Attachment C Air Emissions Calculations

Attachment C
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Construction Air Emissions Summary - Tranquillon Ridge Project

Emissions Summary - Proposed Project

Location and Construction Activity	Total (Annual) Emissions (tons/year)				
	CO	ROC	NOx	SO_2	PM_{10}
LOGP & Valve St #2	8.03	1.39	19.37	2.00	1.52
LOGP & Valve St #2 - Fugitive dust	-	-	-	-	0.01
Platform Irene	0.08	0.03	0.20	0.02	0.03
Offsite - onshore and offshore	3.14	0.76	2.18	0.05	0.16
Construction Total Emissions	**11.26**	**2.17**	**21.75**	**2.07**	**1.71**
Significance Criteria	**25.0**	**55.0**	**55.0**	**25.0**	**25.0**
Significant?	**No**	**No**	**No**	**No**	**No**

Onsite Construction Equipment Emissions

Proposed Project

LOGP and Valve Site 2 Equipment Modifications																			
Construction Equipment	Number	Daily Usage	Daily Hours	Duration (Days)	Hourly Emissions (lbs/hr)					Peak Daily Emission (lbs/day)					Total (Yearly) Emissions (tons)				
					CO	ROC	NO_x	SO_2	PM_{10}	CO	ROC	NO_x	SO_2	PM_{10}	CO	ROC	NO_x	SO_2	PM_{10}
Backhoe	2	0.8	8	220	1.14	0.46	3.80	0.36	0.34	7.32	2.94	24.32	2.33	2.18	0.81	0.32	2.68	0.26	0.24
Trencher	1	0.8	8	11	0.57	0.23	1.90	0.18	0.17	3.66	1.47	12.16	1.16	1.09	0.02	0.01	0.07	0.01	0.01
A-frame Truck	3	0.5	8	270	5.40	0.57	12.51	1.35	0.78	21.60	2.28	50.04	5.40	3.12	2.92	0.31	6.76	0.73	0.42
Service Truck	2	0.5	8	270	3.60	0.38	8.34	0.90	0.52	14.40	1.52	33.36	3.60	2.08	1.94	0.21	4.50	0.49	0.28
15-ton Crane	2	0.8	8	151	2.34	0.78	5.98	0.52	0.78	14.98	4.99	38.27	3.33	4.99	1.13	0.38	2.89	0.25	0.38
Concrete Truck	2	0.5	8	100	3.60	0.38	8.34	0.90	0.52	14.40	1.52	33.36	3.60	2.08	0.72	0.08	1.67	0.18	0.10
Welding Machine	3	0.5	8	150	1.65	0.30	2.70	0.30	0.30	6.60	1.20	10.80	1.20	1.20	0.50	0.09	0.81	0.09	0.09
Total					**18.31**	**3.10**	**43.57**	**4.52**	**3.41**	**82.96**	**15.93**	**202.31**	**20.62**	**16.74**	**8.03**	**1.39**	**19.37**	**2.00**	**1.52**
Platform Irene Equipment Modifications																			
15-ton Crane	2	0.5	8	15	2.34	0.78	5.98	0.52	0.78	9.36	3.12	23.92	2.08	3.12	0.07	0.02	0.18	0.02	0.02
Welding Machine	1	0.5	8	10	0.55	0.1	0.9	0.1	0.1	2.20	0.40	3.60	0.40	0.40	0.01	0.00	0.02	0.00	0.00
Total					**2.89**	**0.88**	**6.88**	**0.62**	**0.88**	**11.56**	**3.52**	**27.52**	**2.48**	**3.52**	**0.08**	**0.03**	**0.20**	**0.02**	**0.03**

Construction Mobile Emissions (Offsite) - Proposed Project

	Parameters									Peak Day Emissions, lbs/day					Total Emissions, Tons				
Source	**Vehicle Type**	**Include in Peak Hour?**	**Number of Vehicles per Day**	**Load Factor**	**Daily Trips (one way)**	**No. of days**	**Distance One Way (miles)**	**Speed (mph)**	**Time of Trip (min)**	**CO**	**ROC**	**NOx**	**SO2**	**PM10**	**CO**	**ROC**	**NOx**	**SO2**	**PM10**
The LOGP & Valve #2 - Onshore																			
Workers Commuting	Gasoline	1	40	-	80	270	5	25	12	9.35	2.40	0.86	0.05	0.02	1.263	0.324	0.116	0.007	0.002
Truck Travel - Other [a]	Diesel	1	7	-	14	215	25	25	60	10.72	2.32	10.11	0.05	0.74	1.152	0.249	1.087	0.005	0.079
Construction Equipment Delivery [b]	Diesel	0	4	-	8	4	20	25	48	4.90	1.06	4.62	0.02	0.34	0.010	0.002	0.009	0.000	0.001
Construction Equipment Removal	Diesel	0	4	-	8	4	20	25	48	4.90	1.06	4.62	0.02	0.34	0.010	0.002	0.009	0.000	0.001
Construction Materials Delivery [c]	Diesel	1	4	-	8	200	20	25	48	4.90	1.06	4.62	0.02	0.34	0.490	0.106	0.462	0.002	0.034
The Pump Stations - Onshore																			
Workers Commuting	Gasoline	1	21	-	0	98	5	25	12	0.00	0.33	0.00	0.00	0.00	0.000	0.016	0.000	0.000	0.000
Truck Travel - Other [a]	Diesel	1	4	-	0	98	25	25	60	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000
Construction Equipment Delivery [b]	Diesel	0	4	-	0	2	20	25	48	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000
Construction Equipment Removal	Diesel	0	4	-	0	2	20	25	48	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000
Construction Materials Delivery [c]	Diesel	1	4	-	0	15	20	25	48	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000
Platform Irene - Offshore																			
Workers Commuting	Gasoline	1	15	-	30	10	10	25	24	5.52	1.37	0.52	0.04	0.01	0.028	0.007	0.003	0.000	0.000
Truck Travel - Material Delivery	Diesel	1	2	-	4	10	25	25	60	3.06	0.66	2.89	0.01	0.21	0.015	0.003	0.014	0.000	0.001
Helicopter (construction) - idle [d]	Gasoline	1	1	-	2	10	-	-	25	9.39	5.38	0.08	0.04	0.05	0.047	0.027	0.000	0.000	0.000
Helicopter (construction) - cruise	Gasoline	1	1	-	2	10	-	-	25	5.86	0.73	7.57	0.73	0.98	0.029	0.000	0.000	0.000	0.000
Supply Boat - main engines [e]	Diesel	1	1	0.65	1	2	-	-	330	54.86	11.77	173.07	19.76	22.42	0.055	0.012	0.173	0.020	0.022
Supply Boat - auxiliary engines [f]	Diesel	1	1	0.50	1	2	-	-	330	42.20	9.06	302.38	15.20	17.25	0.042	0.009	0.302	0.015	0.017
Supply Boat - bow thruster [g]	Diesel	1	1	-	1	2	-	-	60	1.74	0.66	8.09	0.38	0.55	0.002	0.001	0.008	0.000	0.001
Total										***147.6***	***35.7***	***510.2***	***36.3***	***42.6***	***3.14***	***0.76***	***2.18***	***0.05***	***0.16***

Emissions calculations based on EMFAC7G. See Emission Factors spreadsheet
Equipment (backhoes, cranes, etc) assume delivered and removed as 2 separate trips.
Helicopter horse powers 1400

Notes/Assumptions:

a - Includes the following equipment: Service Trucks, A-Frame Trucks, Concrete Trucks
b - Total number of trucks needed to deliver construction equipment
equipment that needs to be delivered does not include various trucks
c - Materials include vessel, eductor, pumps, valves and piping delivery - 20 trucks
d - Helicopter trips originate from Santa Maria Airport and take 50 minutes round-trip on the average (PTO 9106)
idle time is assumed to take 5% of the trip;
construction is assumed that construction would generate 1 additional helicopter round-trip per day
e - Boat power - Main engines = two at 2000 bhp each; Auxiliary engines = two at 245 bhp; Bow thruster = 515 bhp (PTO 9106

Construction Air Emissions - Fugitive Dust Emissions (PM_{10})

Emission factor for travel on unpaved roads based on following inputs		Assumptions, Comments	Data Sources
surface silt loading in percent	*24*		*Site debris clearing based on CEQA SCAQMD Tables 9-9 and 9-9-f*
mean vehicle speed in mph	*15*		*Graded surface based on SCAQMD Table 9-9*
mean vehicle weight in tons	*2*	Light vehicles only	
mean number of wheels on vehicle	*4*	All vehicles are small	
mean number of rain days per year	*34*		
soil, tons/yd^3	*1.01*		
silt content of soil	*1.5*		

Proposed Project

Activity (at LOGP and Valve Site #2)	Source	Source Units	Number of Days	Emission Factor	Emission Factor, Units	Mitigation Reduction percentage	Peak Day Emissions, lbs/day	Total PM10 Emissions, tons
Site grading	0.34	acres	10	26.4	lbs/acre	0	0.91	0.005
Fill dumping	84	tons	5	0.009	lbs/ton	0	0.15	0.000
Travel on dirt roads - estimate	0.13	vehicle-miles	15	1.43	lbs/vehicle-miles	0	0.01	0.000
Disturbed area	0.52	acres	15	26.4	lbs/acre	0	0.91	0.007
Fill Storage Piles - estimate	0.00	acres	5	6.39	lbs/day/acre	0	0.00	0.000
Total							**1.98**	**0.012**

Average number of vehicles per day	7	**Assumptions: 1) a portion of the pipeline for the Upgraded Water System will be underground**
Travel distance for each vehicle on site, ft	100	**2) a portion of power line will be underground under Vandenberg power line**
Site disturbed area per day, acres/day	*0.03*	**3) to construct transformer station, a 50 x 50 feet area would be cleared**
Total days of excavation/soil disturbance	*12*	
Total fill excavated/delivered, yd^3	*83*	Underground water pipe + underground portion of power line = 250' x 3'x3'

Equipment Emission Factors

Code	Equipment	Hp	Type	Load Factor, %	Emission Factors (lb/hr)					Emission Factors (lb/hp-hr)					Reference
					CO	ROG	NO_x	SO_2	PM_{10}	CO	ROG	NO_x	SO_2	PM_{10}	
1	Air Compressor (400 ACFM)	150	Diesel	na	0.675	0.15	1.7	0.143	0.14	-	-	-	-	-	1) for misc. equip
2	Backhoe/Loader (510C)	86	Diesel	na	0.572	0.23	1.9	0.182	0.17	-	-	-	-	-	1) for wheeled loader
3	Concrete Pump Truck (65 CY/hr)	90	Diesel	na	1.8	0.19	4.17	0.45	0.26	-	-	-	-	-	1) for off-highway truck
4	Crane (20 ton)	130	Diesel	100	1.17	0.39	2.99	0.26	0.39	0.009	0.003	0.023	0.002	0.003	2) for cranes
5	Crawler Crane (250 ton)	330	Diesel	100	2.97	0.99	7.59	0.66	0.99	0.009	0.003	0.023	0.002	0.003	2) for cranes
6	Dozer	95	Diesel	100	0.95	0.19	1.995	0.19	0.095	0.010	0.002	0.021	0.002	0.001	2) for rubber tired dozer
7	Dump Truck (16 CY)	250	Diesel	na	1.8	0.19	4.17	0.45	0.26	-	-	-	-	-	1) for off-highway truck
8	Fork Lift (7 ton)	100	Diesel	na	0.52	0.17	1.54	0.143	0.093	-	-	-	-	-	1) for 175 hp fork lift
9	Front End Loader (3 CY)	140	Diesel	na	0.572	0.23	1.9	0.182	0.17	-	-	-	-	-	1) for wheeled loader
10	Grader	150	Diesel	na	1.25	0.27	3.84	0.46	0.41	-	-	-	-	-	1) for scraper
11	Hydro Crane (18 ton)	130	Diesel	100	1.17	0.39	2.99	0.26	0.39	0.009	0.003	0.023	0.002	0.003	2) for cranes
12	Hydro Crane (30 ton)	130	Diesel	100	1.17	0.39	2.99	0.26	0.39	0.009	0.003	0.023	0.002	0.003	2) for cranes
13	Man Lift (40 ft)	32	Diesel	na	0.18	0.053	0.441	0.143	0.031	-	-	-	-	-	1) for 50 hp forklift
14	Man Lift (80 ft)	63	Diesel	na	0.18	0.053	0.441	0.143	0.031	-	-	-	-	-	1) for 50 hp forklift
15	Misc. Equipment	50	Diesel	na	0.675	0.15	1.7	0.143	0.14	-	-	-	-	-	1) for misc. equip
16	Motor Grader	-	Diesel	na	0.151	0.039	0.713	0.086	0.061	-	-	-	-	-	1) for motor grader
17	Pick-up Truck (3/4 ton)	250	Gasoline	na	17.02	0.543	0.412	0.023	0.026	-	-	-	-	-	1) for misc. equip
18	Pumps	20	Diesel	na	0.011	0.002	0.018	0.002	0.002	-	-	-	-	-	2) for pumps
19	Shovel/Breaker	128	Diesel	na	0.675	0.15	1.7	0.143	0.14	-	-	-	-	-	1) for misc. equip
20	Tractor/Trailer (60 ton, 40 ft)	225	Diesel	na	1.8	0.19	4.17	0.45	0.26	-	-	-	-	-	1) for off-highway truck
21	Truck Crane (65 ton)	400	Diesel	na	1.8	0.19	4.17	0.45	0.26	-	-	-	-	-	1) for off-highway truck
22	Vibro Roller	42	Diesel	na	0.3	0.065	0.87	0.067	0.05	-	-	-	-	-	1) for rollers
23	Water Truck (4,000 gal)	200	Diesel	na	1.8	0.19	4.17	0.45	0.26	-	-	-	-	-	1) for off-highway truck
24	Welding Machine	50	Diesel	100	0.55	0.1	0.9	0.1	0.1	0.011	0.002	0.018	0.002	0.002	2) for welders
29	Asphalt Paver	91	Diesel	100	0.637	0.091	2.093	0.182	0.091	0.007	0.001	0.023	0.002	0.001	1) for paving equip (4-strk)
30	Bore/Drill Rig	209	Diesel	100	4.18	0.627	5.016	0.418	0.3135	0.020	0.003	0.024	0.002	0.002	1) bore/drill rig
31	Concrete Saw	56	Diesel	100	1.12	1.344	0.112	0.168	0.056	0.020	0.024	0.002	0.003	0.001	1) concrete saw
32	Tug (EMD 12-645E5)	3000	Diesel	100	0.775	0.351	12.494	0.162	0.684						3)
33	Barge Generator (800 HP)	800	Diesel	100	8.712	1.584	14.256	1.584	0.792						3)
34	Generator sets <50HP	22	Diesel	100	0.242	0.044	0.396	0.044	0.022	0.011	0.002	0.018	0	0.001	1) for generator sets <50 HP

References
1) Emission factors taken from SCAQMD CEQA Air Quality Handbook, Table 9-8-A
2) Emission factors taken from SCAQMD CEQA Air Quality Handbook, Table 9-8-C. Pounds/hour calculated from load factor and hp rating
3) Emission factors from personal communication with Joe Petrini, SBCAPCD

Emission Factors - On Road Mobile Emission Factors from California ARB EMFAC7G

		NOx		CO		ROG					SO2	PM10
Code	Vehicle Type	Exhaust Emission Factor (g/mile)	Continuous Start EF (g/trip)	Exhaust Emission Factor (g/mile)	Continuous Start EF (g/trip)	Exhaust Emission Factor (g/mile)	Continuous Start EF (g/trip)	Hot Soak Factor (g/trip)	Diurnal & Resting Losses (g/vehicle-day)	Evap Running Losses, (g/mile)	Emission Factor (g/mile)	Emission Factor (g/mile)
101	Gasoline	0.61	1.84	6.09	22.70	0.40	2.44	0.51	7.10	1.03	0.06	0.02
102	Diesel	13.13	0.00	13.92	0.00	3.01	0.00	0.00	0.00	0.00	0.06	0.96

Diurnal & Resting losses vehicle ROG emissions based on a 10 hour day
Based on Calif. ARB EMFAC7G model years 1963 - 1997, enhanced I&M, 75 deg F, 25 MPH
Trip time assumed to be 60 minutes for continuous start emission factors
EMFAC7G was finalized in Oct. 1996

Tranquillon Ridge Development Project - Air Emissions
Operating Emissions Summary

Proposed Project (Tranquillon Ridge Project)

Location and Activity or Equipment	Peak Daily Emission (lbs/day)					Annual Emissions (tons/yr)				
	CO	ROC	NOx	SO_2	PM_{10}	CO	ROC	NOx	SO_2	PM_{10}
LOGP + Valve Site 2 Additional Emissions										
Heater Treaters - 2 additional units	14.13	1.31	20.43	9.60	5.76	2.579	0.238	3.728	1.752	1.051
Additional Truck trips	1.44	0.35	0.14	0.01	0.00	0.075	0.018	0.007	0.001	0.000
Additional fugitive emissions (Valve Site 2)	-	0.06	-	-	-	-	0.011	-	-	-
Platform Irene Additional Emissions										
Emissions from drilling muds	-	1.00	-	-	-	-	0.040	-	-	-
Drilling Equipment	32.06	12.06	88.89	2.22	10.58	1.144	0.430	3.170	0.079	0.377
Helicopter emissions (do not contribute to peak day)	-	-	-	-	-	3.844	1.355	0.019	0.010	0.013
Boat emissions (do not contribute to peak day)	-	-	-	-	-	1.238	0.305	0.305	0.412	0.483
Fugitive emissions	-	39.00	-	-	-	-	7.118	-	-	-
Total Additional Operational Emissions (Project)	**47.64**	**53.78**	**109.46**	**11.84**	**16.35**	**8.88**	**9.52**	**7.23**	**2.25**	**1.92**
Significance Criteria	**n/a**	**55**	**55**	**n/a**	**80**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Significant?		**Yes**	**Yes**							

Proposed Project Emissions vs Permitted and Current Emissions of Point Pedernales Project

Location and Activity or Equipment	Peak Daily Emission (lbs/day)					Annual Emissions (tons/yr)				
	CO	ROC	NOx	SO_2	PM_{10}	CO	ROC	NOx	SO_2	PM_{10}
LOGP Permitted Equipment - Current (2005)	n/a *	n/a *	n/a *	n/a *	n/a *	0.89	35.86	2.53	0.58	0.61
LOGP Exempt Equipment - Current (Estimate)						0.83	0.42	3.31	0.22	0.22
Platform Permitted Equipment - Current (2005)	n/a *	n/a *	n/a *	n/a *	n/a *	2.66	26.05	12.52	1.04	1.01
Platform Exempt Equipment - Current (Estimate)						4.10	4.27	11.24	0.70	0.68
Total Current						8.48	66.60	29.60	2.54	2.52
Total Additional from Project						8.88	9.52	7.23	2.25	1.92
Total = (Current + Project)						**17.36**	**76.11**	**36.83**	**4.79**	**4.44**

Total Point Pedernales Project ESE (Permitted - PTO 6708 Table 5.4, page 59)	23.76	75.25	74.86	13.73	8.06
Available Offset Credits **	**n/a**	**166.03**	**82.52**	**n/a**	**n/a**

ESE - Entire Source Emissions
ESE includes Permitted Emissions of the entire source at the Potential to Emit, includes Pl. Irene, LOGP, Orcutt Pump Station & Lompoc Oil Field
** Daily emissions are not reported*
*** Offset Credits are required only for NOx and ROC and are in terms of quarterly and annual emissions, and not in terms of daily emissions*
LOGP and Platform Current Emissions are from Operation Data reported to SBCAPCD.

LOGP Operating Equipment Parameters

		Equipment Specifications				Usage Data			Peak Load Schedule (hrs)			
Equipment Category	**Emissions Unit**	**Fuel**	**% S**	**Size**	**Units**	**Capacity**	**Units**	**Load**	**hr**	**day**	**qtr**	**year**
Combustion - External	Heater Treater A	NG	0.0080	16	MMBtu/hr	0.140	MMBtu/yr	--	1	24	2190	8760
	Heater Treater B	NG	0.0080	16	MMBtu/hr	0.140	MMBtu/yr	--	1	24	2190	8760
	Heater Treater C	NG	0.0080	16	MMBtu/hr	0.140	MMBtu/yr	--	1	24	2190	8760
	Thermal Oxidizer	NG	0.0080	12	MMBtu/hr	0.105	MMBtu/yr	--	1	24	2190	8760
Flare - combustion	Purge & Pilot	PG	0.0080	45	scfh	0.059	MMBtu/hr	--	1	24	2190	8760
	Planned - continuous	--	--	--	--	--	--	--	--	--	--	--
	Unplanned	SG	0.0796	625	MMBtu/hr	0.959	MMscf/yr	--	--	--	0.25	1
Fugitive emissions	Oil - controlled	--	--	5,778	comp-lp	--	--	--	1	24	2190	8760
	Gas - controlled (valves)	--	--	1,111	comp-lp	--	--	--	1	24	2190	8760
	Gas - controlled (connections)	--	--	6,500	comp-lp	--	--	--	1	24	2190	8760
	Gas - controlled (pumps)	--	--	4	comp-lp	--	--	--	1	24	2190	8760
	Gas - controlled (PRD)	--	--	45	comp-lp	--	--	--	1	24	2190	8760
	Gas - controlled (compressors)	--	--	6	comp-lp	--	--	--	1	24	2190	8760
Oil pipeline (Surf to LOGP)	Oil - controlled (valves)	--	--	222	comp-lp	--	--	--	1	24	2190	8760
	Oil - controlled (connections)	--	--	1	comp-lp	--	--	--	1	24	2190	8760
Gas pipeline (Surf to LOGP)	Gas - controlled (valves)	--	--	89	comp-lp	--	--	--	1	24	2190	8760
	Gas - controlled (connections)	--	--	1	comp-lp	--	--	--	1	24	2190	8760
Oil pipeline (LOGP to OPS)	Oil - controlled (valves)	--	--	17	comp-lp	--	--	--	1	24	2190	8760
	Oil - controlled (connections)	--	--	96	comp-lp	--	--	--	1	24	2190	8760
Pigging Equipment	Oil Pig Receiver	--	--	32	cf	5.0	psig	--	1	24	92	366
	Gas Pig Receiver	--	--	32	cf	5.0	psig	--	1	24	104	417
Sumps	S-800 (Inlet sump)	--	--	12.50	ft2	--	--	--	1	24	2190	8760
	S-801 (Crude dehydration sump)	--	--	12.50	ft2	--	--	--	1	24	2190	8760
	S-820 (Water treating sump)	--	--	12.50	ft2	--	--	--	1	24	2190	8760
	S-830 (Reject Tank sump)	--	--	12.50	ft2	--	--	--	1	24	2190	8760
	S-840 (Outlet sump)	--	--	12.50	ft2	--	--	--	1	24	2190	8760
	S-850 (Flotation unit froth sump)	--	--	12.50	ft2	--	--	--	1	24	2190	8760
	S-860 (Control Building Lab sump	--	--	12.50	ft2	--	--	--	1	24	2190	8760
	S-870 (Oil surge tank sump)	--	--	12.50	ft2	--	--	--	1	24	2190	8760
	S-890 (Containment area sump)	--	--	12.50	ft2	--	--	--	1	24	2190	8760
	S-895 (Amine sump)	--	--	12.50	ft2	--	--	--	1	24	2190	8760
Solvent Usage	Cleaning/degreasing	--	--	various		--	--	--	1	24	2190	8760

Notes: OPS - Orcutt Pump Station

LOGP Equipment Emission Factors - from Part 70 PTO 6708

Equipment Category	Emissions Unit	Emission Factors						Units	
		NOx	ROC	CO	SOx	PM	PM10		
Combustion - External	Heater Treater A	0.0266	0.0017	0.0184	0.0125	0.0075	0.0075	lb/MMBtu	
	Heater Treater B	0.0266	0.0017	0.0184	0.0125	0.0075	0.0075	lb/MMBtu	
	Heater Treater C	0.0266	0.0017	0.0184	0.0125	0.0075	0.0075	lb/MMBtu	
	Thermal Oxidizer	0.0495	0.0043	0.0380	0.0145	0.0110	0.0110	lb/MMBtu	
Flare - combustion	Purge & Pilot	0.0680	0.0027	0.0333	0.1020	0.0048	0.0048	lb/MMBtu	
	Planned	0.0680	0.0027	0.0333	0.1020	0.0048	0.0048	lb/MMBtu	
	Unplanned	0.0680	0.0027	0.0333	0.1020	0.0048	0.0048	lb/MMBtu	
Fugitive emissions (Oil plant)	Oil - controlled	--	0.0304	--	--	--	--	lb/day-clp	
	Oil - uncontrolled	--	0.4020	--	--	--	--	lb/day-clp	
	Gas - controlled (valves)	--	0.0249	--	--	--	--	lb/day-clp	
	Gas - controlled (connections)	--	2.6070	--	--	--	--	lb/day-clp	
	Gas - controlled (pumps)	--	0.6963	--	--	--	--	lb/day-clp	
	Gas - controlled (PRD)	--	--	--	--	--	--	lb/day-clp	
Fugitive emissions (Gas plant	Gas - controlled								
Oil pipeline (Surf to LOGP)	Oil - controlled (valves)	--	0.0304	--	--	--	--	lb/day-clp	
	Oil - controlled (connections)	--	0.0304	--	--	--	--	lb/day-clp	
Gas pipeline (Surf to LOGP)	Gas - controlled (valves)	--	0.4020	--	--	--	--	lb/day-clp	
	Gas - controlled (connections)	--	0.0249	--	--	--	--	lb/day-clp	
Oil pipeline (LOGP to OPS)	Oil - controlled (valves)	--	0.0304	--	--	--	--	lb/day-clp	
	Oil - controlled (connections)	--	0.0304	--	--	--	--	lb/day-clp	
Pigging Equipment	Oil Pig Receiver	--	0.0611	--	--	--	--	lb/acf-event	
	Gas Pig Receiver	--	0.0281	--	--	--	--	lb/acf-event	
Sumps	S-800 (Inlet sump)	--	0.0130	--	--	--	--	lb/ft2-day	
	S-801 (Crude dehydration sump)	--	0.0130	--	--	--	--	lb/ft2-day	
	S-820 (Water treating sump)	--	0.0130	--	--	--	--	lb/ft2-day	
	S-830 (Reject Tank sump)	--	0.0130	--	--	--	--	lb/ft2-day	
	S-840 (Outlet sump)	--	0.0130	--	--	--	--	lb/ft2-day	
	S-850 (Flotation unit froth sump)	--	0.0130	--	--	--	--	lb/ft2-day	
	S-860 (Control Building Lab sum	--	0.0130	--	--	--	--	lb/ft2-day	
	S-870 (Oil surge tank sump)	--	0.0130	--	--	--	--	lb/ft2-day	
	S-890 (Containment area sump)	--	0.0130	--	--	--	--	lb/ft2-day	
	S-895 (Amine sump)	--	0.0130	--	--	--	--	lb/ft2-day	
Solvent Usage	Cleaning/degreasing	--	various	--	--	--	--	lbs/gal	

LOGP Hourly and Daily Operations Emissions

		NOx		ROC		CO		SOx		PM		PM10	
Equipment Category	**Emissions Unit**	**lbs/hr**	**lbs/day**	**lbs/hr**	**lbs/day**	**lbs/hr**	**lbs/day**	**lbs/hr**	**lbs/day**	**lbs/hr**	**lbs/day**	**lbs/hr**	**lbs/day**
Combustion - External	Heater Treater A	0.43	10.21	0.03	0.65	0.29	7.07	0.20	4.80	0.12	2.88	0.12	2.88
	Heater Treater B	0.43	10.21	0.03	0.65	0.29	7.07	0.20	4.80	0.12	2.88	0.12	2.88
	Heater Treater C	0.43	10.21	0.03	0.65	0.29	7.07	0.20	4.80	0.12	2.88	0.12	2.88
	Thermal Oxidizer	0.59	14.26	0.05	1.24	0.46	10.94	0.17	4.18	0.13	3.17	0.13	3.17
Flare - combustion	Purge & Pilot	0.00	0.10	0.00	0.00	0.00	0.05	0.01	0.14	0.00	0.01	0.00	0.01
	Planned	--	--	--	--	--	--	--	--	--	--	--	--
	Unplanned	--	--	--	--	--	--	--	--	--	--	--	--
Fugitive emissions (Oil plant)	Oil - controlled	--	--	1.46	35.13	--	--	--	--	--	--	--	--
	Oil - uncontrolled	--	--	3.72	89.32	--	--	--	--	--	--	--	--
	Gas - controlled (valves)	--	--	1.35	32.37	--	--	--	--	--	--	--	--
	Gas - controlled (connections)	--	--	0.09	2.09	--	--	--	--	--	--	--	--
	Gas - controlled (pumps)	--	--	0.26	6.27	--	--	--	--	--	--	--	--
	Gas - controlled (PRD)	--	--	0.00	0.00	--	--	--	--	--	--	--	--
Fugitive emissions (Gas plant)	Gas - controlled	--	--	2.14	51.38	--	--	--	--	--	--	--	--
Oil pipeline (Surf to LOGP)	Oil - controlled (valves)	--	--	0.06	1.35	--	--	--	--	--	--	--	--
	Oil - controlled (connections)	--	--	0.00	0.01	--	--	--	--	--	--	--	--
Gas pipeline (Surf to LOGP)	Gas - controlled (valves)	--	--	0.30	7.16	--	--	--	--	--	--	--	--
	Gas - controlled (connections)	--	--	0.00	0.00	--	--	--	--	--	--	--	--
Oil pipeline (LOGP to OPS)	Oil - controlled (valves)	--	--	0.00	0.10	--	--	--	--	--	--	--	--
	Oil - controlled (connections)	--	--	0.02	0.58	--	--	--	--	--	--	--	--
Pigging Equipment *	Oil Pig Receiver	--	--	1.95	1.95	--	--	--	--	--	--	--	--
	Gas Pig Receiver	--	--	0.90	0.90	--	--	--	--	--	--	--	--
Sumps	S-800 (Inlet sump)	--	--	0.00	0.02	--	--	--	--	--	--	--	--
	S-801 (Crude dehydration sump)	--	--	0.00	0.02	--	--	--	--	--	--	--	--
	S-820 (Water treating sump)	--	--	0.00	0.02	--	--	--	--	--	--	--	--
	S-830 (Reject Tank sump)	--	--	0.00	0.02	--	--	--	--	--	--	--	--
	S-840 (Outlet sump)	--	--	0.00	0.02	--	--	--	--	--	--	--	--
	S-850 (Flotation unit froth sump)	--	--	0.00	0.02	--	--	--	--	--	--	--	--
	S-860 (Control Building Lab sum	--	--	0.00	0.02	--	--	--	--	--	--	--	--
	S-870 (Oil surge tank sump)	--	--	0.00	0.02	--	--	--	--	--	--	--	--
	S-890 (Containment area sump)	--	--	0.00	0.02	--	--	--	--	--	--	--	--
	S-895 (Amine sump)	--	--	0.00	0.02	--	--	--	--	--	--	--	--
Solvent Usage	Cleaning/degreasing	--	--	3.95	31.6								
Totals		**1.87**	**45.00**	**16.35**	**263.58**	**1.34**	**32.19**	**0.78**	**18.72**	**0.49**	**11.81**	**0.49**	**11.81**

Source: PTO 6708

LOGP Quarterly and Annual Operations Emissions

Equipment Category	Emissions Unit	NOx		ROC		CO		SOx		PM		PM10	
		TPQ	TPY	TPQ	TPY	TPQ	TPY	TPQ	TPY	TPQ	TPY	TPQ	TPY
Combustion - External	Heater Treater A	0.466	1.864	0.030	0.119	0.322	1.289	0.219	0.876	0.131	0.526	0.131	0.526
	Heater Treater B	0.466	1.864	0.030	0.119	0.322	1.289	0.219	0.876	0.131	0.526	0.131	0.526
	Heater Treater C	0.466	1.864	0.030	0.119	0.322	1.289	0.219	0.876	0.131	0.526	0.131	0.526
	Thermal Oxidizer	0.650	2.602	0.057	0.226	0.499	1.997	0.191	0.762	0.145	0.578	0.145	0.578
Flare - combustion	Purge & Pilot	0.004	0.018	0.000	0.001	0.002	0.009	0.007	0.026	0.000	0.001	0.000	0.001
	Planned	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Unplanned	0.009	0.036	0.000	0.001	0.004	0.018	0.013	0.054	0.001	0.003	0.001	0.003
Fugitive emissions (Oil plant)	Oil - controlled	--	--	1.603	6.411	--	--	--	--	--	--	--	--
	Oil - uncontrolled	--	--	4.075	16.302	--	--	--	--	--	--	--	--
	Gas - controlled (valves)	--	--	1.477	5.908	--	--	--	--	--	--	--	--
	Gas - controlled (connections)	--	--	0.095	0.381	--	--	--	--	--	--	--	--
	Gas - controlled (pumps)	--	--	0.286	1.144	--	--	--	--	--	--	--	--
	Gas - controlled (PRD)	--	--	0.000	0.000	--	--	--	--	--	--	--	--
Fugitive emissions (Gas plant)	Gas - controlled	--	--	2.35	9.38	--	--	--	--	--	--	--	--
Oil pipeline (Surf to LOGP)	Oil - controlled (valves)	--	--	0.005	0.020	--	--	--	--	--	--	--	--
	Oil - controlled (connections)	--	--	0.028	0.110	--	--	--	--	--	--	--	--
Gas pipeline (Surf to LOGP)	Gas - controlled (valves)	--	--	0.000	0.000	--	--	--	--	--	--	--	--
	Gas - controlled (connections)	--	--	0.018	0.070	--	--	--	--	--	--	--	--
Oil pipeline (LOGP to OPS)	Oil - controlled (valves)	--	--	0.008	0.030	--	--	--	--	--	--	--	--
	Oil - controlled (connections)	--	--	0.000	0.000	--	--	--	--	--	--	--	--
Pigging Equipment *	Oil Pig Receiver	--	--	0.089	0.357	--	--	--	--	--	--	--	--
	Gas Pig Receiver	--	--	0.047	0.188	--	--	--	--	--	--	--	--
Sumps	S-800 (Inlet sump)	--	--	0.007	0.030	--	--	--	--	--	--	--	--
	S-801 (Crude dehydration sump	--	--	0.007	0.030	--	--	--	--	--	--	--	--
	S-820 (Water treating sump)	--	--	0.007	0.030	--	--	--	--	--	--	--	--
	S-830 (Reject Tank sump)	--	--	0.007	0.030	--	--	--	--	--	--	--	--
	S-840 (Outlet sump)	--	--	0.007	0.030	--	--	--	--	--	--	--	--
	S-850 (Flotation unit froth sump	--	--	0.007	0.030	--	--	--	--	--	--	--	--
	S-860 (Control Building Lab sur	--	--	0.007	0.030	--	--	--	--	--	--	--	--
	S-870 (Oil surge tank sump)	--	--	0.007	0.030	--	--	--	--	--	--	--	--
	S-890 (Containment area sump	--	--	0.007	0.030	--	--	--	--	--	--	--	--
	S-895 (Amine sump)	--	--	0.007	0.030	--	--	--	--	--	--	--	--
Solvent Usage	Cleaning/degreasing	--	--	0.620	2.480	--	--	--	--	--	--	--	--
Totals		**2.062**	**8.248**	**10.920**	**43.661**	**1.473**	**5.892**	**0.868**	**3.470**	**0.540**	**2.159**	**0.540**	**2.159**

Source: PTO 6708

** - Assumes a maximum of one pigging event eavery day*

Platform Irene Equipment - PTO 9106

Emission Factors

Equipment Category	Description	Emission Factors						
		NOx	ROC	CO	SOx	PM	PM10	Units
Combustion Engines	North Crane	2.446	0.36	0.95	0.20	0.31	0.30	lb/MMBtu
	South Crane	2.471	0.36	0.95	0.20	0.31	0.30	lb/MMBtu
Combustion Flare	Purge & Pilot	0.068	0.12	0.37	0.102	0.02	0.02	lb/MMBtu
	Planned- cont.	0.068	0.12	0.37	0.102	0.02	0.02	lb/MMBtu
	Planned - other	0.068	0.12	0.37	0.102	0.02	0.02	lb/MMBtu
	Unplanned	0.068	0.12	0.37	0.102	0.02	0.02	lb/MMBtu
Fugitive Components	Oil-controlled	-	0.0009	-	-	-	-	lb/day-clp
	Oil-unsafe	-	0.0009	-	-	-	-	lb/day-clp
	Gas-controlled	-	0.0147	-	-	-	-	lb/day-clp
	Gas-unsafe	-	0.0147	-	-	-	-	lb/day-clp
Supply Boat	Main Engines-con	337	16.8	78.3	28.2	33	32	lb/1000 gal
	Main Engines-uncon	561	16.8	78.3	28.2	33	32	lb/1000 gal
	Auxiliary Engines	600	49	129.3	28.2	42.2	40.5	lb/1000 gal
	Bow Thruster	600	49	129.3	28.2	42.2	40.5	lb/1000 gal
	Emergency Response	561	16.8	78.3	28.2	33	32	lb/1000 gal
Pigging Equipment	Oil Pig Launcher	-	0.061	-	-	-	-	lb/acf-evnt
	Gas Pig Launcher	-	0.028	-	-	-	-	lb/acf-evnt
Sumps/Tanks/Separators	Sub-deck Sump #A	-	0.013	-	-	-	-	lb/ft2-day
	Sub-deck Sump #B	-	-	-	-	-	-	lb/ft2-day
	Sub-deck Sump #C	-	-	-	-	-	-	lb/ft2-day
	Wastewater Tank 530	-	-	-	-	-	-	lb/ft2-day
	Wastewater Tank 540	-	-	-	-	-	-	lb/ft2-day
	Roll-off Bins (total of 4)	-	0.097	-	-	-	-	lb/ft2-day
Solvent Usage	Cleaning/Degreasing	-	various	-	-	-	-	lb/gal

Equipment Operation Parameters

Equipment Category	Description	Device Specifications				Usage Data			Peak Load Schedule (hrs)			
		Fuel	%S	Size	Units	Capacity	Units	Load	hr	day	qtr	year
Combustion Engines	North Crane		0.20	210	bhp	7,143	Btu/bhp-hr	-	1	24	730	2920
	South Crane		0.20	197	bhp	7,069	Btu/bhp-hr	-	1	24	730	2920
Combustion Flare	Purge & Pilot		0.0796			0.059	mmBtu/hr	-	1	24	2190	8760
	Planned- cont.		0.0796			3.101	mmscf/yr	-	1	24	0.25	1
	Planned - other		0.0537			1.699	mmscf/yr	-	-	-	0.25	1
	Unplanned		0.2996			20.8	mmscf/yr	-	-	-	0.25	1
Fugitive Components	Oil-controlled			3.859	comp-lp	-	-	-	1	24	2190	8760
	Oil-unsafe			0	comp-lp	-	-	-	1	24	2190	8760
	Gas-controlled			7.11	comp-lp	-	-	-	1	24	2190	8760
	Gas-unsafe			0	comp-lp	-	-	-	1	24	2190	8760
Supply Boat	Main Engines-con		0.20			0.049	gal/bhp-hr	0.65	1	11	275	1100
	Main Engines-uncon		0.20			0.055	gal/bhp-hr	0.65	1	11	28	110
	Auxiliary Engines		0.20			0.055	gal/bhp-hr	0.5	1	11	275	1100
	Bow Thruster		0.20			0.055	gal/bhp-hr	1	1	2	50	200
	Emergency Response		0.20			0.055	gal/bhp-hr	0.65	-	-	32	127
Pigging Equipment	Oil Pig Launcher		-	32	cf	5	psig	-	1	1	13	52
	Gas Pig Launcher		-	5	cf	5	psig	-	1	1	46	182
Sumps/Tanks/Separators	Sub-deck Sump #A		-	6	ft2	-	-	-	1	24	2190	8760
	Sub-deck Sump #B		-	18	ft2	-	-	-	1	24	2190	8760
	Sub-deck Sump #C		-	79	ft2	-	-	-	1	24	2190	8760
	Wastewater Tank 530		-	79	ft2	-	-	-	1	24	2190	8760
	Wastewater Tank 540		-	79	ft2	-	-	-	1	24	2190	8760
	Roll-off Bins (total of 4)		-	60	ft2	-	-	-	1	24	1008	3024
Solvent Usage	Cleaning/Degreasing		-	various	gals	various	-	-	1	24	2190	8760

Platform Irene Operations Emissions - PTO 9106

Hourly and Daily Emissions

Equipment Category	Description	NOx		ROC		CO		SOx		PM		PM10	
		lbs/hr	lbs/day	lbs/hr	lbs/day	lbs/hr	lbs/day	lbs/hr	lbs/day	lbs/hr	lbs/day	lbs/hr	lbs/day
Combustion Engines	North Crane	3.89	93.30	0.57	13.70	1.51	7.80	0.32	7.80	0.49	11.80	0.47	11.40
	South Crane	3.65	87.50	0.53	12.80	1.40	7.20	0.30	7.20	0.46	11.00	0.44	10.50
Combustion Flare	Purge & Pilot	0.00	0.10	0.00	0.01	0.00	0.12	0.01	0.15	0.00	0.00	0.00	0.01
	Planned- cont.	0.03	0.76	0.00	0.06	0.04	0.92	0.05	1.14	0.00	0.08	0.00	0.08
	Planned - other	-	-	-	-	-	-	-	-	-	-	-	-
	Unplanned	-	-	-	-	-	-	-	-	-	-	-	-
Fugitive Components	Oil-controlled	-	-	0.14	3.50	-	-	-	-	-	-	-	-
	Oil-unsafe	-	-	0.00	0.00	-	-	-	-	-	-	-	-
	Gas-controlled	-	-	4.35	104.50	-	-	-	-	-	-	-	-
	Gas-unsafe	-	-	0.00	0.00	-	-	-	-	-	-	-	-
Supply Boat	Main Engines-con	31.47	346.10	2.14	23.50	9.98	109.70	3.59	39.50	4.20	46.20	4.04	44.40
	Main Engines-uncon	80.25	882.70	2.40	26.40	11.20	123.20	4.03	44.30	4.72	51.90	4.53	49.80
	Auxiliary Engines	8.09	88.90	0.66	7.30	1.74	19.20	0.38	4.20	0.57	6.30	0.55	6.00
	Bow Thruster	17.00	34.00	1.39	2.80	3.66	7.30	0.80	1.60	1.19	2.40	1.15	2.30
	Emergency Response	-	-	-	-	-	-	-	-	-	-	-	-
Pigging Equipment	Oil Pig Launcher	-	-	1.95	1.95	-	-	-	-	-	-	-	-
	Gas Pig Launcher	-	-	0.14	0.14	-	-	-	-	-	-	-	-
Sumps/Tanks/Separators	Sub-deck Sump #A	-	-	0.00	0.10	-	-	-	-	-	-	-	-
	Sub-deck Sump #B	-	-	0.01	0.20	-	-	-	-	-	-	-	-
	Sub-deck Sump #C	-	-	0.04	1.00	-	-	-	-	-	-	-	-
	Wastewater Tank 530	-	-	0.04	1.00	-	-	-	-	-	-	-	-
	Wastewater Tank 540	-	-	0.04	1.00	-	-	-	-	-	-	-	-
	Roll-off Bins (total of 4)	-	-	0.97	23.30	-	-	-	-	-	-	-	-
Solvent Usage	Cleaning/Degreasing	-	-	3.95	31.60	-	-	-	-	-	-	-	-
Totals		**95.91**	**1187.40**	**15.82**	**231.40**	**15.89**	**165.70**	**5.09**	**66.40**	**6.24**	**83.50**	**5.99**	**80.10**

Quarterly and Annual Emissions

		tons/qtr	tons/yr	tons/qtr	tons/yr	tons/qtr	tons/yr	tons/qtr	tons/yr	tons/qtr	tons/yr	tons/qtr	tons/yr
Combustion Engines	North Crane	1.42	5.68	0.21	0.84	0.55	2.21	0.12	0.47	0.18	0.72	0.17	0.69
	South Crane	1.33	5.33	0.19	0.78	0.51	2.05	0.11	0.44	0.17	0.67	0.16	0.64
Combustion Flare	Purge & Pilot	0.00	0.02	0.00	0.00	0.01	0.02	0.01	0.03	0.00	0.00	0.00	0.00
	Planned- cont.	0.03	0.14	0.00	0.01	0.04	0.17	0.05	0.21	0.00	0.02	0.00	0.02
	Planned - other	0.02	0.08	0.00	0.01	0.02	0.09	0.03	0.11	0.00	0.01	0.00	0.01
	Unplanned	0.23	0.93	0.02	0.07	0.28	1.13	1.32	5.27	0.03	0.10	0.03	0.10
Fugitive Components	Oil-controlled	-	-	0.16	0.63	-	-	-	-	-	-	-	-
	Oil-unsafe	-	-	0.00	0.00	-	-	-	-	-	-	-	-
	Gas-controlled	-	-	4.77	19.07	-	-	-	-	-	-	-	-
	Gas-unsafe	-	-	0.00	0.00	-	-	-	-	-	-	-	-
Supply Boat	Main Engines-con	4.33	17.31	0.29	1.18	1.37	5.49	0.49	1.97	0.58	2.31	0.55	2.22
	Main Engines-uncon	1.10	4.41	0.03	0.13	0.15	0.62	0.06	0.22	0.06	0.26	0.06	0.25
	Auxiliary Engines	1.11	4.45	0.09	0.36	0.24	0.96	0.05	0.21	0.08	0.31	0.08	0.30
	Bow Thruster	0.42	1.70	0.03	0.14	0.09	0.37	0.02	0.08	0.03	0.12	0.03	0.11
	Emergency Response	1.40	5.61	0.04	0.17	0.20	0.78	0.07	0.28	0.08	0.33	0.08	0.32
Pigging Equipment	Oil Pig Launcher	-	-	0.01	0.10	-	-	-	-	-	-	-	-
	Gas Pig Launcher	-	-	0.00	0.00	-	-	-	-	-	-	-	-
Sumps/Tanks/Separators	Sub-deck Sump #A	-	-	0.00	0.10	-	-	-	-	-	-	-	-
	Sub-deck Sump #B	-	-	0.01	0.04	-	-	-	-	-	-	-	-
	Sub-deck Sump #C	-	-	0.05	0.19	-	-	-	-	-	-	-	-
	Wastewater Tank 530	-	-	0.05	0.19	-	-	-	-	-	-	-	-
	Wastewater Tank 540	-	-	0.05	0.19	-	-	-	-	-	-	-	-
	Roll-off Bins (total of 4)	-	-	0.49	1.47	-	-	-	-	-	-	-	-
Solvent Usage	Cleaning/Degreasing	-	-	0.62	2.47	-	-	-	-	-	-	-	-
Totals		**11.39**	**45.66**	**7.11**	**28.14**	**3.46**	**13.89**	**2.33**	**9.29**	**1.21**	**4.85**	**1.16**	**4.66**

Estimated Permit Exempt Operating Emissions

LOGP

A. Quarterly (Tons/Qtr)						
Equipment Category	NOx	ROC	CO	SOx	PM	PM10
Emergency Production Generators	1.46	0.12	0.32	0.10	0.10	0.10
Emergency Firewater Pump	1.84	0.14	0.40	0.12	0.12	0.12
Surface Coating - Maintenance	--	0.13	--	--	--	--
Trucks	0.00	0.01	0.03	0.00	0.00	0.00
TOTALS (ton/qtr)	**3.30**	**0.40**	**0.75**	**0.22**	**0.22**	**0.22**

B. Annual (Tons/yr)						
Equipment Category	NOx	ROC	CO	SOx	PM	PM10
Emergency Production Generators	1.46	0.12	0.32	0.10	0.10	0.10
Emergency Firewater Pump	1.84	0.14	0.40	0.12	0.12	0.12
Surface Coating - Maintenance	--	0.13	--	--	--	--
Trucks	0.01	0.03	0.11	0.00	0.00	0.00
TOTALS (ton/yr)	**3.31**	**0.42**	**0.83**	**0.22**	**0.22**	**0.22**

Soure: PTO 6708

Plarform Irene

A. Quarterly (Tons/Qtr)						
Equipment Category	NOx	ROC	CO	SOx	PM	PM10
Emergency Drill Generators	5.37	0.44	1.16	0.35	0.38	0.38
Emergency Production Generators	0.73	0.06	0.16	0.05	0.05	0.05
Emergency Firewater Pump	0.92	0.07	0.20	0.06	0.06	0.06
Helicopters	1.06	0.88	0.65	0.06	0.05	0.05
Diesel Storage Tanks	--	0.01	--	--	--	--
Surface Coating - Maintenance	--	0.13	--	--	--	--
TOTALS (ton/qtr)	8.08	1.59	2.17	0.52	0.54	0.54

B. Annual (Tons/yr)						
Equipment Category	NOx	ROC	CO	SOx	PM	PM10
Emergency Drill Generators	5.37	0.44	1.16	0.35	0.38	0.38
Emergency Production Generators	0.73	0.06	0.16	0.05	0.05	0.05
Emergency Firewater Pump	0.92	0.07	0.20	0.06	0.06	0.06
Helicopters	4.22	3.52	2.58	0.24	0.19	0.19
Diesel Storage Tanks	--	0.05	--	--	--	--
Surface Coating - Maintenance	--	0.13	--	--	--	--
TOTALS (ton/yr)	**11.24**	**4.27**	**4.10**	**0.70**	**0.68**	**0.68**

Source: PTO 9106 (October 2000), Table 5.4, page 50

Supply Boat Emission Estimates - Trips due to Drilling Operations at Platform Irene

Table A - Supply Boat Data

Equipment	Fuel %S	Number	Power (bhp)	Total Power	Fuel Usage (gals/bhp-	Load Factor	gals/hr	Maximum Schedule Daily (hours)	Maximum Schedule Quarterly (hours)	Maximum Schedule Annually (hours)	Project Added Schedule Daily (hours)	Project Added Schedule Quarterly (hours)	Project Added Schedule Annually (hours)
Main Engines - con	0.2	2	2,000	4,000	0.049	0.65	127.40	11	275	1100	0	50	200
Main Engines - uncon	0.2	2	2,000	4,000	0.055	0.65	143.00	11	27.5	110	0	5	20
Auxiliary Engines	0.2	2	245	490	0.055	0.5	13.48	11	275	1100	0	50	200
Bow Thruster	0.2	1	515	515	0.055	1.0	28.33	2	50	200	0	9.1	36.4

Source: Data based upon SBCAPCD PTO 9106, Platform Irene

10 % of the time a charter boat is used with main engines that do not utilize low NOx control

During drilling boat trips will be increased to 1 round trip every 3 days

Assumption: boats will not contribute to peak daily emissions

Table B - Supply Boat Emission Factors

Equipment	Emission Factors (lbs/1,000 gals) NO_X	ROC	CO	SO_X	PM	PM_{10}
Main Engines - con	247.0	16.8	78.3	28.2	33.0	32.0
Main Engines - uncon	561.0	16.8	78.3	28.2	33.0	32.0
Auxiliary Engines	600.0	49.0	129.3	28.2	42.2	40.5
Bow Thruster	600.0	49.0	129.3	28.2	42.2	40.5

Source: Data based upon SBCAPCD PTO 9106, Platform Irene

Table C - Current Supply Boat Fuel Use

Quarter	1999	2000	units
1	8,049	12,481	gallons
2	8,839	16,172	gallons
3	11,891	9,506	gallons
4	11,749	24,171	gallons
Total	**40,528**	**62,330**	gallons

Source: SBC APCD reported data

Table D - Estimated Supply Boat Emissions

Emissions	NO_X	ROC	CO	SO_X	PM	PM_{10}
Peak Hourly (lbs/hr)	60.40	4.19	15.38	4.77	5.97	5.77
Peak Daily (lbs/day)	0.00	0.00	0.00	0.00	0.00	0.00
Quarterly (tons/qr)	0.08	0.08	0.31	0.10	0.12	0.12
Annual (tons/yr)	0.31	0.31	1.24	0.41	0.50	0.48

Table E - Maximum Fuel Usage (at Maximum Operating Schedule)

Equipment	gals/hr	gals/day	gals/qr	gals/yr
Main Engines - con	127.4	1,401.4	36,436	145,746
Main Engines - uncon	143.0	1,573.0	40,898	163,592
Auxiliary Engines	13.5	148.2	3,854	15,415
Bow Thruster	28.3	56.7	1,473	5,892
Maximum Total	171	1,623	42,209	168,837

Notes for Table D and E:

Peak Hour emissions is a maximum based on all engines running simultaneously, charter boat is operating

Each boat round trip takes 11 hours: 8hrs cruise, 2hrs maneuver, 1hr idle

Drilling operations based on 2 boat round trips per week, or 1 additional trip/wk compared to current trips

Calculations use the same assumptions as SBCAPCD PTO 9106, Platform Irene

Drilling operations first (worst) year: 90 days/well x 4 wells = 360 days of operation.

Helicopter Emissions During Drilling at Platform Irene - Proposed Project

	Helicopters Operating Parameters						Peak Day Emissions, lbs					Annual Emissions, Tons				
Source	No. per Day	Daily Trips (one way)	No. of days per well*	Wells per year (worst case)	Horse Power	Time of Trip (min)	CO	ROC	NOx	SO2	PM10	CO	ROC	NOx	SO2	PM10
Helicopter - drilling - idle	1	3	90	4	1400	25	13.14	7.53	0.11	0.05	0.07	2.37	1.35	0.02	0.01	0.01
Helicopter - drilling - cruise	1	3	90	4	1400	25	8.21	1.03	10.60	1.03	1.37	1.48	0.00	0.00	0.00	0.00
Total							**21.35**	**8.55**	**10.71**	**1.08**	**1.44**	**3.84**	**1.35**	**0.02**	**0.01**	**0.01**

** - assumes that each well requires 90 days of daily helicopter support; 4 wells are drilled in the worst year.*

Helicopter Emission Factors

Reference	Mode	CO	ROC	NOx	SO_2	PM10	Units
Table 3.2.1-8, EPA 1980	Idle	73.0	41.8	0.6	0.3	0.4	g/hp-hr
Table 3.2.1-8, EPA 1980	Cruise	2.4	0.3	3.1	0.3	0.4	g/hp-hr

Cruise mode is assumed to take 95% of time of the whole trip

Trucks at the LOGP Mobile Emissions - Proposed Project

	Trucks Operating Parameters						Peak Day Emissions, lbs/day					Annual Emissions, Tons/yr				
Number of Vehicles per Day	Daily Trips (one way)	Number of trucks per week	Number of days per year	Distance One Way (miles)	Speed (mph)	Time of Trip (min)	CO	ROC	NOx	SO2	PM10	CO	ROC	NOx	SO2	PM10
Current																
1	2	3	156	50	50	60	1.44	0.34	0.14	0.01	0.00	0.112	0.027	0.011	0.001	0.000
Additional from Project																
1	2	2	104	50	50	60	1.44	0.35	0.14	0.01	0.00	0.075	0.018	0.007	0.001	0.000
Total (Current + Project)	**4**	**5**	**260**				**2.879**	**0.695**	**0.285**	**0.026**	**0.009**	**0.187**	**0.045**	**0.018**	**0.002**	**0.001**

Truck emissions factors - see Emission Factors for Mobile Sources in Construction in this Appendix (page C-8)

Drilling Equipment Emission Estimates - During Drilling at Platform Irene

Table A - Drill Rig Data

Equipment	Quantity	Load (hp)	Fuel	Note
Well Logging Unit	1	100	Diesel	1
Acidizing Pump	1	100	Diesel	2
Cement Pump	1	200	Diesel	3
Slurry Pump (Alternative Injection only)	1	1,000	Diesel	4

Notes to Table A - Estimated Data

1. Well logging unit operates 10 days per month.
2. Acidizing pump is operated 5 days per well, 8 hours/day
3. Cement pump operates 2 days per month, 8 hours per day
4. Slurry Pump operates 8 hrs/day, 55 days per well (Alternative)

Table B - Equipment Emission Factors

Equipment	g/hp-hr					
	NO_X	ROC	CO	SO_X	PM	PM_{10}
Well Logging Unit	8.4	1.14	3.03	0.21	1	1
Acidizing Pump	8.4	1.14	3.03	0.21	1	1
Cement Pump	8.4	1.14	3.03	0.21	1	1
Slurry Pump	8.4	1.14	3.03	0.21	1	1

Diesel I.C. Engines raw factors from AP-42, Table 3.3-1. NOx reduced by 40% to reflect optimum injection timing retard.
SO_2 adjusted for 0.05% sulfur in fuel. HC assumed to be 100% ROC. PM assumed to be 100% PM10.

Table C - Drilling Emissions

Drilling Emissions	NO_X	ROC	CO	SO_2	PM	PM_{10}
Peak Hour, lbs/hr						
Well Logging Unit	1.85	0.25	0.67	0.05	0.22	0.22
Acidizing Pump	1.85	0.25	0.67	0.05	0.22	0.22
Cement Pump	3.70	0.50	1.34	0.09	0.44	0.44
Slurry Pump	18.52	2.51	6.68	0.46	2.20	2.20
Total Hourly Emissions - Project	***7.41***	***1.01***	***2.67***	***0.19***	***0.88***	***0.88***
Total Hourly Emissions - Alternative	***25.93***	***3.52***	***9.35***	***0.65***	***3.09***	***3.09***
Peak Day, lbs/day						
Well Logging Unit	44.45	6.03	16.03	1.11	5.29	5.29
Acidizing Pump	14.82	2.01	5.34	0.37	1.76	1.76
Cement Pump	29.63	4.02	10.69	0.74	3.53	3.53
Slurry Pump	148.15	20.11	53.44	3.70	17.64	17.64
Peak Daily Emissions - Project	***88.89***	***12.06***	***32.06***	***2.22***	***10.58***	***10.58***
Total Daily Emissions - Alternative	***237.04***	***32.17***	***85.50***	***5.93***	***28.22***	***28.22***
tons/qr						
Well Logging Unit	0.67	0.09	0.24	0.02	0.08	0.08
Acidizing Pump	0.04	0.01	0.01	0.00	0.00	0.00
Cement Pump	0.09	0.01	0.03	0.00	0.01	0.01
Slurry Pump	4.07	0.55	1.47	0.10	0.49	0.66
Total Quarterly Emissions - Project	***0.79***	***0.11***	***0.29***	***0.02***	***0.09***	***0.09***
Total Quarterly Emissions - Alternative	***4.87***	***0.66***	***1.76***	***0.12***	***0.58***	***0.76***
First year - tons/yr						
Well Logging Unit	2.67	0.36	0.96	0.07	0.32	0.32
Acidizing Pump	0.15	0.02	0.05	0.00	0.02	0.02
Cement Pump	0.36	0.05	0.13	0.01	0.04	0.04
Slurry Pump	16.30	2.21	5.88	0.41	1.94	2.65
Total Annual Emissions - Project	***3.17***	***0.43***	***1.14***	***0.08***	***0.38***	***0.38***
Total Annual Emissions - Alternative	***19.47***	***2.64***	***7.02***	***0.49***	***2.32***	***3.02***
Every following year - tons/yr						
Well Logging Unit	1.33	0.18	0.48	0.03	0.16	0.16
Acidizing Pump	0.07	0.01	0.03	0.00	0.01	0.01
Cement Pump	0.18	0.02	0.06	0.00	0.02	0.02
Slurry Pump	8.15	1.11	2.94	0.20	0.97	1.32
Total Annual Emissions - Project	***1.59***	***0.22***	***0.57***	***0.04***	***0.19***	***0.19***
Total Annual Emissions - Alternative	***9.73***	***1.32***	***3.51***	***0.24***	***1.16***	***1.51***

Notes to Table C - Assumptions:

Assumes 30 wells drilled at Irene
Assumes one well takes 3 mnths to complete.
Drilling will be spread over 15 years
Assumes in an average year: 2 wells/year.
First year - 4 wells will be drilled
Worst case scenario: 1 well/quarter, 4 wells/year

Estimated Emissions from Mud System (ROC) - Drilling at Platform Irene (Proposed Project)

Assumptions

Volume of gas in drilling mud from one well = 85,000 scf
Density of gas = 0.0056 lbs/scf
Fraction of gas that is reactive organic compounds (ROC) = 20.5%
Density of ROC gas = 0.00115 lbs/scf
Average time required to drill one well = 95 days
Time when gas may be present in mud per well = 20 days
The mud-gas separator and mud degasser removal efficiency = 98%
Mud-gas separator and mud degasser are vented at the top of the derrick
Worst case scenario - 4 wells per year

				ROC Emissions				
Source	**SCF/hr**	**SCF/day**	**% ROC**	**lbs/hr**	**lbs/day**	**lbs/well**	**tons/qrt**	**tons/yr**
Mud-gas Separator/Mud Degasser Vent	174	4165	20.5%	0.041	0.980	19.590	0.010	0.039
Fugitives from Mud Tanks	4	85	20.5%	0.001	0.020	0.400	0.000	0.001
Total	177	4250		0.042	0.999	19.990	0.010	0.040

Estimated Fugitive Emissions from New Wells - Platform Irene (Proposed Project)

Component Type	**Quantity**	**Emission Factor**	**ROC Emissions**			
		lbs/day-clp	**lbs/hr**	**lbs/day**	**tons/qr**	**tons/yr**
Oil - controlled	2500	0.0009	0.094	2.25	0.103	0.411
Oil - unsafe	0	0.0044	0.000	0.00	0.000	0.000
Gas - controlled	2500	0.0147	1.531	36.75	1.677	6.707
Gas - unsafe	0	0.0736	0.000	0.00	0.000	0.000
Total	5000		1.625	39.00	1.779	7.118

Source: Emission Factors from SBCAPCD PTO 9107, Platform Irene.

Notes: Component counts are estimates only. Actual counts will be developed when wells are installed.
Assumes 20 new Tranquillon Ridge wells operating at one time, 250 leak paths per well.

LOGP Health Screening Assessment based on HAPs Emissions
Current Estimated HAPs Emissions - PTO 6708

					Health Risk Screening						HI - Chronic		HI - Acute	
Type	**Substance**	**ROC Emissions, lb/hr**	**ROC Emissions, lb/day**	**ROC Emissions, lb/yr**	**X/Q Value***	**MET**	**Unit Risk Factor $(um/m^3)^{-1}$**	**MP factor**	**LEA**	**MICR**	**REL**	**HI**	**REL**	**HI**
Hydrocarbon Based														
VOC	Benzene	0.0062	1.49E-01	0.720	13.050	1.000	2.90E-05	1.000	1.000	1.36E-07	7.10E+01	6.62E-05	7.80E+02	6.02E-06
VOC	Toluene	0.0052	1.25E-01	6.060	13.050						2.00E+02		3.70E+04	1.07E-06
VOC	Xylene	0.0020	4.80E-02	2.490	13.050						3.00E+02	5.42E-05	2.20E+03	7.39E-06
VOC	Acetaldehyde	0.0203	4.87E-01	0.630	13.050	1.000	2.70E-06	1.000	1.000	1.11E-08				
VOC	Acrolein	0.0015	3.60E-02	0.340	13.050						2.00E-02	1.11E-01	1.20E-01	1.85E-02
VOC	Butadiene-1,3	0.0104	2.50E-01	0.100	13.050	1.000	1.70E-04	1.000	1.000	1.11E-07				
VOC	Formaldehyde	0.0417	1.00E+00	0.860	13.050	1.000	6.00E-06	1.000	1.000	3.37E-08	3.60E+00	1.56E-03	1.70E+01	3.30E-04
VOC	Methanol	0.0001	2.40E-03	1.050	13.050						6.20E+02		2.80E+03	2.45E-06
VOC	Naphthalene	0.0008	1.92E-02	1.170	13.050						1.40E+01			
Particulate Based														
Other	H_2S	0.0023	5.52E-02	0.500	13.050						4.20E+01	7.77E-05	4.20E+01	7.77E-05
Other	NO_2			16500.000	13.050						4.70E+02	2.29E-01		
Metal	Mercury	0.0001	2.40E-03	0.000	13.050						3.00E-01	0.00E+00	1.80E+00	0.00E+00
Metal	Lead	0.0001	2.40E-03	0.000	13.050	1.000	8.00E-05	1.000	1.000	0.00E+00	1.50E+00			
						Health Risk Screening Results = 2.92E-07					**HI chr = 3.42E-01**		**HI act = 1.89E-02**	

*Notes: * - > 30,000 ft^2 facility*

Maximum Individual Cancer Risk (MICR)
MICR = Q tons x **X/Q** x **MET** x **URF** x **MP** x **LEA**

Q - maximum emissions rate (tons/year)
X/Q - Dispersion factor (ug/m3)/(tons/yr)
MET - Meteorological correction factor
URF - Unit Risk Factor (ug/m3)-1
MP - Multipathway factor (if applicable)
LEA - Lifetime exposure adjustment factor

Health Index (HI)
HI = (Q tons x **X/Q) / (REL)**

REL - reference exposure level (ug/m3)

Greenhouse Gases Operating Emissions Summary - Proposed Project

Location and Activity or Equipment	Annual Emissions (tons/yr)			
	CO2	CH4	NOx	SO2
LOGP + Valve Site #2 Additional Emissions				
Heater Treaters	13,355.5	0.002	3.728	1.752
Additional Truck trips	29.2	0.001	0.007	0.001
Additional fugitive emissions (Valve Site #2)	-	0.044	-	-
Platform Irene Additional Emissions				
Emissions from drilling muds	-	0.160	-	-
Drilling Equipment	182.9	0.023	3.170	0.079
Helicopter emissions	534.3	0.134	0.019	0.010
Boat emissions	1,197.5	0.016	0.305	0.412
Fugitive emissions	-	28.470	-	-
Total Additional Emissions (Project)	15,299.4	28.8	7.2	2.3

References

1. California ARB, 1991. Identification of Volatile Organic Compound Species Profiles.
2. Union Oil Project/Exxon Shamrock Project EIR/EIS Table 4-29
3. Perry's Chemical Engineer's Handbook, 6th edition, McGraw Hill, pp. 9-10 & 9-11.
4. Personal communcation with Lester Truck Rentals Co., Thousand Oaks, CA.
5. Perry's Chemical Engineer's Handbook, 6th edition, McGraw Hill, p. 3-78

Assumptions/Information

CO_2 amount is calculated from fuel combustion reaction stoichiometry

99.5% of carbon in fuel is converted to CO_2 during combustion (estimate)

CH_4 = Total hydrocarbons (THC) - Reactive Organic Compounds (ROC)

For fugitive component emissions: THC = 80% CH_4 + 20% ROC (estimate)

For diesel fuel combustion: THC = 5% CH4 + 95% ROC (Ref. 1)
For gasoline combustion: THC = 9% CH4 + 81% ROC (Ref. 1)

For natural gas combustion: THC = 1% CH4 + 99% ROC (estimate)

Helicopter fuel usage - 124 gal/hr (cruise), 18.7 gal/hr (idle) (Ref. 2)

Carbon content of diesel fuel = 84.7 - 87.3 C% (Ref. 3)
Diesel fuel density = 0.85 - 0.876 g/liter (Ref. 3)
Diesel usage by trucks - 4-5 miles/gallon (Ref. 4)
Drilling equipment diesel usage - 19 gallons/hour (estimate)

Density of CO2 (Ref.5) standard conditions, lbs/cu ft = **0.1235**
Density of CH4 (Ref.5) standard conditions, lbs/cu ft = **0.0448**
Amount of CO2 from gasoline combustion, lbs/gall = **20.0**
Amount of CO2 from diesel combustion, lbs/gall = **22.5**
Amount of CO2 from gas combustion, lbs/lb of CH4 = **2.7**
Stoichiometry: $CH_4 + 2O_2 = CO_2 + 2H_2O$