

Battery Application (16-07) 102.16-18-010-27W1

Appendix B- Gas Dispersion Modelling

Screen3 Calculator Assumptions					
Company	Tundra Oil & Gas		Date Reviewed	10-May-24	
Facility	(16-07) 102.16-18-010-27		Name	S. Benko	
RED are inputs					
Oil (m3)	16		Treater	Flare	Tank Vent
H2O (m3)	35	% volume of total	0	100	0
GOR (m3/m3)	52	m3	0	832	0
Total Gas=	832 m3				
Mole Fraction	0.0044	Date of test	May 2, 2024 at Wellhead Casing		
	Treater	Flare	Tank Vent		
Vent Height (m	4.5	Vent Height (m)	12.2	Vent Height (m	10
Stack ID (m)	0.4573	Stack ID (m)	0.0762	Stack ID (m)	0.0762
	point	point	point	point	Source
RESULTS					
Flare					
Vent stack Exit Flow Rate	0.000042370 m3/s				
Emission Rate	H2S	0.061073076 g/s			
	SO2	0.114801247 g/s			
Vent stack area	0.004560233 m2				
Vent stack exit velocity	2.111653071 m/s				



Sour Gas Flare Properties

Company **Tundra Oil & Gas**
 Facility **(16-07) 102.16-18-010-27 Wellhead**
 Case **Solution Gas**

Flow Rate

Gas Stream	flare	scrubber	total gas	
Flow Rate	0.832	0.000	0.832	10 ³ m ³ /d at 15°C and 101.3 kPa
Percentage	100.0	0.0	100.0	%
Reference Temp	15	15	15	°C

Composition (dry)

				Mole Fraction
H ₂	0.0007		0.0007	
He	0.0006		0.0006	
N ₂	0.5589		0.5589	
CO ₂	0.0331		0.0331	
H ₂ S	0.0044		0.0044	
C ₁	0.0705		0.0705	
C ₂	0.1385		0.1385	
C ₃	0.1287		0.1287	
iC ₄	0.0140		0.0140	
nC ₄	0.0320		0.0320	
iC ₅	0.0064		0.0064	
nC ₅	0.0063		0.0063	
C ₆	0.0038		0.0038	
C ₇₊	0.0021		0.0021	
Total	1.0000	0.0000	1.0000	

Gas Stream Properties

Molecular Mass	32.37	0.00	32.37	kg/kmole
Net Heating Value	29.93	0.00	29.93	10 ³ m ³ /d at 15°C and 101.3 kPa
Net Heat Release Rate	68,846	0	68,846	cal/s
Equivalent SO ₂ Inlet	0.010	0.000	0.010	t/d
Equivalent SO ₂ Inlet	0.11	0.00	0.11	g/s

Stack Parameters

Flare Stack Height	12.2	m		
Flare Stack Diameter	76.20	mm		
Actual Exit Velocity	2.11	m/s		
Length of Flame:	1.19	m		
Heat Intensity at Base	1.07	kW/m ²		Background = 1.04 kW/m ²
Conversion Efficiency	100.00	%		
Radiation Loss	25	%		(Brode => 55%, AENV => 25%)
Sensible Heat Release	51,635	cal/s		Based on conversion efficiency & radiation loss

Model Input Parameters

Effective Stack Height	13.14	m		(per EPA and Beychok, M.; 1979)
Pseudo-diameter	0.691	m		based on actual exit velocity
Actual Exit Velocity	2.11	m/s		
Exit Temperature	1273	K	1000	°C
Ambient temperature	288	K		Pseudo temperature for modelling

Emissions

SO ₂ Emission	0.115	g/s		Based on user-specified conversion efficiency
H ₂ S Emission	0.000	g/s		Based on user-specified conversion efficiency
NO _x Emission	0.008	g/s		Based on US EPA AP-42

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Model Results:

05/10/24

14:56:07

*** SCREEN3 MODEL RUN ***

*** VERSION DATED 13043 ***

SIMPLE TERRAIN INPUTS:

SOURCE TYPE = FLARE

EMISSION RATE (G/S) = 0.114800

FLARE STACK HEIGHT (M) = 12.2000

TOT HEAT RLS (CAL/S) = 51635.0

RECEPTOR HEIGHT (M) = 0.0000

URBAN/RURAL OPTION = RURAL

EFF RELEASE HEIGHT (M) = 13.0161

BUILDING HEIGHT (M) = 0.0000

MIN HORIZ BLDG DIM (M) = 0.0000

MAX HORIZ BLDG DIM (M) = 0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.

THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = $0.856 \text{ M}^{**4}/\text{S}^{**3}$; MOM. FLUX = $0.522 \text{ M}^{**4}/\text{S}^{**2}$.

*** FULL METEOROLOGY ***

*** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	U10M STAB (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
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1.	0.000	1	1.0	1.0	320.0	31.74	0.75	0.65	NO
100.	13.53	1	2.0	2.0	640.0	22.38	26.99	14.20	NO
200.	15.48	3	2.0	2.1	640.0	22.30	23.77	14.28	NO
300.	15.76	3	1.0	1.0	320.0	31.59	34.70	21.01	NO
400.	14.78	3	1.0	1.0	320.0	31.59	44.96	26.97	NO
500.	13.83	4	1.5	1.6	480.0	25.24	36.31	18.63	NO
600.	13.35	4	1.0	1.0	320.0	31.35	43.04	21.85	NO
700.	12.82	4	1.0	1.0	320.0	31.35	49.47	24.60	NO
800.	11.92	4	1.0	1.0	320.0	31.35	55.82	27.29	NO
900.	10.92	4	1.0	1.0	320.0	31.35	62.10	29.93	NO
1000.	9.934	4	1.0	1.0	320.0	31.35	68.33	32.52	NO
1100.	9.044	4	1.0	1.0	320.0	31.35	74.49	34.52	NO
1200.	8.258	4	1.0	1.0	320.0	31.35	80.61	36.47	NO
1300.	7.566	4	1.0	1.0	320.0	31.35	86.68	38.36	NO
1400.	6.955	4	1.0	1.0	320.0	31.35	92.70	40.20	NO
1500.	6.415	4	1.0	1.0	320.0	31.35	98.68	42.00	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

254.	16.26	3	1.5	1.5	480.0	25.40	29.75	17.87	NO
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DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, $X < 3 * LB$

*** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION	MAX CONC	DIST TO	TERRAIN
PROCEDURE	(UG/M**3)	MAX (M)	HT (M)
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SIMPLE TERRAIN	16.26	254.	0.

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
