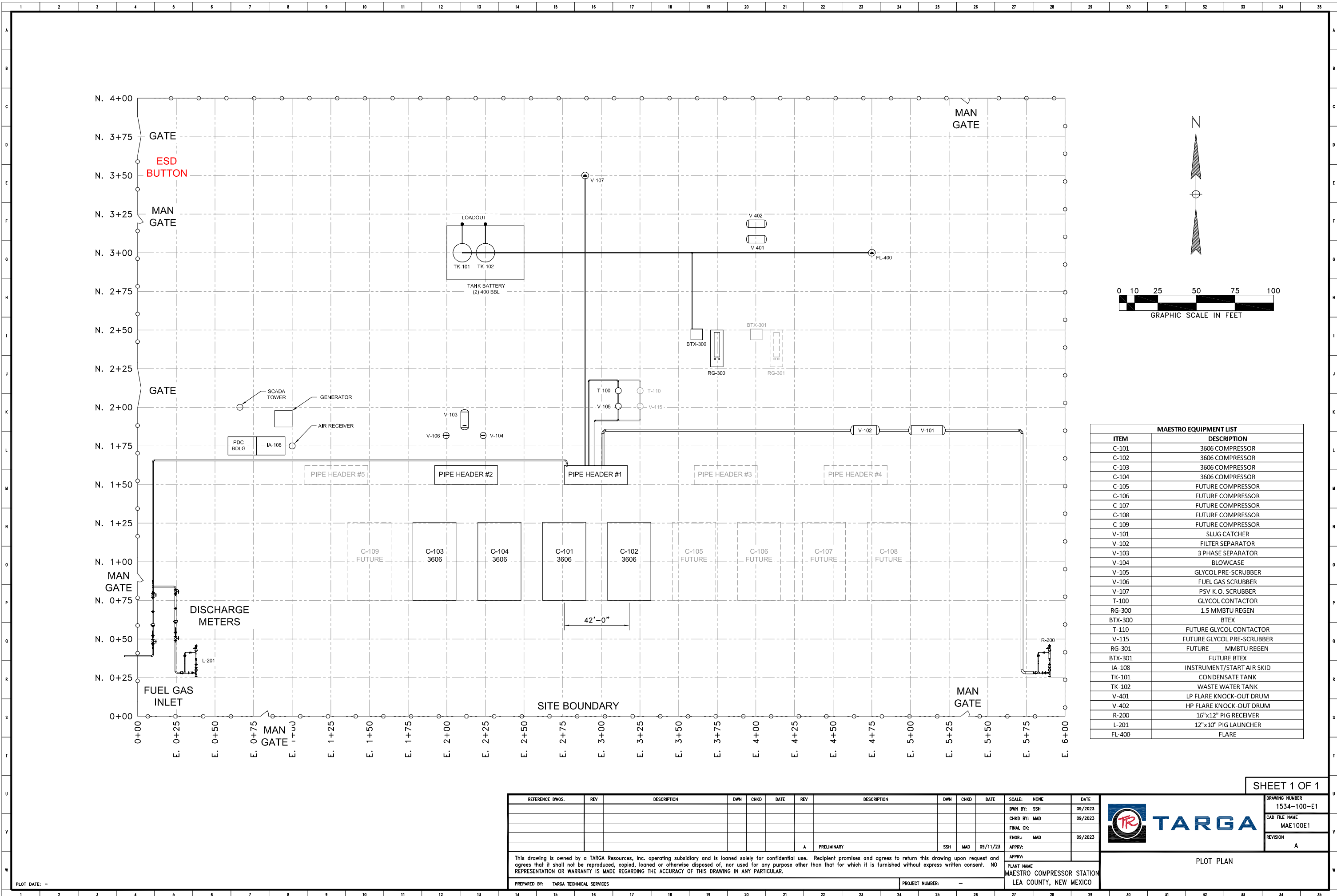
Release angle (from horizontal)
 90 ✓ deg Ⓞ



Unstable, High Wind, Cold Ambient



Appendix A – Plot Plan



MAESTRO EQUIPMENT LIST	
ITEM	DESCRIPTION
C-101	3606 COMPRESSOR
C-102	3606 COMPRESSOR
C-103	3606 COMPRESSOR
C-104	3606 COMPRESSOR
C-105	FUTURE COMPRESSOR
C-106	FUTURE COMPRESSOR
C-107	FUTURE COMPRESSOR
C-108	FUTURE COMPRESSOR
C-109	FUTURE COMPRESSOR
V-101	SLUG CATCHER
V-102	FILTER SEPARATOR
V-103	3 PHASE SEPARATOR
V-104	BLOWCASE
V-105	GLYCOL PRE-SCRUBBER
V-106	FUEL GAS SCRUBBER
V-107	PSV K.O. SCRUBBER
T-100	GLYCOL CONTACTOR
RG-300	1.5 MMBTU REGEN
BTX-300	BTEX
T-110	FUTURE GLYCOL CONTACTOR
V-115	FUTURE GLYCOL PRE-SCRUBBER
RG-301	FUTURE MMBTU REGEN
BTX-301	FUTURE BTEX
IA-108	INSTRUMENT/START AIR SKID
TK-101	CONDENSATE TANK
TK-102	WASTE WATER TANK
V-401	LP FLARE KNOCK-OUT DRUM
V-402	HP FLARE KNOCK-OUT DRUM
R-200	16"x12" PIG RECEIVER
L-201	12"x10" PIG LAUNCHER
FL-400	FLARE

SHEET 1 OF 1

REFERENCE DWGS.	REV	DESCRIPTION	DWN	CHKD	DATE	REV	DESCRIPTION	DWN	CHKD	DATE
						A	PRELIMINARY	SSH	MAD	09/11/23

SCALE:	NONE	DATE:	
DWN BY:	SSH	DATE:	09/2023
CHKD BY:	MAD	DATE:	09/2023
FINAL CK:		DATE:	
ENGR.:	MAD	DATE:	09/2023
APPRV:		DATE:	



DRAWING NUMBER	1534-100-E1
CAD FILE NAME	MAE100E1
REVISION	A

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PREPARED BY: TARGA TECHNICAL SERVICES PROJECT NUMBER: --

PLANT NAME
MAESTRO COMPRESSOR STATION
LEA COUNTY, NEW MEXICO

PLOT PLAN



PLOT DATE: --

Appendix B – Full Gas and Dispersion Gas Compositions










	Total
	%
H2S	0.597684
Nitrogen	1.44849
Carbon Dioxide	5.87353
Methane	72.5516
Ethane	9.36096
Propane	5.17148
i-Butane	0.886289
n-Butane	1.80311
i-Pentane	0.584926
n-Pentane	0.463357
2,2-Dimethylbutane	0.00794501
Cyclopentane	0.0466797
2-Methylpentane	0.131906
3-Methylpentane	0.0862352
n-Hexane	0.147496
2,2-Dimethylpentane	0.00987976
Methylcyclopentane	0.0603847
2,2,3-Trimethylbutane	0
Benzene	0.0267255
Cyclohexane	0.0671403
2-Methylhexane	0.0186885
3-Methylhexane	0.0235731
1,1-Dimethylcyclopentane	0.00295459
Heptane	0.0332583
Methylcyclohexane	0.0567274
2,5-Dimethylhexane	0.0019393
Toluene	0.0477863
2-Methylheptane	0.00863589
Octane	0.0293116
Ethylcyclohexane	0.00377805
Ethylbenzene	0.00374933
p-Xylene	0.0121458
o-Xylene	0.00277923
Nonane	0.00792767
Decane	0.01065
Water	0.410288
TEG	0

Material properties

Material selected

MAESTRO VENT GAS   +

+ Add component

Component	Mole %	
HYDROGEN SULFIDE (7783064)	2	
NITROGEN (7727379)	1.448	
CARBON DIOXIDE (124389)	5.874	
METHANE (74828)	72.553	
ETHANE (74840)	9.361	
PROPANE (74986)	5.1715	
ISOBUTANE (75285)	0.8863	
N-BUTANE (106978)	1.803	
ISOPENTANE (78784)	0.5849	
N-PENTANE (109660)	0.3183	