APPENDIX F

AIR QUALITY

APPENDIX F.1

EMISSIONS CALCULATIONS AND SUPPORT DATA

APPENDIX F.1

Calculation of Maximum Hourly, Daily, and Annual Emissions

Tables presented in this Appendix are as follows:

F.1-1	Criteria Pollutant and GHG Emissions from the Wartsila Engines
F.1-2	Wartsila Operational Case Data for QBPP
F.1-3	Criteria Pollutant and GHG Emissions from the Fuel Gas Heater
F.1-5	HAPs Emissions from the Fuel Gas Heater
F.1-6	Criteria Pollutant and GHG Emissions from the Warm Start Heater
F.1-7	HAPs Emissions from the Warm Start Heater
F.1-8	Criteria Pollutant, DPM, and GHG Emissions from the Fire Pump Engine
F.1-9	SO2 Emissions from the Wartsila Engines
F.1-10	Operational Related Truck and Employee Vehicle Emissions Estimates
F.1-11	Commissioning Emissions Estimates
F.1-12	Startup and Shutdown Emissions Estimates
F.1-13	Low Load Emissions Estimates (Steady State)

In addition to the above tables, other miscellaneous support data for the device-specific emissions calculations is also included in this Appendix.

Attachment F.1-1	Urea MSDS
Attachment F.1-2	Fire Pump Engine Specification Sheets
Attachment F.1-3	Wartsila 34SG Engine Brochure

Table F.1-1

Maximum Hourly, Daily, and Annual Emissions Calculations

Number of Identical Engines: 11

Full Load Case

Input data per unit:

Operation hrs/day	Annual Op hrs	Avg # of Cold Startups day	Avg # of Warm Startups day	Cold Startup Time hrs	Warm Startup Time hrs	Shutdown Time hrs	Cold Starts yr	Warm Starts yr	Estimated Shutdowns yr	Max Estimated Shutdowns day
24	4032	1	1	0.5	0.25	0.1417	300	100	400	2

	Cold Startup Emissions lbs/event	Warm Startup Emissions lbs/event	Shutdown Emissions lbs/event	Steady State Emissions lbs/hr *(100% Load)*	Total Cold Start hrs/yr	Total Warm Start hrs/yr	Total Shutdown hrs/yr	Annual Steady State Non SU/SD hrs/yr	Total Annual Emissions Cold Starts lbs/yr	Warm Starts lbs/yr	Shutdowns lbs/yr
NOx	8.82	2.43	0.2	1.317	150	25	56.68	3800.32	2646.0	243.0	80.0
CO	12.57	1.322	0.31	1.564					3771.0	132.2	124.0
VOC	6.614	1.764	0.34	1.584					1984.2	176.4	136.0
SOx	0.137	0.07	0.05	0.256					41.1	7.0	20.0
PM10	1.54	1.54	0.35	1.379					462.0	154.0	140.0
PM2.5	1.54	1.54	0.35	1.379					462.0	154.0	140.0

1. SU/SD emissions data and times derived from: Wartsila Emissions Data Sheet, DBAB715360, 2-27-11.
2. Cold start (CS): engine will reach steady state in 10 minutes and controls (SCR and CO Cat) will be fully operational in 30 minutes.
3. Warm start (WS): engine will reach steady state in 10 minutes and controls (SCR and CO Cat) will be fully operational in 15 minutes.
4. A warm start is defined as a start initiated within 2-6 hours after the engine has been shutdown, or when the emissions control system is at a temperature of no less than 270 C (518 F).
5. Shutdown time is optimally 8.5 minutes per Wartsila.
6. Cold start plus shutdown = 0.6417 hrs steady state = 0.3583 hrs
7. Warm start plus shutdown = 0.3917 hrs steady state = 0.6083 hrs
8. Shut down = 0.1417 hrs steady state = 0.8583 hrs
9. Steady state (SS) emissions values derived from Cogentrix/Wartsila.
10. SO2 emissions include S to SO2 from lube oil burn-off from cylinder sleeves.

Maximum Estimated Hourly Emissions 1 Hour Period	NOx lbs/hr	CO lbs/hr	VOC lbs/hr	SOx lbs/hr	PM10 lbs/hr	PM2.5 lbs/hr		
Scenario 1	9.48	13.35	7.41	0.27	2.23	2.23	*1 Engine*	
Cold Start w/Steady State	104.26	146.87	81.47	2.92	24.52	24.52	All Engines	
Scenario 2	3.42	2.50	2.95	0.26	2.57	2.57	*1 Engine*	
Warm Start w/Steady State	37.60	27.45	32.47	2.88	28.32	28.32	All Engines	
Scenario 3	9.49	13.44	7.52	0.28	2.38	2.38	*1 Engine*	Max Hr
Cold Start, Steady State, Shutdown	104.41	147.84	82.74	3.07	26.23	26.23	All Engines	Max Hr
Scenario 4	3.43	2.58	3.07	0.28	2.73	2.73	*1 Engine*	
Warm Start, Steady State, Shutdown	37.74	28.42	33.74	3.03	30.02	30.02	All Engines	
Scenario 5	1.33	1.65	1.70	0.27	1.53	1.53	*1 Engine*	
Steady State w/Shutdown	14.63	18.18	18.70	2.97	16.87	16.87	All Engines	
Scenario 6	1.32	1.56	1.58	0.26	1.38	1.38	*1 Engine*	
Steady State	14.49	17.20	17.42	2.82	15.17	15.17	All Engines	

Maximum Estimated Daily Emissions 24 Hr Period Run Day	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	39.78	49.41	43.95	6.17	34.10	34.10	*1 Engine*
Cold Start, Steady State, Shutdown	437.61	543.54	483.49	67.83	375.11	375.11	All Engines
Scenario 2	33.72	38.56	39.50	6.16	34.45	34.45	*1 Engine*
Warm Start, Steady State, Shutdown	370.94	424.11	434.50	67.80	378.90	378.90	All Engines
Scenario 3	31.61	37.54	38.02	6.14	33.10	33.10	*1 Engine*
Steady State	347.69	412.90	418.18	67.58	364.06	364.06	All Engines
Scenario 4							*1 Engine*
******							All Engines

Maximum Estimated Daily Emissions 16 Hr Period Run Day	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	29.25	36.90	31.28	4.12	23.07	23.07	*1 Engine*
Cold Start, Steady State, Shutdown	321.72	405.90	344.10	45.31	253.76	253.76	All Engines
Scenario 2	23.19	26.04	26.83	4.12	23.41	23.41	*1 Engine*
Warm Start, Steady State, Shutdown	255.05	286.48	295.10	45.27	257.55	257.55	All Engines
Scenario 3	21.07	25.02	25.34	4.10	22.06	22.06	*1 Engine*
Steady State	231.79	275.26	278.78	45.06	242.70	242.70	All Engines
Scenario 4							*1 Engine*
******							All Engines

Maximum Estimated Daily Emissions 8 Hr Period Run Day	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	18.71	24.39	18.61	2.07	12.04	12.04	*1 Engine*
Cold Start, Steady State, Shutdown	205.82	268.27	204.71	22.78	132.41	132.41	All Engines
Scenario 2	12.65	13.53	14.16	2.07	12.38	12.38	*1 Engine*
Warm Start, Steady State, Shutdown	139.15	148.85	155.71	22.74	136.20	136.20	All Engines
Scenario 3	10.54	12.51	12.67	2.05	11.03	11.03	*1 Engine*
Steady State	115.90	137.63	139.39	22.53	121.35	121.35	All Engines
Scenario 4							*1 Engine*
******							All Engines

Other Misc Scenarios -based on run hour type

(CS-cold start hour, WS-warm start hour, SD-shutdown hour, SS-steady state hour)

	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day		
a - CS, SS, SD, WS, SS, SD (total ops period 12 hrs)								
	25.72	31.22	25.98	3.04	18.51	18.51	*1 Engine*	
	282.92	343.43	285.78	33.46	203.63	203.63	All Engines	
b - 3 CSs, 1 WS, 4 SDs, SS (total ops period 24 hrs)								
	58.25	74.18	57.31	6.23	37.46	37.46	*1 Engine*	Max Day
	640.71	816.03	630.43	68.55	412.07	412.07	All Engines	Max Day

Maximum Estimated Annual Emissions	NOx	CO	VOC	SOx	PM10	PM2.5	
	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	
Ops Scenario							
Cold Startups	2646.0	3771.0	1984.2	41.1	462.0	462.0	
Warm Startups	243.0	132.2	176.4	7.0	154.0	154.0	
Shutdowns	80.0	124.0	136.0	20.0	140.0	140.0	
Steady State	5005.0	5943.7	6019.7	972.9	5240.6	5240.6	
1 Engine Totals, lbs/yr:	*7974.0*	*9970.9*	*8316.3*	*1041.0*	*5996.6*	*5996.6*	
1 Engine Totals, tons/yr:	3.99	4.99	4.16	0.52	3.00	3.00	Max Annual
	NOx	CO	VOC	SOx	PM10	PM2.5	
	tpy	tpy	tpy	tpy	tpy	tpy	
Total Tons/Yr All Engines:	**43.86**	**54.84**	**45.74**	**5.73**	**32.98**	**32.98**	Max Annual

EPA	PSD Significant Emissions Rates, TPY:	40	100	40	40	15	10
SDAPCD	Air Agency Offset Trigger Levels, TPY:	50	100	50	100	100	100

GHG Emissions Estimates CCAR, General Reporting Protocol, Version 3.1, January 2009, Table C.6.

Fuel:	Natural Gas									
Btu/scf:	1019	HHV								
Heat Rate:	80.18	mmbtu/hr						CO2e		
Fuel Rate:	0.0787	mmscf/hr				short	IPCC SAR	short		
Emissions Factors			*Emissions*	lbs/hr	lbs/year	tons/yr	Values	tons/yr		
CO2	116.954	lbs/mmbtu		9.38E+03	3.78E+07	1.89E+04	1	1.89E+04		
CH4	0.01301	lbs/mmbtu		1.04E+00	4.21E+03	2.10E+00	21	4.42E+01		
N2O	0.0002205	lbs/mmbtu		1.77E-02	7.13E+01	3.56E-02	310	1.10E+01		
							Total CO2e:	18960	TPY	
							Total CO2e:	17236	metric TPY	1 Engine
							Total CO2e:	**189600**	**metric TPY**	11 Engines

PSD Triggered for GHGs: Yes

50% Load Evaluation
Maximum Hourly, Daily Emissions Calculations

Number of Identical Engines: 11

Input data per unit:

Operation hrs/day	Annual Op hrs	Avg # of Cold Startups day	Avg # of Warm Startups day	Cold Startup Time hrs	Warm Startup Time hrs	Shutdown Time hrs	Cold Starts yr	Warm Starts yr	Estimated Shutdowns yr	Max Estimated Shutdowns day
24	4032	1	1	0.5	0.25	0.1417	300	100	400	2

	Cold Startup Emissions lbs/event	Warm Startup Emissions lbs/event	Shutdown Emissions lbs/event	Steady State Emissions lbs/hr *(50% Load)*
NOx	8.82	2.43	0.2	0.921
CO	12.57	1.322	0.31	1.494
VOC	6.614	1.764	0.34	1.504
SOx	0.137	0.07	0.05	0.256
PM10	1.54	1.54	0.35	1.361
PM2.5	1.54	1.54	0.35	1.361

1. SU/SD emissions data and times derived from: Wartsila Emissions Data Sheet, DBAB715360, 2-27-11.
2. Cold start (CS): engine will reach steady state in 10 minutes and controls (SCR and CO Cat) will be fully operational in 30 minutes.
3. Warm start (WS): engine will reach steady state in 10 minutes and controls (SCR and CO Cat) will be fully operational in 15 minutes.
4. A warm start is defined as a start initiated within 2-6 hours after the engine has been shutdown, or when the emissions control system is at a temperature of no less than 270 C (518 F).
5. Shutdown time is optimally 8.5 minutes per Wartsila.
6. Cold start plus shutdown = 0.6417 hrs steady state = 0.3583 hrs
7. Warm start plus shutdown = 0.3917 hrs steady state = 0.6083 hrs
8. Shut down = 0.1417 hrs steady state = 0.8583 hrs
9. Steady state (SS) emissions values derived from Cogentrix/Wartsila.
10. SO2 emissions include S to SO2 from lube oil burn-off from cylinder sleeves.

Maximum Estimated Hourly Emissions 1 Hour Period	NOx lbs/hr	CO lbs/hr	VOC lbs/hr	SOx lbs/hr	PM10 lbs/hr	PM2.5 lbs/hr		
Scenario 1	9.28	13.32	7.37	0.27	2.22	2.22	*1 Engine*	
Cold Start w/Steady State	102.09	146.49	81.03	2.92	24.43	24.43	All Engines	
Scenario 2	3.12	2.44	2.89	0.26	2.56	2.56	*1 Engine*	
Warm Start w/Steady State	34.33	26.87	31.81	2.88	28.17	28.17	All Engines	
Scenario 3	9.35	13.42	7.49	0.34	2.38	2.38	*1 Engine*	Max Hr
Cold Start, Steady State, Shutdown	102.85	147.57	82.42	3.77	26.15	26.15	All Engines	Max Hr
Scenario 4	3.19	2.54	3.02	0.28	2.72	2.72	*1 Engine*	
Warm Start, Steady State, Shutdown	35.09	27.95	33.21	3.03	29.90	29.90	All Engines	
Scenario 5	0.99	1.59	1.63	0.27	1.52	1.52	*1 Engine*	
Steady State w/Shutdown	10.90	17.52	17.94	2.97	16.70	16.70	All Engines	
Scenario 6	0.92	1.49	1.50	0.26	1.36	1.36	*1 Engine*	
Steady State	10.13	16.43	16.54	2.82	14.97	14.97	All Engines	

Maximum Estimated Daily Emissions 24 Hr Period Run Day	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day		
Scenario 1	30.53	47.78	42.08	6.17	33.68	33.68	*1 Engine*	
Cold Start, Steady State, Shutdown	335.86	525.55	462.93	67.83	370.49	370.49	All Engines	
Scenario 2	24.37	36.90	37.61	6.16	34.02	34.02	*1 Engine*	
Warm Start, Steady State, Shutdown	268.11	405.93	413.72	67.80	374.23	374.23	All Engines	
Scenario 3	22.10	35.86	36.10	6.14	32.66	32.66	*1 Engine*	
Steady State	243.14	394.42	397.06	67.58	359.30	359.30	All Engines	
Scenario 4							*1 Engine*	
******							All Engines	

Maximum Estimated Daily Emissions 16 Hr Period Run Day	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	23.16	35.83	30.05	4.12	22.79	22.79	*1 Engine*
Cold Start, Steady State, Shutdown	254.81	394.08	330.58	45.31	250.72	250.72	All Engines
Scenario 2	17.01	24.95	25.58	4.12	23.13	23.13	*1 Engine*
Warm Start, Steady State, Shutdown	187.06	274.46	281.37	45.27	254.46	254.46	All Engines
Scenario 3	14.74	23.90	24.06	4.10	21.78	21.78	*1 Engine*
Steady State	162.10	262.94	264.70	45.06	239.54	239.54	All Engines
Scenario 4							*1 Engine*
******							All Engines

Maximum Estimated Daily Emissions 8 Hr Period Run Day	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	15.80	23.87	18.02	2.07	11.90	11.90	*1 Engine*
Cold Start, Steady State, Shutdown	173.77	262.61	198.23	22.78	130.95	130.95	All Engines
Scenario 2	9.64	13.00	13.55	2.07	12.24	12.24	*1 Engine*
Warm Start, Steady State, Shutdown	106.01	142.99	149.02	22.74	134.69	134.69	All Engines
Scenario 3	7.37	11.95	12.03	2.05	10.89	10.89	*1 Engine*
Steady State	81.05	131.47	132.35	22.53	119.77	119.77	All Engines
Scenario 4							*1 Engine*
******							All Engines

Other Misc Scenarios -based on run hour type

(CS-cold start hour, WS-warm start hour, SD-shutdown hour, SS-steady state hour)

	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day		
a - CS, SS, SD, WS, SS, SD (total ops period 12 hrs)								
	21.49	30.47	25.13	3.04	18.32	18.32	*1 Engine*	
	236.38	335.20	276.38	33.46	201.52	201.52	All Engines	
b - 3 CSs, 1 WS, 4 SDs, SS (total ops period 24 hrs)								
	49.66	72.67	55.58	6.23	37.07	37.07	*1 Engine*	Max Day
	546.26	799.33	611.35	68.55	407.78	407.78	All Engines	Max Day

75% Load Evaluation
Maximum Hourly, Daily Emissions Calculations

Number of Identical Engines: 11

Input data per unit:

Operation hrs/day	Annual Op hrs	Avg # of Cold Startups day	Avg # of Warm Startups day	Cold Startup Time hrs	Warm Startup Time hrs	Shutdown Time hrs	Cold Starts yr	Warm Starts yr	Estimated Shutdowns yr	Max Estimated Shutdowns day
24	4032	1	1	0.5	0.25	0.1417	300	100	400	2

	Cold Startup Emissions lbs/event	Warm Startup Emissions lbs/event	Shutdown Emissions lbs/event	Steady State Emissions lbs/hr ***(75% Load)***
NOx	8.82	2.43	0.2	1.11
CO	12.57	1.322	0.31	1.48
VOC	6.614	1.764	0.34	1.541
SOx	0.137	0.07	0.05	0.256
PM10	1.54	1.54	0.35	1.372
PM2.5	1.54	1.54	0.35	1.372

1. SU/SD emissions data and times derived from: Wartsila Emissions Data Sheet, DBAB715360, 2-27-11.
2. Cold start (CS): engine will reach steady state in 10 minutes and controls (SCR and CO Cat) will be fully operational in 30 minutes.
3. Warm start (WS): engine will reach steady state in 10 minutes and controls (SCR and CO Cat) will be fully operational in 15 minutes.
4. A warm start is defined as a start initiated within 2-6 hours after the engine has been shutdown, or when the emissions control system is at a temperature of no less than 270 C (518 F).
5. Shutdown time is optimally 8.5 minutes per Wartsila.
6. Cold start plus shutdown = 0.6417 hrs steady state = 0.3583 hrs
7. Warm start plus shutdown = 0.3917 hrs steady state = 0.6083 hrs
8. Shut down = 0.1417 hrs steady state = 0.8583 hrs
9. Steady state (SS) emissions values derived from Cogentrix/Wartsila.
10. SO2 emissions include S to SO2 from lube oil burn-off from cylinder sleeves.

Maximum Estimated Hourly Emissions 1 Hour Period	NOx lbs/hr	CO lbs/hr	VOC lbs/hr	SOx lbs/hr	PM10 lbs/hr	PM2.5 lbs/hr		
Scenario 1	9.38	13.31	7.38	0.27	2.23	2.23	*1 Engine*	
Cold Start w/Steady State	103.13	146.41	81.23	2.92	24.49	24.49	All Engines	
Scenario 2	3.26	2.43	2.92	0.26	2.57	2.57	*1 Engine*	
Warm Start w/Steady State	35.89	26.75	32.12	2.88	28.26	28.26	All Engines	
Scenario 3	9.42	13.41	7.51	0.34	2.38	2.38	*1 Engine*	Max Hr
Cold Start, Steady State, Shutdown	103.59	147.51	82.57	3.77	26.20	26.20	All Engines	Max Hr
Scenario 4	3.31	2.53	3.04	0.28	2.72	2.72	*1 Engine*	
Warm Start, Steady State, Shutdown	36.36	27.86	33.46	3.03	29.97	29.97	All Engines	
Scenario 5	1.15	1.58	1.66	0.27	1.53	1.53	*1 Engine*	
Steady State w/Shutdown	12.68	17.38	18.29	2.97	16.80	16.80	All Engines	
Scenario 6	1.11	1.48	1.54	0.26	1.37	1.37	*1 Engine*	
Steady State	12.21	16.28	16.95	2.82	15.09	15.09	All Engines	

Maximum Estimated Daily Emissions 24 Hr Period Run Day	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	34.95	47.45	42.95	6.17	33.94	33.94	*1 Engine*
Cold Start, Steady State, Shutdown	384.42	521.95	472.44	67.83	373.31	373.31	All Engines
Scenario 2	28.84	36.57	38.48	6.16	34.28	34.28	*1 Engine*
Warm Start, Steady State, Shutdown	317.19	402.30	423.33	67.80	377.09	377.09	All Engines
Scenario 3	26.64	35.52	36.98	6.14	32.93	32.93	*1 Engine*
Steady State	293.04	390.72	406.82	67.58	362.21	362.21	All Engines
Scenario 4							*1 Engine*
******							All Engines

Maximum Estimated Daily Emissions 16 Hr Period Run Day	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	26.07	35.61	30.62	4.12	22.96	22.96	*1 Engine*
Cold Start, Steady State, Shutdown	286.74	391.71	336.83	45.31	252.58	252.58	All Engines
Scenario 2	19.96	24.73	26.16	4.12	23.30	23.30	*1 Engine*
Warm Start, Steady State, Shutdown	219.51	272.06	287.72	45.27	256.35	256.35	All Engines
Scenario 3	17.76	23.68	24.66	4.10	21.95	21.95	*1 Engine*
Steady State	195.36	260.48	271.22	45.06	241.47	241.47	All Engines
Scenario 4							*1 Engine*
******							All Engines

Maximum Estimated Daily Emissions 8 Hr Period Run Day	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day	
Scenario 1	17.19	23.77	18.29	2.07	11.99	11.99	*1 Engine*
Cold Start, Steady State, Shutdown	189.06	261.47	201.22	22.78	131.84	131.84	All Engines
Scenario 2	11.08	12.89	13.83	2.07	12.33	12.33	*1 Engine*
Warm Start, Steady State, Shutdown	121.83	141.82	152.11	22.74	135.61	135.61	All Engines
Scenario 3	8.88	11.84	12.33	2.05	10.98	10.98	*1 Engine*
Steady State	97.68	130.24	135.61	22.53	120.74	120.74	All Engines
Scenario 4							*1 Engine*
******							All Engines

Other Misc Scenarios -based on run hour type

(CS-cold start hour, WS-warm start hour, SD-shutdown hour, SS-steady state hour)

	NOx lbs/day	CO lbs/day	VOC lbs/day	SOx lbs/day	PM10 lbs/day	PM2.5 lbs/day		
a - CS, SS, SD, WS, SS, SD (total ops period 12 hrs)								
	23.51	30.32	25.52	3.04	18.44	18.44	*1 Engine*	
	258.59	333.55	280.73	33.46	202.81	202.81	All Engines	
b - 3 CSs, 1 WS, 4 SDs, SS (total ops period 24 hrs)								
	53.76	72.36	56.38	6.23	37.31	37.31	*1 Engine*	Max Day
	591.34	795.99	620.18	68.55	410.40	410.40	All Engines	Max Day

Table F.1-2 Wartsila Engine Run Case Data

Altitude	500	ft amsl
Fuel methane number	80	
Power factor	0.8	
Coolant	13.50%	propylene glycol

		Case	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	no glycol 21
Ambient air temp	F		35	35	35	35	64	64	64	64	70	70	70	70	81	81	81	81	95	95	95	95	95
Relative Humidity	%		68	68	68	68	60	60	60	60	55	55	55	55	48	48	48	48	24	24	24	24	24
Engine Load	%		30	50	75	100	30	50	75	100	30	50	75	100	30	50	75	100	30	50	75	100	100
Output	kW		2744	4646	6998	9341	2744	4646	6998	9341	2744	4646	6998	9341	2744	4646	6998	9341	2744	4646	6998	9184	9341
Heat rate	Btu/kWh LHV		10088	8514	7996	7741	10088	8514	7996	7741	10088	8514	7996	7741	10088	8514	7996	7741	10088	8514	7996	7751	7741
Fuel use	mmBTU/h LHV		27.68	39.56	55.96	72.31	27.68	39.56	55.96	72.31	27.68	39.56	55.96	72.31	27.68	39.56	55.96	72.31	27.68	39.56	55.96	71.19	72.31
Fuel use	mmBTU/h HHV		30.69	43.86	62.04	80.18	30.69	43.86	62.04	80.18	30.69	43.86	62.04	80.18	30.69	43.86	62.04	80.18	30.69	43.86	62.04	78.93	80.18
Shaft Power	hp		3862	6437	9655	12874	3862	6437	9655	12874	3862	6437	9655	12874	3862	6437	9655	12874	3862	6437	9655	12659	12847
Exhaust temp	F		831	831	822	741	825	825	816	735	824	824	815	734	822	822	813	732	819	819	810	731	730
Exhaust gas flow	lb/h		49200	64800	87600	117700	49,161	64,802	87,603	117,815	49,156	64,800	87,606	117,836	49200	64800	87600	118206.6	49300	65100	88400	117300	119300
Combustion air flow	lb/h		47860	62940	84940	114300	47,864	62,949	84,981	114,428	47,859	62,947	84,984	114,449	47860	62950	85000	114800	48000	63300	85800	113900	115800
Exhaust composition																							
O2	vol%		11.6	10.2	9.6	10	11.5	10.1	9.5	9.9	11.45	10.07	9.45	9.88	11.4	10	9.4	9.8	11.5	10.1	9.6	10	10
N2	vol%		74.4	74.2	74	74.2	73.9	73.6	73.5	73.6	73.8	73.5	73.4	73.6	73.5	73.3	73.1	73.3	73.8	73.6	73.4	73.6	73.6
Ar	vol%		0.88	0.88	0.88	0.88	0.9	0.9	0.9	0.9	0.878	0.875	0.873	0.877	0.88	0.87	0.87	0.87	0.88	0.88	0.87	0.88	0.88
CO2	vol%		4.17	4.87	5.18	5	4.16	4.86	5.16	4.98	4.16	4.86	5.16	4.98	4.16	4.85	5.15	4.96	4.15	4.83	5.11	4.92	4.92
H20	vol%		8.4	9.6	10.2	9.8	9.09	10.31	10.84	10.49	9.24	10.45	10.98	10.48	9.6	10.8	11.3	10.9	9.2	10.4	10.9	10.5	10.5
Exhaust flow	scf/s		183	241	326	438	183	242	327	440	183	242	328	440	183	242	328	442	184	243	331	438	445
Exhaust flow	acf/s*		462	611	820	1032	461	610	819	1,031	461	609	819	1,030	461	609	819	1033	461	610	823	1023	1040
Exhaust flow	acfm*		27720	36660	49200	61920	27682	36580	49159	61865	27660	36540	49140	61800	27660	36540	49140	61980	27660	36600	49380	61380	62400
Controlled emissions																							
Nox	g/kwh			0.090	0.072	0.064		0.090	0.072	0.064		0.090	0.072	0.064		0.090	0.072	0.064		0.090	0.072	0.064	0.064
CO	g/kWh			0.146	0.096	0.076		0.146	0.096	0.076		0.146	0.096	0.076		0.146	0.096	0.076		0.146	0.096	0.076	0.076
VOC	g/kWh			0.147	0.100	0.077		0.147	0.100	0.077		0.147	0.100	0.077		0.147	0.100	0.077		0.147	0.100	0.077	0.077
PM10 (tot)	g/kWh			0.133	0.089	0.067		0.133	0.089	0.067		0.133	0.089	0.067		0.133	0.089	0.067		0.133	0.089	0.067	0.067
Ammonia (10 ppm)	g/kWh			0.061	0.054	0.052		0.061	0.054	0.052		0.061	0.054	0.052		0.061	0.054	0.052		0.061	0.054	0.052	0.052
Formaldehyde	g/kWh			0.018	0.013	0.010		0.018	0.013	0.010		0.018	0.013	0.010		0.018	0.013	0.010		0.018	0.013	0.010	0.010
Nox	lb/h			0.921	1.110	1.317		0.921	1.110	1.317		0.921	1.110	1.317		0.921	1.110	1.317		0.921	1.110	1.295	1.317
CO	lb/h			1.494	1.480	1.564		1.494	1.480	1.564		1.494	1.480	1.564		1.494	1.480	1.564		1.494	1.480	1.537	1.564
VOC	lb/h			1.504	1.541	1.584		1.504	1.541	1.584		1.504	1.541	1.584		1.504	1.541	1.584		1.504	1.541	1.558	1.584
PM10 (tot)	lb/h			1.361	1.372	1.379		1.361	1.372	1.379		1.361	1.372	1.379		1.361	1.372	1.379		1.361	1.372	1.355	1.379
Ammonia (10 ppm)	lb/h			0.624	0.832	1.070		0.624	0.832	1.070		0.624	0.832	1.070		0.624	0.832	1.070		0.624	0.832	1.052	1.070
Formaldehyde	lb/h			0.184	0.200	0.206		0.184	0.200	0.206		0.184	0.200	0.206		0.184	0.200	0.206		0.184	0.200	0.202	0.206

* (actual at 60F and 14.6959psi)

Basis: Rev 6

Table F.1-3
Air Toxic and HAP Emissions from Natural Gas Fired IC Engines

Engine ID:	20V34SG-C2		Max Heat Rating:	80.18	mmbtu/hr	Max Daily Fuel use:	1.89	mmscf
NG (HHV):	1019	btu/scf	Max Fuel Use:	78685.0	scf/hr at HHV	Max Annual Fuel use:	317.26	mmscf
Stroke:	4			0.0787	mmscf/hr at HHV	CO Oxidation Catalyst:	Yes	
Type:	Lean Burn		Max Ops, hrs/day:	24		Minimum VOC Control Eff for CO Cat:	0.7	
# of Units:	11		Max Ops, hrs/year:	4032		Catalyst EF Multiplier:	0.3	

	EF	EF	Single Engine				All Engines				Federal HAP
Substance/Pollutant	**lb/mmbtu**	**Source**	**lbs/hr**	**lbs/day**	**lbs/year**	**tpy**	**lbs/hr**	**lbs/day**	**lbs/year**	**tpy**	**Y/N**
Acetaldehyde	0.0005191	1	0.0125	0.2997	50.345	0.0252	0.1374	3.2964	553.798	0.2769	Y
Acrolein	0.0000579	1	0.0014	0.0334	5.615	0.0028	0.0153	0.3677	61.770	0.0309	Y
1-3 Butadiene	0.00036	1	0.0087	0.2078	34.915	0.0175	0.0953	2.2861	384.063	0.1920	Y
Benzene	0.000214	1	0.0051	0.1235	20.755	0.0104	0.0566	1.3590	228.304	0.1142	Y
Biphenyl	0.000212	2	0.0051	0.1224	20.561	0.0103	0.0561	1.3463	226.171	0.1131	Y
Ethylbenzene	0.0000698	1	0.0017	0.0403	6.770	0.0034	0.0185	0.4432	74.466	0.0372	Y
Formaldehyde	0.00232	1	0.0558	1.3393	225.007	0.1125	0.6139	14.7326	2475.076	1.2375	Y
Methanol	0.0025	2	0.0601	1.4432	242.464	0.1212	0.6615	15.8756	2667.108	1.3336	Y
n-Hexane	0.00111	1	0.0267	0.6408	107.654	0.0538	0.2937	7.0488	1184.196	0.5921	Y
Naphthalene	0.0000246	1	0.0006	0.0142	2.386	0.0012	0.0065	0.1562	26.244	0.0131	Y
PAH (total)	2.49E-07	1	0.0000	0.0001	0.024	0.0000	0.0001	0.0016	0.266	0.0001	Y
Toluene	0.000235	1	0.0057	0.1357	22.792	0.0114	0.0622	1.4923	250.708	0.1254	Y
Xylenes	0.000634	1	0.0153	0.3660	61.489	0.0307	0.1678	4.0261	676.378	0.3382	Y
Propylene	0.00528	1	0.1270	3.0481	512.085	0.2560	1.3971	33.5294	5632.931	2.8165	N
	0		0.0000	0.0000	0.000	0.0000	0.0000	0.0000	0.000	0.0000	
	0		0.0000	0.0000	0.000	0.0000	0.0000	0.0000	0.000	0.0000	
	0		0.0000	0.0000	0.000	0.0000	0.0000	0.0000	0.000	0.0000	
	0		0.0000	0.0000	0.000	0.0000	0.0000	0.0000	0.000	0.0000	
Ammonia	n/a	3	1.0800	25.9200	4354.560	2.1773	11.8800	285.1200	47900.160	23.9501	N

Total Federal HAPs: 4.40 tpy

References:

(1) CARB/CATEF Natural gas ICE, SCC 20200202, 4 stroke, lean burn, uncontrolled Efs, mean values. CATEF Database.
See Humboldt Bay GS FDOC, Table 6, NCAQMD, 4/8/08.
(2) EPA, AP-42, Section 3.2, Table 3.2-2, 7/2000.
(3) NH3 value from Wartsila data at 10 ppmvd slip.
(4) CO Catalyst control eff% for VOC is 70% per Wartsila/Cogentrix.

Table F.1-4 Fuel Gas Heater

Calculation of Criteria Pollutant Emissions for Process Heaters Firing Gaseous Fuels

Heater Operation Mode: Normal firing mode

Ops Hr/Day: 24 Worst Case

Ops Hr/Yr: 4232

# of Units: 1

Fuel Type: Nat Gas

Calculation of Criteria Pollutant Emissions from Each Identical Unit

Compound	Emission Factor, lbs/MMscf (1)	Maximum Hourly Emissions, lb/hr (2)	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr (3)	All Units: Maximum Hourly Emissions, lb/hr	All Units: Maximum Daily Emissions, lb/day	All Units: Maximum Annual Emissions, lbs/yr	All Units: Annual Emissions, ton/yr
NOx	4.92E+01	1.93E-01	4.64E+00	8.18E+02	4.09E-01	1.93E-01	4.64E+00	8.18E+02	4.09E-01
CO	9.17E+01	3.60E-01	8.64E+00	1.52E+03	7.62E-01	3.60E-01	8.64E+00	1.52E+03	7.62E-01
VOC	4.08E+01	1.60E-01	3.84E+00	6.77E+02	3.39E-01	1.60E-01	3.84E+00	6.77E+02	3.39E-01
SOx	6.00E-01	2.36E-03	5.65E-02	9.97E+00	4.98E-03	2.36E-03	5.65E-02	9.97E+00	4.98E-03
PM10	7.13E+00	2.80E-02	6.72E-01	1.18E+02	5.92E-02	2.80E-02	6.72E-01	1.18E+02	5.92E-02
PM2.5	7.13E+00	2.80E-02	6.72E-01	1.18E+02	5.92E-02	2.80E-02	6.72E-01	1.18E+02	5.92E-02
NH3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	lbs/MMbtu								
CO2	1.17E+02	4.68E+02	1.12E+04	1.98E+06	9.90E+02	4.68E+02	1.12E+04	1.98E+06	9.90E+02
Methane	1.30E-02	5.20E-02	1.25E+00	2.20E+02	1.10E-01	5.20E-02	1.25E+00	2.20E+02	1.10E-01
N2O	2.21E-04	8.82E-04	2.12E-02	3.73E+00	1.87E-03	8.82E-04	2.12E-02	3.73E+00	1.87E-03
CO2e									9.93E+02
								metric tons	902.5

Notes:

(1) natural gas criteria pollutant EF factors

(2) Based on maximum hourly heater fuel use of 4 MMBtu/hr/boiler
and fuel HHV of 1019 Btu/scf gives 0.0039 MMscf/hr/boiler.

(3) Based on maximum annual heater fuel use of 16,928 MMBtu/yr/boiler
and fuel HHV of 1019 Btu/scf gives 16.6124 MMscf/yr/boiler.

(4) PM2.5 = PM10

Exh Flow	3479.00	lbs/hr
Exh Flow	2243.00	acfm
Exh Temp	1015.00	deg F
Exh Vel	12.42	ft/sec
Stk Ht	*	ft.
Stk Diam	*	in.

Refs:

(1) EFs from ETI (mfg) and AP-42, Section 1.4, 7-98.

(2) GHG Factors, General Protocol, CCAR, Ver 3.1, Jan 2009.

(3) Mfg values adjusted for LNB application.

This unit is exempt from the SDAPCD permitting requirements per Rule 11.

This unit is exempt from the SDAPCD BACT requirements per Rule 20.2.

Unit operates during main engine operation plus 200hours/yr for contingency.

* See modeling Appendix F.2 for final data.

Table F.1-5 Fuel Gas Heater Emissions
Calculation of Noncriteria Pollutant Emissions for Process Heaters Firing Gaseous Fuels

Heater Operation Mode: Normal firing mode
Ops Hr/Day: 24
Ops Hr/Yr: 4232

# of Units: 1
Fuel Type: Nat Gas

Calculation of Noncriteria Pollutant Emissions from Each Identical Unit

Compound	Emission Factor, lb/MMscf (1)	Maximum Hourly Emissions, lb/hr (2)	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr (3)	All Units: Maximum Hourly Emissions, lb/hr	All Units: Maximum Daily Emissions, lb/day	All Units: Maximum Annual Emissions, lbs/yr	All Units: Annual Emissions, ton/yr
Acetaldehyde	8.87E-03	3.48E-05	8.36E-04	1.47E-01	7.37E-05	3.48E-05	8.36E-04	1.47E-01	7.37E-05
Acrolein	4.51E-03	1.77E-05	4.25E-04	7.49E-02	3.75E-05	1.77E-05	4.25E-04	7.49E-02	3.75E-05
Ammonia	(5)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	4.31E-03	1.69E-05	4.06E-04	7.16E-02	3.58E-05	1.69E-05	4.06E-04	7.16E-02	3.58E-05
1,3-Butadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethylbenzene	9.50E-03	3.73E-05	8.95E-04	1.58E-01	7.89E-05	3.73E-05	8.95E-04	1.58E-01	7.89E-05
Formaldehyde	1.70E-02	6.67E-05	1.60E-03	2.82E-01	1.41E-04	6.67E-05	1.60E-03	2.82E-01	1.41E-04
Hexane	6.30E-03	2.47E-05	5.94E-04	1.05E-01	5.23E-05	2.47E-05	5.94E-04	1.05E-01	5.23E-05
Naphthalene	3.00E-04	1.18E-06	2.83E-05	4.98E-03	2.49E-06	1.18E-06	2.83E-05	4.98E-03	2.49E-06
PAHs (4)	4.00E-04	1.57E-06	3.77E-05	6.64E-03	3.32E-06	1.57E-06	3.77E-05	6.64E-03	3.32E-06
Propylene	7.31E-01	2.87E-03	6.89E-02	1.21E+01	6.07E-03	2.87E-03	6.89E-02	1.21E+01	6.07E-03
Propylene oxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	3.66E-02	1.44E-04	3.45E-03	6.08E-01	3.04E-04	1.44E-04	3.45E-03	6.08E-01	3.04E-04
Xylene	2.72E-02	1.07E-04	2.56E-03	4.52E-01	2.26E-04	1.07E-04	2.56E-03	4.52E-01	2.26E-04
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Notes:
(1) natural gas HAPs factors
(2) Based on maximum hourly boiler fuel use of 4 MMBtu/hr/boiler
and fuel HHV of 1019 Btu/scf gives 0.0039 MMscf/hr/boiler.
(3) Based on maximum annual boiler fuel use of 16,928 MMBtu/yr/boiler
and fuel HHV of 1019 Btu/scf gives 16.6124 MMscf/yr/boiler.
(4) PAHs - Polycyclic aromatic hydrocarbons
(5) Ammonia based SCR not proposed for this small process heater

Refs:
CARB Catef Database
SDAPCD, B17, Toxics Efs Database
SCAQMD, 6/2/2000

This unit is exempt from the SDAPCD permitting requirements per Rule 11.
This unit is exempt from the SDAPCD BACT requirements per Rule 20.2.

Table F.1-6 Warm Start Heater(s)
Calculation of Criteria Pollutant Emissions for Process Heaters Firing Gaseous Fuels

Heater Operation Mode: Normal firing mode
Ops Hr/Day: 24 Worst Case
Ops Hr/Yr: 4928

# of Units: 1 *
Fuel Type: Nat Gas

Calculation of Criteria Pollutant Emissions from Each Identical Unit

Compound	Emission Factor, lbs/MMscf (1)	Maximum Hourly Emissions, lb/hr (2)	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr (3)	All Units: Maximum Hourly Emissions, lb/hr	All Units: Maximum Daily Emissions, lb/day	All Units: Maximum Annual Emissions, lbs/yr	All Units: Annual Emissions, ton/yr
NOx	4.92E+01	1.93E-01	4.64E+00	9.53E+02	4.76E-01	1.93E-01	4.64E+00	9.53E+02	4.76E-01
CO	9.17E+01	3.60E-01	8.64E+00	1.77E+03	8.87E-01	3.60E-01	8.64E+00	1.77E+03	8.87E-01
VOC	4.08E+01	1.60E-01	3.84E+00	7.88E+02	3.94E-01	1.60E-01	3.84E+00	7.88E+02	3.94E-01
SOx	6.00E-01	2.36E-03	5.65E-02	1.16E+01	5.80E-03	2.36E-03	5.65E-02	1.16E+01	5.80E-03
PM10	7.13E+00	2.80E-02	6.72E-01	1.38E+02	6.90E-02	2.80E-02	6.72E-01	1.38E+02	6.90E-02
PM2.5	7.13E+00	2.80E-02	6.72E-01	1.38E+02	6.90E-02	2.80E-02	6.72E-01	1.38E+02	6.90E-02
NH3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	lbs/MMbtu								
CO2	1.17E+02	4.68E+02	1.12E+04	2.31E+06	1.15E+03	4.68E+02	1.12E+04	2.31E+06	1.15E+03
Methane	1.30E-02	5.20E-02	1.25E+00	2.56E+02	1.28E-01	5.20E-02	1.25E+00	2.56E+02	1.28E-01
N2O	2.21E-04	8.82E-04	2.12E-02	4.35E+00	2.17E-03	8.82E-04	2.12E-02	4.35E+00	2.17E-03
CO2e									1.16E+03
								metric tons	1050.9

Notes:
(1) natural gas criteria pollutant EF factors
(2) Based on maximum hourly heater fuel use of 4 MMBtu/hr/boiler
and fuel HHV of 1019 Btu/scf gives 0.0039 MMscf/hr/boiler.
(3) Based on maximum annual heater fuel use of 19,712 MMBtu/yr/boiler
and fuel HHV of 1019 Btu/scf gives 19.3445 MMscf/yr/boiler.
(4) PM2.5 = PM10

Exh Flow	3479	lbs/hr
Exh Flow	2243	acfm
Exh Temp	1015	deg F
Exh Vel	12.42	ft/sec
Stl Ht	*	ft.
Stk Diam	*	in.

Refs:
(1) EFs from ETI (mfg) and AP-42, Section 1.4, 7-98.
(2) GHG Factors, General Protocol, CCAR, Ver 3.1, Jan 2009.
(3) Mfg Nox values adjusted for LNB application.

These units are exempt from the SDAPCD permitting requirements per Rule 11.
These units are exempt from the SDAPCD BACT requirements per Rule 20.2.
* 2 units total, but one unit is strictly a standby/backup unit, and only used when the primary unit is down.
Total hours per year for both units combined will not exceed the above noted value.
Ops hours/year includes a 200 hour/year contingency.
*See modeling Appendix F.2 for final data.

Table F.1-7 Warm Start Heater Emissions
Calculation of Noncriteria Pollutant Emissions for Process Heaters Firing Gaseous Fuels

Heater Operation Mode: Normal firing mode
Ops Hr/Day: 24
Ops Hr/Yr: 4928

# of Units: 1 *
Fuel Type: Nat Gas

Calculation of Noncriteria Pollutant Emissions from Each Identical Unit

Compound	Emission Factor, lb/MMscf (1)	Maximum Hourly Emissions, lb/hr (2)	Maximum Daily Emissions, lb/day	Maximum Annual Emissions, lbs/yr	Annual Emissions, ton/yr (3)	All Units: Maximum Hourly Emissions, lb/hr	All Units: Maximum Daily Emissions, lb/day	All Units: Maximum Annual Emissions, lbs/yr	All Units: Annual Emissions, ton/yr
Acetaldehyde	8.87E-03	3.48E-05	8.36E-04	1.72E-01	8.58E-05	3.48E-05	8.36E-04	1.72E-01	8.58E-05
Acrolein	4.51E-03	1.77E-05	4.25E-04	8.72E-02	4.36E-05	1.77E-05	4.25E-04	8.72E-02	4.36E-05
Ammonia	(5)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	4.31E-03	1.69E-05	4.06E-04	8.34E-02	4.17E-05	1.69E-05	4.06E-04	8.34E-02	4.17E-05
1,3-Butadiene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethylbenzene	9.50E-03	3.73E-05	8.95E-04	1.84E-01	9.19E-05	3.73E-05	8.95E-04	1.84E-01	9.19E-05
Formaldehyde	1.70E-02	6.67E-05	1.60E-03	3.29E-01	1.64E-04	6.67E-05	1.60E-03	3.29E-01	1.64E-04
Hexane	6.30E-03	2.47E-05	5.94E-04	1.22E-01	6.09E-05	2.47E-05	5.94E-04	1.22E-01	6.09E-05
Naphthalene	3.00E-04	1.18E-06	2.83E-05	5.80E-03	2.90E-06	1.18E-06	2.83E-05	5.80E-03	2.90E-06
PAHs (4)	4.00E-04	1.57E-06	3.77E-05	7.74E-03	3.87E-06	1.57E-06	3.77E-05	7.74E-03	3.87E-06
Propylene	7.31E-01	2.87E-03	6.89E-02	1.41E+01	7.07E-03	2.87E-03	6.89E-02	1.41E+01	7.07E-03
Propylene oxide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	3.66E-02	1.44E-04	3.45E-03	7.08E-01	3.54E-04	1.44E-04	3.45E-03	7.08E-01	3.54E-04
Xylene	2.72E-02	1.07E-04	2.56E-03	5.26E-01	2.63E-04	1.07E-04	2.56E-03	5.26E-01	2.63E-04
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Notes:
(1) natural gas HAPs factors
(2) Based on maximum hourly boiler fuel use of 4 MMBtu/hr/boiler
and fuel HHV of 1019 Btu/scf gives 0.0039 MMscf/hr/boiler.
(3) Based on maximum annual boiler fuel use of 19,712 MMBtu/yr/boiler
and fuel HHV of 1019 Btu/scf gives 19.3445 MMscf/yr/boiler.
(4) PAHs - Polycyclic aromatic hydrocarbons
(5) Ammonia based SCR not proposed for this small process heater

Refs:
CARB Catef Database
SDAPCD, B17, Toxics Efs Database
SCAQMD, 6/2/2000

These units are exempt from the SDAPCD permitting requirements per Rule 11.
These units are exempt from the SDAPCD BACT requirements per Rule 20.2.
* 2 units total, but one unit is strictly a standby/backup unit, and only used when the primary unit is down.
Total hours per year for both units will not exceed the above noted value.

Table F.1-8 EXPECTED INTERNAL COMBUSTION ENGINE EMISSIONS

Liquid Fuel

Emergency Fire Pump

Mfg:	John Deere		# of Identical Engines:	1
Engine #:	JU4H-UFADW8 (Clarke)		Exhaust Temp, F:	1040
Kw	0	approx.	# of Cylinders:	4
BHP:	144		Stroke:	4
RPM:	1760		Turbocharged:	Yes
Fuel:	#2 Diesel		Intercooled:	
Fuel Use:	10	Gph (1)	Ignition:	CI
FuelHHV:	139000	Btu/gal	Exhaust Flow, acfm	740
mmbtu/hr:	1.39	HHV	Max Daily Op Hrs:	1
EPA/CARB Tier #:	3		Max Annual Op Hrs:	50
			Stk Ht	* ft.
Fuel Wt:	7	Lbs/gal	Stk Diam	4 in.
Fuel S:	0.0015	% wt.		
Fuel S:	0.105	Lbs/1000 gal		
SO2:	0.21	Lbs/1000 gal		

		Single Engine				*All Engines*			
EFs (g/bhp-hr)		Lb/Hr	Lb/Day	Lbs/Yr	Tons/Yr	*Lb/Hr*	*Lb/Day*	*Lbs/Yr*	*Tons/Yr*
NOx	2.8	0.89	0.89	44.41	0.022	*0.89*	*0.89*	*44.41*	*0.02*
CO	1	0.32	0.32	15.86	0.008	*0.32*	*0.32*	*15.86*	*0.01*
VOC	0.1	0.03	0.03	1.59	0.001	*0.03*	*0.03*	*1.59*	*0.001*
PM10	0.09	0.03	0.03	1.43	0.001	*0.03*	*0.03*	*1.43*	*0.001*
SOx	NA	0.0021	0.0021	0.11	0.0001	*0.0021*	*0.0021*	*0.11*	*0.0001*
	lbs/gal								
CO2	22.38	224	224	11190	5.60	*224*	*224*	*11190*	*5.60*
Methane	0.000661	0.01	0.01	0.33	0.000	*0.01*	*0.01*	*0.33*	*0.000*
N2O	0.000221	0.00	0.00	0.11	0.0001	*0.00*	*0.00*	*0.11*	*0.0001*
CO2e					5.62				*5.62*
								CO2e metric tons/yr	*5.11*

Notes:

1. fuel consumption based on 0.055 gal/hp-hr (avg EPA and SCAQMD values) if no value given by mfg for specific engine.
2. PM10 equals PM2.5.
3. PM10 used in HRA to represent DPM emissions.
4. GHG EFs, General Protocol, CCAR, Ver 3.1, 1/09.

* See modeling Appendix F.2 for final data.

Table F.1-9 SO2 Emissions Calculations based on Fuel S Content and Lube Oil Consumption

Fuel:	NG			S to SO2:	2	Std Conv Factor		Hrs/Yr/Unit:	4032	
S content:	0.25	gr S/100 scf		# of Engines:	11					
Fuel:	1019	btu/scf HHV					Lube Oil	1 Engine	All Engines	All Engines
							Burn-off	Final	Final	Final
Load Level	Heat Rate	Fuel Use	Fuel Use	S in Fuel	S in Fuel	SO2	SO2	SO2	SO2	SO2
	mmbtu/hr	scf/hr	100 scf/hr	grs/hr	lbs/hr	lbs/hr	lbs/hr	lbs/hr	lbs/hr	TPY
100%	80.18	78685	786.85	196.71	0.028	0.056	0.2	0.256	2.82	5.68
90%	72.16	70816	708.16	177.04	0.025	0.051	0.18	0.231	2.54	5.11
75%	60.14	59014	590.14	147.53	0.021	0.042	0.15	0.192	2.11	4.26
50%	40.09	39342	393.42	98.36	0.014	0.028	0.1	0.128	1.41	2.84

1. lube oil burn-off rate is best estimate from Wartsila, ref. DAAB744303, at full load.
2. assumes fuel use and load factor are essentially equal.

Lube Oil Burn-off (Lube oil consumption-LOC) comments:

Lube oil burn-off refers to the oil picked up by the engine piston rings that is distributed to the pistion sleeve each time piston moves up the firing cycle. When ignition occurs a portion of the oil is combusted, and a portion is contaminated and removed from the piston sleeve wall as the cyclinder moves down the firing cycle. The contaminated oil is collected in the lube oil sump where settling takes place and oil is pumped from the sump to the filter system and back to the engine (cycle repeats). Periodically the lube oil and filters are changed.

Wartsila has estimated that approximately 0.1 lbs of S per hour is combusted and converted to 0.2 lbs SO2 per hour as a result of LOC. This value was used in the SOx emissions calculations, although it is anticipated that SO2 mass emissions will be far less than this value once compliance testing is completed.

Refs:

1. Impact of Oil Consumption Mechanisms On Diesel Exhaust Particle Size Distributions, J. Stetter, et.al., Univ of Wisconsin, 2003.
2. Prevention of Air Pollution Form Ships: DPM Reduction via Lube Oil Consumption Control, T. Miller, et.al., USCG, USN.
3. The Influence of Engine Lubricating Oil on Diesel Nanoparticle Emissions and Kinestics of Oxidation, H. Jung, et.al., Univ of Minnesota, 2003.
4. Characterization and Assessment of Diesel Engine Particulate Emissions Reduction via Lube-Oil Consumption Control, M. Jackson, et.al., MIT.

Table F.1-10 Operations Related Mobile Source Emissions

Operations Site Delivery Emissions

Maximum # Deliveries/Month:	30
Roundtrip delivery VMT:	40
VMT/month:	1200
VMT/year:	14400
VMT/day:	40

Emission Factors (Lbs/VMT)

Vehicle Type	NOx	SOx	CO	VOC	PM10	PM2.5	CO2
Passenger	0.00067	0.00001	0.00689	0.00074	0.00009	0.00009	0.95810
Delivery HDD	0.02157	0.00004	0.00681	0.00155	0.00095	0.00094	3.81160

Operations Employee Commuting Emissions

Off Season Employee #	11
Peak Season Employee #	11
Annual average employee #	11
Average roundtrip distance, miles	40
VMT/day	440
VMT/year	160600

Emissions (lbs/day)

	NOx	SOx	CO	VOC	PM10	PM2.5	CO2
Passenger	0.295	0.004	3.032	0.326	0.040	0.040	421.56
Delivery HDD	0.863	0.001	0.272	0.062	0.038	0.038	152.46
Totals	*1.158*	*0.006*	*3.304*	*0.388*	*0.078*	*0.077*	*574.03*

Emissions (tons/year)

	NOx	SOx	CO	VOC	PM10	PM2.5	CO2
Passenger	0.054	0.001	0.553	0.059	0.007	0.007	76.94
Delivery HDD	0.155	0.000	0.049	0.011	0.007	0.007	27.44
Totals	*0.209*	*0.001*	*0.602*	*0.071*	*0.014*	*0.014*	*104.38*

Assumptions:

1) Delivery Vehicles Avg Round Trip VMT estimated to be 40 miles.
2) Employee Vehicle Avg Round Trip VMT estimated to be 40 miles.
3) Emission factors reflect 2013 EMFAC data for the site location County.
   Passenger vehicles = LDP/LDT, Delivery vehicles=heavy duty diesel trucks.

Dedicated Site Equipment

#	Type	HP	Daily Hrs	Annual Hrs	Annual Hp-Hrs
1	8000 lb Forklift	120	4	1460	175200

	NOx	SOx	CO	VOC	PM10	PM2.5	CO2	CH4	N2O
EFs, lbs/Hp-hr	**0.00309**	**0.000004**	**0.00201**	**0.000453**	**0.000244**	**0.0002418**	**0.317**	**0.000041**	**0**
lbs/day	1.4832	0.00192	0.9648	0.21744	0.11712	0.1160659	152.16	0.01968	0
lbs/yr	541.368	0.7008	352.152	79.3656	42.7488	42.364061	55538.4	7.1832	0
TPY	0.27	0.0004	0.18	0.04	0.02	0.02	27.8	0.004	0

Table F.1-11 Commisioning Emissions Estimates

	100% Load		*90% Load*		*75% Load*		*50% Load*	
Pollutant	*ppmvd*	*lb/hr*	*ppmvd*	*lb/hr*	*ppmvd*	*lb/hr*	*ppmvd*	*lb/hr*
Nox	120	31.86	120	28.96	110	22.68	100	14.82
CO	260	42.02	260	38.19	300	37.64	400	36.1
VOC	110	10.16	110	9.23	140	10.04	170	8.77
SOx		0.274		0.266		0.255		0.237
	mg/m3		mg/m3		mg/m3		mg/m3	
PM10/2.5	25		25		30		40	

1. vendor provided values at the stated loads for 20V34SG rated at 72 mmbtu/hr
2. ppmvd and mg/Nm3 at 15% O2, per Wartsila document DAAB714309.
3. SOx includes combustion plus lube oil addition (burn-off in cyclinder chamber), calculated based on fuel use at load

Data:	Load %	mmbtu/hr	APCD STP F:	68	at 1 atm	Calc 1
	50	40.09	molar vol:	385.3	dscf/lb-mol	385300000
	75	60.135	Mol Wts			
	90	72.162	Nox	46		
	100	80.18	CO	28		
			VOC	16	as CH4	
Ref O2%:	15		EPA Fd	8710	dscf/mmbtu at 68 F at 0% O2	
Ambt O2%:	20.9		EPA Fd	30854	dscf/mmbtu at 68 F at 15% O2	

1. assumes load and heat rates are closely related.

Calculated Commissioning Emissions Values for 20V34SG-C2 rated at 80.18 mmbtu/hr.

					lbs/hr			
Load %	*mmbtu/hr*	*DSCFH*	*DSCMH*	*Nox*	*CO*	*VOC*	*SO2*	*PM10/2.5*
50	40.09	1236940	35021	14.77	35.96	8.73	0.237	3.09
75	60.135	1855409	52531	24.37	40.45	10.79	0.255	3.47
90	72.162	2226491	63038	31.90	42.07	10.17	0.266	3.47
100	80.18	2473879	70042	35.44	46.74	11.30	0.274	3.86

Worst Case Hourly and Daily Commissioning Emissions Estimates

Pollutant	*# Engines*	*Per Engine*	*All Engines*	*Ops Period*	*Per Engine*	*All Engines*
		lbs/hr	*lbs/hr*	*Hrs/Day*	*lbs/day*	*lbs/day*
Nox	3	35.44	106.32	12	425.28	1275.84
CO	3	46.74	140.22	12	560.88	1682.64
VOC	3	11.3	33.9	12	135.6	406.8
SOx	3	0.274	0.822	12	3.288	9.864
PM10/2.5	3	3.86	11.58	12	46.32	138.96

1. assumes maximum of 3 engines in commissioning in any 1 hour or day
2. assumes max ops hours per any commissioning phase day is no more than 12 hours

TABLE F.1-12 Facility Startup/Shutdown Emission Rates for Each Engine for the QBPP

Scenario	NO_x	CO	VOC	PM10/2.5	SOx
Cold Start, lb/event	8.82	12.57	6.614	1.54	0.137
Warm Start, lb/event	2.43	1.322	1.764	1.54	0.07
Shutdown, lb/event	0.2	0.31	0.34	0.35	0.05

Wartsila Doc ID: DBAB715360, 2/27/11.
Estimates based on startup/shutdown data supplied by engine mfg in units of kg/per start.
Cold start sequence is 30 minutes, while a warm start sequence is 15 minutes or less, i.e., times required for control systems to reach full abatement efficiency. The remaining part of the cold or warm startup hour would be at steady state, full control levels.
Shutdown is 8.5 minutes. The remaining part of the shutdown hour would be at steady state, full control levels.
Due to rapid start capability of the engines, the engines will reach full load power production in 10 minutes.

Table F.1-13 Low Load Emissions Scenarios-Steady State Operations

Basis: Annual Avg Cases at 70F (Cases 10 and 11) Engines: 11

	lbs/hr						
	Nox	CO	VOC	Sox*	PM10/2.5	NH3	
Case 10	0.921	1.494	1.504	0.256	1.361	0.624	50% Load
Case 11	1.11	1.48	1.541	0.256	1.372	0.832	75% Load

*majority of SOx emissions from LOC.

11 Engines at 50% Load (Case 10)

	Nox	CO	VOC	Sox*	PM10/2.5	NH3
lbs/hr	10.13	16.43	16.54	2.82	14.97	6.86
lbs/8 hrs	81.05	131.47	132.35	22.53	119.77	54.91
lbs/16 hrs	162.10	262.94	264.70	45.06	239.54	109.82
lbs/24 hrs	243.14	394.42	397.06	67.58	359.30	164.74

11 Engines at 75% Load (Case 11)

	Nox	CO	VOC	Sox*	PM10/2.5	NH3
lbs/hr	12.21	16.28	16.95	2.82	15.09	9.15
lbs/8 hrs	97.68	130.24	135.61	22.53	120.74	73.22
lbs/16 hrs	195.36	260.48	271.22	45.06	241.47	146.43
lbs/24 hrs	293.04	390.72	406.82	67.58	362.21	219.65

**SU/SDs not included.

Attachment F.1-1 Urea MSDS

Material Safety Data Sheet

I. CHEMICAL PRODUCT and EMERGENCY TELEPHONE CONTACT

Product Name	Urea Solution
Chemical Family	Amide
Synonyms	Urea Liquor; Nitrogen Solution for SCR NOx Control Systems
Formula	CH4N2O + H2O
Product Use	SCR NOx Control

EMERGENCY TELEPHONE NUMBER

CHEMTREC (U.S.)	800-424-9300

II. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	Percentage by Weight	CAS Number
Urea	30 - 70%	57-13-6
Free Ammonia	0.1 - 1.0%	7664-41-7
Buiret	0.1 - 0.5%	108-19-0
Ammonium Carbamate	0.1 - 0.5%	1111-78-0
Water	28 - 69.7%	7732-18-5

Exposure Limits

Component	TWA	STEL	PEL	IDLH
Ammonia	25ppm	33ppm	50ppm	300 ppm

No limits established for urea solution, biuret, or ammonium carbamate

III. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Colorless liquid. With slight ammonia (pungent) odor. Reacts with sodium hypochlorite or calcium hypochlorite to form the explosive nitrogen trichloride. When heated, urea releases ammonia and when heated to decomposition it emits toxic fumes of nitrogen oxides (NOx), ammonia, and cyanuric acid. Use water to control fires involving urea solution if water is compatible with burning material. Urea Solution itself is non- flammable.

POTENTIAL HEALTH EFFECTS

Primary Routes of Entry: Skin contact/absorption, eye contact, and vapor inhalation.

General Acute Exposure: May cause irritation to eyes and skin. Ammonia and carbon dioxide vapors may accumulate in a confined space.

General chronic Exposure: No test data available.

Carcinogenicity:

NTP:	Not Listed
IARC:	Not Listed
OSHA:	Not Required

Medical Conditions Aggravated by Exposure: No test data available.

IV. FIRST AID MEASURES

First Aid for Eyes: Flush eyes with copious amounts of tepid water for at least 15 minutes. If irritation, pain, swelling, excessive tearing, or light sensitivity persists, the patient should be seen in a health care facility.

First Aid for Skin: If irritation occurs, flush exposed area with copious amounts of tepid water for at least 15 minutes followed by washing area thoroughly with soap and water. The patient should be seen in a health care facility if irritation or pain persists.

First Aid for Inhalation: If irritation develops, move patient to fresh air and monitor. If cough or difficulty in breathing develops, evaluate for respiratory tract irritation. If trained to do so, administer supplemental oxygen if needed. If irritation, coughing or difficulty in breathing persists, the patient should be seen in a health care facility.

First Aid for Ingestion: If conscious, give the patient large quantities of water to drink and induce vomiting. Seek medical attention.

V. FIRE FIGHTING MEASURES

Urea solution is not flammable.

Extinguishing Media: Use water to extinguish a fire involving urea solution if water is compatible with the burning material.

Special Fire Fighting Procedures:
- Positive pressure self-contained breathing apparatus (SCBA) should be used when there is a potential for inhalation of vapors and/or fumes.
- Wear full fire fighting protective equipment that is appropriate for conditions.

Caution:
- Runoff from fire control or dilution water may cause pollution.
- At elevated temperature, urea solution may decompose to form cyanuric acid, ammonia, biuret, and/or nitrogen oxides.

VI. ACCIDENTAL RELEASE MEASURES

Spill or Leak Measures: Keep unnecessary people away and isolate hazard area.

Determining Spill Size: Generally, a small spill is one that involves a single, small package (i.e. up to a 55 gallon drum), small cylinder, or a small (non-continuing) leak from a large container.

Small or Large Spill:
- Spilled urea solution may cause slippery conditions.
- Recover and use as fertilizer.
- If disposal of product or contaminated by-products is necessary, follow guidelines set forth by local, state, and federal environmental agencies.
- Runoff may cause pollution.

VII. HANDLING AND STORAGE

No unusual storage precautions are necessary.

Handling Precautions: Use proper personal protective equipment when working with or around urea solution

(See section VIII).

VIII. EXPOSURE CONTROLS, PERSONAL PROTECTION

Respiratory Protection Requirements: Urea solution may pose an inhalation hazard in confined areas due to its ability to produce ammonia and carbon dioxide vapors. If necessary to enter an area that contains urea solution, monitor for ammonia and oxygen content. Oxygen levels should be maintained between 19.5% and 23.5%, if outside of this range use appropriate precautions. If ammonia vapors are present, protect as follows:

<25ppm:	No protection required.
25 to 35 ppm:	Protection required if the daily TWA is exceeded.
35 to 50 ppm:	Protection required if exposed for more than 15 minutes.
50 to 250 ppm:	Minimum of an air-purifying respirator equipped with ammonia canister(s) or cartridge(s).
250 to 300 ppm:	Minimum of a full- face air-purifying respirator equipped with ammonia canister(s) or cartridge(s).
<300 ppm:	A fresh air supply system must be used (i.e. positive pressure self contained breathing apparatus).

Engineering Controls: Adequate ventilation should be supplied.

Skin Protection Requirements: Impervious gloves should be worn.

Eye Protection Requirements: It is recommended that safety glasses or goggles be used and if there is a potential for splashing liquid, a face shield should be used in conjunction with the safety glasses or goggles.

Other Protective Equipment: Safety shower and eyewash fountain or at least 5 gallons of accessible clean water should be provided in a urea liquid handling area.

IX. PHYSICAL AND CHEMICAL PROPERTIES

Physical Form	Liquid
Color	Colorless
Odor	Slight ammonia odor (pungent)
Boiling Point	50% urea solution boils at 223 degrees F (106 degrees C)
Melting Point	40% urea solution salts out at 33 degrees F (0.6 degrees C) 50% urea solution salts out at 64 degrees F (18 degrees C) 70% urea solution salts out at 135 degrees F(57 degrees C)
pH	9.25 @ 40% urea solution
Solubility	100%
Specific Gravity	1.11 for 40% urea solution 1.14 for 50% urea solution 1.175 for 70% urea solution
Vapor Density	No test results
Vapor Pressure	No test results
% Volatile by Volume	No test results
Molecular Weight	Not applicable
Density	9.28 lb. @ 60 degrees F per gallon for 40% solution 9.51 lb. per gallon for 50% solution 9.80 lb. per gallon for 70% solution
Critical Temperature	No test results
Critical Pressure	No test results

X. REACTIVITY

Stability:	This is a stable material
Hazardous Polymerization:	Will not occur.

Decomposition: Urea solution forms ammonia, cyanuric acid, biuret, and/or nitrogen oxides (NOx) upon decomposition.

Incompatibilities: Reacts with sodium hypochlorite or calcium hypochlorite to form nitrogen trichloride that may explode spontaneously in air. Incompatible with sodium nitrite, phosphorus pentachloride, and nitrosyl or gallium perchlorate.

XI. TOXICOLOGICAL INFORMATION

Toxicity	
Acute Oral Toxicity	
LD50, Rat:	14,300 – 15,000 mg/kg
LD50, Mouse:	11,500 – 13,000 mg/kg
LD 0, Cattle:	510 mg/kg
Repeated Dose Toxicity	
Rat:	NOAEL = 40% in ointment (24 wks; dermal)
Ecotoxicity	
Acute Toxicity to Fish	
LC50 Barillius barna	9,100 mg/L (96 hr)
Acute Toxicity to Aquatic Invertebrates	
EC50 Daphnia magna	>10,000 mg/L (DIN 38412 Part II; 24 hr)
Toxicity to Aquatic Plants	
TT Scenedesmus quadracauda	>10,000 mg/L (192 hr cell multiplication inhibition test)

Note: Data is for Urea
Source: TFI Product Testing Program April 2003

XII. ECOLOGICAL INFORMATION

Notify local health and wildlife officials and operators of any nearby water intakes of contamination or discharge into or leading to waterways.

Note: See Ecotoxicity information in section XI

XIII. DISPOSAL CONSIDERATIONS

Urea solution is not listed by the Federal EPA as a hazardous waste. Consult state and local environmental agencies for acceptable disposal methods. Recover product for use as a fertilizer, if possible.

XIV. TRANSPORTATION INFORMATION

Urea solution is not listed by any U.S. or Canadian transportation authority as a hazardous material and as such, no specific information is available.

XV. REGULATORY INFORMATION

SARA TITLE III: Not Listed
CERCLA Hazardous Substances List: Not Listed
TSCA Inventory: Listed

The information and recommendations herein are taken from data contained in independent, industry-recognized references including but not limited to NIOSH, OSHA, CHRIS, the TFI Product Testing Program, and SAX's Dangerous Properties of Industrial Materials – ninth edition. **INDUSTRIAL SOLUTION SERVICES, INC.** makes no guarantee, warranty or other representation concerning this substance, since conditions of its use are beyond the control of the company. **INDUSTRIAL SOLUTION SERVICES, INC.** disclaims any liability for loss or damage incurred in connection with the use of this substance.

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Attachment F.1-2 Fire Pump Specification Data and CARB EO#

(5 Pages)

Rating Specific Emissions Data - John Deere Power Systems

JOHN DEERE

Nameplate Rating Information

Clarke Model	JU4H-UFADW8
Power Rating (BHP / kW)	144 / 107
Certified Speed (RPM)	1760

Rating Data

Rating	4045HFC28A
Certified Power (kW)	117
Rated Speed	1760
Vehicle Model Number	Clarke Fire Pump

Units	g/kW-hr	g/hp-hr
NOx	3.7	2.8
HC	0.1	0.1
NOx + HC	3.8	2.8
Pm	0.12	0.09
CO	1.3	1.0

Certificate Data

Engine Model Year	2011
EPA Family Name	BJDXL06.8105
EPA JD Name	350HAC
EPA Certificate Number	JDX-NRCI-11-14
CARB Executive Order	U-R-004-0429
Parent of Family	4045HF285A

Units	g/kW-hr
NOx	3.3
HC	0.1
NOx + HC	3.4
Pm	0.25
CO	1.5

* The emission data listed is measured from a laboratory test engine according to the test procedures of 40 CFR 89 or 40 CFR 1039, as applicable. The test engine is intended to represent nominal production hardware, and we do not guarantee that every production engine will have identical test results. The family parent data represents multiple ratings and this data may have been collected at a different engine speed and load. Emission results may vary due to engine manufacturing tolerances, engine operating conditions, fuels used, or other conditions beyond our control.

This information is property of Deere & Company. It is provided solely for the purpose of obtaining certification or permits of Deere powered equipment. Unauthorized distribution of this information is prohibited

CLARKE

Fire Protection Products, Inc.

JU4H-UFADW8

INSTALLATION & OPERATION DATA (I&O Data)

USA Produced

Basic Engine Description

Engine Manufacturer	John Deere Co.
Ignition Type	Compression (Diesel)
Number of Cylinders	4
Bore and Stroke - in (mm)	4.19 (106) X 5 (127)
Displacement - in³ (L)	275 (4.5)
Compression Ratio	19.0:1
Valves per cylinder	
Intake	1
Exhaust	1
Combustion System	Direct Injection
Engine Type	In-Line, 4 Stroke Cycle
Fuel Management Control	Electronic, High Pressure Common Rail
Firing Order (CW Rotation)	1-3-4-2
Aspiration	Turbocharged
Charge Air Cooling Type	None
Rotation, viewed from front of engine, Clockwise (CW)	Standard
Engine Crankcase Vent System	Open
Installation Drawing	D630
Weight - lb (kg)	1490 (676)

Power Rating	**1760**
Nameplate Power - HP (kW)	144 (107)

Cooling System - [C051386]	**1760**
Engine Coolant Heat - Btu/sec (kW)	62 (65.4)
Engine Radiated Heat - Btu/sec (kW)	33 (34.8)
Heat Exchanger Minimum Flow	
60°F (15°C) Raw H_20 - gal/min (L/min)	8.9 (33.7)
95°F (35°C) Raw H_20 - gal/min (L/min)	13.3 (50.3)
Heat Exchanger Maximum Cooling Raw Water	
Inlet Pressure - psi (bar)	60 (4.1)
Flow - gal/min (L/min)	40 (151)
Typical Engine H_20 Operating Temp - °F (°C)[1]	180 (82.2) - 195 (90.6)
Thermostat	
Start to Open - °F (°C)	180 (82.2)
Fully Opened - °F (°C)	203 (95)
Engine Coolant Capacity - qt (L)	15.3 (14.5)
Coolant Pressure Cap - lb/in² (kPa)	15 (103)
Maximum Engine Coolant Temperature - °F (°C)	230 (110)
Minimum Engine Coolant Temperature - °F (°C)	160 (71.1)
High Coolant Temp Alarm Switch - °F (°C)[2]	235 (113) - 241 (116)

Electric System - DC	**Standard**		**Optional**	
System Voltage (Nominal)	12		24	
Battery Capacity for Ambients Above 32°F (0°C)				
Voltage (Nominal)	12	[C07633]	24	[C07633]
Qty. Per Battery Bank	1		2	
SAE size per J537	8D		8D	
CCA @ 0°F (-18°C)	1400		1400	
Reserve Capacity - Minutes	430		430	
Battery Cable Circuit, Max Resistance - ohm	0.0012		0.0012	
Battery Cable Minimum Size				
0-120 in. Circuit Length[3]	00		00	
121-160 in. Circuit Length[3]	000		000	
161-200 in. Circuit Length[3]	0000		0000	
Charging Alternator Maximum Output - Amp,	40	[C071363]	55	[C071366]
Starter Cranking Amps, Rolling - @60°F (15°C)	345	[RE59595/RE59589]	250	[C07819/C07820]

NOTE: This engine is intended for indoor installation or in a weatherproof enclosure. [1]Engine H_2O temperature is dependent on raw water temperature and flow. [2]High Coolant Switch threshold varies with engine load. [3]Positive and Negative Cables Combined Length.

CLARKE

Fire Protection Products, Inc.

JU4H-UFADW8

INSTALLATION & OPERATION DATA (I&O Data)

USA Produced

Exhaust System	**1760**
Exhaust Flow - ft.³/min (m³/min)	740 (21)
Exhaust Temperature - °F (°C)	1040 (560)
Maximum Allowable Back Pressure - in H_20 (kPa)	30 (7.5)
Minimum Exhaust Pipe Dia. - in (mm)[4]	4 (102)

Fuel System	**1760**
Fuel Consumption - gal/hr (L/hr)	10 (37.8)
Fuel Pressure - lb/in² (kPa)	3 (20.7) - 6 (41.4)
Minimum Line Size - Supply - in.	.50 Schedule 40 Steel Pipe
Pipe Outer Diameter - in (mm)	0.848 (21.5)
Minimum Line Size - Return - in.	.375 Schedule 40 Steel Pipe
Pipe Outer Diameter - in (mm)	0.675 (17.1)
Maximum Allowable Fuel Pump Suction Lift with clean Filter - in H_20 (mH_20)	80 (2)
Maximum Allowable Fuel Head above Fuel pump, Supply or Return - ft (m)	6.6 (2)
Fuel Filter Micron Size	2 (Secondary)

Heater System	**Standard**	**Optional**
Engine Coolant Heater		
Wattage (Nominal)	1500	1500
Voltage - AC, 1 Phase	120 (+5%, -10%)	240 (+5%, -10%)
Part Number	[C124948]	[C124949]

Air System	**1760**	
Combustion Air Flow - ft.³/min (m³/min)	273 (7.7)	
Air Cleaner	**Standard**	**Optional**
Part Number	[C03396]	[C03327]
Type	Indoor Service Only, with Shield	Canister, Single-Stage
Cleaning method	Washable	Disposable
Air Intake Restriction Maximum Limit		
Dirty Air Cleaner - in H_20 (kPa)	12 (3)	10 (2.5)
Clean Air Cleaner - in H_20 (kPa)	6 (1.5)	5 (1.2)
Maximum Allowable Temperature (Air To Engine Inlet) - °F (°C)[5]	130 (54.4)	

Lubrication System	
Oil Pressure - normal - lb/in² (kPa)	40 (276) - 60 (414)
Low Oil Pressure Alarm Switch - lb/in² (kPa)[6]	30 (207) to 35 (241)
In Pan Oil Temperature - °F (°C)	220 (104) - 245 (118)
Total Oil Capacity with Filter - qt (L)	15.5 (14.7)

Lube Oil Heater	**Optional**	**Optional**
Wattage (Nominal)	150	150
Voltage	120V (+5%, -10%)	240V (+5%, -10%)
Part Number	C04430	C04431

Performance	**1760**
BMEP - lb/in² (kPa)	236 (1630)
Piston Speed - ft/min (m/min)	1467 (447)
Mechanical Noise - dB(A) @ 1m	C133364
Power Curve	C133154

[4]Based on Nominal System. Back pressure flow analysis must be done to assure maximum allowable back pressure is not exceeded. (Note: minimum exhaust Pipe diameter is based on: 15 feet of pipe, on 90° elbow, and a silencer pressure drop no greater than one half of the maximum allowable back pressure.) [5]Review for horsepower derate if ambient air entering engine exceeds 77°F (25°C). [6]Low Oil Pressure Switch threshold varies w/engine speed. [ ] indicates component reference part number.

California Environmental Protection Agency AIR RESOURCES BOARD	JOHN DEERE POWER SYSTEMS	EXECUTIVE ORDER U-R-004-0429 New Off-Road Compression-Ignition Engines

Pursuant to the authority vested in the Air Resources Board by Sections 43013, 43018, 43101, 43102, 43104 and 43105 of the Health and Safety Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-02-003;

IT IS ORDERED AND RESOLVED: That the following compression-ignition engines and emission control systems produced by the manufacturer are certified as described below for use in off-road equipment. Production engines shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	ENGINE FAMILY	DISPLACEMENT (liters)	FUEL TYPE	USEFUL LIFE (hours)
2011	BJDXL06.8105	4.5, 6.8	Diesel	8000

SPECIAL FEATURES & EMISSION CONTROL SYSTEMS	TYPICAL EQUIPMENT APPLICATION
Direct Diesel Injection, Turbocharger, Charge Air Cooler, Electronic Control Module, Smoke Puff Limiter	Loaders, Tractor, Pump, Compressor, Generator Set, Other Industrial Equipment

The engine models and codes are attached.

The following are the exhaust certification standards (STD), or family emission limit(s) (FEL) as applicable, and certification levels (CERT) for hydrocarbon (HC), oxides of nitrogen (NOx), or non-methane hydrocarbon plus oxides of nitrogen (NMHC+NOx), carbon monoxide (CO), and particulate matter (PM) in grams per kilowatt-hour (g/kw-hr), and the opacity-of-smoke certification standards and certification levels in percent (%) during acceleration (Accel), lugging (Lug), and the peak value from either mode (Peak) for this engine family (Title 13, California Code of Regulations, (13 CCR) Section 2423):

RATED POWER CLASS	EMISSION STANDARD CATEGORY		EXHAUST (g/kw-hr)					OPACITY (%)		
			HC	NOx	NMHC+NOx	CO	PM	ACCEL	LUG	PEAK
75 ≤ kW < 130	Tier 3	STD	N/A	N/A	4.0	5.0	0.30	20	15	50
		CERT	--	--	3.4	1.5	0.25	13	3	25

BE IT FURTHER RESOLVED: That for the listed engine models, the manufacturer has submitted the information and materials to demonstrate certification compliance with 13 CCR Section 2424 (emission control labels), and 13 CCR Sections 2425 and 2426 (emission control system warranty).

Engines certified under this Executive Order must conform to all applicable California emission regulations.

This Executive Order is only granted to the engine family and model-year listed above. Engines in this family that are produced for any other model-year are not covered by this Executive Order.

Executed at El Monte, California on this 6 day of December 2010.

Annette Hebert

Annette Hebert, Chief
Mobile Source Operations Division

Engine Model Summary Form

CARB EO#
U-R-004-0429

Manufacturer: John Deere Power Systems
Engine category: Nonroad CI
EPA Engine Family: BJDXL06.8105
Mfr Family Name: 350HAC
Process Code: New Submission

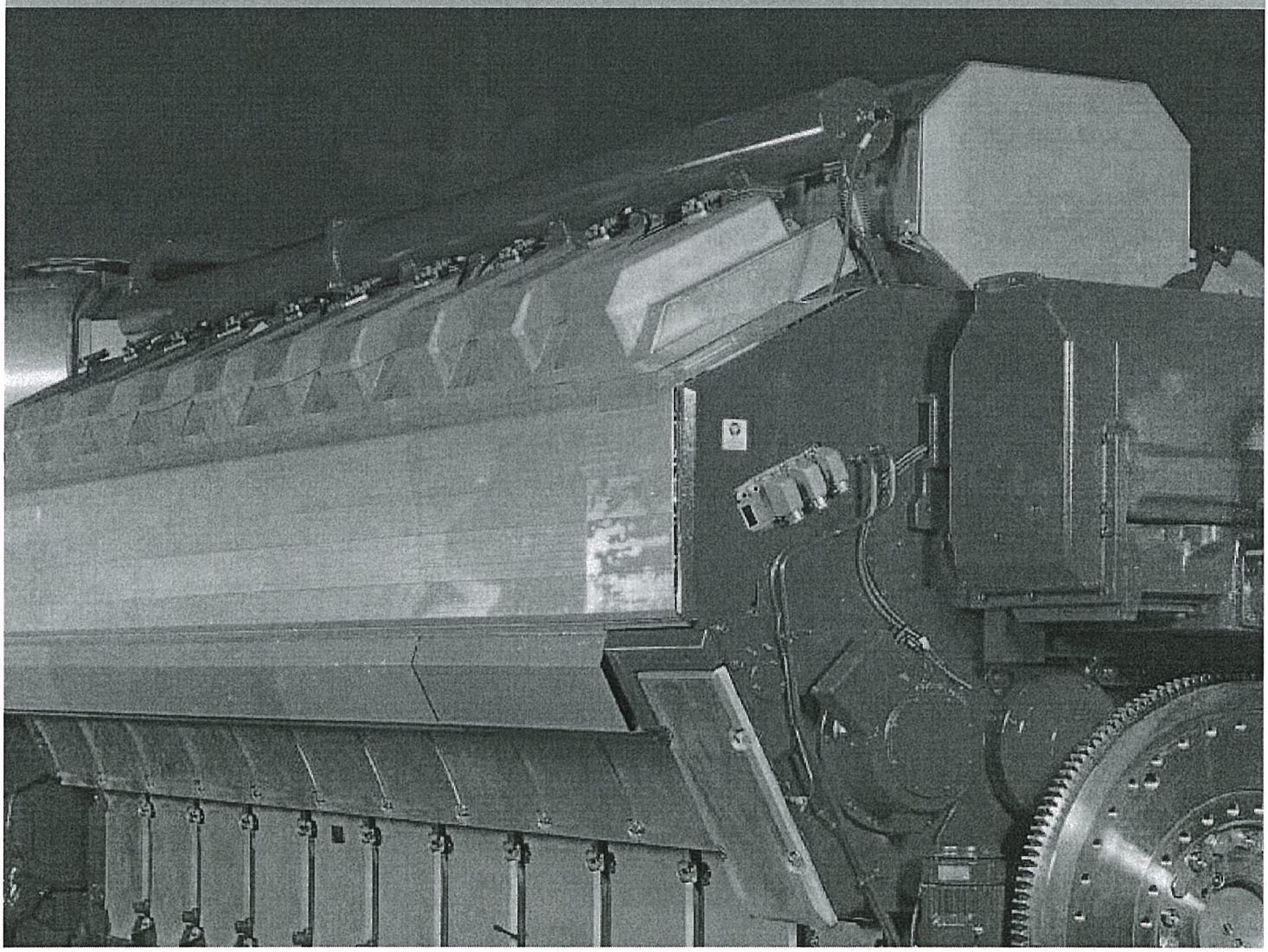
1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (lbs/hr) @ peak HP (for diesels only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Device Per SAE J1930
4045HF268	4045H	115.33@2400	84.80@2400	45.77@2400	317.11@1600	101.1@1600	36.45@1600	EM EC SPL
4045HF285A	4045H	146.18@2400	111.50@2400	60.17@2400	413.65@1600	131.8@1600	47.40@1600	EM EC SPL
4045HFS83	4045H	158.25@1800	144.10@1800	58.32@1800				EM EC SPL
4045HFS82	4045H	128.06@1800	115.80@1800	46.90@1800				EM EC SPL
6068HRT86	6068H	151.54@2200	82.00@2200	58.65@2200	487.58@1500	105.7@1500	51.59@1500	EM EC SPL
6068HRT85B	6068H	138.13@2200	74.80@2200	53.58@2200	426.26@1500	94.9@1500	46.30@1500	EM EC SPL
6068HRT85A	6068H	127.40@2200	70.50@2200	50.27@2200	393.07@1500	92.2@1500	44.98@1500	EM EC SPL
4045HRT83A	4045H	131.43@2200	107.30@2200	53.14@2200	383.49@1650	118.6@1650	43.88@1650	EM EC SPL
4045HRT83B	4045H	120.70@2200	100.00@2200	49.39@2200	376.11@1650	118@1650	43.66@1650	EM EC SPL
4045HRT83C	4045H	111.31@2200	92.60@2200	45.64@2200	345.88@1650	107.7@1650	39.91@1650	EM EC SPL
4045HRT83D	4045H	119.36@2200	97.50@2200	48.06@2200	373.90@1650	117.4@1650	43.44@1650	EM EC SPL
4045HRT83E	4045H	108.63@2200	89.90@2200	44.54@2200	351.04@1650	110.7@1650	41.01@1650	EM EC SPL
4045HE050	4045H	124.72@2400	91.80@2400	49.56@2400	354.72@1600	111.9@1600	40.33@1600	EM EC SPL
4045HT085	4045H	127.40@2200	89.50@2200	49.01@2200	304.58@1600	131.1@1600	45.15@1600	EM EC SPL
6068HN054	6068H	173.00@2400	89.40@2400	67.91@2400	506.64@1500	104.5@1500	52.25@1500	EM EC SPL
4045HL288B	4045H	130.08@2300	98.90@2300	49.61@2300	387.17@1600	124.0@1600	43.44@1600	EM EC SPL
4045HL288A	4045H	130.08@2300	98.90@2300	49.61@2300	387.17@1600	124.0@1600	43.44@1600	EM EC SPL
4045HRW51	4045H	130.08@2300	98.90@2300	49.61@2300	387.17@1600	124.0@1600	43.44@1600	EM EC SPL
6068HL282A	6068H	140.81@2300	71.90@2300	55.78@2300	429.21@1600	92.7@1600	49.83@1600	EM EC SPL
6068HL282B	6068H	140.81@2300	71.90@2300	55.78@2300	429.21@1600	92.7@1600	49.83@1600	EM EC SPL
6068HRW84	6068H	140.81@2300	71.90@2300	55.78@2300	429.21@1600	92.7@1600	49.83@1600	EM EC SPL
6068HL283A	6068H	173.00@2100	90.50@2100	63.94@2100	575.23@1500	119.7@1500	60.41@1500	EM EC SPL
6068HL283B	6068H	173.00@2100	90.50@2100	63.94@2100	575.23@1500	119.7@1500	60.41@1500	EM EC SPL
6068HRW81	6068H	173.00@2100	90.50@2100	63.94@2100	575.23@1500	119.7@1500	60.41@1500	EM EC SPL
4045HFC28B	4045H	139.47@2400	101.10@2400	54.59@2400				EM EC SPL
4045HFC28C	4045H	139.47@2350	100.60@2350	53.14@2350				EM EC SPL
4045HFC28D	4045H	135.45@2100	108.10@2100	51.06@2100				EM EC SPL
4045HFC28A	4045H	156.90@1760	142.10@1760	56.20@1760				EM EC SPL
4045HFC28E	4045H	139.47@2400	102.10@2400	55.14@2400	387.17@1600	120.2@1600	43.33@1600	EM EC SPL

Attachment F.1-3 Wartsila 34SG Technical Brochure

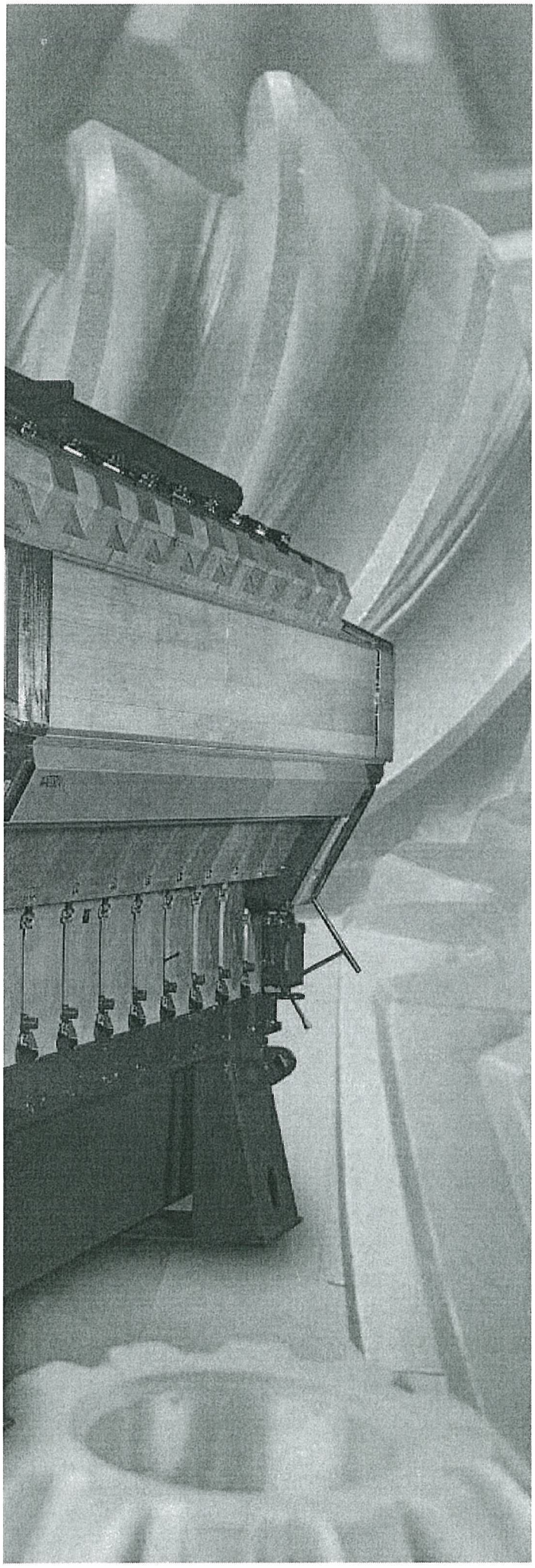
(15 Pages)

WÄRTSILÄ **34SG**

Engine technology 16 and 20V34SG



WÄRTSILÄ



WÄRTSILÄ 34SG

Engine technology

Introduction 4

Design philosophy 5

The lean-burn concept 6

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Gas admission system 7

Gas supply system 7

Prechamber 8

Ignition system 8

Air-fuel ratio 8

Cooling system 9

Lubricating oil system 9

Starting system 10

Piston 10

Piston ring set 10

Cylinder head 10

Connecting rod and big-end bearings 11

Engine block 11

Crankshaft and bearings 12

Cylinder liner and anti-polishing ring 12

Turbocharging system 12

Multiduct 13

Automation system 13

Easy maintenance 14

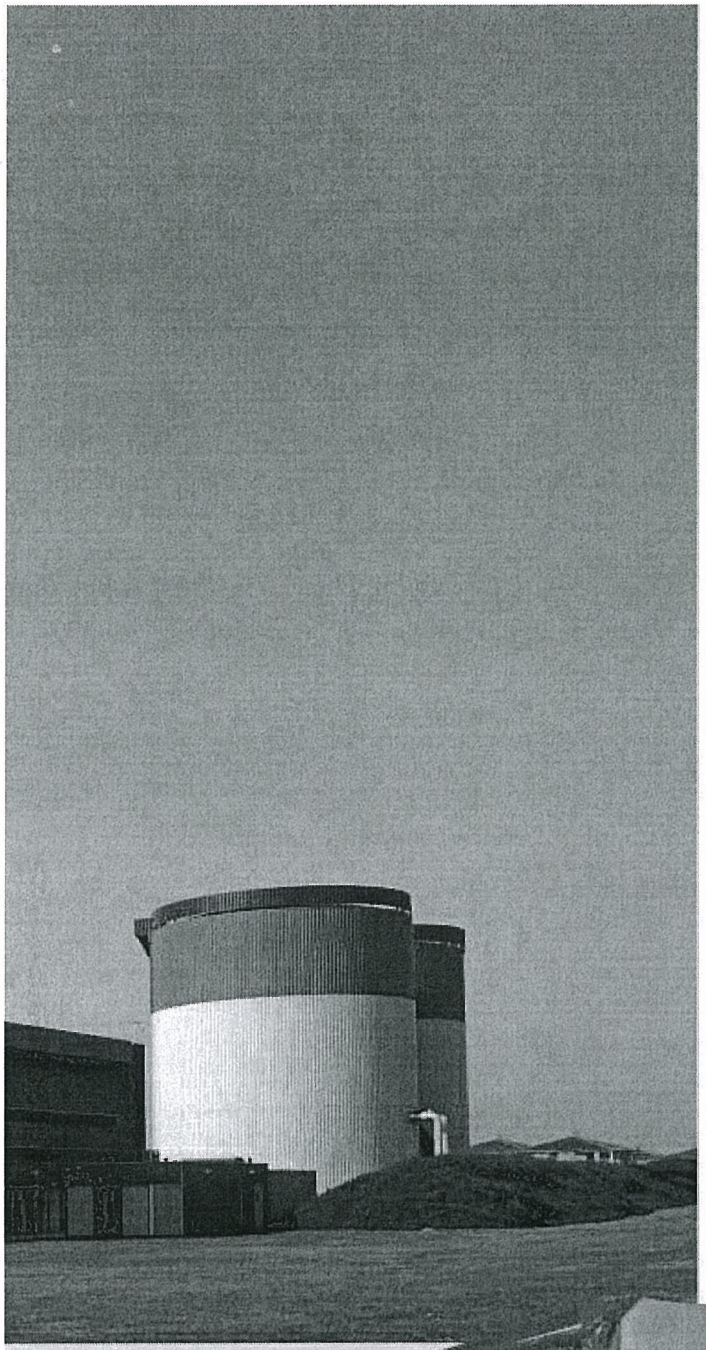
Main technical data 15

Ringköping, Denmark
Engine type: 1 x Wärtsilä 20V34SG
Total electrical output: 7.9 MW
Total heat output: 9.7 MW
Total efficiency: >95%.

In 1992, Wärtsilä started the development of lean-burn, spark-ignited Otto gas engines. The first 34SG engine was released in 1995 and now the product range of lean-burn gas engines has been expanded by introducing the new WÄRTSILÄ® 34SG. These engines take the power output of the 34SG series up to 9 MW.

The Wärtsilä 34SG is a four-stroke, spark-ignited gas engine that works according to the Otto process and the lean-burn principle. The engine has ported gas admission and a prechamber with a spark plug for ignition.

The engine runs at 720 or 750 rpm for 60 or 50 Hz applications and produces 6950 to 9000 kW of mechanical power, respectively. The efficiency of the Wärtsilä 34SG is the highest of any spark-ignited gas engines today. The natural gas fuelled, lean-burn, medium-speed engine is a reliable, high-efficiency and low-pollution power source for co-generation plants.



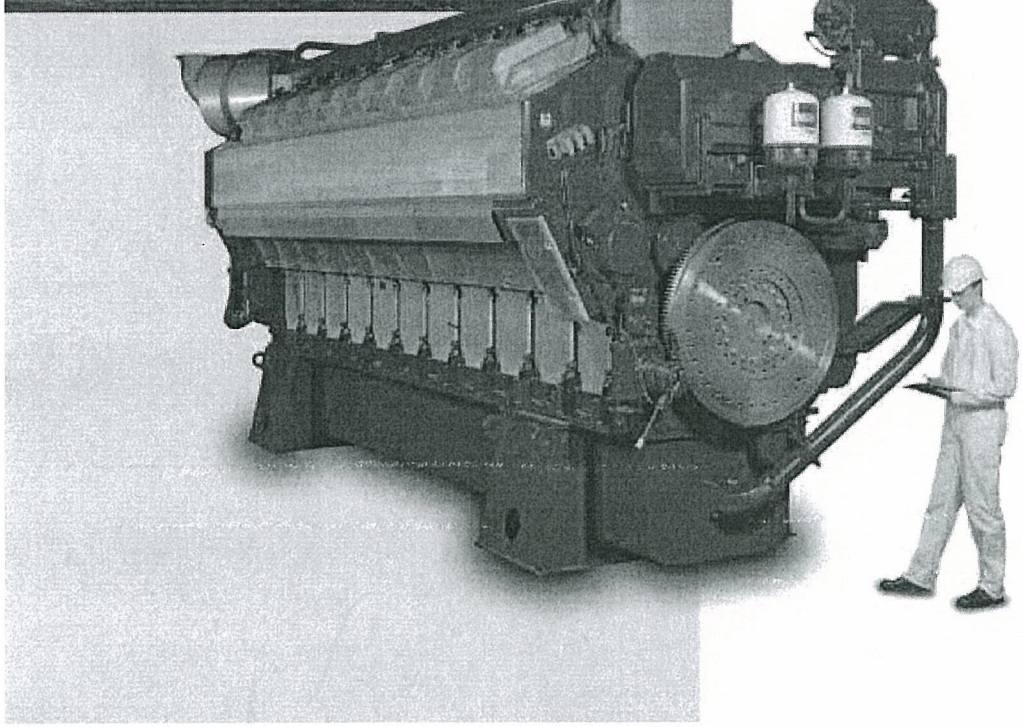
Design philosophy

The Wärtsilä 34SG was developed in response to the market need for bigger gas engines. Its design principles are based on the well-proven technology of the 18V version but with substantial improvements. The Wärtsilä 34SG lean-burn gas engine utilizes the frame of the new Wärtsilä 32 diesel/heavy fuel engine with its advanced integrated lube oil and cooling water channels. The bore has been increased to 340 mm to fully utilize the power potential of this engine block.

The Wärtsilä 34SG meets current and future requirements for overall cost of ownership. It is designed for flexible manufacturing methods and long maintenance-free operating periods. The engine is fully equipped with all essential ancillaries and a thoroughly planned interface to external systems.

The Wärtsilä 34SG combines high efficiency with low emissions. This is achieved applying state-of-the-art technology with features including:

- use of a lean gas mixture for clean combustion
- individual combustion control and monitoring, providing even load on all cylinders
- stable combustion, ensured by a high-energy ignition system and pre-combustion chamber
- self-learning and self-adjustable functions in the control system
- efficient heat recovery design
- minimal consumables.



The lean-burn concept

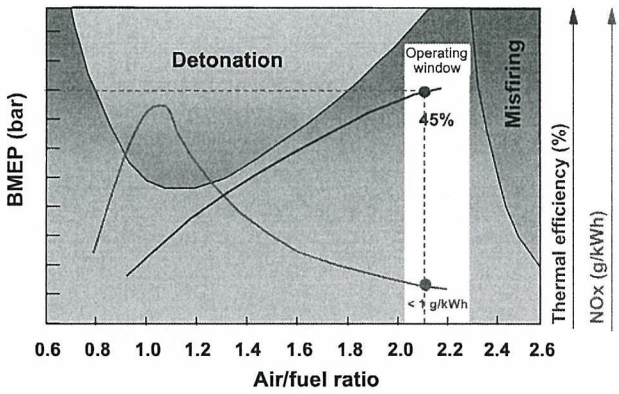
In a lean-burn gas engine, the mixture of air and gas in the cylinder is lean, i.e. more air is present in the cylinder than is needed for complete combustion. With leaner combustion, the peak temperature is reduced and less NO_X is produced. Higher output can be reached while avoiding knocking and the efficiency is increased as well, although a too lean mixture will cause misfiring.

Ignition of the lean air-fuel mixture is initiated with a spark plug located in the prechamber, giving a high-energy ignition source for the main fuel charge in the cylinder. To obtain the best efficiency and lowest emissions, every cylinder is individually controlled to ensure operation at the correct air-fuel ratio and with the correct timing of the ignition.

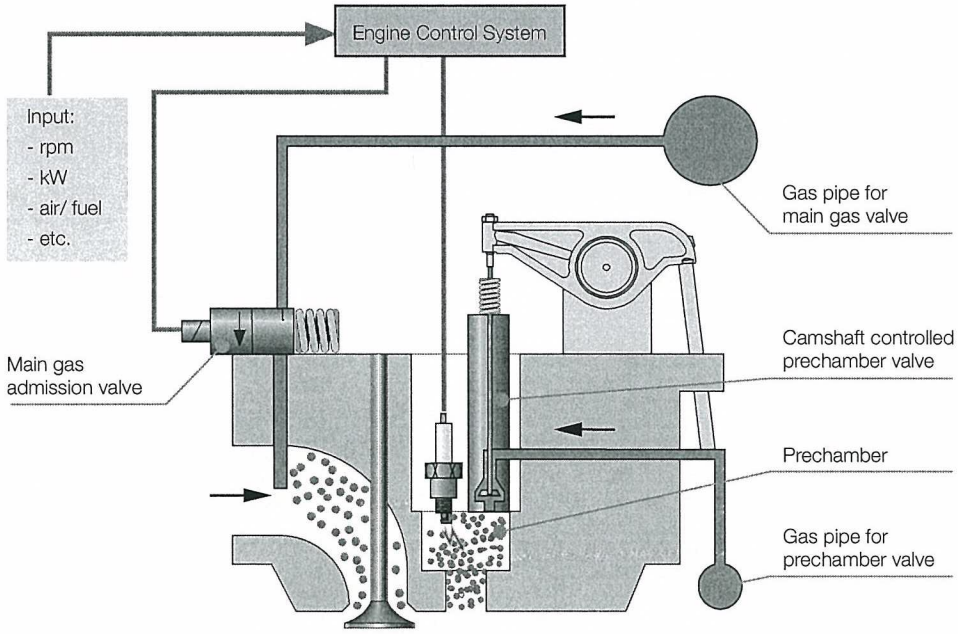
Stable and well-controlled combustion also contributes to less mechanical and thermal load on engine components. The specially developed Engine Control System is designed to control the combustion process in each cylinder, and to keep the engine within the operating window, by optimizing the efficiency and emissions level of each cylinder under all conditions.

Low emissions

The main parameters governing the rate of NO_X formation in internal combustion engines are peak temperature and residence time. The temperature is reduced by the combustion chamber air-fuel ratios: the higher the air-fuel ratio the lower the temperature and consequently the lower the NO_X emissions.



In the Wärtsilä 34SG engine, the air-fuel ratio is very high and is uniform throughout the cylinder, due to premixing of the fuel and air before introduction into the cylinders. Maximum temperatures and subsequent NO_X formation are therefore low, since the same specific heat quantity released by combustion is used to heat up a larger

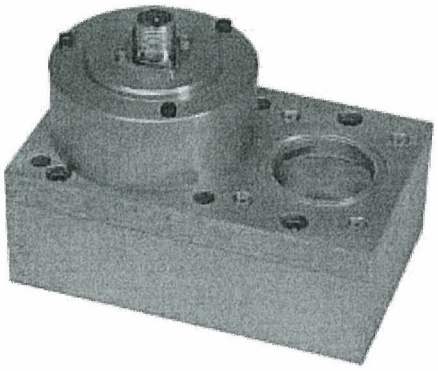


mass of air. Benefiting from this unique feature of the lean-burn principle, the NO_X emissions from the Wärtsilä 34SG are extremely low, and comply with the most stringent existing NO_X legislation.

Gas admission system

The Wärtsilä 34SG engine fully controls the combustion process in each cylinder. The "brain" for controlling the combustion process and the whole engine is the Engine Control System.

The gas admission valves located immediately upstream of the inlet valve are electronically actuated and controlled to feed the correct amount of gas to each cylinder. Since the gas valve is timed independently of the inlet valve, the cylinder can be scavenged without risk of the gas escaping directly from the inlet to the exhaust. Various parameters like engine load, speed and cylinder exhaust temperatures are monitored and work as inputs to the Engine Control System. With this arrangement, each cylinder always works within the operating window for the best efficiency at the lowest emission levels.



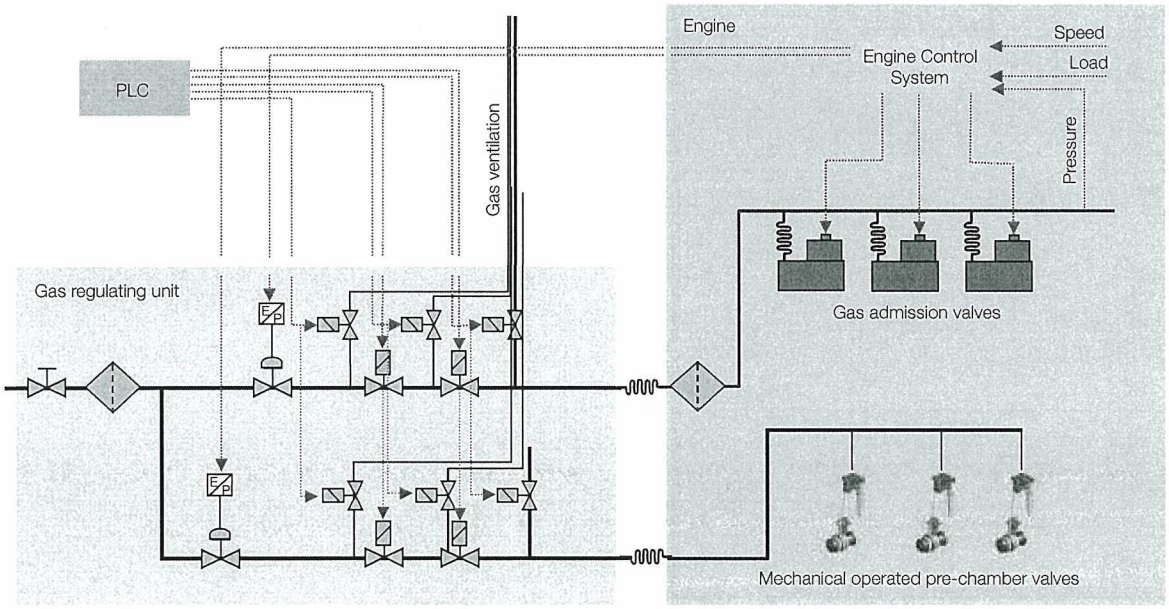
The ported gas admission concept gives:

- high efficiency
- good load response
- lower thermal loading of engine components
- no risk of backfire to the air inlet manifold.

Gas supply system

Before the natural gas is supplied to the engine it passes through a gas-regulating unit, including filter, pressure regulators, shut off valves and ventilating valves. The external pressure regulator regulates the gas pressure to the correct value under different loads; however, the maximum pressure needed is not more than 4.5 bar(a) under full load.

In the engine, the gas is supplied through common pipes running along the engine, continuing with individual feed pipes to each main gas admission valve located on each cylinder head. There are two common pipes per bank, one for the main and one for the prechamber gas supply. A filter is placed before every gas admission valve to prevent particles from entering the valve.

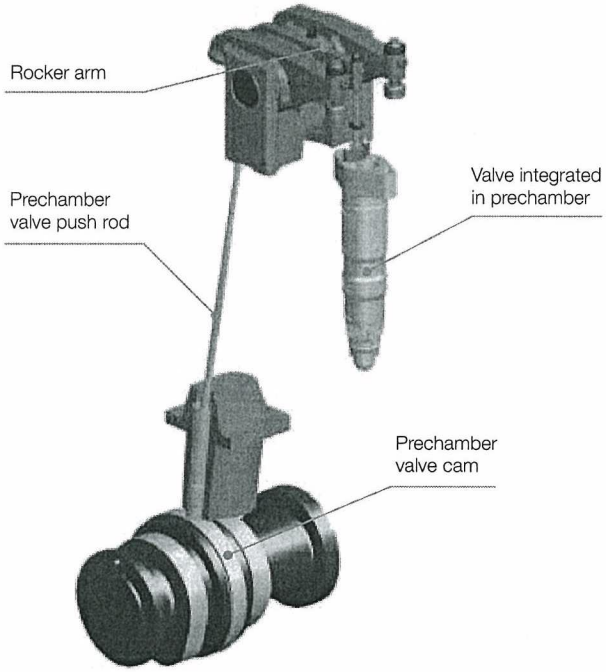


Prechamber

The prechamber is the ignition source for the main fuel charge and is one of the essential components of a lean-burn spark-ignited gas engine.

The prechamber should be as small as possible to give low NO_X values, but big enough to give rapid and reliable combustion. Some of the design parameters considered are:

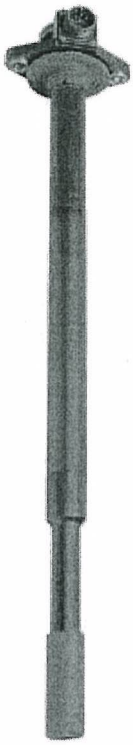
- shape and size
- mixing of air and fuel
- gas velocities and turbulence at the spark plug
- cooling of the prechamber and the spark plug
- choice of material.



The prechamber of the Wärtsilä 34SG is already optimized at the design stage using advanced three-dimensional, computerized fluid dynamics. In practice, the results can be seen as:

- reliable and powerful ignition
- high combustion efficiency and stability
- extended spark plug life
- very low NO_X levels.

Gas is admitted to the prechamber through a mechanical, camshaft-driven valve. This solution has proved to be extremely reliable and gives an excellent mixture into the prechamber.



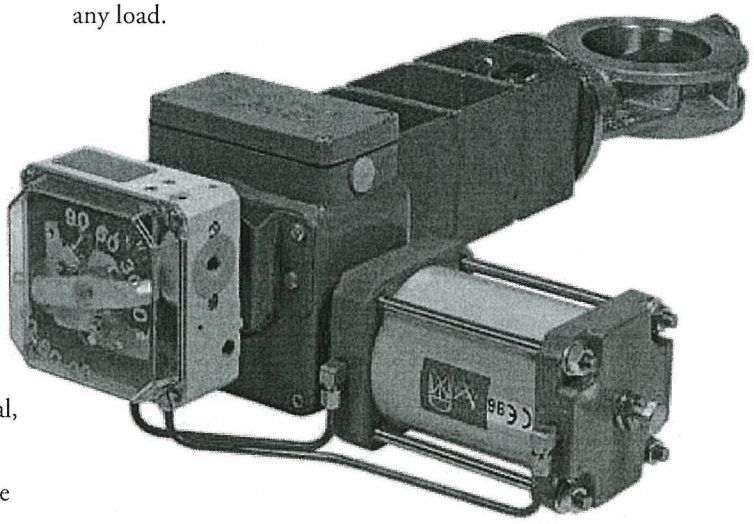
Ignition system

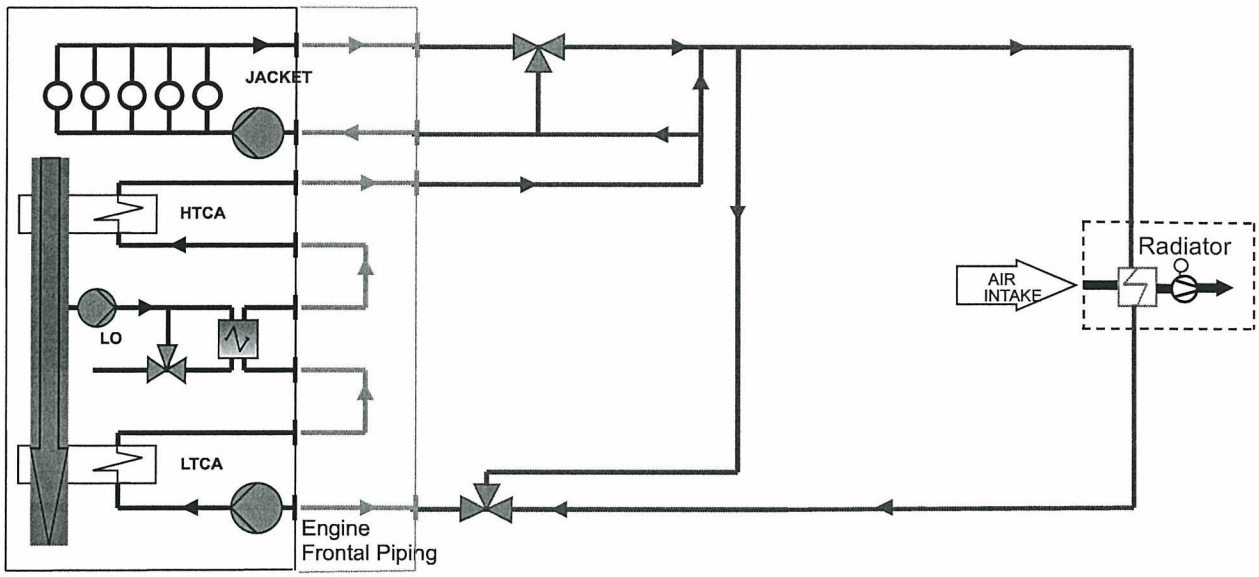
The Wärtsilä 34SG ignition system is tailor-made for the engine type and integrated in the Engine Control System. The ignition module communicates with the main control module, which determines the global ignition timing. The ignition module controls the cylinder-specific ignition timing based on the combustion quality. The cylinder-specific control ensures the optimum combustion in every cylinder with respect to reliability and efficiency.

The ignition coil is located in the cylinder cover and is integrated in the spark plug extension. The coil-on-plug design ensures a reliable solution with a minimum of joints between the spark plug and the ignition coil. The spark plug has been especially developed for long lifetime and to withstand the high cylinder pressure and temperature related to the high engine output.

Air-fuel ratio

To always ensure correct performance of the engine, it is essential to have the correct air-fuel ratio under all types of conditions. The Wärtsilä 34SG uses an exhaust gas wastegate valve to adjust the air-fuel ratio. Part of the exhaust gases bypasses the turbocharger through the waste-gate valve. This valve adjusts the air-fuel ratio to the correct value regardless of varying site conditions under any load.





Cooling system

The Wärtsilä 34SG engine is designed with a Wärtsilä open-interface cooling system for optimal cooling and heat recovery. The system has four cooling circuits: the cylinder cooling circuit (Jacket), the charge air low-temperature (LTCA) and high-temperature (HTCA) cooling circuits, and the circuit for the lube oil cooler (LO) built on the engine.

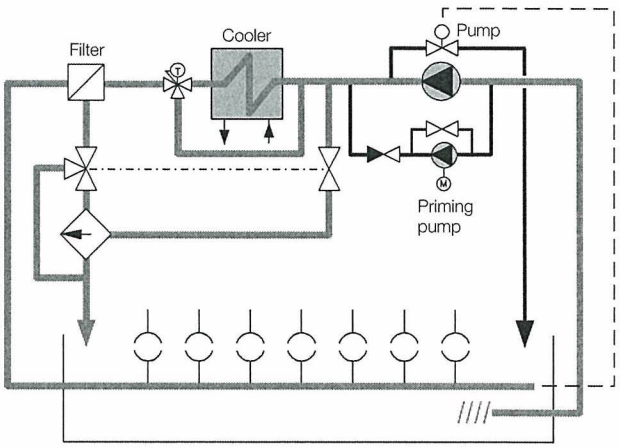
The LTCA cooling circuit and Jacket cooling circuit have water pumps integrated in the cover module at the free end of the engine. The LO circuit has its own thermostatic valve built on the engine. The water temperature into the LTCA cooler and the water temperature out from the Jacket cooling circuit are controlled by external thermostatic valves.

The default cooling system is a single-circuit radiator cooling system where the cooling circuits on the engine are connected in series. For heat recovery applications each cooler can be individually connected to an external cooling system. The open interface allows full freedom in cooling and heat recovery system design.

Lubricating oil system

The Wärtsilä 34SG is equipped with a wet oil sump, an engine-driven main pump, electrically driven pre-lubricating pump, cooler, full flow filter and centrifugal filter. The pumps, pressure regulation valves and safety valves are integrated into one module fitted at the free end of the engine. Filter, cooler and thermostatic valves make up another module.

The lube oil filtration is based on an automatic back-flushing filter requiring a minimum of maintenance. The filter elements are made of a seamless sleeve fabric with high temperature resistance. A centrifugal filter is mounted in the back-flushing line, acting as an indicator for excessive dirt in the lube oil. The engine uses a pre-lubricating system before starting to avoid wear of engine parts. For running in, provision has been made for mounting special running-in filters in front of each main bearing.



Starting system

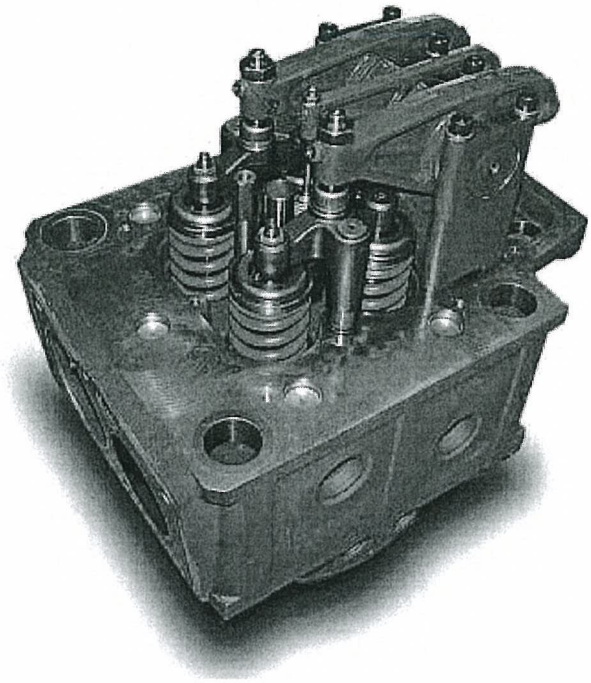
The Wärtsilä 34SG engine is provided with pneumatic starting valves in the cylinder heads of one bank. The valves are operated by air from a distributor at the end of the camshaft. A starting limiter valve prevents the engine from starting if the turning gear is engaged.

Piston

Pistons are of the low-friction, composite type with forged steel top and aluminium skirt. The design itself is tailored for an engine of this size and includes a number of innovative approaches. Long lifetime is obtained through the use of Wärtsilä's patented skirt-lubrication system, a piston crown cooled by "cocktail-shaker" cooling, induction hardened piston ring grooves and the low-friction piston ring.

Piston ring set

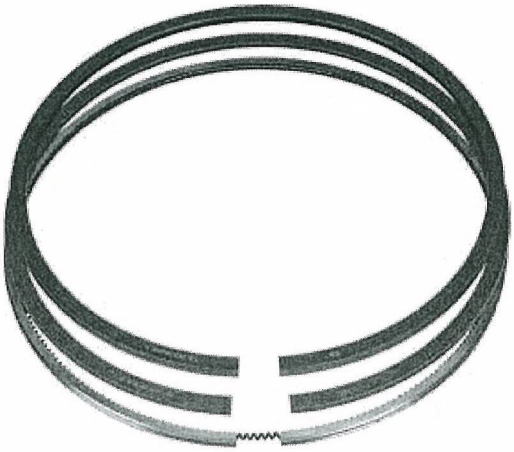
The two compression rings and the oil control ring are located in the piston crown. This three-ring concept has proved its efficiency in all Wärtsilä engines. In a three-pack, every ring is dimensioned and profiled for the task it must perform. Most of the frictional loss in a reciprocating combustion engine originates from the piston rings. A three-ring pack is thus optimal with respect to both function and efficiency.



Cylinder head

Wärtsilä successfully employs four-screw cylinder head technology. At high cylinder pressure it has proved its superiority, especially when liner roundness and dynamic behaviour are considered. In addition to easier maintenance and reliability, it provides freedom to employ the most efficient air inlet and exhaust outlet channel port configuration.

A distributed water flow pattern is used for proper cooling of the exhaust valves, cylinder head flame plate and the prechamber. This minimizes thermal stress levels and guarantees a sufficiently low exhaust valve temperature. Both inlet and exhaust valves are fitted with rotators for even thermal and mechanical loading.



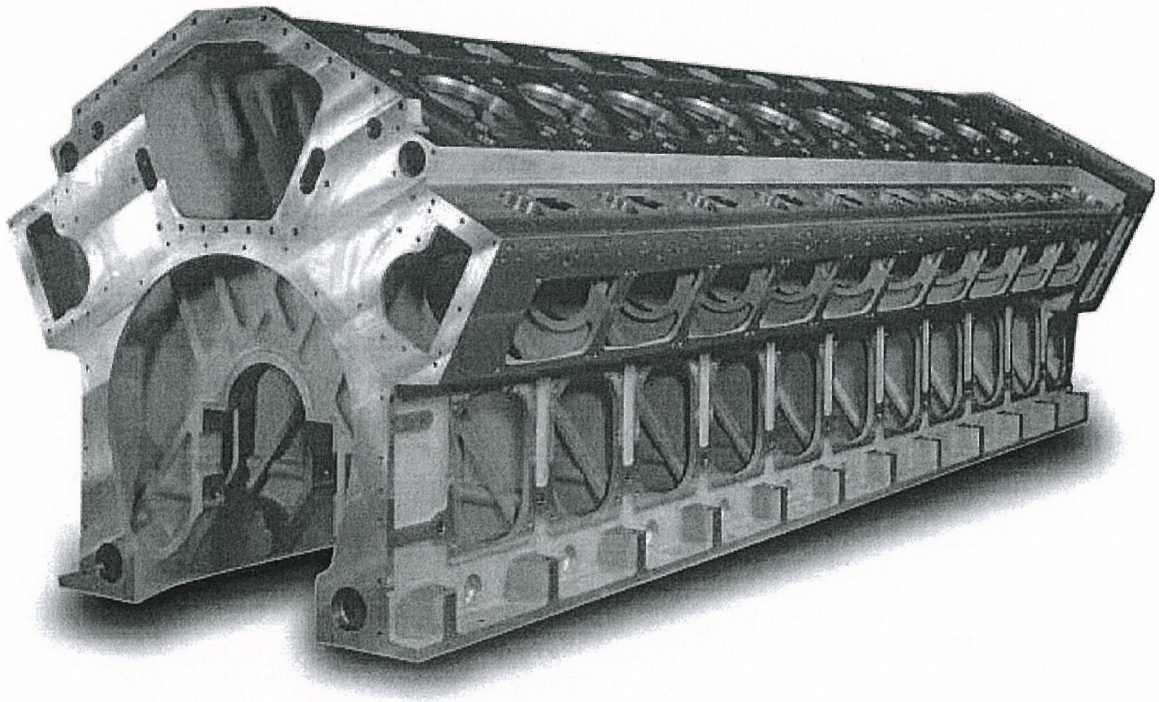
Connecting rod and big-end bearings

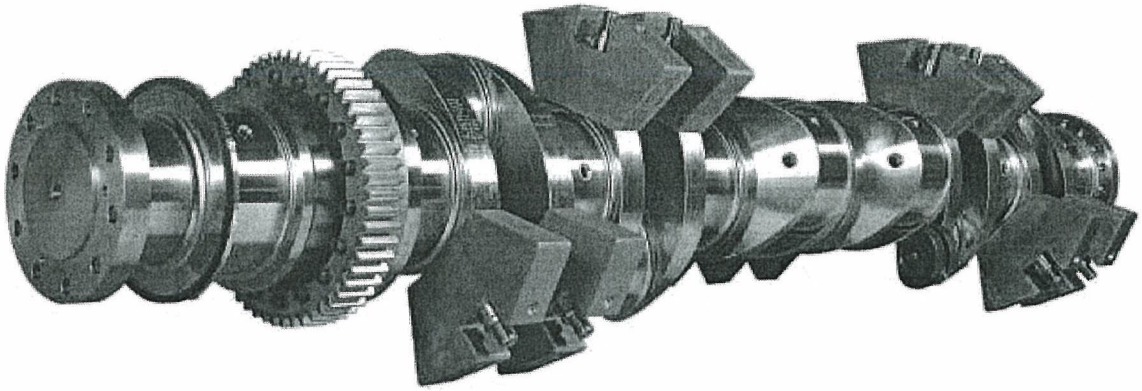
The connecting rod is designed for optimum bearing performance. It is a three-piece design, in which combustion forces are distributed over a maximum bearing area and relative movements between mating surfaces are minimized. Piston overhaul is possible without touching the big-end bearing and the big-end bearing can be inspected without removing the piston.

The three-piece design also reduces the height required for piston overhauling. The big-end bearing housing is hydraulically tightened, resulting in a distortion-free bore for the corrosion-resistant precision bearing. The three-piece connecting rod design allows variation of the compression ratio to suit gases with different knocking resistance.

Engine block

Nodular cast iron is the natural choice for engine blocks today due to its strength and stiffness properties. The Wärtsilä 34SG makes optimum use of modern foundry technology to integrate most oil and water channels. The result is a virtually pipe-free engine with a clean outer exterior. The engine has an underslung crankshaft, which imparts very high stiffness to the engine block, providing excellent conditions for main bearing performance. The engine block has large crankcase doors allowing easy maintenance.





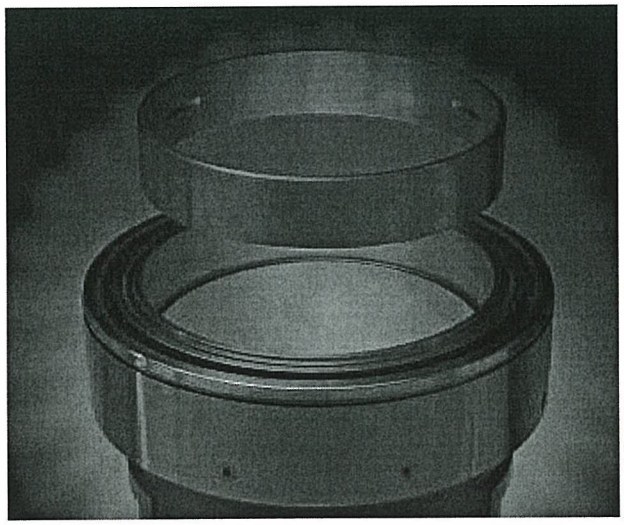
Crankshaft and bearings

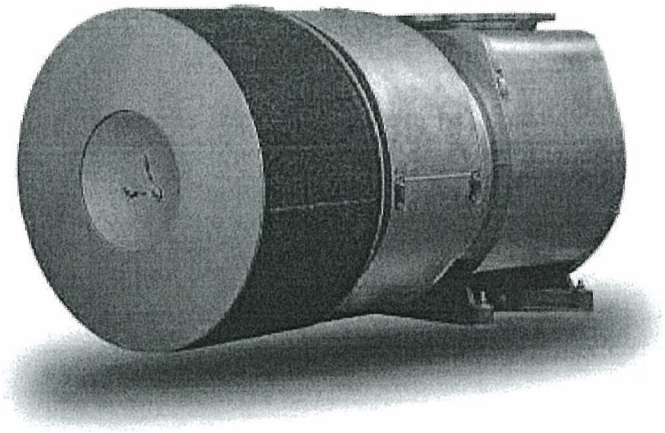
The latest advance in combustion development requires a crank gear that can operate reliably at high cylinder pressures. The crankshaft must be robust and the specific bearing loads maintained at acceptable levels. Careful optimization of crankthrow dimensions and fillets achieve this.

The specific bearing loads are conservative, and the cylinder spacing, which is important for the overall length of the engine, is minimized. In addition to low bearing loads, the other crucial factor for safe bearing operation is oil film thickness. Ample oil film thickness in the main bearings is ensured by optimal balancing of rotational masses and, in the big-end bearing, by ungrooved bearing surfaces in the critical areas.

Cylinder liner and anti-polishing ring

The cylinder liner and piston designs are based on Wärtsilä's extensive expertise in tribology and wear resistance acquired over many years of pioneering work in heavy-duty diesel engine design. An integral feature is the anti-polishing ring, which reduces lube oil consumption and wear. The bore-cooled collar design of the liner ensures minimum deformation and efficient cooling. Each cylinder liner is equipped with two temperature sensors for continuous monitoring of piston and cylinder liner behaviour.





Turbocharging system

Every Wärtsilä 34SG is equipped with the Spex turbocharging system. The system is designed for minimum flow losses on both the exhaust and air sides. The interface between the engine and turbocharger is streamlined to avoid all the adaptation pieces and piping frequently used in the past. The Wärtsilä 34SG engine uses high-efficiency turbochargers with inboard plain bearings, and the engine lube oil is used for the turbocharger.

Multiduct

The multiduct replaces a number of individual components in traditional engine designs. These include:

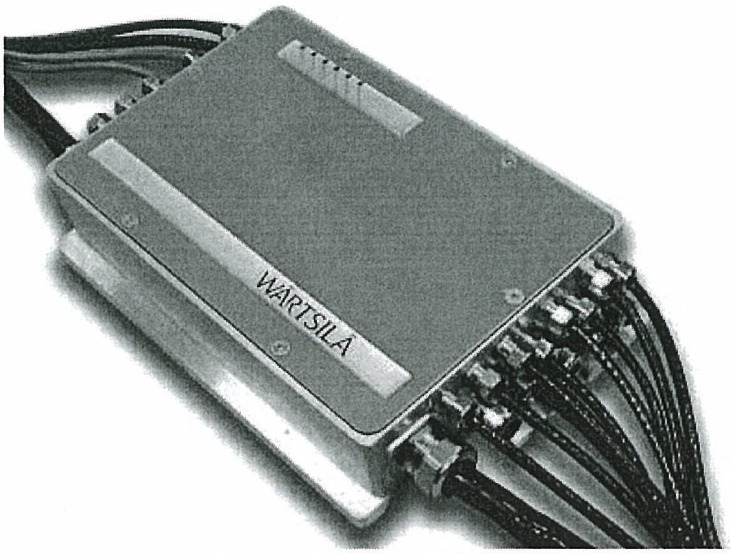
- air transfer from the air receiver to the cylinder head
- exhaust transfer to the exhaust system
- cooling water outlet after the cylinder head
- cooling water return channel from the engine
- gas fuel mixing into the combustion air.

  Additional functions are:
- introduction of an initial swirl to the inlet air for optimal part-load combustion
- insulation / cooling of the exhaust transfer duct
- support for the exhaust system and its insulation.

Automation system

The Engine Control System is an engine-mounted distributed system. The various electronic modules are dedicated to different functions and communicate with each other via a CAN databus. All parameters handled by the Engine Control System are transferred to the operator interface and the plant control system. Its features are:

- easy maintenance and high reliability due to rugged engine-dedicated connectors, CIB's (cabling interface boxes) and high quality cables
- less cabling on and around the engine
- easy interfacing with external system via a databus
- digitized signals giving immunity from electromagnetic disturbance
- built-in diagnosis for easy troubleshooting.

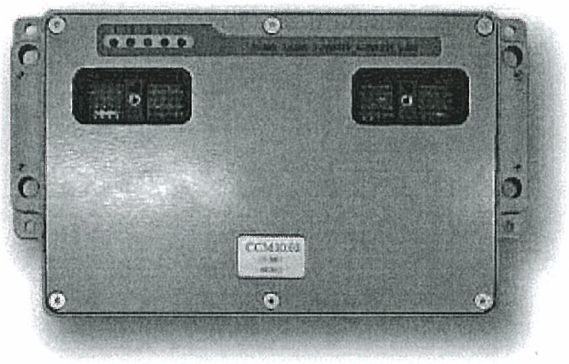


Main control module

The main control module, the core of the Engine Control System, reads the information sent by all the other modules. Using this information it determines reference values for the main gas admission to control the engine's speed and load.

The main control module also uses the information sent from the different distributed modules to control the global air-fuel ratio and global ignition timing in order to obtain the best performance and reliable operation in different site conditions, such as varying ambient temperature and methane number.

The main control module automatically controls the start and stop sequences of the engine and the engine safety. It also communicates with the plant control system (PLC).

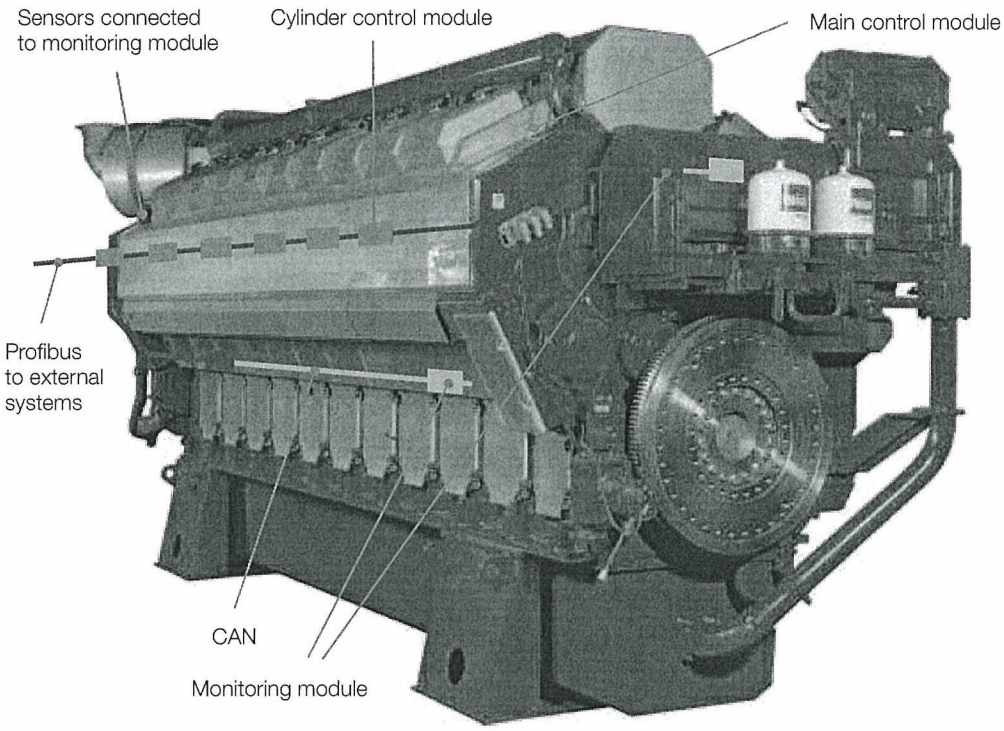


The cylinder control module also monitors the exhaust gas and cylinder liner temperatures of all cylinders.

Cylinder control module

Each cylinder control module monitors and controls three cylinders. The cylinder control module controls the cylinder-specific air-fuel ratio by adjusting the gas admission individually for all cylinders. This ensures optimal combustion in all cylinders.

The cylinder control module also measures the knock intensity i.e. uncontrolled combustion in all cylinders. Information on knock intensity is used to adjust the cylinder-specific ignition timing by the cylinder control module. Light knocking leads to automatic adjustment of the ignition timing and air-fuel ratio. Heavy knocking leads to load reduction and ultimately to shut-down of the engine if heavy knocking does not disappear.



Monitoring modules

Several monitoring modules are located close to groups of sensors, which reduces cabling harness on the engine. The monitored signals are transmitted to the main control module and used for the engine control or safety system. The monitored values are also transferred to the operator interface and the plant control system. The cylinder control module also monitors the exhaust gas and cylinder liner temperatures of all cylinders.

Easy maintenance

The service life of Wärtsilä 34SG engine components and the time between overhauls are very long due to the purity of the gas. The design incorporates efficient and easy maintenance. In combination with the long intervals between overhauls, the hours spent on maintenance are reduced to a minimum. There is greater accessibility to all the components because the number of pipes is minimized and the components are ergonomically designed.

For ease of maintenance, the engine block has large openings to the crankcase and camshaft. All bolts requiring high tension are hydraulically tightened. Hydraulics is extensively used for many other operations as well. Since the main bearing caps are relatively heavy, each bearing cap is equipped with a permanently fitted hydraulic jack for easy manoeuvring of the cap. During delivery test runs, a running-in filter is installed to prevent the bearings from being scratched by any particles left in the oil system.

- The multiduct arrangement allows the cylinder head to be lifted without having to remove gas pipes or water pipes. The slide-in connections allow lifting of the cylinder head without the need to remove oil or air pipes.

- The water pumps are easy to replace thanks to the cassette design principle and water channel arrangement in the pump cover at the free end of the engine.
- A rigid and tight but easily removable insulating box surrounds the exhaust system.
- Easy access to the piping system is obtained by removing the insulating panels.
- The camshaft is built of identical cylinder segments bolted to intermediate bearing pieces.
- A wide range of special tools and measuring equipment specifically designed to facilitate service work are also available.
- Access to and maintenance of the spark plug and prechamber gas valve in the prechamber is easy. The prechamber does not need to be removed. For spark plug replacement, the valve cover does not need to be removed.
- Use of electrically controlled gas admission valves means few mechanical parts and less need for periodic adjustments.
- The three-piece connecting rod allows inspection of the big-end bearing without removal of the piston, and piston overhaul without dismantling the big-end bearing.

WÄRTSILÄ 34SG

Main technical data

Cylinder bore	340 mm
Piston stroke	400 mm
Speed	720 / 750 rpm
Mean effective pressure	20.0 / 19.8 bar
Piston speed	9.6 / 10 m/s
Natural gas specification for nominal load	
Lower heating value	≥ 28 MJ/m^3_N

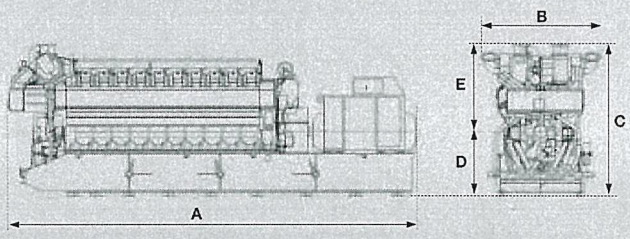
Technical data Compression ratio 12		Unit	16V34SG		20V34SG	
Speed/Hz	NO_x	mg/Nm^3 at 5 % O_2	500	250	500	250
	Methane number		>80	>70	>80	>70
720 rpm 60 Hz	Electrical power	kW	6751	6751	8439	8439
	Electrical efficiency	%	46.5	45.1	46.5	45.1
750 rpm 50 Hz	Electrical power	kW	6984	6984	8730	8730
	Electrical efficiency	%	46.5	45.1	46.5	45.1

Technical data Compression ratio 11		Unit	16V34SG		20V34SG	
Speed/Hz	NO_x	mg/Nm^3 at 5 % O_2	500	250	500	250
	Methane number		>65	>55	>65	>55
720 rpm 60 Hz	Electrical power	kW	6751	6751	8439	8439
	Electrical efficiency	%	45.5	44.1	45.5	44.1
750 rpm 50 Hz	Electrical power	kW	6984	6984	8730	8730
	Electrical efficiency	%	45.5	44.1	45.5	44.1

Electrical power at generator terminals, including engine-driven pumps, ISO 3046 conditions and LHV. Tolerance + 5%. Power factor 0.8.

Principal genset dimensions (mm) and weights (tonnes)

Engine type	A	B	C	D	E	Engine weight	Genset weight
16V34SG	11692	3233	4348	1998	2648	66.5	115
20V34SG	12466	3233	4348	1998	2648	76.4	137.5



For more specific information, please contact Wärtsilä.

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APPENDIX F.2

DISPERSION MODELING AND AIR QUALITY IMPACT ANALYSIS SUPPORT DATA

APPENDIX F.2

Modeling Support Data

Tables presented in this Appendix are as follows:

F.2-1	Building and Structure Dimensions
F.2-2	Screening Modeling Impact Summary Table
F.2-3	Ambient Air Quality Standards

In addition, this appendix contains the following figures:

F.2-1	Facility Plot Plan
F.2-2	Site Layout
F.2-3	Facility Elevation View
F.2-4a-4e	Wind Rose Figures (5)
F.2-5	Fine Receptor Grid
F.2-6	Coarse Receptor Grid
F.2-7	BPIP Site Arrangement
F.2-8	San Diego Air Monitoring Station Map
F.2-9	Maximum 24 Hour PM10 Impact Plot
F.2-10	3-Year Avg of Maximum 24 Hour PM2.5 Impacts Plot
F.2-11	Maximum Annual PM2.5 Impacts Plot
F.2-12	AERMOD 24 Hour PM10 Impacts (CTSCREEN) Plot
F.2-13	Agua Tibia Class I Area Receptor Plot
F.2-14	San Jacinto Wilderness Class I Area Receptor Plot

Attachment F.2-1 Additional Climate Data for the San Diego Regional Area

Modeling input/output files are included in the enclosed CD's.

Table F.2.1 Building, Structure and Stack Dimensions

Structure ID	Height, ft (agl)	Length, ft.	Width, ft,	Diameter, ft.
Engine Hall	24 @ eave 29.58 @ crest	361	68.5	-
Urea Tank	22	-	-	13
Used Oil Tank	20	-	-	10
New Oil Tank	20	-	-	10
Potable Water Tank	20	-	-	10
Fire Water Tank	30	-	-	60
Maintenance Oil Tank	16	-	-	8
Radiator Set 1	18	85	43.75	-
Radiator Set 2	18	100	43.75	
SCR/CO Catalyst Housing	25	20	10	-
Warm Start Heater	21	22.5	5	-
Fuel Gas Heater	21	22.5	5	-
Stack Data				
Stack ID	**Height, ft (agl)**	**Diameter, ft.**	**~Temperature**	**~ACFM**
Wartsila Engines (11)	100	4	730-831	62400
Fuel Heater	30	2	1015	2243
Warm Start Heater	30	2	1015	2243
Fire Pump ICE	30	0.33	1040	740

Data derived from Figures F.2-2 and F.2-3.

Building coordinates are specified in the BPIP files, included on the CDs accompanying the AFC.

Table F.2-2 Quail Brush AERMOD Engine Screening Results (w/ All 11 Engines)

Regular 20/50/100/200-meter Receptor Grids and 10m Fenceline Receptors

100' Stack Heights

Case	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Load	**50**	**75**	**100**	**50**	**75**	**100**	**50**	**75**	**100**	**50**	**75**	**100**	**50**	**75**	**100**	**100**
Output kW	4646	6998	9341	4646	6998	9341	4646	6998	**9341**	**4646**	6998	9341	**4646**	6998	9184	9341
Ambient Temp, °F	35	35	35	64	64	64	70	70	**70**	**81**	81	81	**95**	95	95	95
Stack Exit Temp (deg.F)	831	822	741	825	816	735	824	815	734	822	813	732	819	810	731	730
Volumetric Flowrate ACFM	36,660	49,200	61,920	36,580	49,159	61,865	36,540	49,140	61,800	36,540	49,140	61,980	36,600	49,380	61,380	62,400
Stack Inside Diameter (ft)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Stack Height (m)	30.480	30.480	30.480	30.480	30.480	30.480	30.480	30.480	**30.480**	**30.480**	30.480	30.480	30.480	30.480	30.480	30.480
Stack Exit Temp (deg.K)	717.039	712.039	667.039	713.706	708.706	663.706	713.150	708.150	**663.150**	**712.039**	707.039	662.039	710.372	705.372	661.483	660.928
Stack Exit Velocity (m/s)	14.820	19.889	25.031	14.788	19.873	25.009	14.771	19.865	**24.983**	**14.771**	19.865	25.056	14.796	19.962	24.813	25.225
Stack Inside Diameter (m)	1.2192	1.2192	1.2192	1.2192	1.2192	1.2192	1.2192	1.2192	**1.2192**	**1.2192**	1.2192	1.2192	1.2192	1.2192	1.2192	1.2192
Normal Operations - Short-term Emissions (lb/hr)																
NOx (lb/hr/engine)	0.922	1.111	1.318	0.922	1.111	1.318	0.922	1.111	**1.318**	0.922	1.111	1.318	0.922	1.111	1.296	1.318
CO (lb/hr/engine)	1.495	1.481	1.565	1.495	1.481	1.565	1.495	1.481	1.565	**1.495**	1.481	1.565	1.495	1.481	1.539	1.565
SO2 (lb/hr/engine)	0.128	0.192	0.256	0.128	0.192	0.256	0.128	0.192	**0.256**	0.128	0.192	0.256	0.128	0.192	0.256	0.256
PM10 (lb/hr/engine)	1.362	1.373	1.380	1.362	1.373	1.380	1.362	1.373	1.380	**1.362**	1.373	1.380	1.362	1.373	1.357	1.380
Normal Operations - Unitized Impacts (ug/m3 for 1.0 g/s/engine)																
1-Hr Unitized Conc (ug/m3)	803.05544	658.01125	574.71553	805.22422	659.76946	576.47825	806.40949	660.20810	577.13585	807.17988	660.68285	576.52153	807.10865	659.24644	580.38991	574.45567
X(m)	497840.0	497840.0	497820.0	497840.0	497840.0	497820.0	497860.0	497840.0	497820.0	497860.0	497840.0	497820.0	497860.0	497840.0	497820.0	497820.0
Y(m)	3635140.0	3635160.0	3635180.0	3635140.0	3635160.0	3635180.0	3635120.0	3635160.0	3635180.0	3635120.0	3635160.0	3635180.0	3635120.0	3635160.0	3635180.0	3635180.0
Z(m)	231.1	237.3	241.5	231.1	237.3	241.5	227.9	237.3	241.5	227.9	237.3	241.5	227.9	237.3	241.5	241.5
YYMMDDHH	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603
3-Hr Unitized Conc (ug/m3)	402.97036	336.07488	289.52895	403.70791	337.08491	290.69227	404.41680	337.33578	291.12409	404.85035	337.60754	290.72327	404.81360	336.79098	293.24801	289.36720
X(m)	497780.0	497760.0	497740.0	497780.0	497760.0	497740.0	497780.0	497760.0	497740.0	497780.0	497760.0	497740.0	497780.0	497760.0	497740.0	497740.0
Y(m)	3635180.0	3635200.0	3635220.0	3635160.0	3635200.0	3635220.0	3635160.0	3635200.0	3635220.0	3635160.0	3635200.0	3635220.0	3635160.0	3635200.0	3635220.0	3635220.0
Z(m)	235.9	237.8	238.7	228.0	237.8	238.7	228.0	237.8	238.7	228.0	237.8	238.7	228.0	237.8	238.7	238.7
YYMMDDHH	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603	03032603
8-Hr Unitized Conc (ug/m3)	256.04970	223.76365	216.02881	256.85171	223.80060	216.34489	257.11685	223.80907	216.46393	257.27527	223.81775	216.34837	257.25257	223.78893	217.05245	215.96469
X(m)	495300.0	495200.0	495200.0	495300.0	495200.0	495200.0	495300.0	495200.0	495200.0	495300.0	495200.0	495200.0	495300.0	495200.0	495200.0	495200.0
Y(m)	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0
Z(m)	244.6	263.9	263.9	244.6	263.9	263.9	244.6	263.9	263.9	244.6	263.9	263.9	244.6	263.9	263.9	263.9
YYMMDDHH	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608	04122608
24-Hr Unitized Conc (ug/m3)	118.58982	103.41288	99.97259	118.95935	103.42707	100.11615	119.08137	103.43025	100.17011	119.15449	103.43347	100.11798	119.14452	103.42265	100.43650	99.94445
X(m)	495300.0	495200.0	495200.0	495300.0	495200.0	495200.0	495300.0	495200.0	495200.0	495300.0	495200.0	495200.0	495300.0	495200.0	495200.0	495200.0
Y(m)	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0	3633800.0
Z(m)	244.6	263.9	263.9	244.6	263.9	263.9	244.6	263.9	263.9	244.6	263.9	263.9	244.6	263.9	263.9	263.9
YYMMDDHH	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624	04122624
Normal Operations - Short-term Screening Emissions (g/s/engine)																
NOx (g/s/engine)	0.1162	0.1400	0.1661	0.1162	0.1400	0.1661	0.1162	0.1400	0.1661	0.1162	0.1400	0.1661	0.1162	0.1400	0.1633	0.1661
CO (g/s/engine)	0.1884	0.1866	0.1972	0.1884	0.1866	0.1972	0.1884	0.1866	0.1972	0.1884	0.1866	0.1972	0.1884	0.1866	0.1939	0.1972
SO2 (g/s/engine)	0.0161	0.0242	0.0323	0.0161	0.0242	0.0323	0.0161	0.0242	0.0323	0.0161	0.0242	0.0323	0.0161	0.0242	0.0323	0.0323
PM10 (g/s/engine)	0.1716	0.1730	0.1739	0.1716	0.1730	0.1739	0.1716	0.1730	0.1739	0.1716	0.1730	0.1739	0.1716	0.1730	0.1710	0.1739
Normal Operations - Short-term Screening Impacts (ug/m3)																
1-Hour NOx (ug/m3)	93.315	92.122	95.460	93.567	92.368	95.753	93.705	92.429	**95.862**	93.794	92.496	95.760	93.786	92.295	94.778	95.417
1-Hour CO (ug/m3)	151.296	122.785	113.334	151.704	123.113	113.682	151.928	123.195	113.811	**152.073**	123.283	113.690	152.059	123.015	112.538	113.283
8-Hour CO (ug/m3)	48.240	41.754	42.601	48.391	41.761	42.663	48.441	41.763	42.687	**48.471**	41.764	42.664	48.466	41.759	42.086	42.588
1-Hour SO2 (ug/m3)	12.929	15.924	18.563	12.964	15.966	18.620	12.983	15.977	**18.641**	12.996	15.989	18.622	12.994	15.954	18.747	18.555
3-Hour SO2 (ug/m3)	6.488	8.133	9.352	6.500	8.157	9.389	6.511	8.164	**9.403**	6.518	8.170	9.390	6.517	8.150	9.472	9.347
24-Hour SO2 (ug/m3)	1.909	2.503	3.229	1.915	2.503	3.234	1.917	2.503	**3.235**	1.918	2.503	3.234	1.918	2.503	3.244	3.228
24-Hour PM10 (ug/m3)	20.350	17.890	17.385	20.413	17.893	17.410	20.434	17.893	17.420	**20.447**	17.894	17.411	20.445	17.892	17.175	17.380

Worst-Case Operating Scenarios are **bolded**.

Table F.2-3

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		Federal Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m^3)		0.075 ppm (147 µg/m^3)		
Respirable Particulate Matter (PM10)	24 Hour	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		—		
Fine Particulate Matter (PM2.5)	24 Hour	No Separate State Standard		35 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	15.0 µg/m^3		
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	9 ppm (10 mg/m^3)	None	Non-Dispersive Infrared Photometry (NDIR)
	1 Hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)		
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	—
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.030 ppm (57 µg/m3)	Gas Phase Chemiluminescence	53 ppb (100 µg/m^3) (see footnote 8)	Same as Primary Standard	Gas Phase Chemiluminescence
	1 Hour	0.18 ppm (339 µg/m^3)		100 ppb (188 µg/m^3) (see footnote 8)	None	
Sulfur Dioxide (SO_2)	24 Hour	0.04 ppm (105 µg/m^3)	Ultraviolet Fluorescence	—	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)[9]
	3 Hour	—		—	0.5 ppm (1300 µg/m^3) (see footnote 9)	
	1 Hour	0.25 ppm (655 µg/m^3)		75 ppb (196 µg/m^3) (see footnote 9)	—	
Lead[10]	30 Day Average	1.5 µg/m^3	Atomic Absorption	—	—	—
	Calendar Quarter	—		1.5 µg/m^3	Same as Primary Standard	High Volume Sampler and Atomic Absorption
	Rolling 3-Month Average[11]	—		0.15 µg/m^3		
Visibility Reducing Particles	8 Hour	Extinction coefficient of 0.23 per kilometer — visibility of ten miles or more (0.07 — 30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape.		No Federal Standards		
Sulfates	24 Hour	25 µg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[10]	24 Hour	0.01 ppm (26 µg/m^3)	Gas Chromatography			

See footnotes on next page …

1. California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, suspended particulate matter—PM10, PM2.5, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact U.S. EPA for further clarification and current federal policies.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. Any equivalent procedure which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

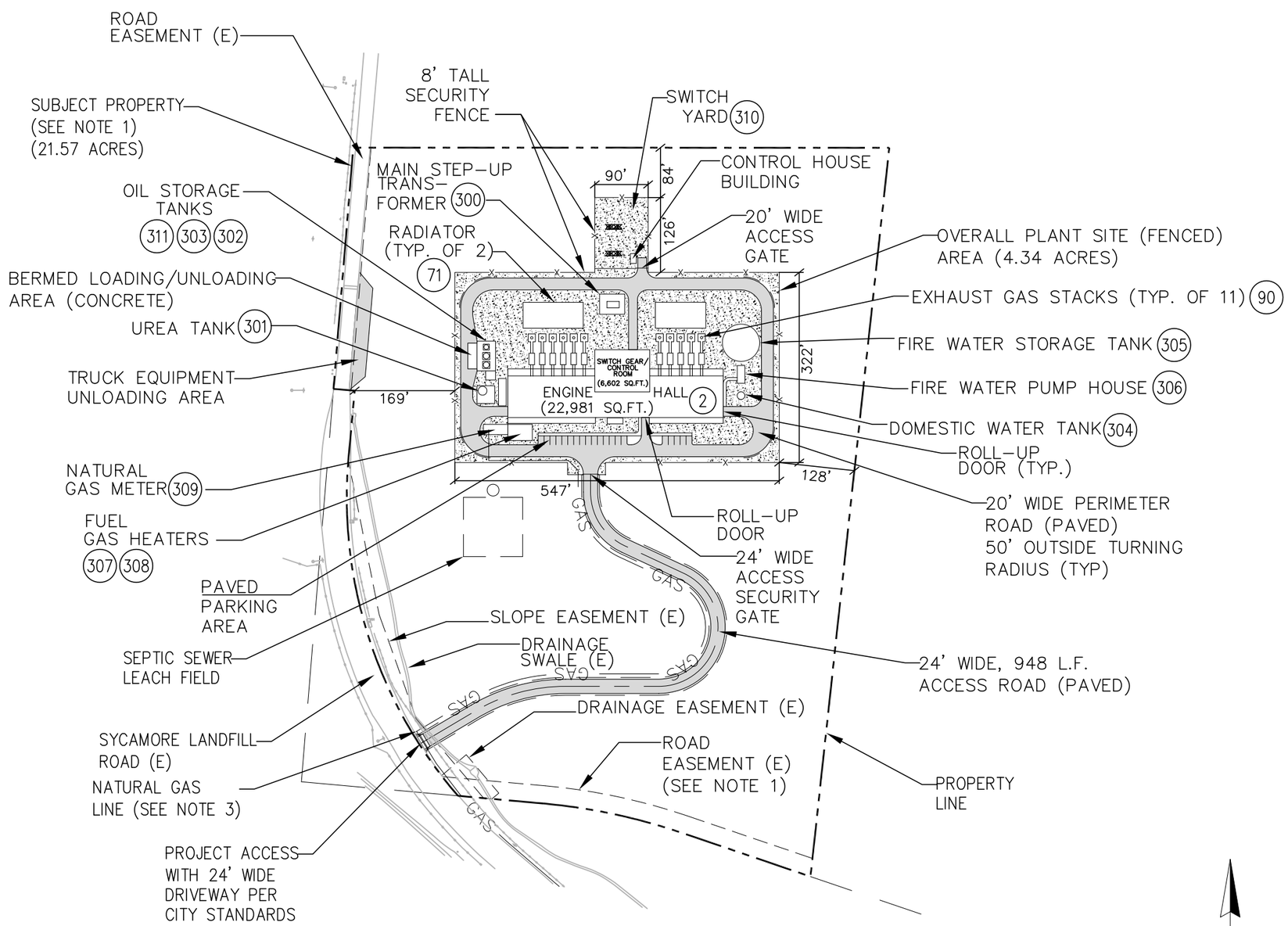
7. Reference method as described by the EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the EPA.

8. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010). Note that the EPA standards are in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national standards to the California standards the units can be converted from ppb to ppm. In this case, the national standards of 53 ppb and 100 ppb are identical to 0.053 ppm and 0.100 ppm, respectively.

9. On June 2, 2010, the U.S. EPA established a new 1-hour SO_2 standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. EPA also proposed a new automated Federal Reference Method (FRM) using ultraviolet technology, but will retain the older pararosaniline methods until the new FRM have adequately permeated State monitoring networks. The EPA also revoked both the existing 24-hour SO_2 standard of 0.14 ppm and the annual primary SO_2 standard of 0.030 ppm, effective August 23, 2010.
   The secondary SO_2 standard was not revised at that time; however, the secondary standard is undergoing a separate review by EPA. Note that the new standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the new primary national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

10. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

11. National lead standard, rolling 3-month average: final rule signed October 15, 2008.



LEGEND:

GAL.	GALLON
L.F.	LINEAR FEET
SQ.FT.	SQUARE FEET
TYP.	TYPICAL
(E)	EXISTING
310	ITEM NO.
	ASPHALT PAVEMENT
	GRAVEL
—x—	CHAINLINK FENCE
— - —	PARCEL BOUNDARY
— GAS —	NEW NATURAL GAS LINE

POWER PLANT EQUIPMENT (SEE NOTE 2)

Item No	Pcs.	DESCRIPTION	DESCRIPTION Dia.	Ht.	Cap.(G)
2	1	Engine Hall	–	24'	
71	2	Radiator Sets		18' H	
90	11	Exhaust gas Stack	4' ø	100' H	
300	1	Main Step-Up Transformer		30' H	
301	1	UreaTank	13' ø	22' H	20,000
302	1	Used Oil Tank	10' ø	20' H	10,000
303	1	New Oil Tank	10' ø	20' H	10,000
304	1	Domestic Water Tank	10' ø	20' H	10,000
305	1	Fire Water Tank	60' ø	30' H	600,000
306	1	Fire Water Pumphouse		STACK=30'H	
307	1	Warm Start Gas Heater		STACK=30'H	
308	1	Fuel Gas Heater		STACK=30'H	
309	1	Natural Gas Metering Station		6' H	
310	1	Facility 230kV Switchyard		52' H Mast	
311	1	Maintenance Oil Tank	8' ø	16' H	6,000

NOTES:

1. PROPERTY AND EASEMENT INFORMATION FROM ALTA/ACSM LAND TITLE SURVEY PREPARED BY RBF CONSULTING APRIL 25, 2011.
2. PLANT SITE ITEMS FROM QUAIL BRUSH MASTER LAYOUT PLAN QB-SP-2 REVISION B DATED 3/9/11. (SEE APPENDIX B2 FOR ADDITIONAL DETAILS ON THE POWER PLANT LAYOUT.)
3. ALIGNMENT OF NATURAL GAS LINE WILL BE ESTABLISHED BY SAN DIEGO GAS & ELECTRIC.

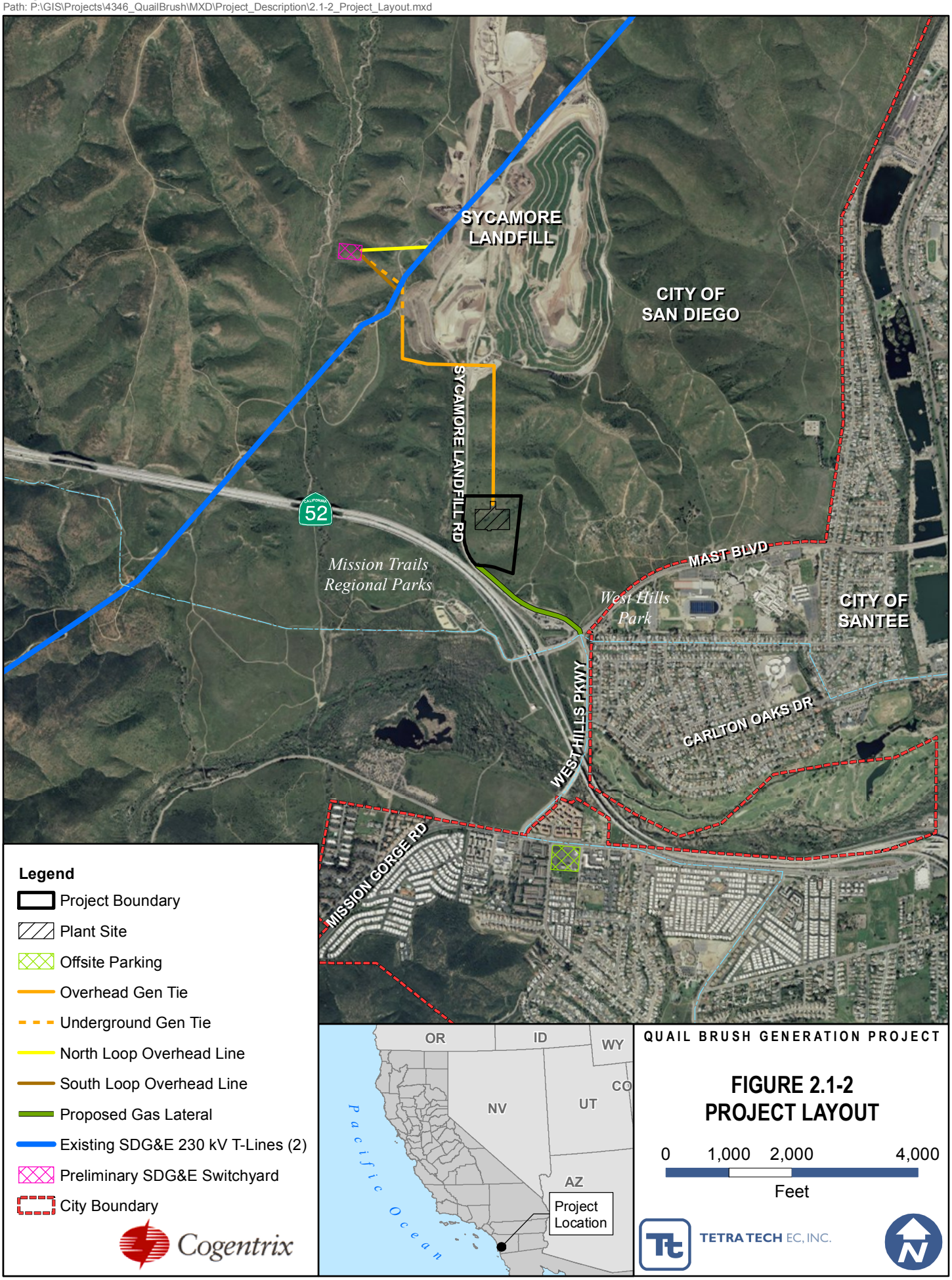
QUAIL BRUSH GENERATION PROJECT

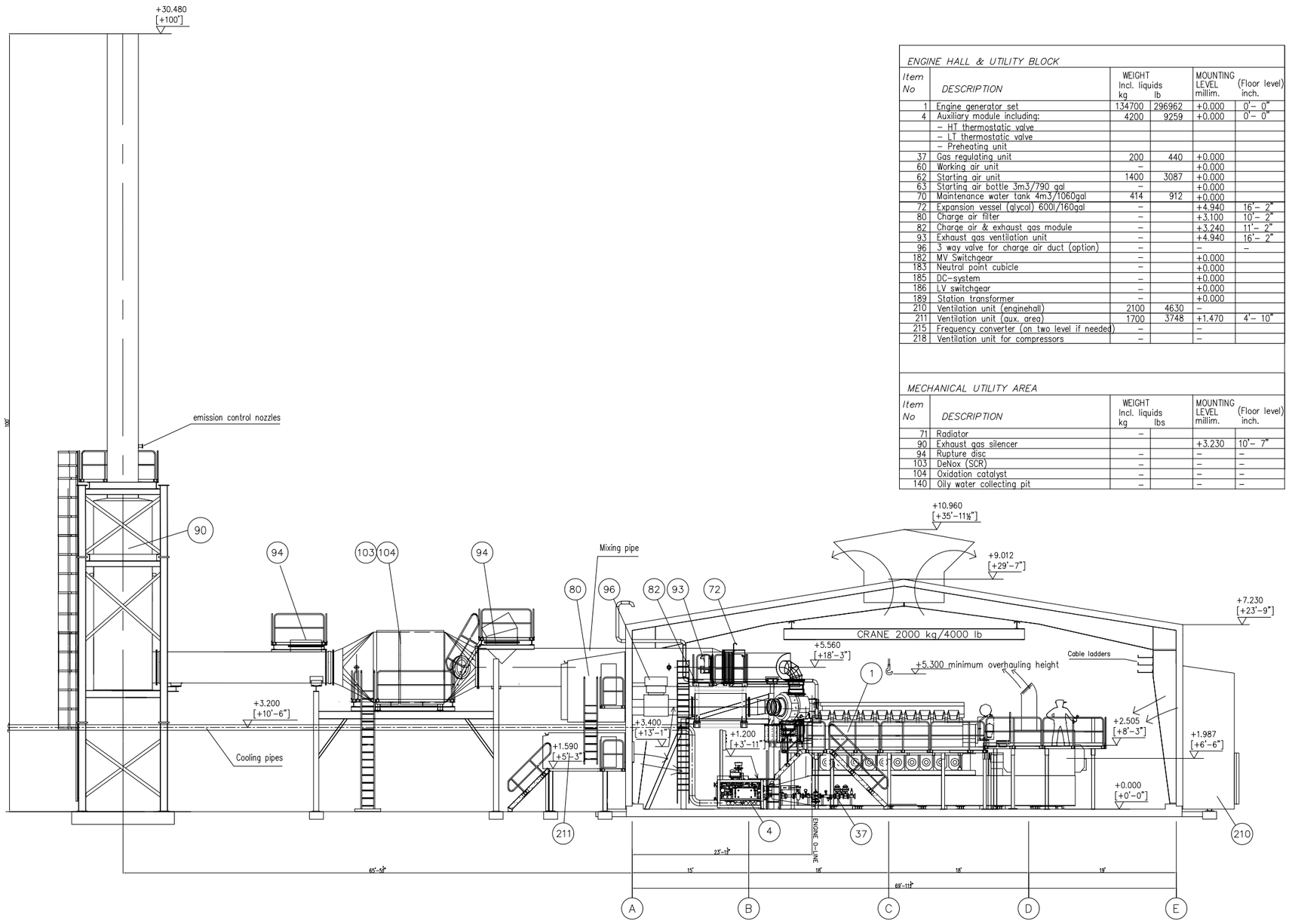
FIGURE 2.3-1
SITE PLAN

TETRA TECH EC, INC. Cogentrix

P:\4346-COGENTRIX QUAIL BRUSH\CAD-ENGINEERING - COPY_11-0817AM\SITE PLAN\CAD\SITE PLAN-COGENTRIX.DWG
PLOT/UPDATE: Aug 8, 2011 4:8:29 PM

Printing Date: 8/19/2011 2:41:37 PM
Path: P:\GIS\Projects\4346_QuailBrush\MXD\Project_Description\2.1-2_Project_Layout.mxd





ENGINE HALL & UTILITY BLOCK

Item No	DESCRIPTION	WEIGHT Incl. liquids kg	lb	MOUNTING LEVEL millim.	(Floor level) inch.
1	Engine generator set	134700	296962	+0.000	0'– 0"
4	Auxiliary module including:	4200	9259	+0.000	0'– 0"
	– HT thermostatic valve				
	– LT thermostatic valve				
	– Preheating unit				
37	Gas regulating unit	200	440	+0.000	
60	Working air unit	–		+0.000	
62	Starting air unit	1400	3087	+0.000	
63	Starting air bottle 3m3/790 gal	–		+0.000	
70	Maintenance water tank 4m3/1060gal	414	912	+0.000	
72	Expansion vessel (glycol) 600l/160gal	–		+4.940	16'– 2"
80	Charge air filter	–		+3.100	10'– 2"
82	Charge air & exhaust gas module	–		+3.240	11'– 2"
93	Exhaust gas ventilation unit	–		+4.940	16'– 2"
96	3 way valve for charge air duct (option)	–		–	–
182	MV Switchgear	–		+0.000	
183	Neutral point cubicle	–		+0.000	
185	DC–system	–		+0.000	
186	LV switchgear	–		+0.000	
189	Station transformer	–		+0.000	
210	Ventilation unit (enginehall)	2100	4630	–	
211	Ventilation unit (aux. area)	1700	3748	+1.470	4'– 10"
215	Frequency converter (on two level if needed)	–		–	
218	Ventilation unit for compressors	–		–	

MECHANICAL UTILITY AREA

Item No	DESCRIPTION	WEIGHT Incl. liquids kg	lbs	MOUNTING LEVEL millim.	(Floor level) inch.
71	Radiator	–			
90	Exhaust gas silencer			+3.230	10'– 7"
94	Rupture disc	–		–	–
103	DeNox (SCR)	–		–	–
104	Oxidation catalyst	–		–	–
140	Oily water collecting pit	–		–	–

LEGEND:

gal	GALLON
kg	KILOGRAM
lb	POUND
millim	MILLIMETERS
m^3	CUBIC METERS
(1)	ITEM NO.

QUAIL BRUSH GENERATION PROJECT

FIGURE 2.3-2
TYPICAL ELEVATION VIEW

TETRA TECH EC, INC.

Cogentrix

Figure F.2-4a
Annual Wind Rose for Overland Avenue
2003-2005

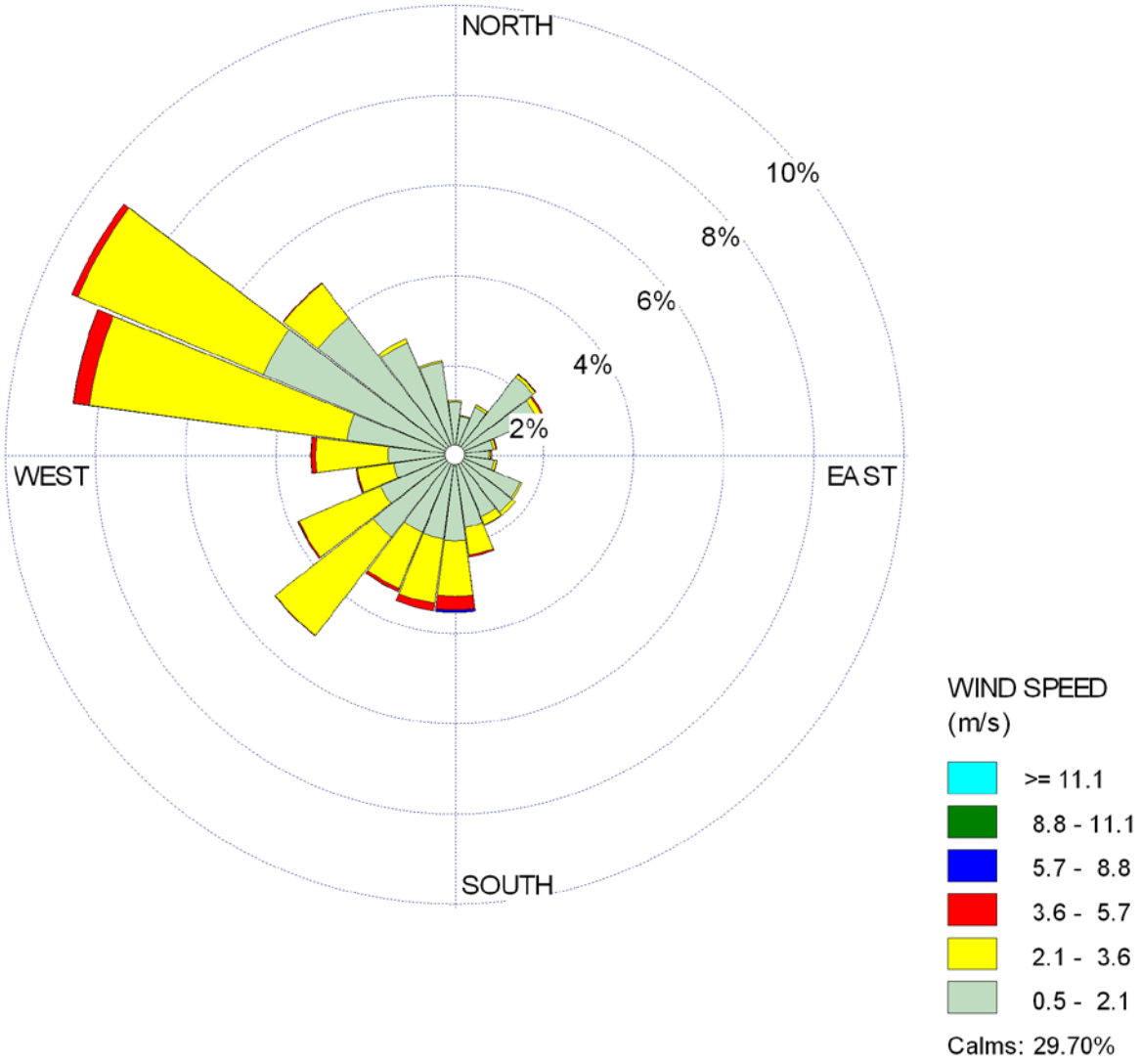


Figure F.2-4b
Winter Wind Rose for Overland Avenue
2003-2005

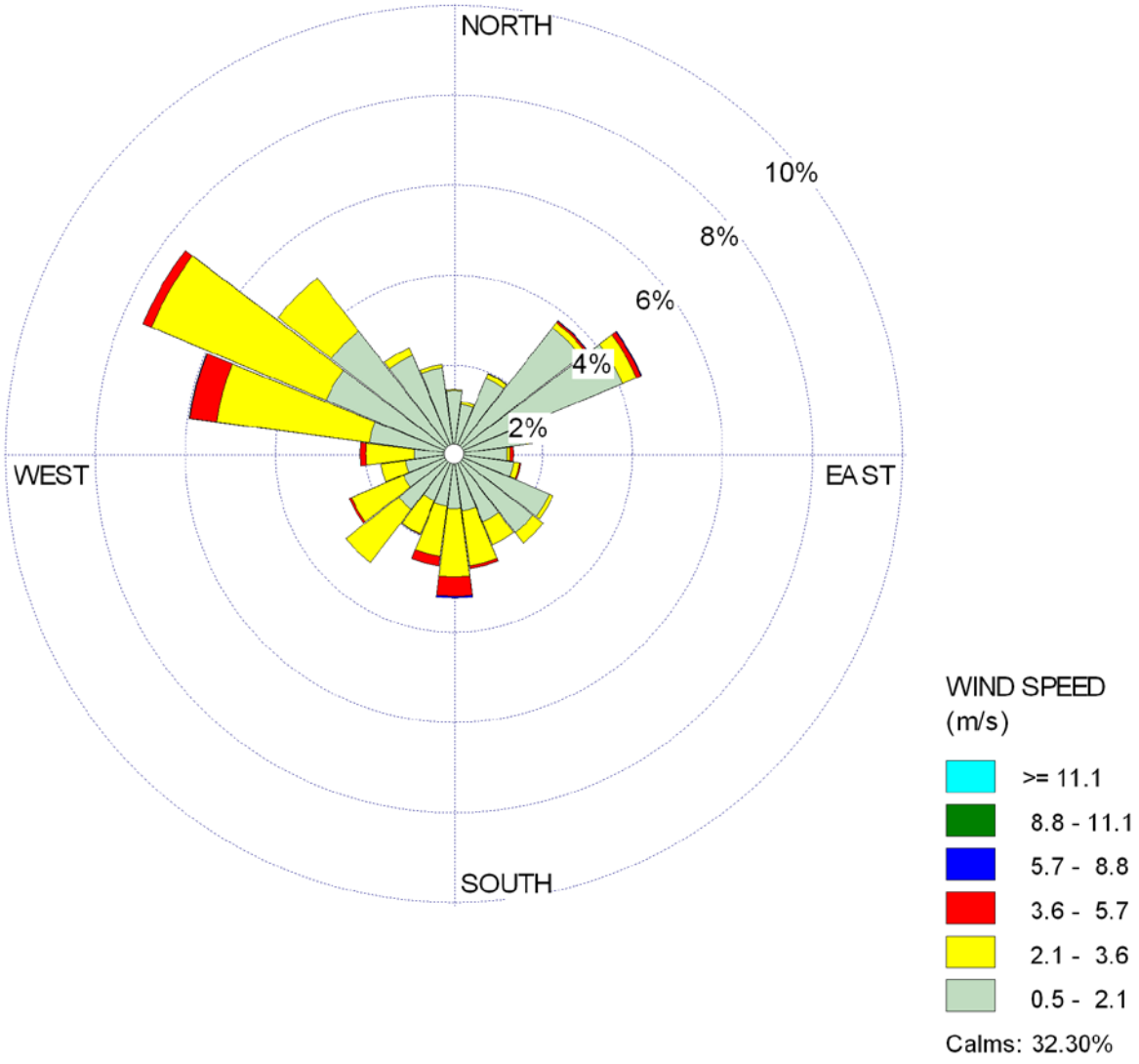


Figure F.2-4c
Spring Wind Rose for Overland Avenue
2003-2005

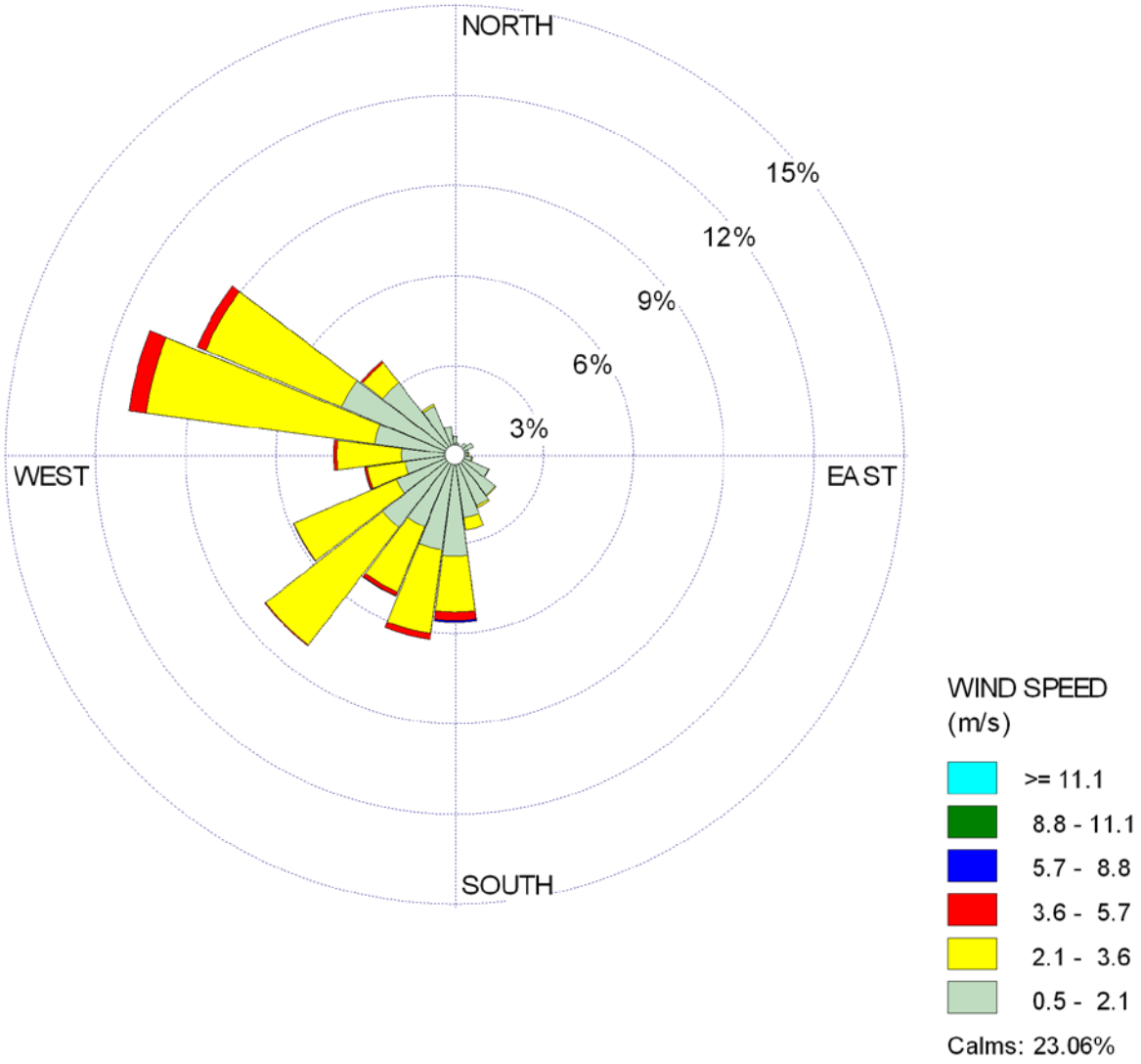


Figure F.2-4d
Summer Wind Rose for Overland Avenue
2003-2005

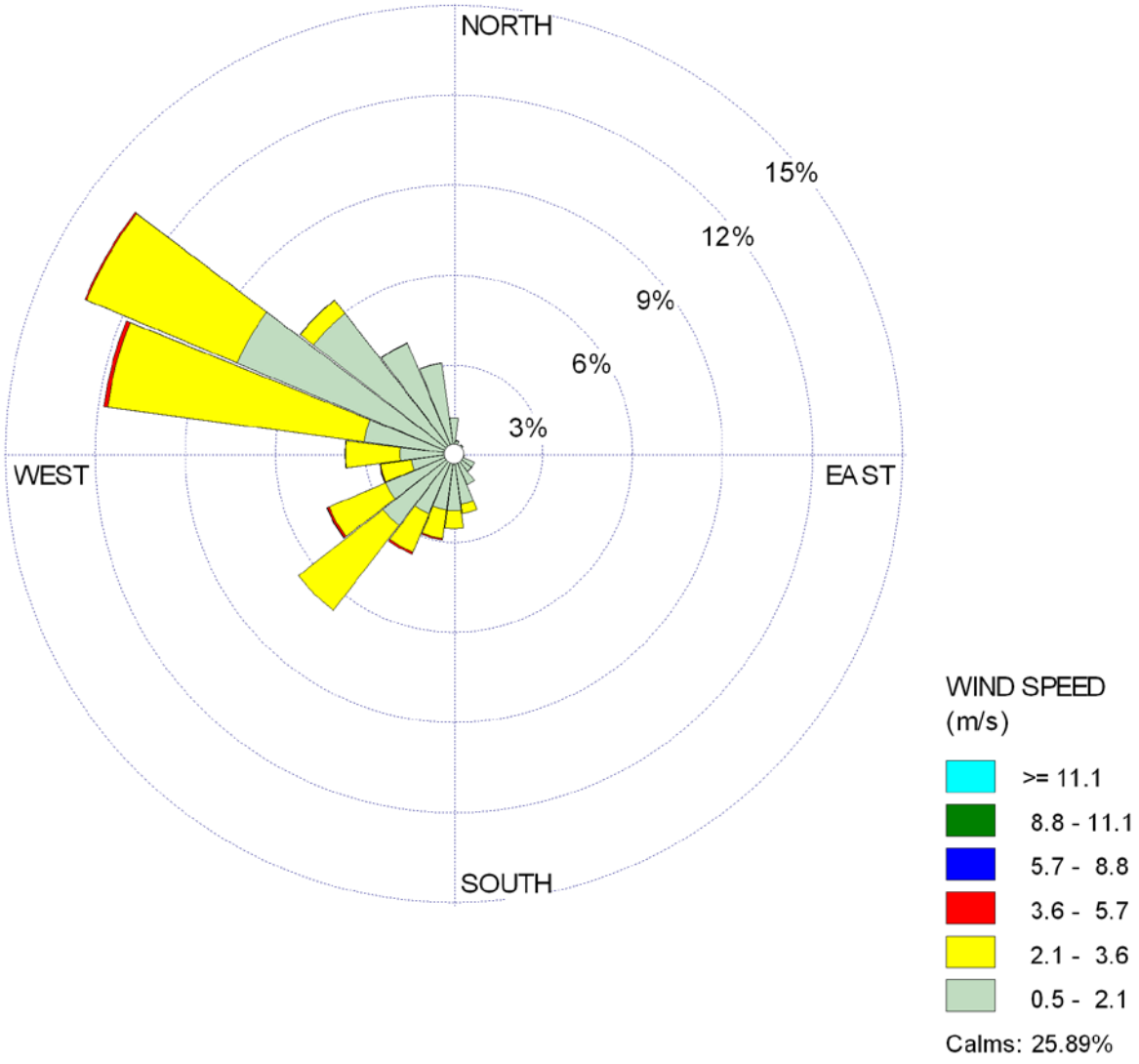


Figure F.2-4e
Fall Wind Rose for Overland Avenue
2003-2005

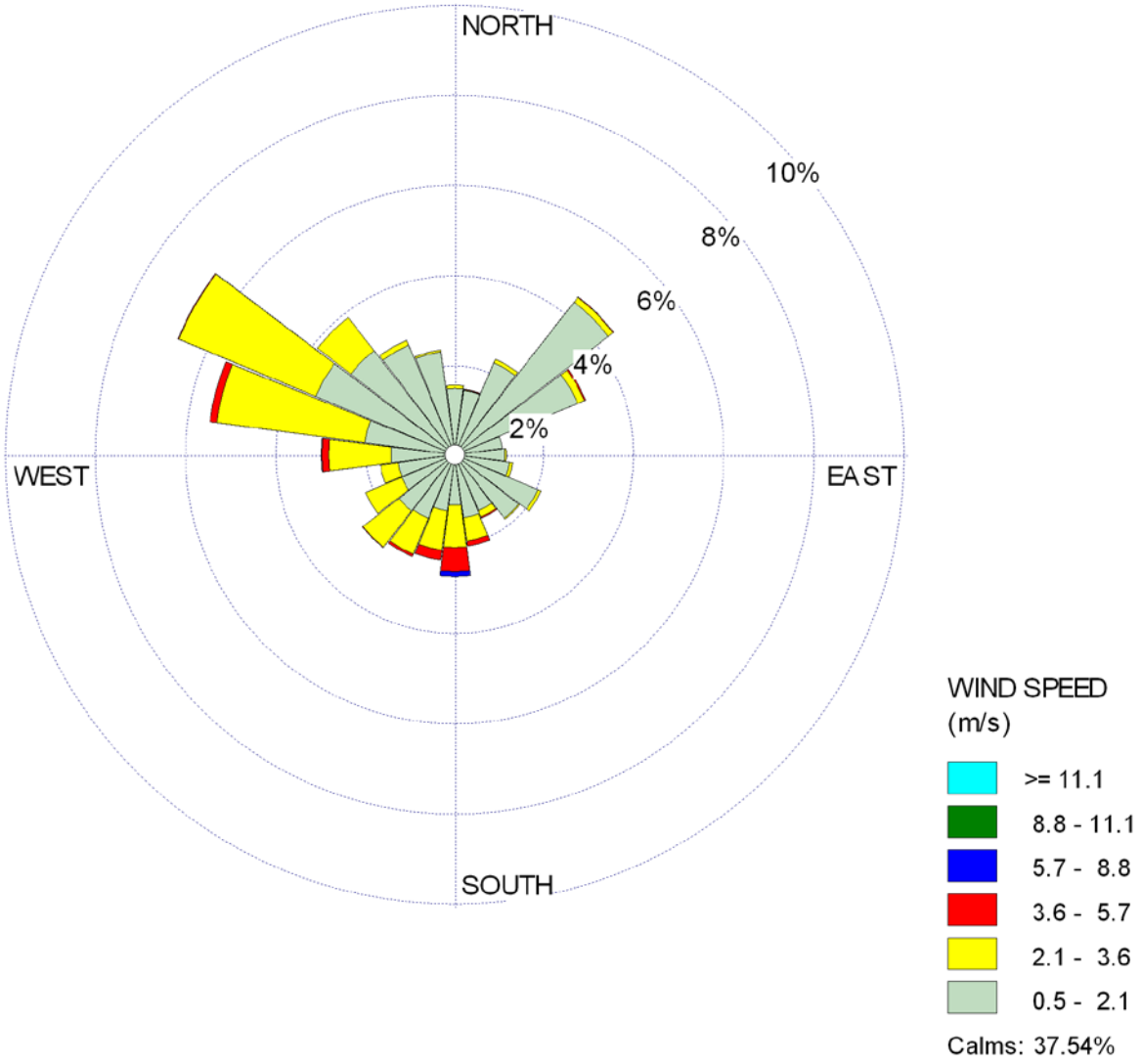


Figure F.2-5
Fine Receptor Grid Delineation

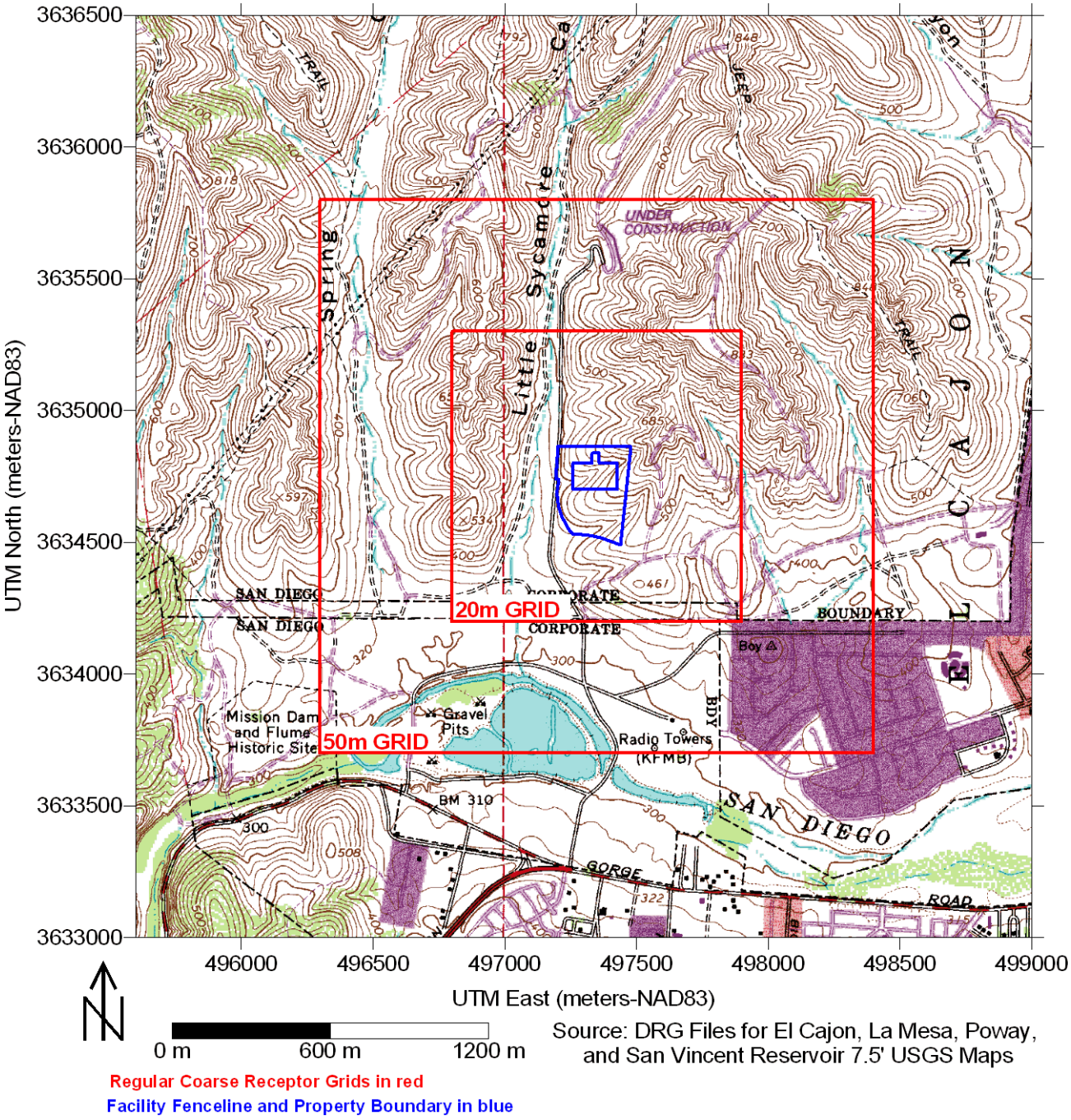
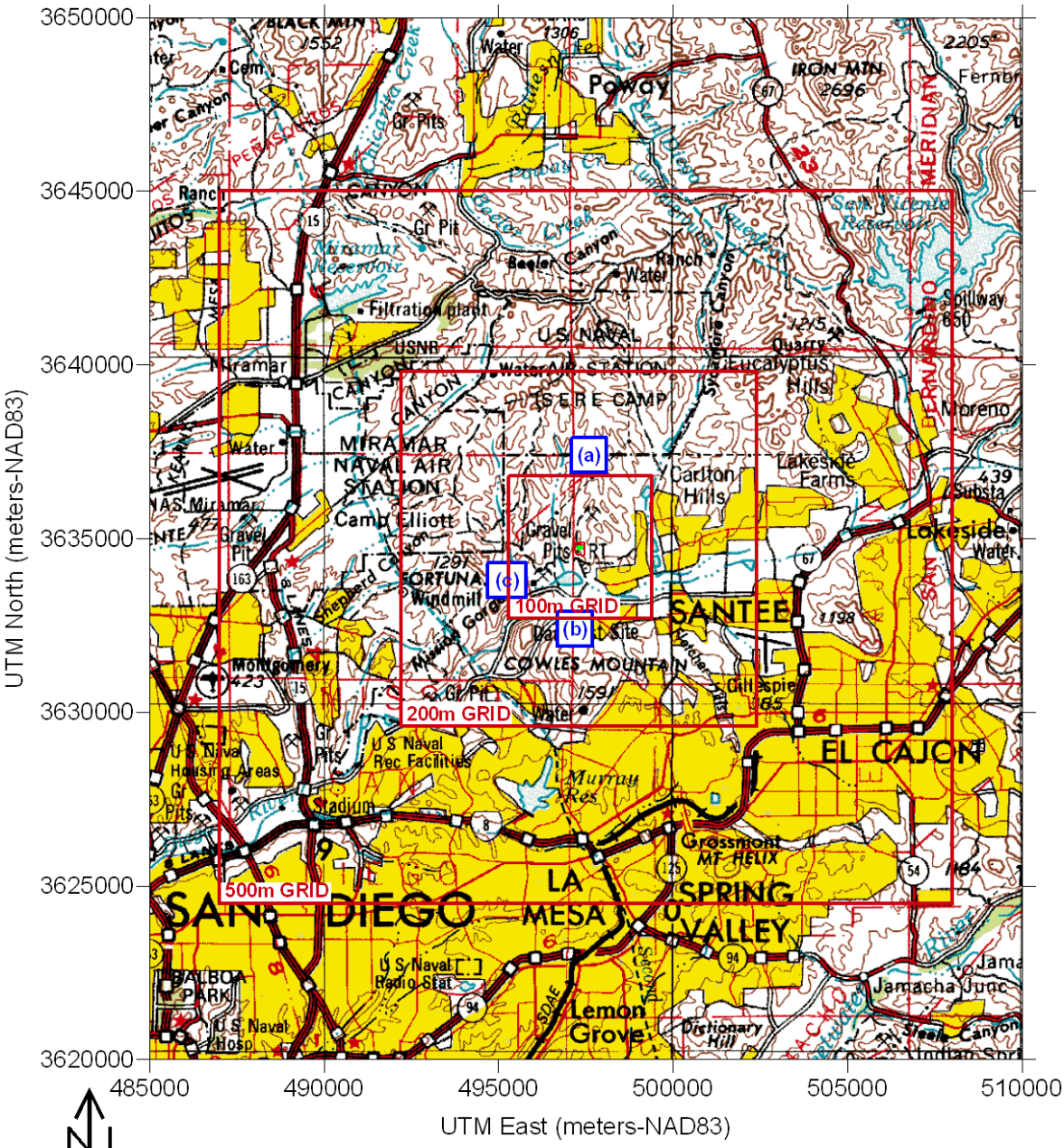


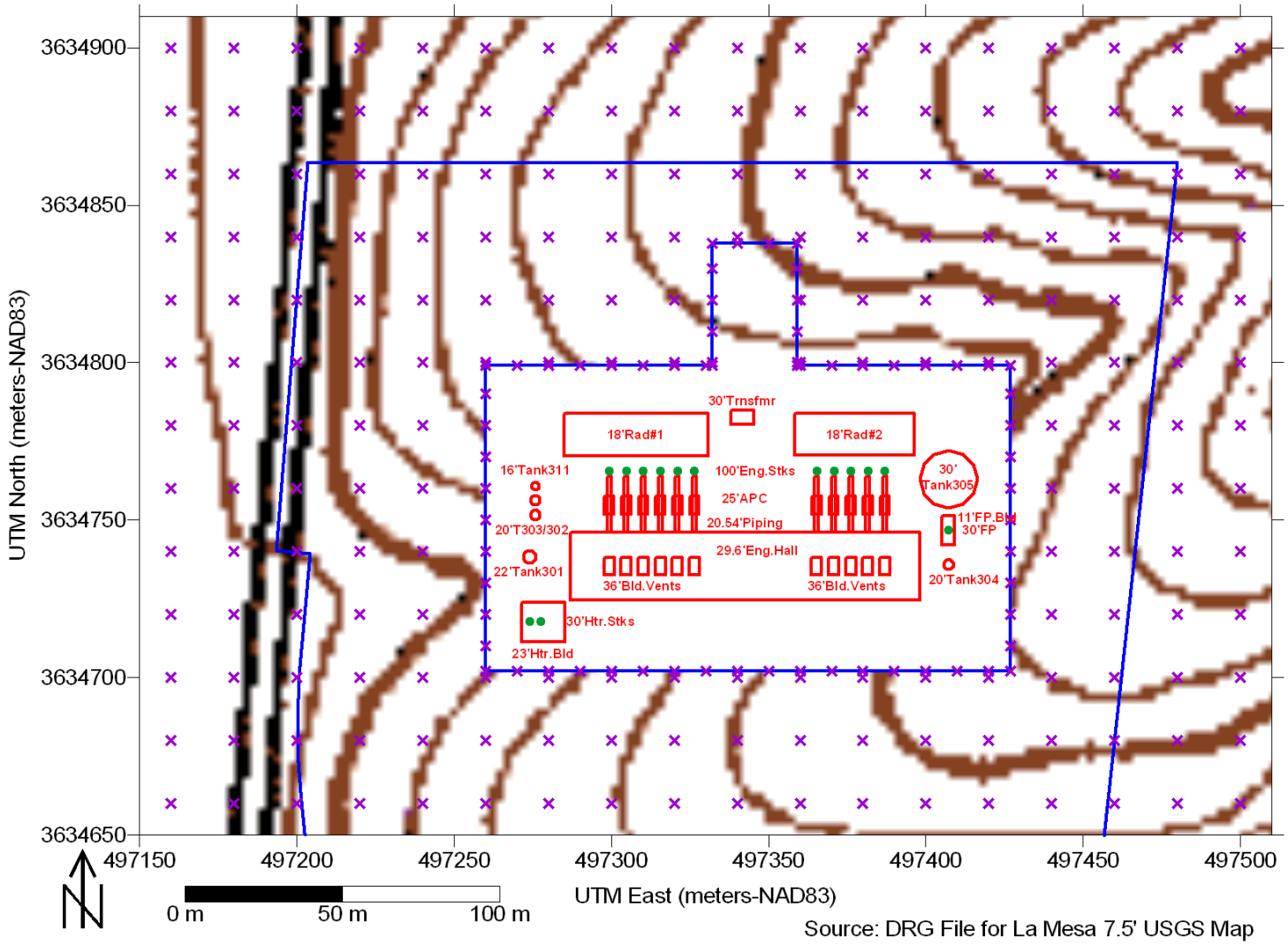
Figure F.2-6
Coarse Receptor Grid Delineation



Regular Coarse Receptor Grids in red

Refined Receptor Grids in blue, (a) is 1-hr NO2 startup for CAAQS, (b) is 1-hr NO2 startup for NAAQS, and (c) is 1-hr NO2 for NAAQS, 8-hr CO startup, and 24-hr and Annual PM10/PM2.5/SO2 Impacts

Figure F.2-7 BPIP Site Arrangement



Source: DRG File for La Mesa 7.5' USGS Map

BPIP Structures shown in Red Facility Fenceline and Property Boundary in blue
20m and Fenceline Receptors shown in purple Stacks shown in green

Figure F.2-8

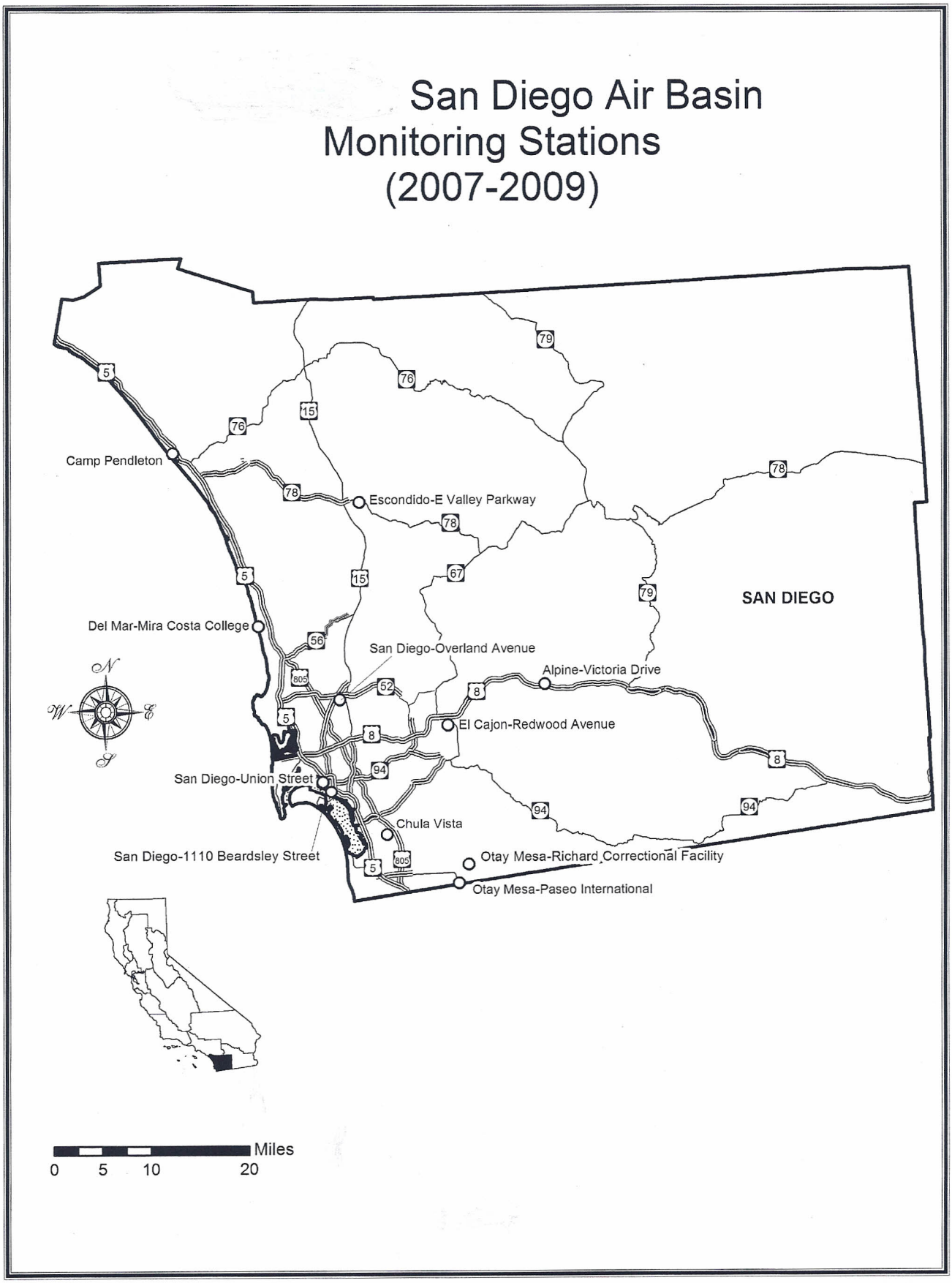
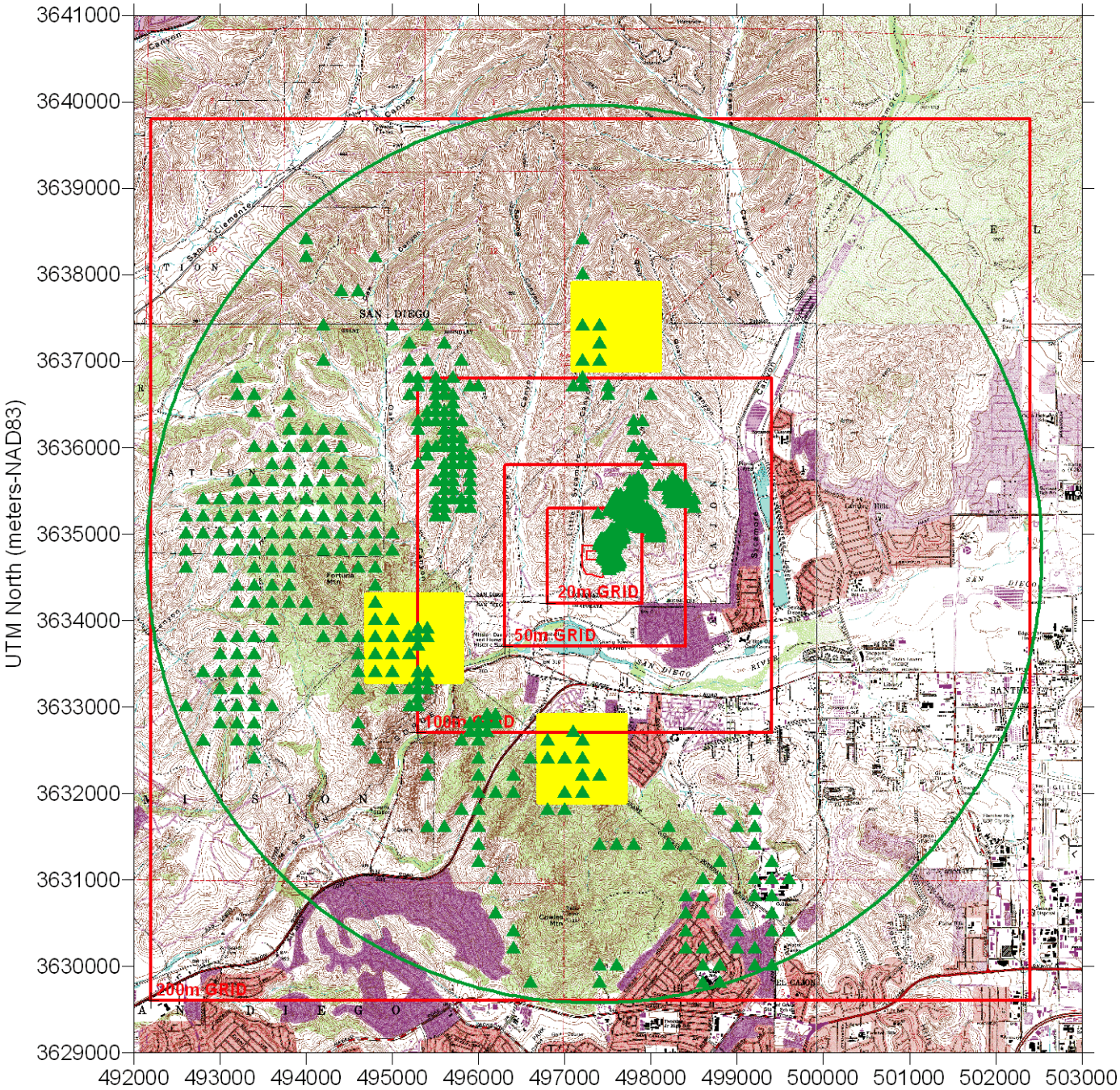

San Diego Air Basin
Monitoring Stations
(2007-2009)
Camp Pendleton
Escondido-E Valley Parkway
Del Mar-Mira Costa College
San Diego-Overland Avenue
Alpine-Victoria Drive
El Cajon-Redwood Avenue
San Diego-Union Street
Chula Vista
San Diego-1110 Beardsley Street
Otay Mesa-Richard Correctional Facility
Otay Mesa-Paseo International
SAN DIEGO
N
W
E
S
Miles
0
5
10
20

Figure F.2-9

Maximum 24-Hour PM10 Impacts > 5.0 ug/m3



Green Triangles Show Regular Receptors > 5.0 ug/m3
Green Circle defines SIA Radius of 5.19 km
Yellow Areas are Refined Receptor Grids

Figure F.2-10

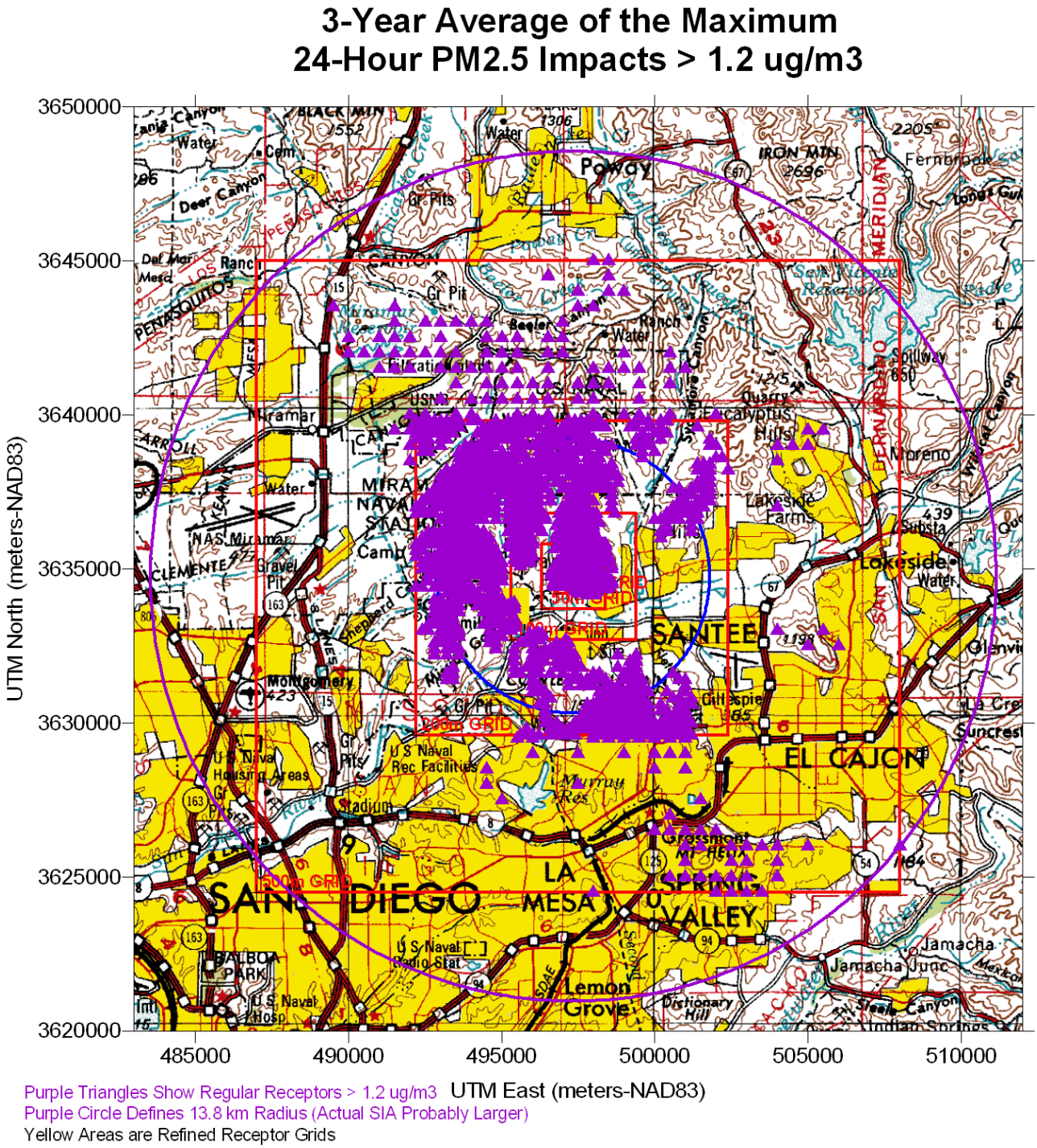
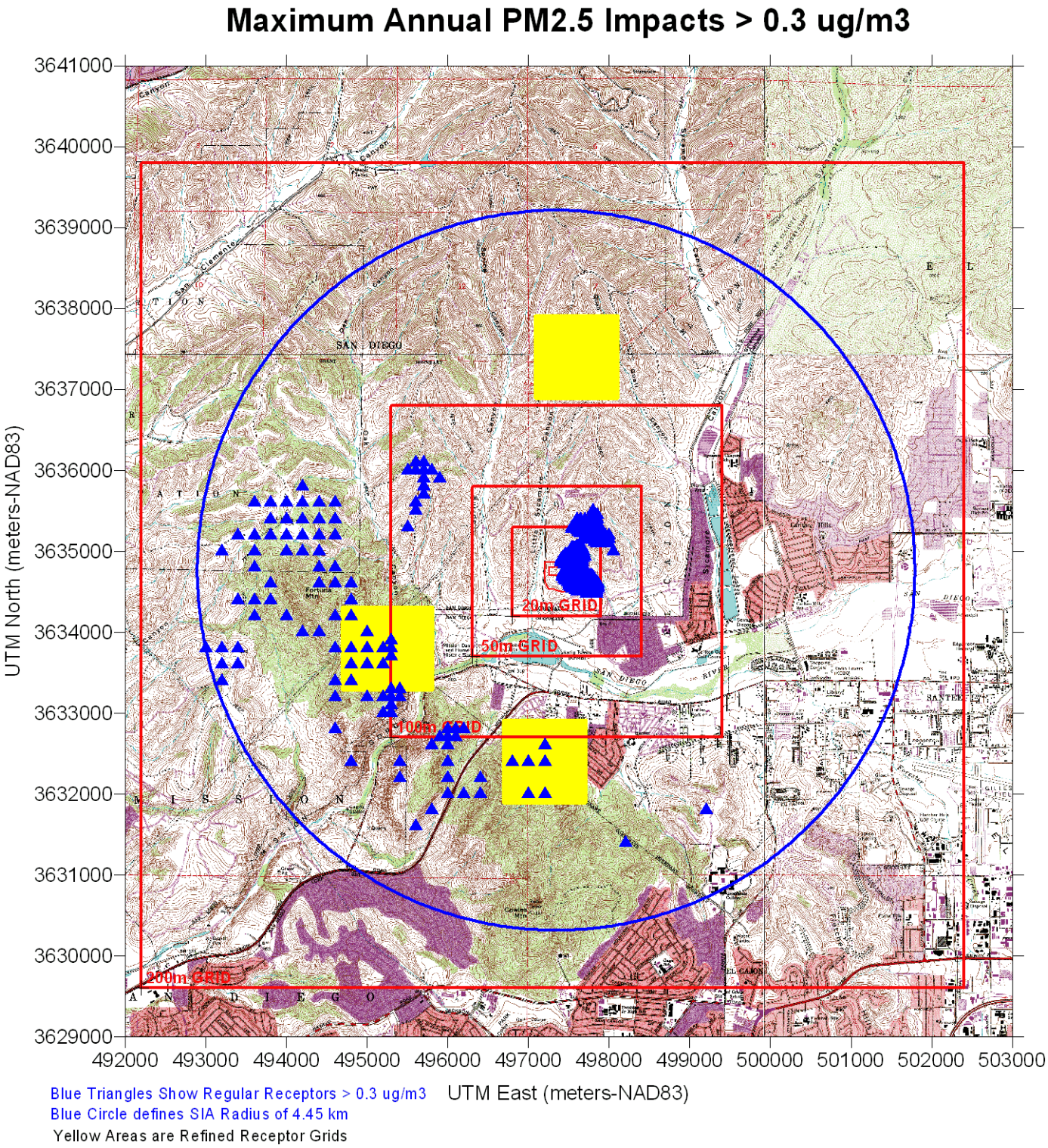
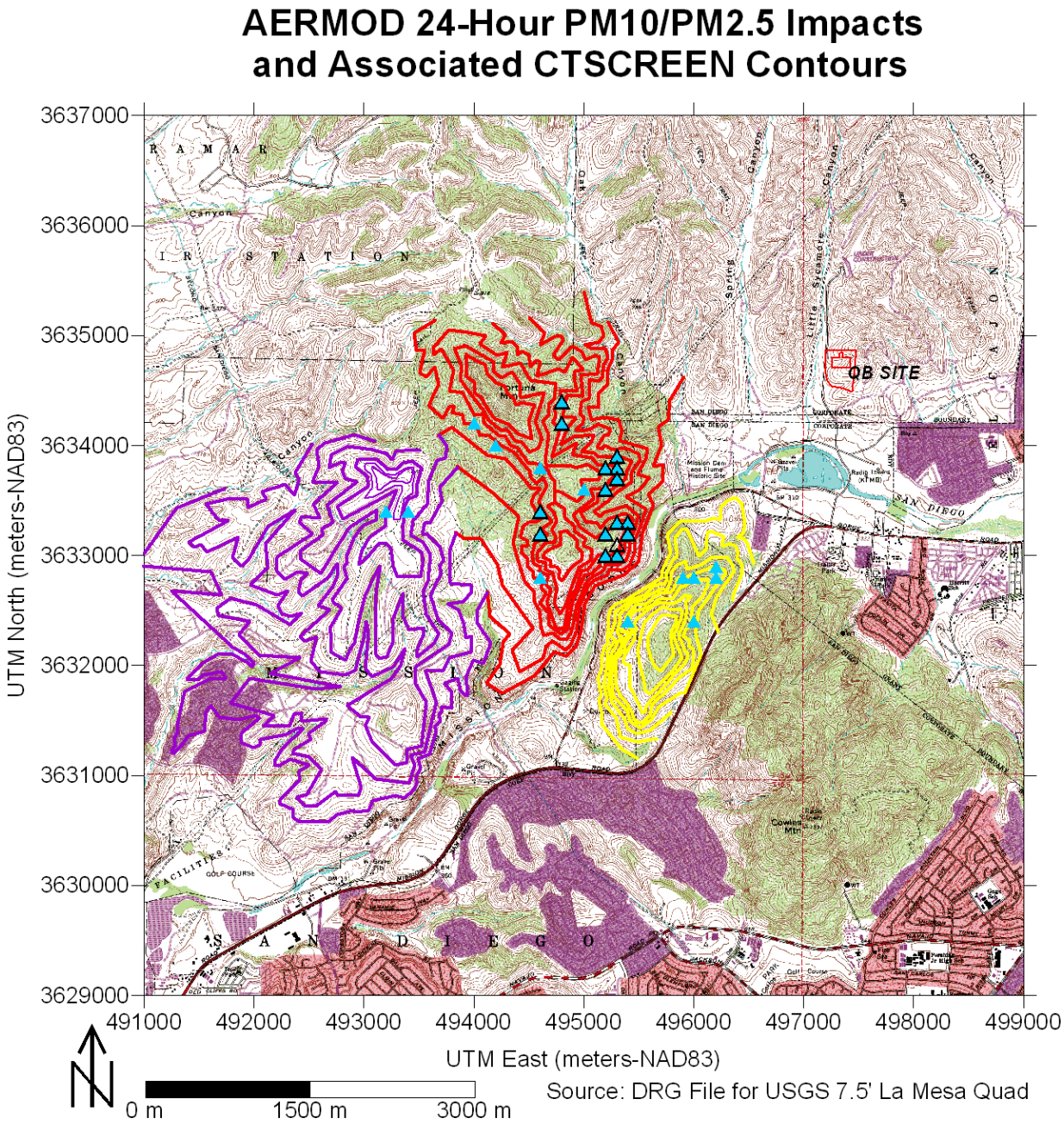

3-Year Average of the Maximum
24-Hour PM2.5 Impacts > 1.2 ug/m3
UTM North (meters-NAD83)
UTM East (meters-NAD83)
3650000
3645000
3640000
3635000
3630000
3625000
3620000
485000
490000
495000
500000
505000
510000
Poway
Miramar
SANTEE
EL CAJON
SAN DIEGO
LA MESA
SPRING VALLEY
Lakeside
Lemon Grove
500m GRID
250m GRID
50m GRID
Purple Triangles Show Regular Receptors > 1.2 ug/m3
Purple Circle Defines 13.8 km Radius (Actual SIA Probably Larger)
Yellow Areas are Refined Receptor Grids

Figure F.2-11



Blue Triangles Show Regular Receptors > 0.3 ug/m3
Blue Circle defines SIA Radius of 4.45 km
Yellow Areas are Refined Receptor Grids

Figure F.2-12



Black Triangular Outlines = AERMOD 24-hr PM2.5 > 11.3 ug/m3
Blue Triangles = AERMOD 24-hr PM10 > 5.0 ug/m3 on 2003 Days w/ Measured Exceedances
Red, Yellow, and Purple Lines show CTSCREEN contours

Figure F.2-13

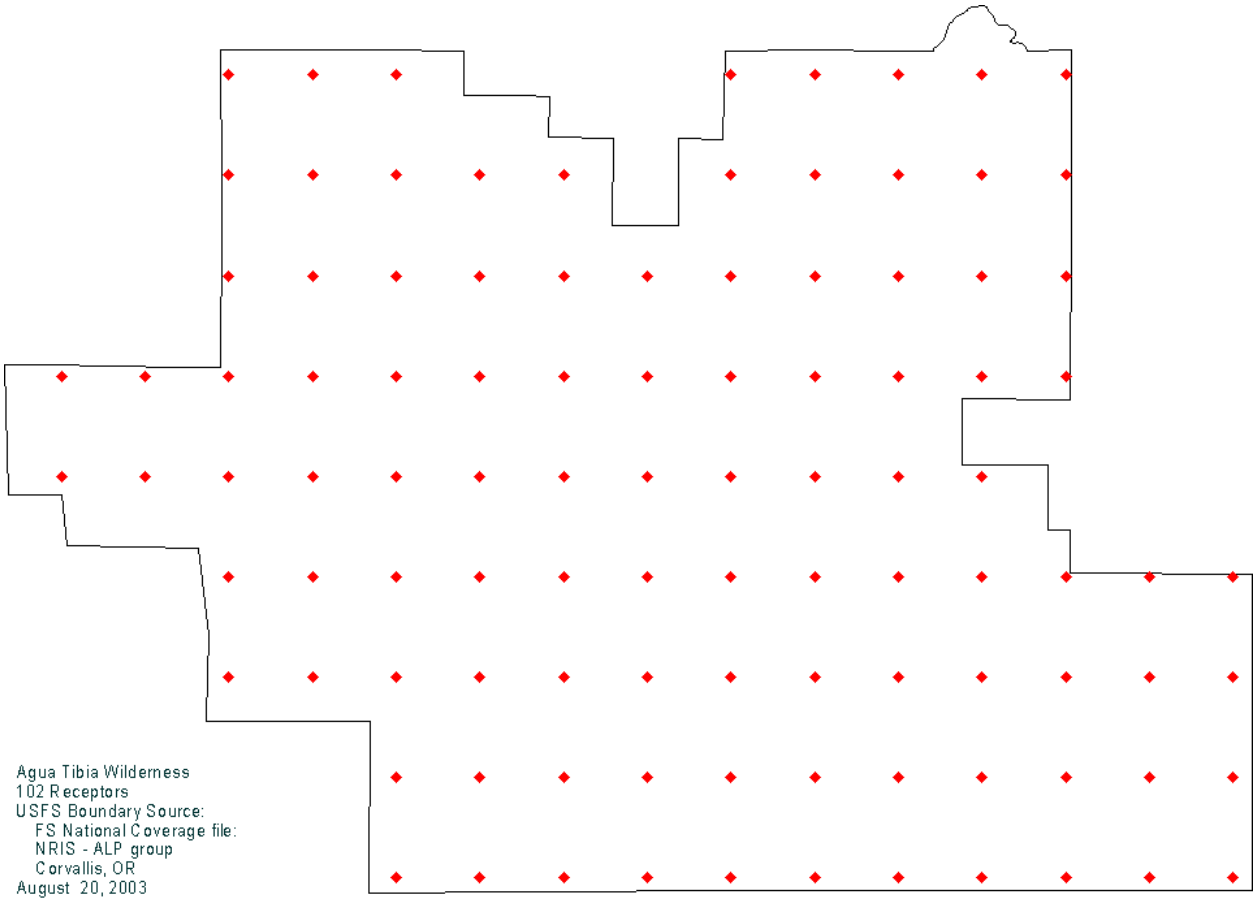
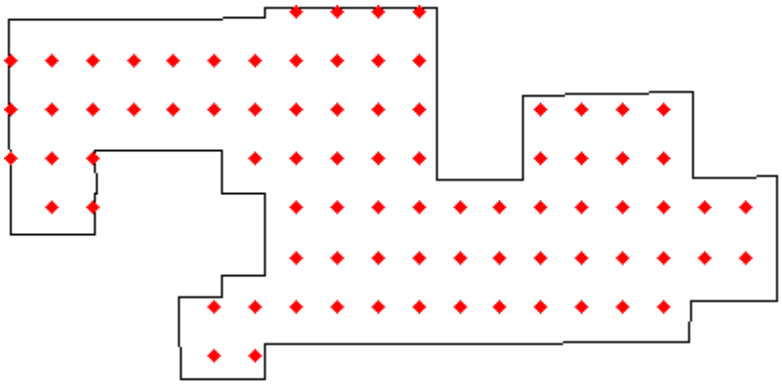
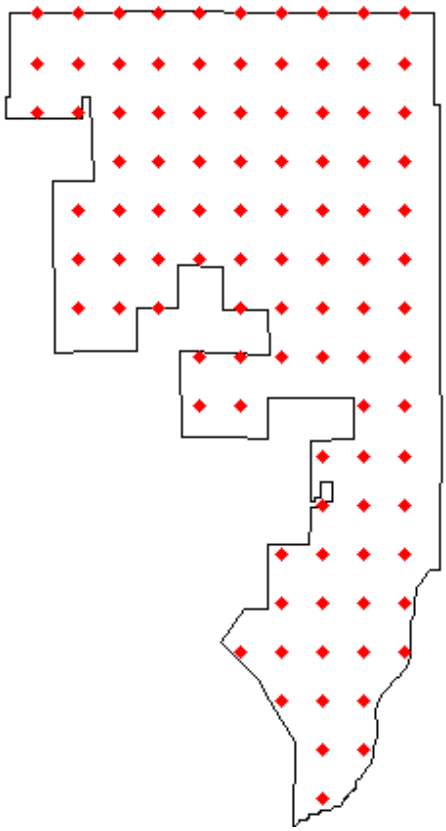

Agua Tibia Wilderness
102 Receptors
USFS Boundary Source:
FS National Coverage file:
NRIS - ALP group
Corvallis, OR
August 20, 2003

Figure F.2-14



San Jacinto Wilderness
181 Receptors
USFS Boundary Source:
FS National Coverage file:
NRIS - ALP group
Corvallis, OR
August 21, 2003



Attachment F.2-1

Additional Climate and Meteorological Data for the San Diego Regional Area

Under the Köppen climate classification system, the San Diego area straddles areas of Mediterranean climate (CSa) to the north and Semi-arid climate (BSh) to the south and east. As a result, it is often described as "arid Mediterranean" and "Semi-arid Steppe". San Diego's climate is characterized by warm, dry summers and mild winters with most of the annual precipitation falling between November and March. The city has mild, mostly dry weather, with an average of 201 days above 70 °F (21 °C) and low rainfall (9-13" annually). Summer temperatures are generally warm, with average highs of 70–78 °F (21–26 °C) and lows of 55–66 °F (13–19 °C). Temperatures exceed 90 °F (32 °C) only four days a year. Winter temperatures are mild, with average high temperatures of 66–70 °F (19–21 °C) and lows of 50–56 °F (10–13 °C). Average annual temperature of the ocean is 65 °F (18 °C), from 59 °F (15 °C) in January to 72 °F (22 °C) in August. The highest recorded temperature at the official weather station is 111 °F (44 °C) on September 26, 1963. The lowest recorded temperature is 25 °F (−4 °C) on January 7, 1913.[42]

Official temperature record-keeping began in San Diego in 1872, although other weather records go back further. The city's first official weather station was located at Mission San Diego from 1849 to 1858. From August 1858 until 1940, the official weather station was located at a series of downtown buildings, and the station has been at Lindbergh Field since February 1940.

There have been only nine days with a recorded temperature of 32 °F (0 °C) or below since record-keeping began in 1872.

The climate in the San Diego area, like much of California, often varies significantly over short geographical distances resulting in microclimates. In San Diego's case this is mainly due to the city's topography (the Bay, and the numerous hills, mountains, and canyons). Frequently, particularly during the "May gray/June gloom" period, a thick "marine layer" cloud cover will keep the air cool and damp within a few miles of the coast, but will yield to bright cloudless sunshine approximately 5–10 miles (8.0–16 km) inland. Even in the absence of June gloom, inland areas tend to experience much more significant temperature variations than coastal areas, where the ocean serves as a moderating influence. Thus, for example, downtown San Diego averages January lows of 50 °F and August highs of 78 °F. The city of El Cajon, just 10 miles (16 km) northeast of downtown San Diego, averages January lows of 42 °F and August highs of 88 °F. However sometimes the June gloom can last for several days even into July causing cloudy skies for San Diego for the entire day.

Rainfall along the coast averages about 10 inches (250 mm) of precipitation annually, which occurs mainly during the cooler months of December through April. Though there are few wet days per month during the rainy period, rainfall can be heavy when it does fall. Rainfall is usually greater in the higher elevations of San Diego; some of the higher elevation areas of San Diego can receive 11–15 inches (280–380 mm) of rain a year.

Snow in the city is so rare that it has been observed only five times in the century-and-a-half that records have been kept. In 1949 and 1967, snow stayed on the ground for a few hours in higher locations like Point Loma and La Jolla. The other three occasions, in 1882, 1946, and 1987, involved flurries but no accumulation.

Climate data for San Diego (San Diego Airport)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °F (°C)	65.8 (18.78)	66.3 (19.06)	66.3 (19.06)	68.7 (20.39)	69.3 (20.72)	72.2 (22.33)	75.8 (24.33)	77.5 (25.28)	77.0 (25)	74.0 (23.33)	69.9 (21.06)	66.3 (19.06)	70.8 (21.56)
Daily mean °F (°C)	57.8 (14.33)	58.9 (14.94)	60.0 (15.56)	62.6 (17)	64.6 (18.11)	67.4 (19.67)	70.9 (21.61)	72.5 (22.5)	71.6 (22)	67.6 (19.78)	61.8 (16.56)	57.6 (14.22)	64.4 (18)
Average low °F (°C)	49.7 (9.83)	51.5 (10.83)	53.6 (12)	56.4 (13.56)	59.8 (15.44)	62.6 (17)	65.9 (18.83)	67.4 (19.67)	66.1 (18.94)	61.2 (16.22)	53.6 (12)	48.9 (9.39)	58.1 (14.5)
Rainfall inches (mm)	2.28 (57.9)	2.04 (51.8)	2.26 (57.4)	0.75 (19)	0.20 (5.1)	0.09 (2.3)	0.03 (0.8)	0.09 (2.3)	0.21 (5.3)	0.44 (11.2)	1.07 (27.2)	1.31 (33.3)	10.77 (273.6)
Avg. rainy days (≥ 0.01 in)	7.2	6.6	7.2	4.1	2.0	1.1	0.6	0.6	1.5	2.8	4.0	5.2	42.9
Sunshine hours	238.7	228.8	260.4	276.0	251.1	243.0	303.8	294.5	252.0	244.9	231.0	232.5	3,056.7

Source #1: NOAA (1971-2000)

Source #2: HKO (1961-1990)

LA MESA, CALIFORNIA (044735)

Period of Record Monthly Climate Summary

Period of Record : 1/ 1/1899 to 2/28/2006

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	67.1	68.1	68.7	71.7	73.9	77.5	83.1	84.5	83.7	79.0	73.5	68.7	75.0
Average Min. Temperature (F)	43.7	45.1	46.8	50.1	53.8	57.0	61.0	62.2	60.3	55.1	48.3	44.5	52.3
Average Total Precipitation (in.)	2.44	2.42	2.43	1.04	0.29	0.10	0.05	0.09	0.24	0.57	1.37	1.89	12.93
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 96.3% Min. Temp.: 95.7% Precipitation: 97% Snowfall: 97.2% Snow Depth: 97.1%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

LA MESA, CALIFORNIA

NCDC 1971-2000 Monthly Normals

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Monthly
Mean Max. Temperature (F)	68.5	69.5	69.8	73.1	74.3	78.9	83.6	85.5	84.1	79.6	73.4	68.8	75.8
Highest Mean Max. Temperature (F)	75.6	74.9	76.5	79.8	81.6	84.9	88.2	90.5	90.9	87.0	78.6	73.7	90.9
Year Highest Occurred	1986	1988	1997	1989	1997	1981	1985	1996	1997	1999	1995	1979	1997
Lowest Mean Max. Temperature (F)	62.5	64.1	64.3	66.1	69.1	72.3	78.1	81.3	77.4	73.8	68.5	61.6	61.6
Year Lowest Occurred	1979	1998	1973	1975	1977	1982	1987	1987	1986	2000	1985	1971	1971
Mean Temperature (F)	57.1	58.2	59.2	62.3	64.8	68.8	73.0	74.7	73.2	68.2	61.5	57.1	64.8
Highest Mean Temperature (F)	63.1	62.8	63.5	68.1	71.2	73.4	77.8	78.6	79.4	72.9	66.2	61.0	79.4
Year Highest Occurred	1986	1995	1997	1989	1997	1981	1984	1996	1984	1999	1995	1977	1984
Lowest Mean Temperature (F)	53.6	54.7	55.4	56.8	60.6	64.1	68.8	71.0	67.9	65.1	57.1	51.0	51.0
Year Lowest Occurred	1979	1990	1973	1975	1977	1982	1987	1975	1986	1981	1994	1971	1971
Mean Min. Temperature (F)	45.7	46.9	48.6	51.4	55.3	58.7	62.3	63.8	62.2	56.8	49.6	45.3	53.9
Highest Mean Min. Temperature (F)	50.6	53.5	52.2	56.9	61.3	61.9	67.5	67.7	68.9	62.2	53.8	51.7	68.9
Year Highest Occurred	1986	1995	1978	1992	1992	1981	1984	1992	1984	1987	1995	1977	1984
Lowest Mean Min. Temperature (F)	39.8	43.1	44.0	47.6	51.5	53.7	58.8	58.7	58.0	51.4	45.1	40.5	39.8
Year Lowest Occurred	1972	1979	1977	1975	1971	1971	1979	1975	1971	1971	1982	1971	1972
Mean Precipitation (in.)	2.89	2.52	2.98	1.05	0.33	0.11	0.06	0.10	0.29	0.58	1.32	1.52	13.75
Highest Precipitation (in.)	12.25	10.95	8.93	6.95	2.75	0.80	0.93	1.85	1.93	2.28	6.79	6.11	12.25
Year Highest Occurred	1993	1998	1983	1988	1977	1972	1991	1977	1976	1987	1985	1984	1993
Lowest Precipitation (in.)	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year Lowest													

Occurred	1976	1974	1997	1993	1999	2000	2000	1999	1999	1999	1999	1999	1976
Heating Degree Days (F)	249.	195.	193.	127.	87.	25.	4.	2.	10.	30.	138.	253.	1313.
Cooling Degree Days (F)	3.	5.	14.	45.	80.	139.	251.	302.	255.	128.	32.	7.	1261.

Western Regional Climate Center, wrcc@dri.edu

LA MESA, CALIFORNIA (044735)

1971-2000 Monthly Climate Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	68.5	69.3	70.3	73.0	74.6	79.1	83.9	85.4	84.0	79.6	70.8	69.0	75.8
Average Min. Temperature (F)	45.7	46.8	48.6	51.4	55.2	58.6	62.3	63.7	61.8	56.6	47.8	45.3	53.8
Average Total Precipitation (in.)	2.75	2.78	2.64	1.11	0.37	0.11	0.05	0.15	0.24	0.58	1.35	1.73	13.85

Unofficial values based on averages/sums of smoothed daily data. Information is computed from available daily data during the 1971-2000 period. Smoothing, missing data and observation-time changes may cause these 1971-2000 values to differ from official NCDC values. This table is presented for use at locations that don't have official NCDC data. No adjustments are made for missing data or time of observation. Check NCDC normals table for official data.

Western Regional Climate Center, wrcc@dri.edu

EL CAJON, CALIFORNIA (042706)

Period of Record Monthly Climate Summary

Period of Record : 11/1/1979 to 12/31/2010

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	69.7	69.8	71.3	75.4	77.4	81.7	87.5	88.9	87.5	81.0	74.8	69.4	77.9
Average Min. Temperature (F)	42.3	44.3	47.3	50.4	55.4	58.5	62.8	64.0	61.2	54.9	46.1	41.5	52.4
Average Total Precipitation (in.)	2.41	2.77	2.31	0.82	0.15	0.08	0.09	0.02	0.16	0.66	1.28	1.72	12.49
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 91.6% Min. Temp.: 91.1% Precipitation: 91.8% Snowfall: 92.1% Snow Depth: 92%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

EL CAJON, CALIFORNIA

NCDC 1971-2000 Monthly Normals

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Monthly
Mean Max. Temperature (F)	68.2	69.3	70.1	74.1	76.4	82.0	87.0	88.1	86.5	80.2	73.5	68.3	77.0
Highest Mean Max. Temperature (F)	73.3	74.9	78.7	81.5	84.9	87.3	91.4	93.0	94.3	89.7	80.2	77.1	94.3
Year Highest Occurred	1986	1981	1997	1996	1997	1974	1980	1995	1979	1999	1995	2000	1979
Lowest Mean Max. Temperature (F)	60.5	64.0	62.5	65.0	70.2	76.3	80.4	83.2	78.2	74.9	67.5	60.1	60.1
Year Lowest Occurred	1979	1998	1973	1975	1995	1991	1987	1987	1986	1972	1994	1971	1971
Mean Temperature (F)	54.9	56.7	58.3	62.1	65.6	70.3	74.7	76.0	73.9	67.4	59.4	54.3	64.5
Highest Mean Temperature (F)	59.3	60.2	62.5	66.9	71.8	73.9	78.7	79.5	79.9	71.4	64.5	59.8	79.9
Year Highest Occurred	1986	1995	1997	1989	1997	1981	1984	1998	1984	1999	1995	1977	1984
Lowest Mean Temperature (F)	50.4	52.5	53.1	55.3	60.7	66.9	70.0	71.9	67.9	63.5	54.7	49.5	49.5
Year Lowest Occurred	1979	1990	1973	1975	1977	1991	1987	1976	1986	1971	1994	1971	1971
Mean Min. Temperature (F)	41.6	44.0	46.5	50.1	54.7	58.5	62.4	63.8	61.3	54.6	45.2	40.3	51.9
Highest Mean Min. Temperature (F)	47.8	48.8	51.3	54.5	61.4	62.0	67.5	67.2	68.1	60.6	48.7	46.7	68.1
Year Highest Occurred	1980	1995	1978	1989	1992	1981	1984	1992	1984	1987	1995	1977	1984
Lowest Mean Min. Temperature (F)	37.0	38.5	40.4	45.5	51.2	55.4	59.0	59.9	57.5	49.8	41.2	37.6	37.0
Year Lowest Occurred	1972	1990	1977	1975	1977	1980	1983	1975	1986	1971	2000	1990	1972
Mean Precipitation (in.)	2.47	2.57	2.66	0.79	0.16	0.06	0.04	0.06	0.15	0.46	1.18	1.36	11.96
Highest Precipitation (in.)	11.43	10.35	9.66	2.42	1.21	0.91	0.68	1.07	1.05	1.92	7.21	5.32	11.43
Year Highest Occurred	1993	1998	1983	1988	1998	1990	1991	1977	1997	1986	1985	1984	1993
Lowest Precipitation (in.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Year Lowest													

Occurred	2000	1989	2000	2000	1999	2000	2000	2000	2000	1999	2000	2000	2000
Heating Degree Days (F)	315.	238.	222.	131.	77.	13.	0.	0.	7.	40.	183.	334.	1560.
Cooling Degree Days (F)	0.	4.	13.	44.	94.	170.	301.	340.	275.	114.	13.	3.	1371.

Western Regional Climate Center, wrcc@dri.edu

EL CAJON, CALIFORNIA (042706)

1971-2000 Monthly Climate Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	69.1	70.0	71.7	75.5	77.2	81.7	87.3	88.8	86.7	81.4	71.9	69.5	77.8
Average Min. Temperature (F)	42.3	44.7	47.2	50.9	55.3	58.6	62.6	64.0	61.2	54.7	44.4	41.2	52.4
Average Total Precipitation (in.)	2.62	2.89	2.59	0.86	0.23	0.10	0.02	0.04	0.16	0.45	1.24	1.57	12.78

Unofficial values based on averages/sums of smoothed daily data. Information is computed from available daily data during the 1971-2000 period. Smoothing, missing data and observation-time changes may cause these 1971-2000 values to differ from official NCDC values. This table is presented for use at locations that don't have official NCDC data. No adjustments are made for missing data or time of observation. Check NCDC normals table for official data.

Western Regional Climate Center, wrcc@dri.edu

SAN DIEGO WSO AIRPORT, CALIFORNIA (047740)

Period of Record Monthly Climate Summary

Period of Record : 1/ 1/1914 to 12/31/2010

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	64.7	65.2	65.9	67.4	68.6	70.9	74.8	76.3	75.7	73.0	70.0	65.8	69.9
Average Min. Temperature (F)	48.0	49.7	51.8	54.7	58.0	60.8	64.4	65.7	63.9	59.3	52.9	48.7	56.5
Average Total Precipitation (in.)	2.03	1.99	1.64	0.78	0.21	0.05	0.02	0.06	0.17	0.51	0.95	1.78	10.18
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 99.9% Min. Temp.: 99.9% Precipitation: 99.9% Snowfall: 83.3% Snow Depth: 83.3%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

SAN DIEGO WSO AIRPORT, CALIFORNIA

NCDC 1971-2000 Monthly Normals

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Monthly
Mean Max. Temperature (F)	65.8	66.3	66.3	68.7	69.3	72.2	75.8	77.5	77.0	74.0	69.9	66.3	70.8
Highest Mean Max. Temperature (F)	70.3	71.3	70.5	73.4	74.5	78.0	81.8	82.8	83.7	78.8	76.5	71.3	83.7
Year Highest Occurred	1986	1977	1984	1992	1978	1981	1984	1983	1984	1982	1976	1976	1984
Lowest Mean Max. Temperature (F)	61.8	61.5	62.9	64.1	64.4	66.9	71.6	72.7	71.4	69.5	65.7	61.7	61.5
Year Lowest Occurred	1971	1971	1991	1975	1999	1999	1987	1999	1999	2000	1994	1971	1971
Mean Temperature (F)	57.8	58.9	60.0	62.6	64.6	67.4	70.9	72.5	71.6	67.6	61.8	57.6	64.4
Highest Mean Temperature (F)	61.3	63.5	64.3	67.0	68.7	72.9	77.2	77.4	78.9	72.2	66.8	63.3	78.9
Year Highest Occurred	1981	1980	1978	1992	1997	1981	1984	1983	1984	1983	1976	1977	1984
Lowest Mean Temperature (F)	54.3	55.2	56.5	58.7	60.5	62.8	67.1	68.0	66.9	64.3	56.4	53.9	53.9
Year Lowest Occurred	1971	1990	1991	1975	1999	1999	1987	1999	1986	1996	1994	1987	1987
Mean Min. Temperature (F)	49.7	51.5	53.6	56.4	59.8	62.6	65.9	67.4	66.1	61.2	53.6	48.9	58.1
Highest Mean Min. Temperature (F)	54.9	56.3	58.3	60.5	63.8	67.7	72.6	72.9	74.0	66.5	58.1	57.6	74.0
Year Highest Occurred	1980	1980	1978	1992	1997	1981	1984	1984	1984	1983	1983	1977	1984
Lowest Mean Min. Temperature (F)	44.9	47.1	50.1	53.1	56.5	58.7	62.5	63.3	61.9	57.1	47.1	45.5	44.9
Year Lowest Occurred	1989	1990	1991	1999	1991	1999	1987	1999	1986	1971	1994	1990	1989
Mean Precipitation (in.)	2.28	2.04	2.26	0.75	0.20	0.09	0.03	0.09	0.21	0.44	1.07	1.31	10.77
Highest Precipitation (in.)	9.09	7.65	6.96	3.71	1.79	0.87	0.24	2.13	1.04	1.74	4.92	4.55	9.09
Year Highest Occurred	1993	1998	1991	1988	1977	1990	1991	1977	1986	1987	1985	1984	1993
Lowest Precipitation (in.)	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Year Lowest													

Occurred	1976	1974	1997	1993	2000	2000	2000	1999	2000	1999	1980	2000	1976
Heating Degree Days (F)	227.	176.	160.	90.	47.	10.	0.	0.	1.	12.	109.	231.	1063.
Cooling Degree Days (F)	2.	4.	5.	17.	32.	81.	183.	230.	199.	97.	15.	1.	866.

Western Regional Climate Center, wrcc@dri.edu

SAN DIEGO WSO AIRPORT, CALIFORNIA (047740)

1971-2000 Monthly Climate Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	65.8	66.2	66.7	68.4	69.4	72.2	75.8	77.4	76.9	74.1	67.5	66.4	70.8
Average Min. Temperature (F)	49.7	51.5	53.6	56.4	59.7	62.6	65.9	67.3	65.9	61.1	52.1	49.1	58.1
Average Total Precipitation (in.)	2.17	2.19	2.00	0.83	0.22	0.09	0.03	0.11	0.18	0.44	1.07	1.45	10.78

Unofficial values based on averages/sums of smoothed daily data. Information is computed from available daily data during the 1971-2000 period. Smoothing, missing data and observation-time changes may cause these 1971-2000 values to differ from official NCDC values. This table is presented for use at locations that don't have official NCDC data. No adjustments are made for missing data or time of observation. Check NCDC normals table for official data.

Western Regional Climate Center, wrcc@dri.edu

APPENDIX F.3

DISPERSION MODELING PROTOCOL

APPENDIX F.3

Modeling Protocol

A number of air quality related impact analyses were conducted using state-of-the-art dispersion models and modeling techniques. Modeling was used to assess impacts for the following types of issues:

- Compliance with state and federal air quality standards,
- Compliance with local air district NSR impact standards,
- Evaluation of PSD increment consumption on Class I areas,
- Evaluation of visibility impacts,
- Evaluation of depositional impacts,
- Evaluation of AQRV impacts,
- Evaluation of Class II area impacts,
- Evaluation of impacts on soils, vegetation, and sensitive biological species,
- Evaluation of cumulative impacts, and,
- Evaluation of health risk impacts.

The air quality models, and analysis techniques used in these analyses, are summarized in the enclosed Modeling Protocol, with additional support data provided in Appendices F.1, and F.2, and F.4 through F.10. The Protocol also outlines the support data that was used in the various analyses, and how the support data was acquired, processed, and quality assured. The protocol has been submitted to the various air quality agencies for review and comment.

Attachment F.3-1 Dispersion Modeling and Impact Analysis Protocol

Attachment F.3-1
Modeling Protocol

ATMOSPHERIC DYNAMICS, INC
Meteorological & Air Quality Modeling

August 4, 2011

Mr. Ralph DeSiena
San Diego Air Pollution Control District
10124 Old Grove Road
San Diego, CA. 92131-1649

Re: Air Quality Modeling Protocol for the Quail Brush Power Project

Dear Ralph:

Attached is the Air Quality Modeling Protocol for the Quail Brush Power Project (QBPP). Quail Brush Genco, LLC, is proposing to construct and operate the QBPP facility located on Sycamore Landfill Road, west of Santee, California. The project will be a nominal 102.3 MW facility utilizing natural gas-fired internal reciprocating engine technology. The engines proposed for use are Wartsila 20V34SG-C2's. Each engine is rated at approximately 9.3 MW. In addition to the power cycle engines, the facility will have a dry "radiator" cooling system, fuel gas and warm start heaters, and an emergency fire pump system.

The proposed project will be a minor new source as defined by the San Diego Air Pollution Control District (APCD or SDAPCD) Siting Regulations. The Environmental Protection Agency (EPA) Prevention of Significant Deterioration rules will apply to the proposed source for GHGs as well as NO_x, PM10, and PM2.5. QBPP will not be subject to APCD requirements for emission offsets but will require an air quality modeling analyses for criteria pollutants and toxics. The APCD regulatory requirements include:

- APCD does not, at this time, have PSD delegation; therefore any required PSD permits will be issued by EPA Region 9.
- PSD applicability per the Tailoring Rule provisions for GHGs, will result in other criteria pollutants being subject to PSD by virtue of emissions exceeding the PSD significant emissions rates (SERs), which include NO_x, PM10 and PM2.5.
- PSD applicability by virtue of the GHG Tailoring Rule provisions, and subsequent imposition of PSD for other criteria pollutants will not affect the source status, i.e., major or non-major, under the APCD NSR Rules (20.1, 20.2, 20.3).

- Based on data derived from discussions with SDAPCD staff, the APCD is classified as a "basic" nonattainment area for ozone. But, the APCD has requested a re-designation to "serious" ozone nonattainment, which will most likely be in effect at the time of submittal of this AFC and the accompanying PSD permit application.
- SDAPCD Rule 20.1 defines the major source emissions thresholds for serious ozone nonattainment areas as follows:
    - PM10 100 TPY
    - NO_x 50 TPY
    - VOCs 50 TPY
    - SO_x 100 TPY
    - CO 100 TPY
- SDAPCD Rule 20.1 further defines NOX and VOC as precursors to ozone. Notwithstanding this definition, the region is attainment for NO_2.

The applicant will submit air quality impact analyses to the SDAPCD, EPA Region 9, and the California Energy Commission (CEC). The modeling analysis, based on GHGs triggering PSD, will include impact evaluations for those pollutants shown in Table 1 and the CEC requirements for evaluation of project air quality impacts. The purpose of this document is to establish the procedure for meeting the APCD, EPA, and CEC air quality modeling requirements for the proposed project.

Table 1
PSD Significant Emissions Thresholds

Pollutant	**Cumulative Increase (tons/yr)**
NO_x	40
SO_2	40
CO	100
VOC	40
PM10/PM2.5	15/10

The project will result in emissions that will exceed PSD significant emissions thresholds for of oxides of nitrogen (NO_x), volatile organic compounds (VOC) and particulate matter (PM10/2.5). Sulfur dioxide (SO_2), carbon monoxide (CO), and are expected to be below the significant emission levels. The project will also trigger CEC modeling requirements for cumulative and construction-based impacts. Based on emissions of NO_x and PM10/2.5, the project will trigger the APCD Air Quality Impact Assessment (AQIA) requirements, which require that a new project does not cause or

contribute to violations of the air quality standards. It should be noted that the project only triggers the PSD modeling requirements for NO_x and PM10/2.5 based on the project emissions of GHGs rather than the rather than the pollutants of NO_x, CO, SO_X, and PM.

As part of the major PSD source permit application, an air quality, toxics, and cumulative impacts analyses are required. At this time, modeled ambient impacts are expected to be below the levels at which preconstruction monitoring is required. The results of these analyses will be presented in detail in the AFC and the application for a Determination of Compliance.

As part of application process and in accordance with the APCD requirements, a modeling protocol is required. This modeling protocol outlines the proposed use of air dispersion modeling techniques that will be used to assess impacts from the proposed facility, and has been prepared by Atmospheric Dynamics, Inc. on behalf of QBPP. This protocol also follows modeling guidance provided by the U.S. Environmental Protection Agency (USEPA) in its "*Guideline on Air Quality Models*" (including supplements), USEPA Memorandum "*Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard*" (March 2011), USEPA Memorandum "*Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard*" (August 2010), USEPA Memorandum "*Modeling Procedures for Demonstrating Compliance with PM2.5 NAAQS (March 2010),* California Air Pollution Control Officers Association (CAPCOA) "*Modeling Compliance of the Federal 1-Hour NO_2 NAAQS*"(Draft Release 2011), the Federal Land Managers' "*Air Quality Related Values Workgroup (FLAG) Phase I Report-Revised*" (October 2010), and the "*Interagency Workgroup on Air Quality Modeling (IWAQM) Phase II Recommendations*" (1998), as well as additional modeling guidance.

Impacts from operation of the facility will be compared to the following in Table 2:

Table 2 Air Quality Criteria	NO_2	PM10	PM2.5	CO	SO_2
PSD Significant Impact Levels	✓	✓	✓		
PSD Monitoring Exemption Levels	✓	✓			
PSD Increments	✓	✓			
Ambient Air Quality Standards	✓	✓	✓	✓	✓
Class I and Class II Visibility	✓	✓			
Impacts to Soils and Vegetation	✓	✓	✓	✓	✓
Class I Area Acid Deposition	✓				

Concurrent with the submittal of the Application for Certification (AFC) to the California Energy Commission and the PSD application to the Environmental

Protection Agency Region 9, the applicant will be applying to the SDAPCD for an Authority to Construct and a Determination of Compliance for the proposed project. Attached for your review is a description of the analytical approach that will be used to comply with District modeling requirements for the project.

We look forward to working with you. If you have any questions, please do not hesitate to call me at (831) 620-0481. Thank you for your attention in this matter.

Sincerely,

Atmospheric Dynamics, Inc.

Gregory S. Darvin
Senior Meteorologist

cc:
Carol Bohnenkamp, EPA Region 9

Mr. Gerry Bemis, P.E.

INTRODUCTION AND FACILITY DESCRIPTION

The proposed facility will consist of eleven (11) Wartsila 20V34SG-C2 engines, each rated at ~9.3 MW. These engines will incorporate lean burn design for primary NO_x control. Each engine will have its own exhaust stack. In addition to lean burn design, each unit will be equipped with an SCR system using urea as the reaction agent in the final NO_x control process, and a CO oxidation catalyst for control of CO (and VOC and VOC HAPs) emissions. Each stack will have a CEMS as required by the local APCD regulations, as well as an exhaust gas silencer system.

The site is located west-northwest of the City of Santee, California (San Diego County). The site is located on the north side of Hwy 52, adjacent to and east of Sycamore Landfill Rd. The Sycamore Landfill lies to the north of the site approximately 0.42 miles. The City of Santee lies in close proximity to the site to the northeast (1.3 miles), east (0.94 miles), and southeast (0.3 miles). The topography of the site and surrounding area is essentially low rolling hills, with elevations ranging from 250 to over 800 feet above mean sea level. The site elevation ranges from approximately 415 to 530 feet above mean sea level. The site and immediate surrounding area to the north, west, and south-southwest are primarily uninhabited vacant open space in nature. The site occupies approximately 21.7 acres of presently vacant "industrial" land. The MCAS Miramar boundary is to the north of the site approximately 1.55 miles, and the main runway complex at MCAS Miramar is 6 miles to the northwest. Gillespie Field (airport) lies approximately 3 miles to the southeast, and Montgomery Field (airport) lies 6.4 miles to the southwest.

There are no stationary sources of air pollutants located on the proposed project site at this time. The property is vacant, with no buildings or structures on the site.

According to the Auer land use classification scheme, a 3-kilometer radius boundary around the proposed site yields a predominately rural classification. This is consistent with the current (City of San Diego) land use and general plan designation for the site and surrounding area as "open space," i.e., a large portion of the land surrounding the proposed site (to the southwest, west, northwest, and northeast) is vacant. The site is zoned RS-1-8 (single family residential), although it is unlikely that residential units will be built in such close proximity to the Sycamore Landfill. The Sycamore landfill, which lies to the north of the project site is zoned "industrial employment".

Each of the new engines will operate in simple-cycle mode, i.e., no heat recovery from the engine exhaust will be used to augment engine power production, and will fire natural gas only. The Wartsila 20V34SG-C2 engines are four-stroke, port injected, turbocharged, inter-cooled, spark-ignited engines, working on the Otto process, lean burn principle. The engines are classified as medium-speed units, and have been proven to be highly efficient, low polluting, power production sources for peaking and cogeneration applications. Approximately 33 seven-fan radiator banks, 3 banks per engine generator set, will be provided for engine cooling.

Other equipment to be located on the site that will support the combustion process is as follows: fuel gas heater, two warm start heaters, fire-pump system, engine cooling water treatment and distribution system, water storage tank and forwarding pumps, electrical switchyard area, urea storage (1-20,000 gallon above ground storage tank) and containment area, administration building, gas compressor area, etc. Based upon a natural gas heat content of 1,019 Btu/scf (~22,900 Btu/lb), each engine will have a maximum heat rating of approximately 80.18 MMBtu/hr (HHV), with gross and net heat rates of 8,600 and 8,834 Btu/kW-hr (HHV) respectively. Each engine will consume fuel at a rate of approximately 78,685 standard cubic feet per hour at maximum rated load. The facility is being evaluated for an operational scenario of 4032 hours per year (which includes startups and shutdown times, as well as 3800 hours per year of normal operations). Daily operations will vary depending upon the dispatch requirements of San Diego Gas and Electric Company and Cal-ISO.

Proposed equipment specifications are summarized as follows:

Power Cycle Engines:

- Engine Manufacturer: Wartsila
- Engine Model: 20V34SG-C2
- Fuel: Natural Gas
- Nominal MW rating: 9.3 MW (~12874 Hp) each
- Number of engines: 11
- Heat rating: ~80.18 MMBtu/hr (HHV) each
- Hours per year: 4032 (each)

Natural Gas Fuel Heater:

- Manufacturer: TBD
- Model: TBD
- Number of heaters: 1
- Fuel: Natural Gas
- Heat Rate: 4 mmbtu/hr (HHV)
- Hours per year: 4232
- Burner Type: Low NOx Burner
- Fuel consumption: 3925.4 scf/hr (@1019 btu/scf)

Warm Start Heaters:

- Manufacturer: TBD
- Model: TBD
- Number of heaters: 2*
- Fuel: Natural Gas
- Heat Rate: 4 mmbtu/hr (HHV)

- Hours per year: 4928
- Burner Type: Low NOx Burner
- Fuel consumption: 3925.4 scf/hr (@1019 btu/scf)

*One of the warm start heaters is a backup, and as such, only one unit will be operated at any given time, and the total operation of both units combined will not exceed 4928 hours per year.

Diesel Engine Fire Pump System

- Mfg: John Deere
- Model: Clarke JU4H-UFADW8
- Tier: 3
- BHP: 144
- Fuel: Diesel
- Fuel Use Rate: 10 gals/hr
- Annual operations: 50 hrs/yr

The only fuel to be combusted on site by the Wartsila power cycle engines and the fuel gas and warm start heaters is Public Utilities Commission (PUC)-grade natural gas supplied by the local gas company (Sempra Utilities).

Table 3 presents the potential to emit annual emissions for the proposed QBPP.

TABLE 3 Potential to Emit for the QBPP

Pollutant	Proposed Facility TPY	SDAPCD Rule 20.1, 20.2 Offset Thresholds, TPY
NO_x	44.8	50
CO	56.5	100
VOC	46.5	50
SO_x	5.74	100
PM_{10}	33.1	100
$PM_{2.5}$	33..1	100
CO2e	191,589	n/a

PROPOSED AIR QUALITY DISPERSION MODELS

The United States Environmental Protection Agency (USEPA) dispersion models proposed for use to quantify pollutant impacts on the surrounding environment based on the emission sources operating parameters and their locations include the AERMOD modeling system (version 11103 with the associated receptor processing program AERMAP version 11103) for modeling most facility operational and construction impacts in both simple and complex terrain, the Building Profile Input Program for PRIME (BPIP-PRIME version 04274) for determining building dimensions for downwash calculations in AERMOD, the CTSCREEN model (version 94111) for determining PM impacts in complex terrain (for comparison to the SDAPCD significant impact levels used for emission offset purposes for the California ambient air quality standards), the SCREEN3 model (version 96043) for determining inversion breakup, impacts, and the use of the California Health Risk Assessment models/protocols for determining toxic impacts, which includes the HARP On-Ramp program. As noted later, AERMOD meteorological data were processed by SDAPCD using AERMET version 06341 and AERSURFACE, version 08009. These models, along with options for their use and how they are used, are discussed below. These models will be used for the following:

- Comparison of operational and construction impacts to significant impact levels (SILs), ambient monitoring significance thresholds, California Ambient Air Quality Standards (CAAQS), National Ambient Air Quality Standards (NAAQS), and PSD Increments using AERMOD or CTSCREEN (as needed);
- Cumulative impacts analyses with AERMOD in accordance with local/state/ USEPA/CEC requirements;
- Toxics analyses using ARB algorithms as incorporated into state/CEC requirements; and
- Assessment of impacts to soil and vegetation

EXISTING METEOROLOGICAL AND AIR QUALITY DATA

Available Meteorological Data: Hourly observations of certain meteorological parameters are used to define the area's dispersion characteristics. These data are used in approved air dispersion models for defining a project's impact on air quality. These data must meet certain criteria established by the USEPA and the following discussion details the proposed data and its applicability to this project.

The nearest representative surface data set in the general area of the proposed Project is the Overland Ave Monitoring Station, operated by the SDAPCD, located approximately 9.4 kilometers west-southwest of the project site. This surface meteorological data set was provided by the SDAPCD for the years 2003-2005, and for each of the listed years,

data recovery exceeds 90 percent. The corresponding upper air data was collected via a sodar operated by the SDAPCD at the Marine Corp Air Station Miramar for the same time periods. These data have been processed by the SDAPCD using AERMET (Version 06341) based on one (1) 360-degree sector for roughness lengths obtained from AERSURFACE for the Kearny Mesa monitoring station. SDAPCD supplemented these data as necessary with surface meteorological observations taken at Montgomery Field and profiler data (collected by the SDAPCD) combined with twice-daily upper air radiosonde observations taken at the Marine Corps Air Station Miramar. These data processed by SDAPCD were used in the AERMOD analyses without any revisions.

The area surrounding the project site, within three (3) km, can be characterized as rural, made up mostly of shrub lands and grasslands, based on review of land use/land cover data as well as recent aerial photo data. In accordance with the Auer land use classification methodology (USEPA's "*Guideline on Air Quality Models*"), land use within the area circumscribed by a three km radius around the facility is greater than 50 percent rural. Therefore, in the modeling analyses supporting the permitting of the facility, no urban coefficients will be assigned.

Meteorological Data Representativeness: The proposed use of the three (3) years of SDAPCD supplied surface meteorological data collected at the Kearny Mesa monitoring location would satisfy the definition of on-site data. USEPA defines the term "on-site data" to mean data that would be representative of atmospheric dispersion conditions at the source and at locations where the source may have a significant impact on air quality. Specifically, the meteorological data requirement originates from the Clean Air Act in Section 165(e)(1), which requires an analysis "of the ambient air quality at the proposed site and in areas which may be affected by emissions from such facility for each pollutant subject to regulation under [the Act] which will be emitted from such facility." This requirement and USEPA's guidance on the use of on-site monitoring data are also outlined in the On-Site Meteorological Program Guidance for Regulatory Modeling Applications (USEPA, 1987). The representativeness of meteorological data is dependent upon: (a) the proximity of the meteorological monitoring site to the area under consideration; (b) the complexity of the topography of the area; (c) the exposure of the meteorological sensors; and (d) the period of time during which the data are collected.

First, the meteorological monitoring site and proposed project location are in close proximity (9.4 kilometers), at approximately the same elevation and with similar topography surrounding each location. Second, the Kearny Mesa monitoring site and proposed project location are located roughly about the same distance and in the same orientation to significant terrain features that might influence wind flow patterns. There are two small scale localized terrain features near the proposed project site; Cowles and Fortuna Mountains which extend approximately 700 feet in height above

both the monitoring and project site base elevations. These terrain features are part of the same large scale terrain features in the area that are oriented in a northeast-southwest direction. Cowles and Fortuna Mountain are bisected with passes and canyons that run in the same northeast and southwest directions as the larger terrain features in the area. Based on the small size of the terrain, it is unlikely that either of these two features will influence the predominant meteorology in the project area. Third, as discussed below, the surface characteristics roughness length, Bowen ratio, and albedo are relatively consistent throughout the area and are nearly identical between the project site and the meteorological monitoring location.

Representativeness is defined in the document "Workshop on the Representativeness of Meteorological Observations" (Nappo et. al., 1982) as "the extent to which a set of measurements taken in a space-time domain reflects the actual conditions in the same or different space-time domain taken on a scale appropriate for a specific application." Judgments of representativeness should be made only when sites are climatologically similar, as is the case with the meteorological monitoring site and the proposed project location. In determining the representativeness of the meteorological data set for use in the dispersion models at the project site, the consideration of the correlation of terrain features to prevailing meteorological conditions, as discussed earlier, would be nearly identical to both locations since the orientation and aspect of terrain at the proposed project location correlates well with the prevailing wind fields as measured by and contained in the meteorological dataset. In other words, the same mesoscale and localized geographic and topographic features that influence wind flow patterns at the meteorological monitoring site also influence the wind flow patterns at the proposed project site.

Surface characteristics were determined with AERSURFACE using Land Use/Land Cover (LULC) data in accordance with USEPA guidance documents ("*AERMOD Implementation Guide,*" 1/09/08; and "*AERSURFACE User's Guide*," EPA-454/B-08-001, 1/08) as described below. AERSURFACE uses U.S. Geological Survey (USGS) National Land Cover Data 1992 archives (NLCD92) to determine the midday albedo, daytime Bowen ratio, and surface roughness length representative of the surface meteorological station. ***Bowen ratio*** is based on a simple unweighted geometric mean while ***albedo*** is based on a simple unweighted arithmetic mean for the 10x10 km square area centered on the selected location (i.e., no direction or distance dependence for either parameter). ***Surface roughness length*** is based on an inverse distance-weighted geometric mean for upwind distances up to one (1) km from the selected location. The circular surface roughness length area (1-km radius) can be divided into any number of sectors as appropriate (USEPA guidance recommends that no sector be less than 30° in width). As noted above, SDAPCD executed AERMET using one 360-degree sector for roughness lengths obtained from AERSURFACE for the Kearny Mesa monitoring location

Running AERSURFACE at both the meteorological monitoring and proposed site locations produced almost identical results for both Bowen ratio and Albedo, based on the 10 kilometer area around each location. There were some variations in land cover and roughness lengths between the two locations based on a one kilometer radius, but both areas are mostly rural. Table 1 presents the AERSURFACE land use types within one kilometer of the meteorological monitoring and project locations. Based on the Auer land use classifications, both locations are classified as rural and there is good correlation of the rural characteristic land types between the two locations. Within the one-kilometer radius around the Kearny Mesa Monitoring Station, there is a 51.4 percent urban classification, but review of the photo aerial data suggests that most of this is due to the airport runways being classified as LULC category 23 (transportation). These areas, although including the paved runway surfaces, have low surface roughness lengths more closely comparable to rural categories than areas with commercial/industrial buildings/structures. Comparing the LULC data at the project site to the meteorological monitoring site showed that the same general land use categories exist around the project site and the meteorological monitoring site, with the both locations having over 75 percent associated with open, rural areas. Thus, the predominant land use in the area is made up of rural categories.

Table 1 AERSURFACE Land Cover Counts: Surface Roughness (1-km)

		Quail Brush Project Site			Kearny Mesa Monitoring Site		
LULC Category		**Count**	**%Rural**	**%Urban**	**Count**	**%Rural**	**%Urban**
11	Open Water:	9	0.3%	-	0	-	-
12	Perennial Ice/Snow:	0	-	-	0	-	-
21	Low Intensity Residential:	29	0.8%	-	145	4.2%	-
22	High Intensity Residential:	11	-	0.3%	0	-	-
23	Commercial/Industrial/Trans:	9	-	0.3%	1794	-	51.4%
31	Bare Rock/Sand/Clay:	256	7.3%	-	201	5.8%	-
32	Quarries/Strip Mines/Gravel:	0	-	-	0	-	-
33	Transitional:	0	-	-	0	-	-
41	Deciduous Forest:	121	3.5%	-	7	0.2%	-
42	Evergreen Forest:	390	11.2%	-	51	1.5%	-
43	Mixed Forest:	90	2.6%	-	105	3.0%	-
51	Shrubland:	1904	54.5%	-	1085	31.1%	-
61	Orchards/Vineyard/Other:	0	-	-	0	-	-
71	Grasslands/Herbaceous:	665	19.0%	-	66	1.9%	-
81	Pasture/Hay:	0	-	-	3	0.1%	-
82	Row Crops:	0	-	-	4	0.1%	-
83	Small Grains:	2	0.1%	-	0	-	-
84	Fallow:	0	-	-	1	0.0%	-
85	Urban/Recreational Grasses:	1	0.0%	-	27	0.8%	-
91	Woody Wetlands:	1	0.0%	-	0	-	-
92	Emergent Herbaceous Wetlands:	5	0.1%	-	4	0.1%	-
	Total:	3493	99.4%	0.6%	3493	48.6%	51.4%

Comparing the AERSURFACE outputs in Table 2, using one 360 degree sector around each location, shows that the average surface characteristics by season are also very similar. For roughness length, the variations between the two sites are minimal.

Roughness lengths are often categorized into classes between 0 (water) and 4 (urban). Open land areas, low vegetation areas, and agriculture are often assigned roughness lengths of 0.01 (class 1) to 0.16 (class 2). Thus, it is noted that there are no changes in classes between the two locations and the predominant land use activity in the project and meteorological monitoring locations are associated with open or rural land uses.

Table 2 AERSURFACE Results/Inputs for Project and Meteorological Monitoring Locations

Parameter by Season (Month)	Quail Brush Project Site	Kearny Mesa Monitoring Site*
Surface Roughness (meters)		
Winter (none)	-	-
Spring (Mar-Apr)	0.286	0.530
Summer (May-Sept)	0.322	0.540
Fall (Oct-Feb)	0.322	0.539
Albedo		
Winter (none)	-	-
Spring (Mar-Apr)	0.17	0.17
Summer (May-Sept)	0.17	0.17
Fall (Oct-Feb)	0.17	0.17
Bowen Ratio		
Winter (none)	-	-
Spring (Mar-Apr)	0.85	0.97
Summer (May-Sept)	0.81	0.95*
Fall (Oct-Feb)	1.25	1.30
AERMOD Inputs		
Latitude/UTM-X(m)	32.851	32.83645
Longitude/UTM-Y(m)	-117.029	-117.12875
Datum	NAD83	NAD83
Source	Google Earth	Google Earth
Snow Cover	NO	NO
Arid Region	NO	NO
Airport Location	NO	NO
Surface Moisture	AVERAGE	AVERAGE
Surface Roughness Radius (km)	1.0	1.0
Number of Sectors	1 (0-360deg)	1 (0-360deg)

*0.94 Bowen ratio in SDAPCD Stage 3 AERMOD input file is the only difference.

For these reasons as discussed above, the Kearny Mesa meteorological data selected for the proposed project are expected to satisfy the definition of representative meteorological data. Thus, it is our assessment that this meteorological data are identical to the dispersion conditions at the project site and to the regional area. As noted above, these data has been processed by the SDAPCD using AERMET (Version 06341) based on one (1) 360-degree sector for roughness lengths in AERSURFACE based on the Kearny Mesa monitoring location.

Existing Baseline Air Quality Data: The nearest criteria pollutant air quality monitoring sites to the proposed project site would be the SDAPCD monitoring stations located at Overland Ave (Kearny Mesa), El Cajon, Escondido, Alpine, and Del Mar.

Ambient monitoring data for these sites for the most recent four-year period (2007-2010) is summarized in Table 4. Data from these sites is estimated to present a reasonable representation of background air quality for the project site and impact area.

Table 4. Air Quality Summary for Most Recent 4 Years[1]

Pollutant	Site	Avg. Time	2007	2008	2009	2010
Ozone, ppm	El Cajon	1 Hr	.11	.107	.098	.102
	Del Mar		.11	.097	.097	.085
	Escondido		.094	.116	.093	.105
	Alpine		.134	.139	.119	.105
	SD-Overland		.088	.100	.105	.100
Ozone, ppm	El Cajon	8 Hr (4th max)	.073	.093	.082	.078
	Del Mar		.072	.078	.084	.072
	Escondido		.075	.098	.080	.084
	Alpine		.086	.109	.097	.088
	SD-Overland		.076	.093	.082	.073
PM10, ug/m^3	El Cajon	24 Hr	61	40	55	41
	Escondido		68	82	73	42
	SD-Overland		65	41	50	33
PM10, ug/m^3	El Cajon	Annual AM	27	27	25	21
	Escondido		24	25	25	21
	SD-Overland		22	24	25	19
PM2.5, ug/m^3	El Cajon	24 Hr (98th pctl)	42.7	30.7	56.5	27.7
	Escondido		124	44	78.3	48.4
	SD-Overland		31	27.2	25.1	18.7
PM2.5, ug/m^3	El Cajon	Annual AM	12.8	13.4	12.1	10.8
	Escondido		13.3	13	13	12
	SD-Overland		10	12	10.5	8.7
CO, ppm	Escondido	8 Hr	3.2	2.8	3.24	2.46
CO, ppm	Escondido	1 Hr	5.2	4.6	ND	ND
NO2, ppm	El Cajon	1 Hr[2]	.065	.054	.054	.058
	SD-Overland		.087	.056	.06	.073
	Escondido		.072	.073	.073	.064
	Alpine		.057	.042	.056	.052
NO2, ppm	El Cajon	Annual	.015	.016	.014	.013
	SD-Overland		.015	.014	.014	.013
	Escondido		.016	.018	.016	.014
	Alpine		.010	.008	.008	.007
SO2, ppm	San Diego Beardsley	Annual	-	.003	.001	.000
SO2, ppm	San Diego Beardsley	24 Hr	.006	.007	.006	.002
SO2, ppm	San Diego	3 Hr	.010	.014	ND	ND

	Beardsley					
SO2, ppm	San Diego Beardsley	1 Hr	.018	.019	ND	ND

Based on the data presented in Table 4, Overland Ave was selected as the most representative monitoring location for the project, given is close proximity to the project site as well as having similar land use characteristics to the project site. Overland Ave does not collect CO or SO_2. For these pollutants, data from Escondido (CO) and Beardsley (SO_2) were selected. The background values represented in Table 5 are the highest values reported for the site during any single year of the most recent three-year period.

Table 5 Estimated Background Air Quality Values

Pollutant and Averaging Time	Background Value
Ozone – 1 Hour	0.105 ppm (210 ug/m3)
Ozone – 8 Hour	0.093 ppm (182.5 ug/m3)
PM10 – 24 Hour	50 ug/m3
PM10 – Annual	25 ug/m3
PM2.5 – 24 Hour	27.2 ug/m3
PM2.5 – Annual	12 ug/m3
CO – 1 Hour	4.6 ppm (5290 ug/m3)
CO – 8 Hour	3.24 ppm (3600 ug/m3)
NO2 – 1 Hour (based on 98th percentile data analysis) Federal	0.0553 ppm (104 ug/m3)
NO2 – 1 Hour (based on 1st high data analysis) State	0.073 ppm (137.5 ug/m3)
NO2 – Annual	0.014 ppm (26.4 ug/m3)
SO2 – 1 Hr	0.019 ppm (49.8 ug/m3)
SO2 – 3 Hr	0.014 ppm (36.4 ug/m3)
SO2 – 24 Hour	0.007 ppm (18.4 ug/m3)

The attainment status of the proposed project site is designated for the NAAQS and CAAQS as follows:

Table 6 SDAPCD Attainment Status Listing

Pollutant	Federal Status	State Status
Ozone	Nonattainment*	Nonattainment
PM10/PM2.5	Attainment	Nonattainment
CO	Attainment	Attainment
NO2	Attainment	Attainment
SO2	Attainment	Attainment
Lead	Attainment	Attainment

*Federal Ozone Status Ranking = "basic", but in June of 2011 the APCD expects the ranking to be upgraded to "serious".

AIR QUALITY MODELING PROCEDURES WITH AERMOD/SCREEN3

Several dispersion models are proposed for use to quantify pollutant impacts on the surrounding environment based on the emission sources and operating parameters. AERMOD will be used to determine facility impacts on Class II areas in the immediate Project vicinity in simple, intermediate, and complex terrain areas during both Project operations and during construction of the Project. The AERMOD model will be used for comparison of impacts to significant impact levels, monitoring significance thresholds, and compliance with PSD Increments and AAQS.

Screening Modeling: A variety of facility operating conditions (e.g., minimum, maximum, and average ambient temperatures) and a range of engine loads will be conducted to identify which operating condition causes worst-case ambient air impacts. The modeling will be performed for stack characteristics and emissions for all applicable short-term averaging times (pollutants and averaging times with AAQS) using three (3) years of the selected meteorological dataset (described above). The worst-case short-term operating condition(s) so identified will be used in the refined modeling described below. Source characteristics for annual average impacts will be based on average operating conditions (i.e., average annual temperature, average operating load and worst-case annual emissions based on permitted hours of operation for both normal and startup, and shutdown conditions).

Refined Modeling: The purpose of the refined modeling analysis will be to demonstrate that air emissions from the Project will not cause or contribute to a NAAQS/CAAQS violation and will not cause a significant health risk impact. For modeling the project's operational impacts under normal and startup, shutdown, or malfunction conditions due to emissions from the proposed sources (as well as temporary project construction impacts) on nearby simple and complex terrain, the AERMOD model will be used with three (3) years of hourly meteorological data.

AERMOD is a steady-state plume dispersion model that simulates transport and dispersion from multiple point, area, or volume sources based on updated characterizations of the atmospheric boundary layer. AERMOD uses Gaussian distributions in the vertical and horizontal for stable conditions, and in the horizontal for convective conditions; the vertical distribution for convective conditions is based on a bi-Gaussian probability density function of the vertical velocity. For elevated terrain AERMOD incorporates the concept of the critical dividing streamline height, in which flow below this height remains horizontal, and flow above this height tends to rise up and over terrain. AERMOD also uses the advanced PRIME algorithm to account for building wake effects.

As part of the input requirements into AERMET and AERMOD, a land use classification must be made. The area surrounding the Project site was determined to be primarily rural following the methods outlined by the Auer land use classification method. As part of the AERMET input requirements, albedo, Bowen ratio, and Surface Roughness must be classified by season. These values will be determined with the AERSURFACE using the latest USEPA guidance (i.e., AERMOD Implementation Guide, revised January 9, 2008, and the AERSURFACE User's Guide (USEPA-454/B-08-001) as described earlier. AERMOD input data options are listed below following these USEPA modeling guidance documents.

- Final plume rise
- Stack tip downwash
- Regulatory default option (i.e., calm and missing meteorological data processing and elevated terrain heights option)

Flagpole receptors are not proposed to be used. AERMAP will be used to calculate receptor elevations and hill height scales for all receptors from NED GeoTIFF data in accordance with USEPA guidance.

Annual NO_2 concentrations will be calculated using the Ambient Ratio Method (ARM), adopted in Supplement C to the *Guideline on Air Quality Models* (USEPA, 1994). The Guideline allows a nationwide default conversion rate of 75% for annual NO_2/NO_x ratios.

To assess 1-hour NO_2 concentrations for comparison with the California AAQS (not the Federal 1-hour standard), ozone limiting will be used along with the temporal paring of background NO_2 data from the Kearny Mesa Monitoring Station. The ozone data and NO_2 data will be based on the same years as the surface meteorology input into AERMOD. Specifically, the background ozone and NO_2 data will be for the years 2003-2005. This approach was previously discussed with the SDAPCD.

<u>CTSCREEN Dispersion Model</u>

If the AERMOD model calculates exceedances of SILs, standards or increments in complex terrain, the CTSCREEN model may be used. The CTSCREEN model, screening mode of CTDMPLUS, is a refined point source Gaussian air quality model for use in all stability conditions for complex terrain applications. As a result of the model accounting for the dimensional nature of the plume and terrain interaction, the model requires digitized terrain of the nearby topographical features. The mathematical representation of terrain is accomplished by the terrain preprocessors, FITCON and HCRIT. CTSCREEN and CTDMPLUS are virtually the same air quality model, the main difference between the two is the meteorological data used. The wind direction used in CTSCREEN is based on the

source-terrain geometry, resulting in computation of the highest impacts likely to occur. Other meteorological variables are chosen from possible combinations from a set of predetermined values. CTSCREEN provides maximum concentration estimates that are similar to, but on the conservative side of, those that would be calculated from the CTDMPLUS model with a full year of on-site meteorological data.

As well as calculating maximum 1-hour concentrations at all receptors, the CTSCREEN model is designed to provide conservative estimates of worst case 3-hour, 24-hour, and annual impacts. Scaling factors are used to convert calculated 1-hour concentrations to 3-hour, 24-hour, and annual estimates. A workgroup study found the ratios to convert 1-hour concentrations to 3-hour, 24-hour, and annual concentrations to be 0.7, 0.15, and 0.03 respectively.

CTSCREEN is appropriate for the following applications:

- Elevated point sources
- Terrain elevations above stack top
- Rural areas
- One hour to annual averaging time periods

Meteorological data used by the CTSCREEN model is internally derived by the model itself, but is similar those 1-hour values used in the screening version of ISCST3. The CTSCREEN model utilizes its own scaling factors for time periods longer than one hour, as listed in Table 7.

Table 7
Model Persistence Factors

Averaging Period	**CTSCREEN Scaling Factor**
1-hour	1.0
3-hour	0.7
8-hour	NA
24-hour	0.15
Annual	0.03

<u>Federal 1-hour NO_2 NAAQS Modeling:</u>

EPA established a new 1-hour standard at a level of 100 ppb (188.68 µg/m3), based on the 3-year average of the annual 98th percentile of the daily maximum 1-hour concentrations in addition to the existing annual secondary standard (100 µg/m3). EPA has also

established requirements for a NO_2 monitoring network that will include monitors at locations where maximum NO_2 concentrations are expected to occur, including within 50 meters of major roadways, as well as monitors sited to measure the area-wide NO_2 concentrations that occur more broadly across communities.

To assess the Federal 1-hour NO_2 Standard, the methods summarized in the Draft CAPCOA Guidance Document "Modeling Compliance of the Federal 1-hour NO_2 NAAQS" are proposed for use. Specifically, the following methods will be used:

- First high with Ozone Limiting Method will be used for significant impact levels (SILs) for 1-hour NO_2.
- Ozone Limiting Method with recommended CAPCOA in stack NO_2/NO_x ratios based on the most recent updated data provided on the APCD web site.
- Three year average of the modeled 98th percentile coupled with seasonal hour of day (3rd highest) background.
- Background Ozone and NO_2 data from Kearny Mesa monitoring station.
- Missing background NO_2 and Ozone data will be filled in following the CAPCOA Gap Filling Procedures.

The Ozone Limiting Method (OLM) is proposed for use. Hourly ozone data collected at Kearny Mesa will be used in the OLM analysis to calculate hourly NO_2 concentrations from hourly NO_x concentrations. The years of ozone data used will be for the same years as the meteorological data modeled. The OLM is incorporated into the AERMOD program and involves an initial comparison of the estimated maximum NO_x concentration and the ambient O_3 concentration to determine which is the limiting factor to NO_2 formation. If the O_3 concentration is greater than the maximum NO_x concentration, total conversion is assumed. If the NO_x concentration is greater than the O_3 concentration, the formation of NO_2 is limited by the ambient O_3 concentration. In this case, the NO_2 concentration is set equal to the O_3 concentration plus a correction factor that accounts for in-stack and near-stack thermal conversion.

As summarized in the CAPCOA Guidelines as well as through EPA Policy Memorandum, OLM is proposed based on five selected criteria:

1. **The model has received a scientific peer review:**

   As noted in the U.S. EPA's June 2010 guidance document, because AERMOD is the preferred model for dispersion for a wide range of applications, the alternative model demonstration for use of the OLM/PVMRM options within AERMOD focuses on the treatment of NOX chemistry within the model, and does not need to address basic dispersion algorithms within AERMOD. The chemistry for OLM has been peer-reviewed, as noted by the documents posted on the U.S. EPA's Support Center for Regulatory Air Modeling web site. The

posted documents include *Sensitivity Analysis of PVMRM and OLM in AERMOD* (MACTEC, 2004) and *Evaluation of Bias in AERMOD-PVMRM* (MACTEC, 2005). Both documents indicate that the models appear to perform as expected.

2. **The model can be demonstrated to be applicable to the problem on a theoretical basis:**

As noted in the document entitled "Sensitivity Analysis of PVMRM and OLM In AERMOD" prepared by Roger W. Brode "This report presents results of a sensitivity analysis of the PVMRM and OLM options for NO_x to NO_2 conversion in the AERMOD dispersion model. Several single source scenarios were examined as well as a multiple-source scenario. The average conversion ratios of NO_2/NO_x for the PVMRM option tend to be lower than for the OLM option and for the Tier 2 option or the Ambient Ratio Method which has a default value of 0.75 for the annual average. The sensitivity of the PVMRM and OLM options to emission rate, source parameters and modeling options appear to be reasonable and are as expected based on the formulations of the two methods. For a given NO_x emission rate and ambient ozone concentration, the NO_2/NO_x conversion ratio for PVMRM is primarily controlled by the volume of the plume, whereas the conversion ratio for OLM is primarily controlled by the ground-level NO_x concentration.

Overall the PVMRM option appears to provide a more realistic treatment of the conversion of NO_x to NO_2 as a function of distance downwind from the source than OLM or the other NO_2 screening options (Hanrahan, 1999a; Hanrahan, 1999b). No anomalous behavior of the PVMRM or OLM options was identified as a result of these sensitivity tests."

Based on this report for both OLM/PVMRM appear to be applicable to the problem of NO_2 formation and as noted by the author provides a better estimation of the NO_2 impacts compared to other screening options (Tier 1 and 2).

3. **The databases which are necessary to perform the analysis are available and adequate:**

The data needed to conduct an OLM run with hourly seasonal background NO_2 data are hourly meteorological data, hourly ozone data, hourly NO_2 data, and in-stack NO_2/NO_x ratios. The hourly ozone and meteorological data exist for the same time period at the same Kearny Mesa Monitoring Station, operated by the SDAPCD.

The Kearny Mesa monitoring site is located on Overland Avenue in the County Operations Center, which is in the northern section of Kearny Mesa. The site

collects and records NO_x/NO_2, Ozone, CO, PM10, PM2.5 along with surface meteorology which includes wind speed, wind direction, temperature and solar radiation. The APCD considers this monitoring station as representative of where reactive photochemistry will occur most extensively.

The site is an urban/commercial area and is bounded by State Route 52 to the north, Interstate 805 to the west, and Interstate 15 to the east. Adjacent communities include Serra Mesa, Clairemont, and Tierrasanta. The air quality in this location is representative of a large part of the metropolitan portion of San Diego due to the diurnal onshore and offshore flow, which mixes the pollutants throughout the metropolitan region.

This monitoring station is located next to major transportation corridors and population centers, so it is able to provide representative concentration data for a significantly large area. The APCD classifies the monitoring objective at this site as "Representative Concentration", which is defined to represent the air quality concentrations for a pollutant that is expected to be similar throughout a geographical area. They may not always indicate the highest concentrations in the area, but review of Table 4 1-hour NO_2 data for Overland Ave indicates that many of the high concentrations for 1-hour NO_2 have been recorded at Overland Ave. Part of the reason for the relatively high NO_2 concentrations may be due to the location of the monitor with respect to State Route 52. Based on prevailing wind direction, the Overland Ave monitoring station appears to be directly impacted from State Route 52 mobile source emissions.

For this project, the use of the Overland Ave monitoring station satisfies the Environmental Protection Agency's new requirements for the placement of NO_2 monitors near major roadways in urban areas in order to determine the highest concentrations in an area covered by a monitoring network. The new Federal 1-hour NO_2 standard requires that monitoring networks be designed to measure the expected highest concentrations. Each of the SDAPCD monitoring stations has unique objectives that are associated with a spatial scale for each site. These spatial scales are defined in 40 CFR Part 58, Appendix D. Additionally, the desired spatial scale of a monitoring site must conform to established criteria for the distance from roadways, based on traffic volumes as defined in 40 CFR Part 58, Appendix E. The goal in siting monitoring stations is to match the spatial scale with the desired monitoring objective.

The new Federal 1-hour NO_2 standard is focused on short-term peak concentrations, which may occur near roadways. As summarized in the 2009 San Diego Air Monitoring Network Plan (June 2010) and based on the last four years of 1-hour NO_2 monitoring data, the Overland Ave monitoring objective appears to be population oriented (typical concentrations in areas of high population density in order to protect public health) and highest concentration (monitoring at locations expected to have the highest concentrations). Based on

the major roadways that surround the monitoring station, the use of the Overland Ave NO_2 monitoring data appears to satisfy the revised EPA population and highest concentration oriented monitoring station requirements for the new 1-hour standard.

NO_2/NO_x ratios will be determined from published data provided by the San Joaquin Valley APCD. Based on the recommended ratios provided by the San Joaquin Valley APCD, the following are proposed:

- Wartsila Natural Gas Fired Reciprocating Engine with post combustion controls: 1.15%
- Natural Gas Fired Fuel Heaters: 10%

4. **Appropriate performance evaluations of the model have shown that the model is not biased toward underestimates:**

   As noted in *Evaluation of Bias in AERMOD-PVMRM* (MACTEC, 2005), which was prepared by Roger W. Brode, PVMRM has been judged to provide unbiased estimates based on criteria that are comparable to, or more rigorous than, evaluations performed for other dispersion models. At the present time no assessment of bias has been conducted for the OLM algorithm. It has been shown in the sensitivity analysis that OLM provides similar more conservative results than PVMRM. Therefore is it assumed that OLM would also provide an unbiased estimate of the modeled concentrations.

5. **A protocol on methods and procedures to be followed has been established.**
   The methods and procedures outlined in this protocol are proposed for implementation.

Fumigation Modeling: The SCREEN3 model will used to evaluate inversion breakup fumigation impacts for all short-term averaging periods (24 hours or less). The methodology outlined in EPA-454/R-92-019 (Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised) will be followed for this analysis. Combined impacts for all sources under fumigation conditions will be evaluated.

For sources with plume heights not subject to inversion breakup fumigation, their contributions to fumigation impacts will be determined using SCREEN3 with all meteorological conditions and ignoring terrain at the distance of the maximum fumigation concentration. The fumigation concentration is then combined with the maximum SCREEN3 concentration from the other sources. The combined fumigation concentrations are also compared to the maximum SCREEN3 concentrations under normal dispersion for all meteorological conditions. If fumigation impacts are less than

SCREEN3 maxima under normal dispersion, no further analysis is required based on Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised (EPA-454/R-92-019).

If fumigation impacts exceed SCREEN3 maxima, then fumigation impacts longer than 1-hour averages will be evaluated based on Section 4.5.3 of Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised (EPA-454/R-92-019) guidance on converting to 3-, 8- and 24-hour average concentrations.

GEP Stack Height and Downwash: Stack locations and heights and building locations and dimensions will be input to BPIP-PRIME. The first part of BPIP-PRIME determines and reports on whether a stack is being subjected to wake effects from a structure or structures. The second part calculates direction-dependent "equivalent building dimensions" if a stack is being influenced by structure wake effects. The BPIP-PRIME output is formatted for use in AERMOD input files.

Receptor Selection: Receptor and source base elevations will be determined from US Geological Survey (USGS) National Elevation Dataset (NED) data in the GeoTIFF format at a horizontal resolution of 1 arc-second. All coordinates (both sources and receptors will be referenced to UTM North American Datum 1983 (NAD83, Zone 11).

Cartesian coordinate receptor grids will be used to provide adequate spatial coverage surrounding the project area for assessing ground-level pollution concentrations, to identify the extent of significant impacts, and to identify maximum impact locations. The maximum extent of the significant impact isopleth for any pollutant will be used to represent the impact radius.

For the full impact analyses, a nested grid will be developed to fully represent the significance area(s) and maximum impact area(s). The fence line receptor grid will be based on 10 meters. The downwash receptor grid will have a receptor spacing of 20-meters along the facility fence line and out to 500 meters from the Project. An intermediate receptor grid with 50-meter receptor spacing will extend from the downwash receptor grid out to 1000 meters from the Project. A coarse receptor grid with 100-meter receptor spacing will extend from the intermediate receptor grid outwards at least two (2) kilometers. The coarse grid spacing will be 200 meters and will extend out ten (10) kilometers in all directions. When maximum impacts occur in areas outside the 10-meter spaced receptor grid, additional refined receptor grids with 20-meter resolution will be placed around the maximum impacts and extended as necessary to determine maximum impacts. Ambient concentrations within the facility fence line will not be calculated.

Ambient Air Quality Impact Analyses: In evaluating the impacts of the proposed project on ambient air quality, ADI will model the ambient impacts of the project, add those impacts to background concentrations, and compare the results to the state and Federal ambient standards for SO_2, NO_2, PM_{10}, $PM_{2.5}$, and CO. The project impacts will also be compared to the PSD significance levels.

In accordance with USEPA guidance (40 CFR part 51, Appendix W, Sections 11.2.3.2 and 11.2.3.3), the highest modeled concentration will be used to compare with the significant impact levels (SILs). The highest modeled concentration will be used to demonstrate compliance with all short-term and annual CAAQS. With respect to the Federal PM2.5 24-hour standard, the 98th percentile will be used. Compliance with other short-term NAAQS may also be demonstrated consistent with the format of the short-term NAAQS (see 40 CFR 50).

PSD INCREMENT CONSUMPTION AND NAAQS ANALYSIS

Increment consumption of NO_x (annual) and PM10 (24-hour and annual) will be evaluated if impacts from the facility are above PSD modeling significance levels. The increment for PM2.5 will not be applicable until October, 2011. Therefore, there will be no PM2.5 increment analysis provided.

PSD Source Impact Analysis. Under EPA's PSD regulations, an applicant must conduct a "source impact analysis", which demonstrates that "allowable emission increases from the source in conjunction with all other applicable emissions increases or reductions (including secondary emissions), would not cause or contribute to air pollution in violation of: (1) Any NAAQS in any region; or (2) Any applicable maximum allowable increase over the baseline concentration in any area." 40 CFR § 52.21(k).

Subparagraph (1) is required to assure that the source's emissions will not cause a violation of the NAAQS, which, in this case, consist of the 24-hour and annual PM10/PM2.5 standards. Subparagraph (2) is the "increment consumption analysis", which assures that, in those locations currently meeting the federal NAAQS (*i.e.*, those deemed "attainment" or "unclassifiable"), the concentration of a given pollutant cannot increase by an amount greater than the "maximum allowable increase" specified by the Clean Air Act and/or the PSD regulations for the particular pollutant.

Role of Significant Impact Levels. For purposes of the PSD program, EPA has traditionally applied "significant impact levels" ("SILs") as a *de minimis* value, which represents the offsite concentration predicted to result from a source's emissions that does not warrant additional analysis or mitigation.

If a source's modeled impact at any offsite location exceeds the relevant SIL, the source owner must then conduct a "multi-source" (or "cumulative") air quality analysis to

determine whether or not the source's emissions will cause or contribute to a violation of the relevant NAAQS or applicable PSD increment.

NAAQS Compliance Demonstration. To demonstrate that the emissions from the proposed projects will not cause or contribute to a violation of the NOx and PM10/PM2.5 NAAQS, a multi-source cumulative modeling analysis will be conducted in accordance with EPA requirements. This analysis considered both the existing background concentrations, as established by ambient monitoring data, and the contribution from additional sources, which might not be reflected by the monitoring data, but could interact with the facility's potential impacts. Appropriate increment consuming sources will be determined in consultation with the EPA and San Diego APCD to determine total increment consumption.

Preconstruction Monitoring Requirements

PSD rules require an applicant's air quality analysis to contain preconstruction ambient air quality monitoring data for purposes of establishing background pollutant concentrations in the impact area of the proposed facility. However, an applicant may be exempted from the requirement for preconstruction monitoring if the predicted air quality impacts of the facility do not exceed the specified *de minimis* levels. An applicant may also, with regulatory agency discretion, rely on existing continuous air quality monitoring data collected at District-approved monitoring stations to satisfy the requirement for preconstruction monitoring.

ADDITIONAL IMPACTS ANALYSIS

The additional impacts analysis is an assessment of the impacts of air, ground, and water pollution on soils, vegetation, and visibility caused by any increase in emissions of any regulated pollutant from the modification under review, and from associated growth. There are four parts of the additional impacts analysis: 1) growth, 2) ambient air quality impact analysis, 3) soils, water, and vegetation analysis, and 4) visibility impairment. This analysis will follow USEPA's guidance provided in the New Source Review Workshop Manual (October 1990 draft).

The growth analysis will quantify the number of employees, the availability of housing in the area, and associated commercial and industrial growth, and construction related activities and mobile sources. The number of employees is not envisioned to be large enough to result in a quantifiable increase in emissions from residential, commercial, or industrial growth (e.g., less than 30 employees).

While Class II visibility is not protected, a visual plume blight analysis must be performed as required under the PSD program. As such, the VISCREEN model will be used to assess this potential.

CLASS I AREA IMPACTS

Agua Tibia National Wilderness is located approximately 62 kilometers north of the Project site. Additionally, San Jacinto Wilderness is located 103 kilometers north east. Following the most recent FLAG Workshop procedures (June 2010), the use of the Screening Procedure (Q/D) to determine if the project could opt (screen) out of an Air Quality Related Value (AQRV) assessment for visibility and deposition with CALPUFF was made. Following the screening procedures in FLAG, the emissions of NO_x, SO_x, PM10/2.5, and H_2SO_4 were summed after adjusting the emissions to reflect 8,760 hours of operation. The screening analysis is summarized below:

- Q = sum(NO_x+PM10/2.5+SOx+H_2SO_4)*(8760/4032) = 181.72
- $D_{agua\ tibia}$ = 62 km
- $D_{san\ jacinto}$ = 103 km
- (Q/D) = 2.93 for Agua Tibia National Wilderness
- (Q/D) = 1.76 for San Jacinto Wilderness

If Q/D is less than 10, then no AQRV analysis is required. Based on the ratio of Q/D, both Class I areas are less than 10 and no further analysis of AQRV is required. The screening assessment does not apply to Class I increment or NAAQS. Therefore, Class I significance modeling for increment and NAAQS will be assessed.

ADDITIONAL IMPACTS ANALYSIS REQUIRED FOR CEC ANALYSES

The additional impacts analysis is an assessment of the impacts of air pollution on soils and vegetation, which includes the potential impacts of deposition. Additionally, cumulative impacts and construction impacts will be assessed.

Screening Health Risk Assessment: A screening health risk assessment will be conducted to evaluate air toxics. The latest version of the Health Risk Assessment Program (HARP version 1.4d) and the HARP On-Ramp will be used to characterize risks from the proposed facility. These models, along with options for their use and how they are used, are discussed below. The screening health risk assessment will be conducted in accordance with the procedures developed by the California Air Resources Board and the Office of Environmental Health Hazard Analysis.

The HARP program is a tool that assists with the programmatic requirements of the Air Toxics Hot Spots Program, and it can be used for preparing health risk assessments for other related programs such as air toxic control measure development or facility

permitting applications. HARP is a computer based risk assessment program, which combines the tools of emission inventory database, facility prioritization, air dispersion modeling, and risk assessment analysis. Use of HARP promotes statewide consistency in the area of risk assessment, increases the efficiency of evaluating potential health impacts, and provides a cost effective tool for developing facility health risk assessments. HARP may be used on single sources, facilities with multiple sources, or multiple facilities in close proximity to each other.

The HARP On-Ramp program will be used to convert the AERMOD output files into a form that can be used by HARP. The HARP On-Ramp program is basically a post-processor that will take ASCII post files from AERMOD and process these files to calculate acute, chronic, and cancer impacts, identical to the methods used in the current version of HARP.

The screening health risk assessment will be carried out in three steps. First, emissions of toxic air pollutants from the project will be calculated. Next, the HARP On-Ramp subroutine will be used to convert the maximum AERMOD concentration at each receptor due to the operation of the proposed project. A separate analysis will be conducted for construction generated PM_{10}, as per CEC requirements. The high-resolution receptor grids as derived from the facility AERMOD modeling will then be used in HARP. Finally, the HARP will be used to evaluate acute, chronic and cancer risks through inhalation and non-inhalation pathways based upon the maximum predicted concentration at each receptor. Some of the assumptions used in running the HARP program will be set as follows:

- Emission rates for non-criteria pollutants will be based upon the expected fuel use of the engines.
- Number of residents affected will be based upon the updated 2000 population data for those census tracts or portions of census tracts, which lie within the maximum impact receptor radius of the proposed facility.
- Number of workers affected will be based upon the county average percentage of non-farm workers as compared to the total county population in 2000. This average will be applied to all affected census tracts.
- Deposition velocity is taken to be 0.02 m/s, as recommended by ARB for controlled sources.
- Fraction of residents with gardens is taken to be 0.052, which is probably conservatively high for the urban area.
- Fraction of produce grown at home is taken to be 0.052, which is also believed to be conservatively high for the urban area.

The receptor grids used for the HARP risk analyses are similar to those used for the refined modeling, with the addition of discrete receptor annotations representing the 1st, 2nd, and 3rd highest impact points, *i.e.*, MIR-1, MIR-2, and MIR-3. In addition, the

point of maximum impact (PMI), maximally exposed individual resident (MEIR), and the maximally exposed individual worker (MEIW) will be shown. A complete list of the discrete sensitive receptors within 1 mile of the facility will be included in the application as well as census tract population data, census tract maps and affected tracts within 6 miles of the facility.

The HARP program results for acute and chronic inhalation and chronic non-inhalation exposures, cancer burden and individual cancer risk (workplace and residential) for the combustion sources will be summarized. Separate calculations will be shown for each type of exposure and risk.

Cumulative Impacts: Pursuant to CEC guidelines, a cumulative impacts analysis will be required and must consider the additional impacts of the following sources located within 8 miles of the project site.

- Sources with impacts on existing air quality that are not reflected in the ambient air quality data used to establish background. These sources are generally those which have received permits authorizing construction but are not yet in operation and sources which have commenced operations subsequent to the data used to establish background air quality levels. Data derived from the SDAPCD, CARB, and USEPA AIRS monitoring data systems indicate that air quality data for the project region is available up to the end of year 2010. As such the cumulative analysis will concentrate on the above types of sources permitted or becoming operational after January 1, 2010.

Construction Impacts Analysis: The potential ambient impacts from air pollutant emissions during the construction of the project will be evaluated by air quality modeling that will account for the construction site location and the surrounding topography; the sources of emissions during construction, including vehicle and equipment exhaust emissions; and fugitive dust. Construction of the proposed project will be divided into three main construction phases: (1) site preparation; (2) construction of foundations; and (3) installation and assembly of mechanical and electrical equipment. The construction impacts analysis will include a schedule for construction operation activities. Site preparation is expected to include site excavation, excavation of footings and foundations, and backfilling operations. After site preparation is finished, the construction of the foundations will begin. Once the foundations are finished, the installation and assembly of the mechanical and electrical equipment will begin.

Fugitive dust emissions from the construction of the project result from (1) dust entrained during excavation and grading at the construction site; (2) dust entrained during onsite travel on paved and unpaved roads and across the unpaved construction

site; (3) dust entrained during aggregate and soil loading and unloading operations; (4) dust entrained from raw material transfer to and from material stockpiles; and (5) wind erosion of areas disturbed during construction activities. Heavy equipment exhaust emissions result from (1) exhaust from the heavy equipment used for excavation, grading, and construction of onsite structures; (2) exhaust from a water truck used to control construction dust emissions; (3) exhaust from diesel welding machines, gasoline-powered generators, air compressors, and water pumps; and (4) exhaust from gasoline-powered pickup trucks and Diesel flatbed trucks used onsite to transport workers and materials around the construction site. Diesel and gasoline truck exhaust emissions will result from transport of mechanical and electrical equipment to the project site and transport of rubble and debris from the site to an appropriate landfill. Diesel exhaust emissions may also result from transport of raw materials to and from stockpiles.

Emissions from a worst-case day will be calculated for each of the three main construction phases and only the phase with the highest emissions will be modeled. As the construction impacts are expected to occur for a relatively short time compared with the lifetime of the project, only short-term averaging periods (24 hours or less) will be included in the construction modeling analysis.

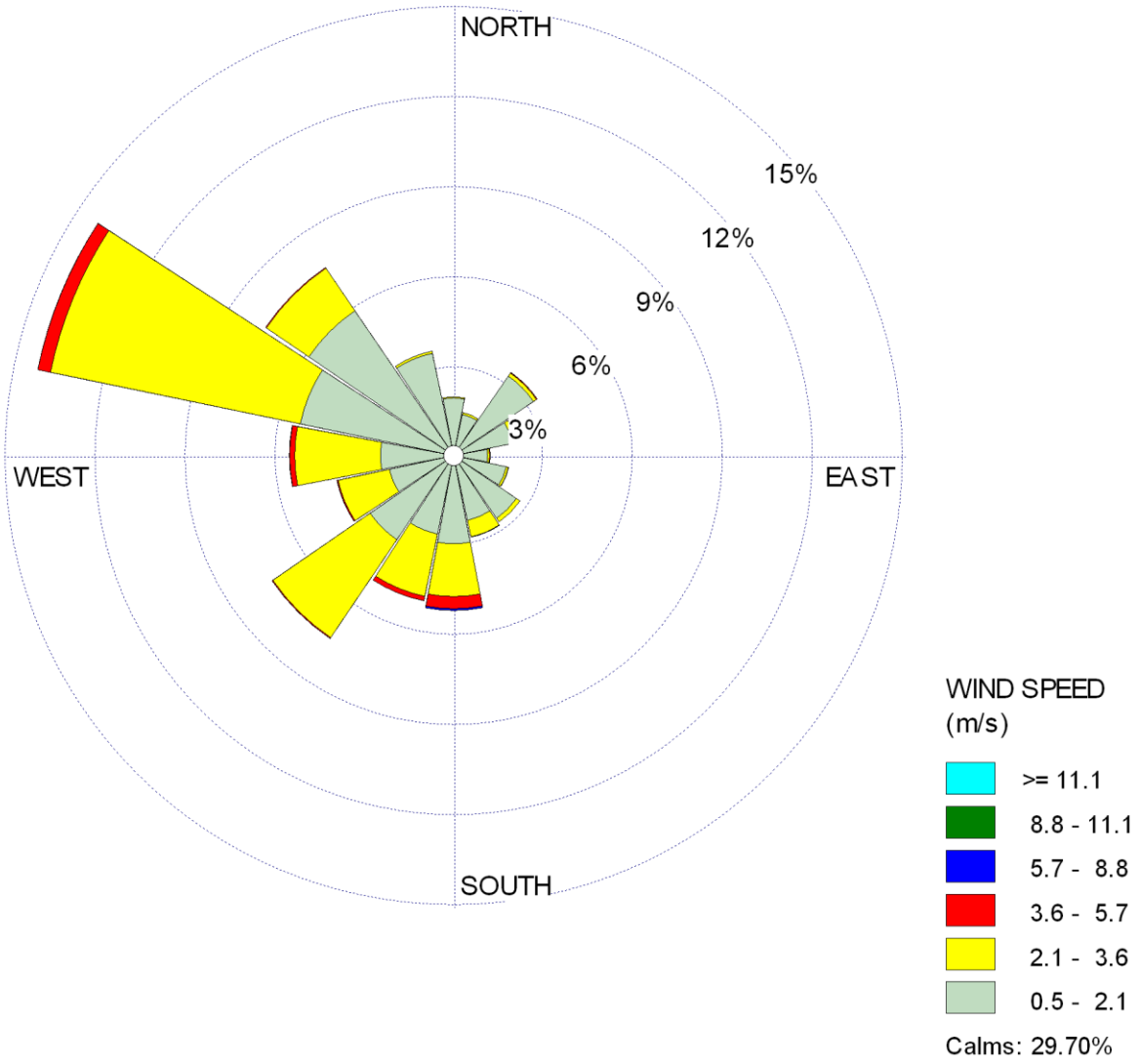
The same USEPA-approved model (AERMOD), receptor grids, modeling options with the exception of the FASTALL keyword to reduce model run time, and meteorological data as described earlier for Project operations will be used to estimate ambient impacts from construction emissions. The construction site in the modeling analysis will be represented as either area or volume sources for fugitive dust emissions and as area, volume, or point sources for combustion emissions.

FINAL MODELING SUBMITTAL

As part of the final modeling analyses, the USEPA, SDAPCD and CEC will be supplied with the following materials:

- Copies of sections of the US Geological Survey (USGS) 7-1/2-minute (1:24,000) map(s) showing the facility;
- Modeling summaries of maximum impacts for each air quality model;
- All modeling outputs (including BPIP and meteorological files) on CD-ROM disc, together with a description of all filenames;
- Plot plan showing emission points, nearby buildings (including dimensions), property lines, fence lines, and
- Figure showing the building identifiers in the BPIP run(s) and a plot plan.

Annual Kearny Mesa Wind Rose



APPENDIX F.4

HEALTH RISK ASSESSMENT SUPPORT DATA

Appendix F.4

Health Risk Assessment Support Data

Health Risk Assessment Process, Goals, Assumptions, and Uses

"In recent years, the public has become increasingly aware of the presence of harmful chemicals in our environment. Many people express concerns about pesticides and other foreign substances in food, contaminants in drinking water, and toxic pollutants in the air. Others believe these concerns are exaggerated or unwarranted. How can we determine which of these potential hazards really deserve attention? How do we, as a society, decide where to focus our efforts and resources to control these hazards? When we hear about toxic threats that affect us personally, such as the discovery of industrial waste buried in our neighborhood or near our children's school, how concerned should we be?

Health risk assessment is a scientific tool designed to help answer these questions. Government agencies rely on risk assessments to help them determine which potential hazards are the most significant. Risk assessments can also guide regulators in abating environmental hazards. Members of the public who learn the basics of risk assessment can improve their understanding of both real and perceived environmental hazards, and they can work more effectively with decision makers on solutions to environmental problems.

Chemicals can be either beneficial or harmful, depending on a number of factors, such as the amounts to which we are exposed. Low levels of some substances may be necessary for good health, but higher levels may be harmful. Health risk assessments are used to determine if a particular chemical poses a significant risk to human health and, if so, under what circumstances. Could exposure to a specific chemical cause significant health problems? How much of the chemical would someone have to be exposed to before it would be dangerous? How serious could the health risks be? What activities might put people at increased risk?

If it were possible to prevent all human exposure to all hazardous chemicals, there would be no need for risk assessment. However, the total removal of harmful pollutants from the environment is often infeasible or impossible, and many naturally occurring substances also pose health risks. Risk assessment helps scientists and regulators identify serious health hazards and determine realistic goals for reducing exposure to toxics so that there is no significant health threat to the public.

Estimating the hazards posed by toxic chemicals in the environment involves the compilation and evaluation of complex sets of data. Government regulators, therefore, turn to specialists to perform or assist with risk assessments. These specialists include scientists with degrees in toxicology (the study of the toxic effects of chemicals) and epidemiology (the study of disease or illness in populations) as well as physicians, biologists, chemists, and engineers.

The term "health risk assessment" is often misinterpreted. People sometimes think that a risk assessment will tell them whether a current health problem or symptom was caused by exposure

to a chemical. This is not the case. Scientists who are searching for links between chemical exposures and health problems in a community may conduct an epidemiologic study. These studies typically include a survey of health problems in a community and a comparison of health problems in that community with those in other cities, communities, or the population as a whole.

Although they are both important, health risk assessments and epidemiologic studies have different objectives. Most epidemiologic studies evaluate whether *past* chemical exposures may be responsible for documented health problems in a specific group of people. In contrast, health risk assessments are used to estimate whether current or future chemical exposures will pose health risks to a broad population, such as a city or a community. Scientific methods used in health risk assessment cannot be used to link individual illnesses to past chemical exposures, nor can health risk assessments and epidemiologic studies prove that a specific toxic substance caused an individual's illness.

The U.S. Environmental Protection Agency (U.S. EPA) is a leading risk assessment agency at the federal level. In California, the Office of Environmental Health Hazard Assessment (OEHHA) in the California Environmental Protection Agency (Cal/EPA) has the primary responsibility for developing procedures and practices for performing health risk assessments. Other agencies within Cal/EPA, such as the Department of Pesticide Regulation and the Department of Toxic Substances Control, have extensive risk assessment programs of their own but work closely with OEHHA.

The Department of Pesticide Regulation uses risk assessments to make regulatory decisions concerning safe pesticide uses. The Department of Toxic Substances Control uses risk assessments to determine requirements for the management and cleanup of hazardous wastes. OEHHA's health risk assessments are used by the Air Resources Board to develop regulations governing toxic air contaminants, and by the Department of Health Services to develop California's drinking water standards. These agencies' decisions take into account the seriousness of potential health effects along with the economic and technical feasibility of measures that can reduce the health risks.

Health risk assessment requires both sound science and professional judgment and is a constantly developing process. Cal/EPA is nationally recognized for developing new procedures that improve the accuracy of risk assessments. Cal/EPA also works closely with U.S. EPA in all phases of risk assessment.

The risk assessment process is typically described as consisting of four basic steps: hazard identification, exposure assessment, dose-response assessment, and risk characterization. Each of these steps will be explained in the following text.

Hazard Identification

In the first step, hazard identification, scientists determine the types of health problems a chemical could cause by reviewing studies of its effects in humans and laboratory animals. Depending on the chemical, these health effects may include short-term ailments, such as headaches; nausea; and eye, nose, and throat irritation; or chronic diseases, such as cancer. Effects on sensitive populations, such as pregnant women and their developing fetuses, the elderly, or those with health problems

(including those with weakened immune systems), must also be considered. Responses to toxic chemicals will vary depending on the amount and length of exposure. For example, short-term exposure to low concentrations of chemicals may produce no noticeable effect, but continued exposure to the same levels of chemicals over a long period of time may eventually cause harm. An important step in hazard identification is the selection of key research studies that can provide accurate, timely information on the hazards posed to humans by a particular chemical. The selection of a study is based upon factors such as whether the study has been peer reviewed by qualified scientists, whether the study's findings have been verified by other studies, and the species tested (human studies provide the best evidence). Some studies may involve humans that have been exposed to the chemical, while others may involve studies with laboratory animals.

Human data frequently are useful in evaluating human health risks associated with chemical exposures. Human epidemiologic studies typically examine the effects of chemical exposure on a large number of people, such as employees exposed to varying concentrations of chemicals in the workplace. In many cases, these exposures took place prior to the introduction of modern worker-safety measures.

One weakness of occupational studies is that they generally measure the effects of chemicals on healthy workers and do not consider children, the elderly, those with pre-existing medical conditions, or other sensitive groups. Since occupational studies are not controlled experiments, there may be uncertainties about the amount and duration of exposure or the influence of lifestyle choices, such as smoking or alcohol use, on the health of workers in the studies. Exposure of workers to other chemicals at the same time may also influence and complicate the results.

Laboratory studies using human volunteers are better able to gauge some health effects because chemical exposures can then be measured with precision. But these studies usually involve small numbers of people and, in conformance with ethical and legal requirements, use only adults who agree to participate in the studies. Moreover, laboratory studies often use simple measurements that identify immediate responses to the chemical but might miss significant, longer-term health effects. Scientists can also use physicians' case reports of an industrial or transportation accident in which individuals were unintentionally exposed to a chemical. However, these reports may involve very small numbers of people, and the level of exposure to the chemical could be greater than exposures to the same chemical in the environment. Nevertheless, human studies are preferred for risk assessment, so OEHHA makes every effort to use them when they are available.

Because the effects of the vast majority of chemicals have not been studied in humans, scientists must often rely on animal studies to evaluate a chemical's health effects. Animal studies have the advantage of being performed under controlled laboratory conditions that reduce much of the uncertainty related to human studies. If animal studies are used, scientists must determine whether a chemical's health effects in humans are likely to be similar to those in the animals tested. Although effects seen in animals can also occur in humans, there may be subtle or even significant differences in the ways humans and experimental animals react to a chemical. Comparison of human and animal metabolism may be useful in selecting the animal species that should be studied, but it is often not possible to determine which species is most like humans in its response to a chemical exposure. However, if similar effects were found in more than one species, the results would strengthen the evidence that humans may also be at risk.

Exposure Assessment

In exposure assessment, scientists attempt to determine how long people were exposed to a chemical; how much of the chemical they were exposed to; whether the exposure was continuous or intermittent; and how people were exposed—through eating, drinking water and other liquids, breathing, or skin contact. All of this information is combined with factors such as breathing rates, water consumption, and daily activity patterns to estimate how much of the chemical was taken into the bodies of those exposed.

People can be exposed to toxic chemicals in various ways. These substances can be present in the air we breathe, the food we eat, or the water we drink. Some chemicals, due to their particular characteristics, may be both inhaled and ingested. For example, airborne chemicals can settle on the surface of water, soil, leaves, fruits, vegetables, and forage crops used as animal feed. Cows, chickens, or other livestock can become contaminated when eating, drinking, or breathing the chemicals present in the air, water, feed, and soil. Fish can absorb the chemicals as they swim in contaminated water or ingest contaminated food. Chemicals can be absorbed through the skin, so infants and children can be exposed simply by crawling or playing in contaminated dirt. They can also ingest chemicals if they put their fingers or toys in their mouths after playing in contaminated dirt. Chemicals can also be passed on from nursing mothers to their children through breast milk.

To estimate exposure levels, scientists rely on air, water, and soil monitoring; human blood and urine samples; or computer modeling. Although monitoring of a pollutant provides excellent data, it is time consuming, costly, and typically limited to only a few locations. For those reasons, scientists often rely on computer modeling, which uses mathematical equations to describe how a chemical is released and to estimate the speed and direction of its movement through the surrounding environment. Modeling has the advantage of being relatively inexpensive and less time consuming, provided all necessary information is available and the accuracy of the model can be verified through testing.

Computer modeling is often used to assess chemical releases from industrial facilities. Such models require information on the type of chemicals released, facilities' hours of operation, industrial processes that release the chemicals, smokestack height and temperature, any pollution-control equipment that is used, surrounding land type (urban or rural), local topography and meteorology, and census data regarding the exposed population.

In all health risk assessments, scientists must make assumptions in order to estimate human exposure to a chemical. For example, scientists assessing the effects of air pollution may need to make assumptions about the time people spend outdoors, where they are more directly exposed to pollutants in the ambient air, or the time they spend in an area where the pollution is greatest. An assessment of soil contamination may require scientists to make assumptions about people's consumption of fruits and vegetables that may absorb soil contaminants.

To avoid underestimating actual human exposure to a chemical, scientists often look at the range of possible exposures. For example, people who jog in the afternoon, when urban air pollution levels are highest, would have much higher exposures to air pollutants than people who come home after work and relax indoors. Basing an exposure estimate on a value near the higher end of

a range of exposure levels (closer to the levels experienced by the jogger than by the person remaining indoors) provides a realistic worst-case estimate of exposure. These kinds of conservative assumptions, which presume that people are exposed to the highest amounts of a chemical that can be considered credible, are referred to as "health-protective" assumptions.

The exposure estimates for the project analysis were conducted using HARP Version 1.4d. Harp On-Ramp was also used to pre-process emissions and receptor files for input into HARP.

Dose-Response Assessment

In dose-response assessment, scientists evaluate the information obtained during the hazard identification step to estimate the amount of a chemical that is likely to result in a particular health effect in humans.

An established principle in toxicology is that "the dose makes the poison." For example, a commonplace chemical like table salt is harmless in small quantities, but it can cause illness in large doses. Similarly, hydrochloric acid, a hazardous chemical, is produced naturally in our stomachs but can be quite harmful if taken in large doses.

Scientists perform a dose-response assessment to estimate how different levels of exposure to a chemical can impact the likelihood and severity of health effects. The dose-response relationship is often different for many chemicals that cause cancer than it is for those that cause other kinds of health problems.

The dose-response estimates for the project analysis were conducted HARP Version 1.4d.

Cancer Effects

For chemicals that cause cancer, the general assumption in risk assessment has been that there are no exposures that have "zero risk" unless there is clear evidence otherwise. In other words, even a very low exposure to a cancer-causing chemical may result in cancer if the chemical happens to alter cellular functions in a way that causes cancer to develop. Thus, even very low exposures to carcinogens might increase the risk of cancer, if only by a very small amount.

Several factors make it difficult to estimate the risk of cancer. Cancer appears to be a progressive disease because a series of cellular transformations is thought to occur before cancer develops. In addition, cancer in humans often develops many years after exposure to a chemical. Also, the best information available on the ability of chemicals to cause cancer often comes from studies in which a limited number of laboratory animals are exposed to levels of chemicals that are much higher than the levels humans would normally be exposed to in the environment. As a result, scientists use mathematical models based on studies of animals exposed to high levels of a chemical to estimate the probability of cancer developing in a diverse population of humans exposed to much lower levels. The uncertainty in these estimates may be rather large. To reduce these uncertainties, risk assessors must stay informed of new scientific research. Data from new studies can be used to improve estimates of cancer risks.

Non-cancer Effects

Non-cancer health effects (such as asthma, nervous system disorders, birth defects, and developmental problems in children) typically become more severe as exposure to a chemical

increases. One goal of dose-response assessment is to estimate levels of exposure that pose only a low or negligible risk for non-cancer health effects. Scientists analyze studies of the health effects of a chemical to develop this estimate. They take into account such factors as the quality of the scientific studies, whether humans or laboratory animals were studied, and the degree to which some people may be more sensitive to the chemical than others. The estimated level of exposure that poses no significant health risks can be reduced to reflect these factors.

Risk Characterization

The last step in risk assessment brings together the information developed in the previous three steps to estimate the risk of health effects in an exposed population. In the risk characterization step, scientists analyze the information developed during the exposure and dose-response assessments to describe the resulting health risks that are expected to occur in the exposed population. This information is presented in different ways for cancer and non-cancer health effects, as explained below.

Cancer Risk

Cancer risk is often expressed as the maximum number of new cases of cancer projected to occur in a population of one million people due to exposure to the cancer-causing substance over a 70-year lifetime. For example, a cancer risk of one in one million means that in a population of one million people, not more than one additional person would be expected to develop cancer as the result of the exposure to the substance causing that risk.

An individual's actual risk of contracting cancer from exposure to a chemical is often less than the theoretical risk to the entire population calculated in the risk assessment. For example, the risk estimate for a drinking-water contaminant may be based on the health-protective assumption that the individual drinks two liters of water from a contaminated source daily over a 70-year lifetime. However, an individual's actual exposure to that contaminant would likely be lower due to a shorter time of residence in the area. Moreover, an individual's risk not only depends on the individual's exposure to a specific chemical but also on his or her genetic background (i.e., a family history of certain types of cancer); health; diet; and lifestyle choices, such as smoking or alcohol consumption.

Cancer risks presented in risk assessments are often compared to the overall risk of cancer in the general U.S. population (about 250,000 cases for every one million people) or to the risk posed by all harmful chemicals in a particular medium, such as the air. The cancer risk from breathing current levels of pollutants in California's ambient air over a 70-year lifetime is estimated to be 760 in one million.

Non-cancer Risk

Non-cancer risk is usually determined by comparing the actual level of exposure to a chemical to the level of exposure that is not expected to cause any adverse effects, even in the most susceptible people. Levels of exposure at which no adverse health effects are expected are called "health reference levels," and they generally are based on the results of animal studies. However, scientists usually set health reference levels much lower than the levels of exposure that were found to have no adverse effects in the animals tested. This approach helps to ensure that real health risks are not underestimated by adjusting for possible differences in a chemical's effects on laboratory animals and humans; the possibility that some humans, such as children and the

elderly, may be particularly sensitive to a chemical; and possible deficiencies in data from the animal studies.

Depending on the amount of uncertainty in the data, scientists may set a health reference level 100 to 10,000 times lower than the levels of exposure observed to have no adverse effects in animal studies. Exposures above the health reference level are not necessarily hazardous, but the risk of toxic effects increases as the dose increases. If an assessment determines that human exposure to a chemical exceeds the health reference level, further investigation is warranted.

Risk managers rely on risk assessments when making regulatory decisions, such as setting drinking water standards, or developing plans to clean up hazardous waste sites. Risk managers are responsible for protecting human health, but they must also consider public acceptance, as well as technological, economic, social, and political factors, when arriving at their decisions. For example, they may need to consider how much it would cost to remove a contaminant from drinking water supplies or how seriously the loss of jobs would affect a community if a factory were to close due to the challenge of meeting regulatory requirements that are set at the most stringent level.

Health risk assessments can help risk managers weigh the benefits and costs of various alternatives for reducing exposure to chemicals. For example, a health risk assessment of a hazardous waste site could help determine whether placing a clay cap over the waste to prevent exposure would offer the same health protection as the more costly option of removing the waste from the site.

One of the most difficult questions of risk management is: How much risk is acceptable? While it would be ideal to completely eliminate all exposure to hazardous chemicals, it is usually not possible or feasible to remove all traces of a chemical once it has been released into the environment. The goal of most regulators is to reduce the health risks associated with exposure to hazardous pollutants to a negligibly low level.

Regulators generally presume that a one-in-one million risk of cancer from life-long exposure to a hazardous chemical is an "acceptable risk" level because the risk is extremely low compared to the overall cancer rate. If a drinking water standard for a cancer-causing chemical were set at the level posing a "one-in-one million" risk, it would mean that not more than one additional cancer case (beyond what would normally occur in the population) would potentially occur in a population of one million people drinking water meeting that standard over a 70-year lifetime.

Actual regulatory standards for chemicals or hazardous waste cleanups may be set at less stringent risk levels, such as one in 100,000 (not more than one additional cancer case per 100,000 people) or one in 10,000 (not more than one additional cancer case per 10,000 people). These less stringent risk levels are often due to economic or technological considerations. Regulatory agencies generally view these higher risk levels to be acceptable if there is no feasible way to reduce the risks further."[1]

[1] A Guide to Health Risk Assessment, CalEPA-Office of Environmental Health Hazard Assessment, 1001 I Street, Sacramento, Ca. 95812, (est. 2001).

The following tables summarize the results of the HRA performed by the Project.

TABLE F.4-1 CRITERIA AND AIR TOXIC POLLUTANTS EMITTED FROM PROPOSED FACILITY	
NOx	Ethylbenzene
CO	Formaldehyde
VOC	Hexane
SOx	Naphthalene
PM10/PM2.5	Propylene
Ammonia	Biphenyl
PAHs	Toluene
Acetaldehyde	Xylene
Acrolein	Diesel Particulate Matter
Benzene	Methanol
1-3 Butadiene	

TABLE F.4-2 HEALTH EFFECTS SIGNIFICANT THRESHOLD LEVELS		
	Significance Thresholds	
Agency	SDAPCD*	State of California
Cancer Risk per one million	<= 1.0 without T-BACT <= 10.0 with T-BACT	<= 1.0 without T-BACT <= 10.0 with T-BACT
Acute HI	1.0	1.0
Chronic HI	1.0	1.0
Cancer Burden	1.0	1.0
*SDAPCD Rule 1200		

The other assumptions used in running the HARP program were as follows:

- Emission rates for non-criteria pollutants are taken from AFC Section 4.7, and from Appendix F.1.
- Number of residents affected is based upon the updated 2000 population data for those census tracts or portions of census tracts which lie within the maximum impact receptor radius of the proposed facility.
- All receptors were treated as residential receptors, which allows for the assumption that the MIR, if assumed residential, will represent the highest risk and no other receptor will show risks higher than the MIR. This deletes the need for running worker risks. The HARP risk run options as recommended by South Coast AQMD (Chico, 10-20-05) were utilized (i.e., for cancer – 70-year and derived adjusted method; for chronic – 70-year and derived OEHHA method; for acute – no options).
- Deposition velocity is taken to be 0.02 m/s, as recommended by ARB for controlled emission sources.
- Fraction of residents with gardens is taken to be 0.052 which is likely conservatively high for the urban area (Santee) near the project site.
- Fraction of produce grown at home is taken to be 0.052, which is also likely to be conservatively high.

The HARP program is a tool that assists with the programmatic requirements of the Air Toxics Hot Spots Program, and it can be used for preparing health risk assessments for other related programs such as air toxic control measure development or facility permitting applications. HARP is a computer based risk assessment program which combines the tools of emission inventory database, facility prioritization, air dispersion modeling, and risk assessment analysis. Use of HARP promotes statewide consistency in the area of risk assessment, increases the efficiency of evaluating potential health impacts, and provides a cost effective tool for developing facility health risk assessments. HARP may be used on single sources, facilities with multiple sources, or multiple facilities in close proximity to each other. The receptor grid used in HARP was a combination of the final grid used in the refined modeling as discussed in Section 4.7, with the addition of the sensitive receptor locations as noted in Table F.4-6.

The HARP program results for acute and chronic inhalation and chronic non-inhalation exposures, cancer burden and individual cancer risk (workplace and residential) for the combustion sources are summarized in this Appendix. Separate calculations are shown for each type of exposure and risk, and the results of the calculations are summarized below. All of the modeling and HRA results are contained on the CD included with this document.

The modeling results show that the maximum modeled cancer risk from QBPP is expected to be 1.53×10^{-6}. This risk is well below the SDAPCD significance value of 10 per million for sources employing T-BACT. T-BACT for the Wartsila IC engines is the use of clean fuels (natural gas) and the operation of a CO catalyst. These T-BACT technologies are proposed for the Project, and as such, the significant risk threshold for the Project is 10 in one million. The chronic and acute non-cancer hazard indices are 0.0061 and 0.0576, respectively. Both are well below the significant impact level of 1.0. The total cancer burden was calculated to be zero, which is also well below the state threshold value of 1.0, as well as being below the SDAPCD Rule 1200 significance level of 1.0. Detailed calculations and results for each significant receptor are included in the modeling results, which are being submitted electronically.

TABLE F.4-3 HEALTH RISK ASSESSMENT SUMMARY (WARTSILA ENGINES AND IC HEATERS)		
Total Facility (All Sources)		
Risk Category	HRA Values	Applicable Significance Threshold
Cancer Risk (MIR) per one million	1.53×10^{-6}	<= 10.0 with T-BACT
Chronic Hazard Index (at cancer MIR)	0.0061	1.0
Acute Hazard Index (at cancer MIR)	0.0576	1.0
Acute Hazard Index at Acute MIR	0.115	1.0
Facility MIR location coordinates are: Cancer and chronic MIR - #36, 497427, 3634740. Acute MIR - #2878, 497800, 3635180.		

The calculated health effects as summarized above do not exceed the district significance threshold values, therefore the health effects would be considered “not significant” and may even be “zero”. These results are also provided on the air modeling CD.

No health studies prepared by the local San Diego County health department were identified for use in the facility health risk assessment.

The screening risk calculation for construction impacts, i.e., diesel equipment particulate matter emissions and the inhalation pathway assumption is presented in Table F.4-8.

The following tables and figures are presented at the end of this appendix:

- Table F.4-4 Census Tract Numbers, Areas, and Population Data
- Table F.4-5 SDAPCD TAC Summary
- Table F.4-6 Sensitive Receptor Listing for the 6-mile Radius
- Table F.4-7 OEHHA/CARB Risk Assessment Health Values
- Table F.4-8 Construction Diesel PM Screening Risk Calculations
- Figure F.4-1 Census Bureau-Tract Map and Site Location
- Figure F.4-2 Sensitive Receptor Map for the 6-mile Radius Distance
- Figure F.4-3 Census Tracts within the 6-mile Radius Distance

Attachment F.4-1 Sycamore Landfill Emissions Inventory

Risk Assessment input and output files are included on the modeling CD.

Table F.4-4 (2 Pages)

CENSUS FINDINGS

Map ID	Tract Number	Total Population	Population in Radius	Total Area(sq.mi.)	Area in Radius(sq.mi.)
T1	0170.49	2722	688.0	4.17	1.05
T2	0169.01	6892	3838.5	17.53	9.76
T3	0095.04	3971	3781.0	22.34	21.27
T4	0170.44	5193	1857.3	0.94	0.33
T5	0170.45	2838	1305.4	0.74	0.34
T6	0170.46	3155	1424.2	1.46	0.66
T7	0170.47	4105	4105.0	0.82	0.82
T8	0170.22	4839	3282.2	1.72	1.16
T9	0083.60	5921	109.0	1.08	0.02
T10	0094.00	6473	3839.4	23.86	14.15
T11	0166.12	6229	6229.0	2.68	2.68
T12	0166.09	5328	5328.0	1.62	1.62
T13	0166.08	2598	2598.0	0.96	0.96
T14	0166.07	6564	6564.0	1.57	1.57
T15	0166.10	4293	4293.0	0.52	0.52
T16	0167.02	7141	6992.1	1.30	1.28
T17	0168.07	7176	737.8	2.03	0.21
T18	0166.15	2704	2704.0	0.93	0.93
T19	0166.14	4019	4019.0	0.84	0.84
T20	0167.01	7153	7153.0	2.44	2.44
T21	0095.05	6793	6793.0	6.73	6.73
T22	0166.13	2221	2221.0	0.33	0.33
T23	0166.06	3116	3116.0	1.09	1.09
T24	0085.11	1177	256.6	5.97	1.30
T25	0166.17	3122	3122.0	0.67	0.67
T26	0095.02	3578	3578.0	1.31	1.31
T27	0168.06	3704	1564.4	0.59	0.25
T28	0166.05	7043	7043.0	2.34	2.34
T29	0166.16	4233	4233.0	0.94	0.94
T30	0162.02	3465	3465.0	2.56	2.56
T31	0098.05	4888	4888.0	2.86	2.86
T32	0095.06	4306	4306.0	0.59	0.59
T33	0095.07	3409	3409.0	1.65	1.65
T34	0162.01	5893	5893.0	1.82	1.82
T35	0165.01	8733	8733.0	0.78	0.78
T36	0095.08	10013	9856.0	1.18	1.17
T37	0165.02	6711	6316.7	0.81	0.76
T38	0095.09	3298	3061.4	2.02	1.88
T39	0164.01	4736	230.9	0.90	0.04
T40	0098.04	4923	4923.0	0.68	0.68
T41	0097.04	5475	5475.0	1.20	1.20
T42	0093.03	8895	758.2	1.69	0.14
T43	0096.02	3699	3699.0	0.74	0.74
T44	0163.02	5114	2948.8	0.46	0.27
T45	0163.01	4976	4976.0	0.41	0.41
T46	0161.00	5720	5720.0	1.10	1.10
T47	0098.01	4470	4470.0	0.82	0.82
T48	0097.06	6870	6870.0	2.48	2.48
T49	0098.02	6071	6071.0	0.76	0.76
T50	0097.03	3451	3451.0	0.63	0.63
T51	0157.01	5500	1119.0	0.37	0.07
T52	0158.01	3239	3239.0	0.24	0.24
T53	0151.00	4600	4600.0	0.84	0.84
T54	0150.00	5541	5541.0	1.20	1.20
T55	0160.00	2507	2507.0	0.71	0.71
T56	0157.03	6335	793.4	0.27	0.03
T57	0158.02	4530	4163.1	0.36	0.34
T58	0159.01	3312	3312.0	0.15	0.15

CENSUS FINDINGS

Map ID	Tract Number	Total Population	Population in Radius	Total Area(sq.mi.)	Area in Radius(sq. mi.)
T59	0097.05	3299	3299.0	0.89	0.89
T60	0096.04	3215	2737.1	0.69	0.59
T61	0096.03	4478	495.8	0.65	0.07
T62	0148.04	4483	4483.0	0.48	0.48
T63	0148.03	4732	4732.0	0.72	0.72
T64	0159.02	4944	4507.2	0.42	0.39
T65	0153.01	3164	422.7	0.25	0.03
T66	0153.02	3949	1053.0	1.30	0.35
T67	0148.01	6776	6776.0	0.86	0.86
T68	0028.01	3776	1693.6	1.15	0.51
T69	0029.04	6704	5326.5	0.70	0.56
T70	0152.00	3769	1753.3	1.65	0.77
T71	0149.00	7497	4553.2	1.25	0.76
T72	0029.05	3794	3794.0	0.44	0.44
T73	0028.04	4477	16.3	0.57	0.00
T74	0146.01	4478	1752.8	0.56	0.22
T75	0147.00	7360	2513.5	0.95	0.32
T76	0029.02	5219	403.4	0.61	0.05
T77	0146.02	3947	1.2	1.06	0.00

San Diego Air Basin

2008 Emission Inventory by Compound

Acetaldehyde

Approximately 90 percent of the emissions of acetaldehyde are from mobile sources.

San Diego - Acetaldehyde			
Emissions Source	**tons/year**	**Percent Air Basin**	**Percent State**
Stationary Sources	8	1%	<1%
Area-wide Sources	45	9%	<1%
On-Road Mobile	154	29%	2%
Gasoline Vehicles	66	13%	1%
Diesel Vehicles	88	17%	1%
Other Mobile	318	61%	3%
Gasoline Fuel	61	12%	1%
Diesel Fuel	192	37%	2%
Other Fuel	64	12%	1%
Natural Sources	0	0%	0%
Total	524	100%	6%
Total Statewide	**9103**		

Table 5-56

Benzene

The primary sources of benzene emissions in the San Diego Air Basin are mobile sources (approximately 94 percent).

San Diego - Benzene			
Emissions Source	**tons/year**	**Percent Air Basin**	**Percent State**
Stationary Sources	42	5%	<1%
Area-wide Sources	4	<1%	<1%
On-Road Mobile	415	54%	4%
Gasoline Vehicles	391	51%	4%
Diesel Vehicles	24	3%	<1%
Other Mobile	310	40%	3%
Gasoline Fuel	227	29%	2%
Diesel Fuel	52	7%	<1%
Other Fuel	31	4%	<1%
Natural Sources	0	0%	0%
Total	770	100%	7%
Total Statewide	**10794**		

Table 5-57

1,3-Butadiene

Approximately 71 percent of the emissions of 1,3-butadiene are from mobile sources, and 22 percent from natural sources.

San Diego - 1,3-Butadiene			
Emissions Source	**tons/year**	**Percent Air Basin**	**Percent State**
Stationary Sources	1	1%	<1%
Area-wide Sources	13	6%	<1%
On-Road Mobile	85	36%	2%
Gasoline Vehicles	83	35%	2%
Diesel Vehicles	2	1%	<1%
Other Mobile	82	35%	2%
Gasoline Fuel	52	22%	1%
Diesel Fuel	5	2%	<1%
Other Fuel	25	11%	1%
Natural Sources	52	22%	1%
Total	233	100%	6%
Total Statewide	**3754**		

Table 5-58

Carbon Tetrachloride

Stationary sources such as chemical and allied product manufacturers account for all of the emissions of carbon tetrachloride.

San Diego - Carbon Tetrachloride			
Emissions Source	**tons/year**	**Percent Air Basin**	**Percent State**
Stationary Sources	0.09	100%	2%
Area-wide Sources	0	0%	0%
On-Road Mobile	0	0%	0%
Gasoline Vehicles	0	0%	0%
Diesel Vehicles	0	0%	0%
Other Mobile	0	0%	0%
Gasoline Fuel	0	0%	0%
Diesel Fuel	0	0%	0%
Other Fuel	0	0%	0%
Natural Sources	0	0%	0%
Total	0.09	100%	2%
Total Statewide	**4.04**		

Table 5-59

Chromium, Hexavalent

Approximately 54 percent of the hexavalent chromium emissions are from stationary sources. Mobile sources account for approximately 44 percent.

San Diego - Chromium, Hexavalent			
Emissions Source	**tons/year**	**Percent Air Basin**	**Percent State**
Stationary Sources	0.03	54%	6%
Area-wide Sources	< .01	2%	<1%
On-Road Mobile	0.02	27%	3%
Gasoline Vehicles	0.02	26%	3%
Diesel Vehicles	< .01	1%	<1%
Other Mobile	0.01	17%	2%
Gasoline Fuel	0.01	17%	2%
Diesel Fuel	< .01	1%	<1%
Other Fuel	< .01	<1%	<1%
Natural Sources	0	0%	0%
Total	0.06	100%	10%
Total Statewide	**0.61**		

Table 5-60

para-Dichlorobenzene

All of the emissions of *para*-dichlorobenzene are from consumer products (non-aerosol insect repellants and solid/gel air fresheners).

San Diego - para-Dichlorobenzene			
Emissions Source	**tons/year**	**Percent Air Basin**	**Percent State**
Stationary Sources	0	0%	0%
Area-wide Sources	122	100%	8%
On-Road Mobile	0	0%	0%
Gasoline Vehicles	0	0%	0%
Diesel Vehicles	0	0%	0%
Other Mobile	0	0%	0%
Gasoline Fuel	0	0%	0%
Diesel Fuel	0	0%	0%
Other Fuel	0	0%	0%
Natural Sources	0	0%	0%
Total	122	100%	8%
Total Statewide	**1508**		

Table 5-61

Formaldehyde

Approximately 92 percent of the formaldehyde emissions are from mobile sources.

San Diego - Formaldehyde			
Emissions Source	**tons/year**	**Percent Air Basin**	**Percent State**
Stationary Sources	49	4%	<1%
Area-wide Sources	56	4%	<1%
On-Road Mobile	397	31%	2%
Gasoline Vehicles	221	17%	1%
Diesel Vehicles	176	14%	1%
Other Mobile	779	61%	4%
Gasoline Fuel	187	15%	1%
Diesel Fuel	385	30%	2%
Other Fuel	208	16%	1%
Natural Sources	0	0%	0%
Total	1282	100%	6%
Total Statewide	**20951**		

Table 5-62

Methylene Chloride

Area-wide sources such as paint removers/strippers, automotive brake cleaners, and other consumer products account for approximately 84 percent of the emissions of methylene chloride.

San Diego - Methylene Chloride			
Emissions Source	**tons/year**	**Percent Air Basin**	**Percent State**
Stationary Sources	57	16%	1%
Area-wide Sources	301	84%	5%
On-Road Mobile	0	0%	0%
Gasoline Vehicles	0	0%	0%
Diesel Vehicles	0	0%	0%
Other Mobile	0	0%	0%
Gasoline Fuel	0	0%	0%
Diesel Fuel	0	0%	0%
Other Fuel	0	0%	0%
Natural Sources	0	0%	0%
Total	359	100%	6%
Total Statewide	**6436**		

Table 5-63

Perchloroethylene

Approximately 58 percent of the emissions of perchloroethylene are from stationary sources such as dry cleaning plants, manufacturers of aircraft parts and fabricated metal parts, and other stationary sources.

San Diego - Perchloroethylene			
Emissions Source	**tons/year**	**Percent Air Basin**	**Percent State**
Stationary Sources	245	58%	5%
Area-wide Sources	177	42%	4%
On-Road Mobile	0	0%	0%
Gasoline Vehicles	0	0%	0%
Diesel Vehicles	0	0%	0%
Other Mobile	0	0%	0%
Gasoline Fuel	0	0%	0%
Diesel Fuel	0	0%	0%
Other Fuel	0	0%	0%
Natural Sources	0	0%	0%
Total	422	100%	8%
Total Statewide	**4982**		

Table 5-64

Diesel Particulate Matter

Approximately 96 percent of the emissions of diesel PM are from mobile sources.

San Diego - Diesel PM			
Emissions Source	**tons/year**	**Percent Air Basin**	**Percent State**
Stationary Sources	56	4%	<1%
Area-wide Sources	0	0%	0%
On-Road Mobile	645	40%	2%
Gasoline Vehicles	0	0%	0%
Diesel Vehicles	645	40%	2%
Other Mobile	905	56%	3%
Gasoline Fuel	0	0%	0%
Diesel Fuel	896	56%	2%
Other Fuel	9	1%	<1%
Natural Sources	0	0%	0%
Total	1607	100%	4%
Total Statewide	**35884**		

Table 5-65

San Diego Air Basin
Annual Average Concentrations and Health Risks

Annual Average Concentrations and Health Risks																			
TAC	Conc.[1]/Risk[2]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Acetaldehyde	Annual Avg	1.33	1.5	1.22	1.41	1.48	0.64	1.03	1	0.86	1.04	0.84	0.95	0.97	0.89	0.89	1.01	0.85	0.88
	Health Risk	6	7	6	7	7	3	5	5	4	5	4	5	5	4	4	5	4	4
Benzene	Annual Avg	2.25	1.7	1.48	1.16	1.39	0.98	0.76	0.76	0.76	0.86	0.65	0.505	0.491	0.483	0.371	0.404	0.362	0.373
	Health Risk	208	158	137	107	129	90	71	70	70	79	60	47	45	45	34	37	34	35
1,3-Butadiene	Annual Avg	0.333	0.257	0.258	0.312	0.307	0.242	0.208	0.198	0.196	0.22	0.159	0.136	0.12	0.089	0.074	0.073	0.068	0.073
	Health Risk	125	97	97	117	115	91	78	75	74	83	60	51	45	33	28	27	26	27
Carbon Tetrachloride	Annual Avg	0.132	0.127		0.103		0.099	0.077				0.094	0.086	0.092	0.093				
	Health Risk	35	34		27		26	20				25	23	24	25				
Chromium, Hexavalent	Annual Avg			0.24	0.19	0.16	0.18	0.11	0.11	0.1	0.1	0.1		0.045	0.05	0.03	0.043	0.05	0.034
	Health Risk			36	28	23	27	16	16	15	15	15		7	8	5	6	8	5
para-Dichlorobenzene	Annual Avg		0.1	0.11	0.13	0.15	0.12	0.11	0.13				0.15	0.15	0.15	0.15	0.15	0.15	
	Health Risk		7	8	8	10	8	7	8				10	10	10	10	10	10	
Formaldehyde	Annual Avg	1.64	1.53	1.26	1.76	2.25	2.13	2.62	2.62	2.27	2.67	2.23	2.59	2.99	2.68	2.19	2.42	2.08	2.24
	Health Risk	12	11	9	13	17	16	19	19	17	20	16	19	22	20	16	18	15	16
Methylene Chloride	Annual Avg	0.59	0.83	1.34	1.13	0.73	0.63	0.59	0.57		0.53	0.76	0.17	0.16	0.16	0.13	0.14	0.14	0.14
	Health Risk	2	3	5	4	3	2	2	2		2	3	<1	<1	<1	<1	<1	<1	<1
Perchloroethylene	Annual Avg	0.282	0.269	0.263	0.2	0.207	0.249	0.147	0.125			0.089	0.061	0.06	0.047	0.037	0.041	0.037	0.03
	Health Risk	11	11	11	8	8	10	6	5			4	2	2	2	1	2	1	1
Diesel PM[3]	*Annual Avg*	*(2.9)*					*(1.9)*					*(1.4)*							
	Health Risk	*(870)*					*(570)*					*(420)*							
Average Basin Risk	w/o Diesel PM	399	328	309	319	312	273	224	200	180	204	187	157	160	147	98	105	98	88
	w/ Diesel PM	*(1269)*					*(843)*					*(607)*							

1 Concentrations for Hexavalent chromium are expressed as ng/m3 and concentrations for diesel PM are expressed as ug/m3. Concentrations for all other TACs are expressed as parts per billion.

2 Health Risk represents the number of excess cancer cases per million people based on a lifetime (70-year) exposure to the annual average concentration. It reflects only those compounds listed in this table and only those with data for that year. There may be other significant compounds for which we do not monitor or have health risk information. Additional information about interpreting the toxic air contaminant air quality trends can be found in Chapter 1, *Interpreting the Emission and Air Quality Statistics.*

3 Diesel PM estimates are based on receptor modeling techniques, and the estimates are available only for selected years. Currently, the estimates are being reviewed.

Table 5-66

TABLE F.4-6 SENSITIVE RECEPTOR LISTING (20 Pages)

Recp #	Receptor Type	Distance from Site, ft	Elevation, ft	Latitude	Longitude
1	Hospital	2754	393	-117.02216	32.84553
2	Daycare	3581	341	-117.02179	32.84254
3	Daycare	4271	350	-117.01870	32.84249
4	Daycare	4501	341	-117.01973	32.84070
5	Daycare	4770	367	-117.01617	32.84312
6	Daycare	4775	338	-117.01954	32.83984
7	School	4856	406	-117.01494	32.84459
8	School	5046	426	-117.01297	32.84981
9	Daycare	5252	362	-117.01524	32.84190
10	Daycare	5311	344	-117.01603	32.84073
11	Daycare	5322	344	-117.01601	32.84071
12	Daycare	5544	357	-117.02542	32.83513
13	Daycare	5773	355	-117.02436	32.83471
14	Daycare	6123	331	-117.02061	32.83489
15	Daycare	6146	389	-117.01003	32.85428
16	Daycare	6157	332	-117.02058	32.83479
17	Daycare	6158	389	-117.01003	32.85442
18	Daycare	6225	388	-117.00944	32.85304
19	Daycare	6542	349	-117.00810	32.85063
20	Daycare	6776	344	-117.00787	32.85410
21	Daycare	6961	365	-117.00934	32.85892
22	School	7432	353	-117.01938	32.83140
23	Daycare	7442	387	-117.02172	32.83059
24	Daycare	7517	428	-117.02472	32.82971
25	Daycare	7754	405	-117.02268	32.82945
26	Daycare	7806	367	-117.00408	32.85193
27	Daycare	7872	380	-117.00488	32.85634
28	Daycare	8212	425	-117.02251	32.82818
29	Daycare	8214	372	-117.00269	32.85134
30	Daycare	8286	391	-117.00327	32.85569
31	Daycare	8313	359	-117.00236	32.84873
32	Daycare	8388	392	-117.00235	32.85325
33	Daycare	8436	355	-117.00210	32.84735
34	Daycare	8702	459	-117.00334	32.85940
35	Daycare	8760	348	-117.00124	32.84611
36	Daycare	8779	372	-117.01113	32.83143
37	Daycare	8828	376	-117.01110	32.83127
38	Daycare	8860	378	-117.01113	32.83114
39	Daycare	8964	365	-117.00030	32.84804
40	Daycare	9086	472	-117.00190	32.85923
41	School	9097	462	-117.00392	32.86278
42	Daycare	9214	341	-117.00669	32.83344
43	Daycare	9339	329	-117.00134	32.84009
44	Daycare	9514	397	-116.99845	32.85126
45	Daycare	9514	397	-116.99845	32.85126
46	Daycare	9561	491	-116.99984	32.85828
47	Daycare	9668	331	-116.99968	32.84121
48	Daycare	9680	420	-117.00498	32.86684
49	Daycare	9699	330	-116.99957	32.84121

50	Hospital	9937	329	-116.99776	32.84424
51	School	9989	367	-116.99697	32.84778
52	Daycare	10034	498	-117.00280	32.86603
53	Daycare	10078	503	-117.00261	32.86601
54	Hospital	10563	438	-117.00358	32.86919
55	Hospital	10563	438	-117.00358	32.86919
56	Daycare	10735	467	-116.99550	32.85724
57	Daycare	10977	367	-116.99373	32.84788
58	School	11119	424	-116.99376	32.85545
59	Daycare	11272	379	-117.00117	32.83018
60	Daycare	11302	375	-117.00069	32.83054
61	School	11302	375	-117.00069	32.83054
62	Daycare	11373	346	-116.99245	32.84781
63	Daycare	11429	391	-116.99220	32.85120
64	Daycare	11457	342	-116.99735	32.83386
65	Daycare	11633	341	-116.99619	32.83460
66	School	11847	346	-116.99590	32.83383
67	Daycare	11856	340	-116.99086	32.84796
68	Daycare	11989	333	-116.99164	32.84160
69	Daycare	12012	360	-116.99623	32.83248
70	Daycare	12045	386	-116.99017	32.85067
71	Daycare	12108	499	-116.99239	32.86151
72	Daycare	12333	347	-116.98923	32.84989
73	Daycare	12377	370	-116.98909	32.85065
74	Daycare	12719	347	-116.99295	32.83337
75	Daycare	12741	420	-116.99876	32.82637
76	Daycare	12799	350	-116.99297	32.83289
77	Hospital	13085	449	-116.99710	32.82652
78	Hospital	13085	449	-116.99710	32.82652
79	Daycare	13187	520	-116.99515	32.82812
80	Daycare	13310	347	-116.98605	32.85065
81	Hospital	13346	370	-116.99234	32.83082
82	Daycare	13427	526	-117.04385	32.81515
83	Daycare	13451	518	-117.04411	32.81516
84	Daycare	13483	343	-116.98831	32.83691
85	Daycare	13483	343	-116.98831	32.83691
86	Daycare	13645	782	-117.01696	32.81397
87	Daycare	13715	433	-116.99293	32.82822
88	Hospital	13727	433	-116.99291	32.82818
89	Hospital	13727	433	-116.99291	32.82818
90	Hospital	13727	433	-116.99291	32.82818
91	Hospital	13985	335	-116.98461	32.84298
92	Daycare	14022	545	-117.04345	32.81331
93	Daycare	14094	340	-116.98352	32.84872
94	Daycare	14094	340	-116.98352	32.84872
95	Daycare	14094	340	-116.98352	32.84872
96	Hospital	14112	340	-116.98541	32.83875
97	School	14162	352	-116.98330	32.85137
98	School	14187	381	-116.98330	32.85269
99	Daycare	14224	724	-117.00894	32.81491
100	Daycare	14224	724	-117.00894	32.81491

101	Hospital	14224	724	-117.00894	32.81491
102	School	14224	724	-117.00894	32.81491
103	College	14224	724	-117.00894	32.81491
104	College	14224	724	-117.00894	32.81491
105	Hospital	14273	433	-116.98326	32.85480
106	Daycare	14327	427	-116.98308	32.85479
107	Daycare	14327	427	-116.98308	32.85479
108	Daycare	14327	427	-116.98308	32.85479
109	Hospital	14327	427	-116.98308	32.85479
110	Hospital	14633	578	-116.99305	32.82397
111	Daycare	14638	347	-116.98549	32.83431
112	Daycare	14759	442	-116.99090	32.82570
113	Daycare	14806	792	-117.01631	32.81081
114	Hospital	14904	350	-116.98387	32.83577
115	Daycare	14926	727	-117.01985	32.80975
116	Hospital	15005	350	-116.98387	32.83499
117	Hospital	15005	350	-116.98387	32.83499
118	Nursing	15005	350	-116.98387	32.83499
119	Hospital	15019	350	-116.98387	32.83489
120	Hospital	15047	350	-116.98387	32.83468
121	Hospital	15047	350	-116.98387	32.83468
122	Daycare	15071	505	-116.99909	32.81740
123	Daycare	15161	780	-117.01071	32.81141
124	Hospital	15189	434	-116.98886	32.82606
125	Hospital	15259	552	-116.99773	32.81766
126	Hospital	15310	346	-116.98465	32.83141
127	Hospital	15310	346	-116.98465	32.83141
128	Daycare	15349	432	-116.98078	32.85982
129	Daycare	15501	724	-117.01896	32.80829
130	Daycare	15547	739	-117.07741	32.83640
131	Daycare	15710	580	-116.98943	32.82302
132	Daycare	15711	343	-116.98006	32.83852
133	Daycare	15830	389	-116.97837	32.85622
134	Daycare	15842	418	-116.97919	32.86005
135	Hospital	15864	350	-116.98265	32.83141
136	Daycare	15931	355	-116.98108	32.83403
137	Daycare	16011	380	-116.97756	32.85481
138	Daycare	16333	417	-116.97745	32.85967
139	Daycare	16431	609	-117.05296	32.80943
140	Daycare	16457	734	-117.01513	32.80638
141	School	16457	734	-117.01513	32.80638
142	Daycare	16495	785	-117.00855	32.80819
143	Daycare	16496	440	-116.97745	32.86158
144	Daycare	16528	406	-117.05984	32.81251
145	Daycare	16555	734	-117.01543	32.80603
146	Daycare	16596	736	-117.00917	32.80767
147	Daycare	16599	733	-117.01579	32.80582
148	Daycare	16681	655	-117.02516	32.80426
149	Daycare	16694	743	-117.01403	32.80596
150	Daycare	16695	721	-117.01675	32.80535
151	Daycare	16702	642	-117.00103	32.81081

152	Daycare	16782	646	-117.03796	32.80442
153	Daycare	16782	646	-117.03796	32.80442
154	Daycare	16782	646	-117.03796	32.80442
155	Hospital	16782	646	-117.03796	32.80442
156	School	16782	646	-117.03796	32.80442
157	Daycare	16783	743	-117.00684	32.80796
158	Daycare	16821	442	-116.97687	32.86316
159	Daycare	16871	675	-117.02214	32.80401
160	Daycare	16943	762	-117.01344	32.80539
161	Daycare	16995	743	-117.01409	32.80509
162	Hospital	17043	350	-116.97559	32.83849
163	Hospital	17043	350	-116.97559	32.83849
164	Hospital	17043	350	-116.97559	32.83849
165	Hospital	17043	350	-116.97559	32.83849
166	Hospital	17043	350	-116.97559	32.83849
167	Hospital	17043	350	-116.97559	32.83849
168	Hospital	17043	350	-116.97559	32.83849
169	Daycare	17087	728	-117.00816	32.80657
170	Hospital	17211	351	-116.97626	32.83493
171	Hospital	17211	351	-116.97626	32.83493
172	Hospital	17211	351	-116.97626	32.83493
173	Hospital	17211	351	-116.97626	32.83493
174	Hospital	17211	351	-116.97626	32.83493
175	Daycare	17253	350	-116.97324	32.85184
176	Daycare	17441	642	-117.02561	32.80214
177	Hospital	17449	443	-116.98341	32.82181
178	Hospital	17449	443	-116.98341	32.82181
179	Daycare	17489	684	-117.02314	32.80219
180	Daycare	17501	715	-117.01384	32.80370
181	Daycare	17507	392	-116.97363	32.86004
182	Daycare	17556	612	-117.05019	32.80502
183	Daycare	17631	399	-116.97365	32.86165
184	Hospital	17784	720	-117.04514	32.80293
185	School	17954	684	-117.02166	32.80106
186	Daycare	18008	690	-117.01464	32.80207
187	Daycare	18102	353	-116.97174	32.83960
188	School	18116	380	-116.97102	32.85728
189	Daycare	18180	505	-116.97675	32.87288
190	Daycare	18195	603	-117.05395	32.80445
191	School	18195	603	-117.05395	32.80445
192	Daycare	18327	530	-116.98449	32.81680
193	Hospital	18348	353	-116.96974	32.85296
194	Hospital	18365	428	-116.98149	32.81976
195	Daycare	18411	409	-116.97108	32.86180
196	Daycare	18411	409	-116.97108	32.86180
197	Hospital	18485	353	-116.97026	32.84046
198	Hospital	18485	353	-116.97026	32.84046
199	Nursing	18485	353	-116.97026	32.84046
200	School	18486	754	-117.00201	32.80473
201	Daycare	18536	473	-117.08160	32.82439
202	Daycare	18588	416	-116.97067	32.86243

203	Daycare	18634	779	-116.99445	32.80810
204	Hospital	18730	678	-117.01446	32.80006
205	Daycare	18741	576	-117.05441	32.80298
206	Daycare	18767	456	-116.97205	32.86787
207	Daycare	18794	408	-116.96927	32.85970
208	Daycare	18815	458	-116.97201	32.86815
209	School	18825	450	-116.97107	32.86595
210	School	18826	450	-116.97107	32.86596
211	Daycare	18949	370	-116.97149	32.83197
212	School	19154	720	-117.00302	32.80226
213	Daycare	19196	659	-117.01814	32.79807
214	Daycare	19235	364	-116.96796	32.83965
215	Hospital	19240	721	-117.00265	32.80215
216	Hospital	19259	452	-116.96908	32.86454
217	Daycare	19331	471	-117.08746	32.82943
218	Daycare	19370	496	-117.08727	32.82878
219	Daycare	19374	463	-116.98265	32.81421
220	School	19400	478	-117.09063	32.83680
221	Daycare	19402	475	-117.09064	32.83682
222	School	19447	409	-116.97967	32.81688
223	School	19447	409	-116.97967	32.81688
224	Daycare	19528	510	-116.97108	32.87143
225	School	19528	510	-116.97108	32.87143
226	Daycare	19602	664	-117.01609	32.79727
227	Daycare	19648	702	-117.01221	32.79795
228	Daycare	19648	690	-117.02269	32.79626
229	Daycare	19686	697	-117.01233	32.79781
230	Daycare	19853	797	-116.99390	32.80437
231	Daycare	19948	637	-117.03233	32.79519
232	School	19948	637	-117.03233	32.79519
233	Daycare	20008	461	-116.98246	32.81183
234	School	20008	461	-116.98246	32.81183
235	Daycare	20063	615	-117.04496	32.79641
236	School	20063	615	-117.04496	32.79641
237	Daycare	20121	506	-117.08700	32.82360
238	Hospital	20172	698	-117.00238	32.79943
239	Hospital	20196	360	-116.96401	32.84390
240	Daycare	20242	427	-117.09279	32.83469
241	School	20317	366	-116.96331	32.85295
242	Daycare	20319	412	-116.96419	32.85956
243	Hospital	20334	757	-116.99362	32.80294
244	Daycare	20370	505	-116.96544	32.86489
245	Hospital	20449	380	-116.96331	32.85703
246	Hospital	20590	473	-116.96456	32.86447
247	Daycare	20651	732	-117.00103	32.79850
248	Hospital	20715	374	-116.96234	32.85631
249	Daycare	20890	427	-117.09507	32.83494
250	School	20891	615	-117.05254	32.79597
251	College	20928	382	-116.96976	32.82212
252	Hospital	20937	376	-116.96171	32.85703
253	Daycare	20971	635	-117.01514	32.79359

254	Daycare	20989	700	-116.99950	32.79809
255	Hospital	21083	603	-117.03651	32.79233
256	Hospital	21086	626	-117.02817	32.79202
257	Hospital	21117	634	-117.01824	32.79269
258	Hospital	21117	634	-117.01824	32.79269
259	Hospital	21117	634	-117.01824	32.79269
260	Daycare	21123	721	-116.99441	32.79998
261	Daycare	21128	460	-116.96281	32.86466
262	Daycare	21158	634	-117.01812	32.79259
263	Daycare	21158	634	-117.01812	32.79259
264	Daycare	21287	635	-117.01980	32.79202
265	Daycare	21319	422	-117.09772	32.83951
266	Daycare	21319	422	-117.09772	32.83951
267	Daycare	21369	663	-117.05982	32.79714
268	Daycare	21393	708	-116.99524	32.79872
269	Hospital	21444	394	-116.96051	32.85972
270	Daycare	21564	274	-117.06721	32.80002
271	School	21584	258	-117.08351	32.81209
272	Daycare	21605	479	-117.09156	32.82214
273	Daycare	21628	706	-117.00839	32.79322
274	Daycare	21632	450	-116.96101	32.86432
275	Daycare	21659	386	-116.95968	32.85913
276	Hospital	21659	386	-116.95968	32.85913
277	Hospital	21659	386	-116.95968	32.85913
278	Hospital	21659	386	-116.95968	32.85913
279	Hospital	21659	386	-116.95968	32.85913
280	Hospital	21659	386	-116.95968	32.85913
281	School	21659	386	-116.95968	32.85913
282	Hospital	21734	396	-116.95972	32.86059
283	Daycare	21806	458	-117.09667	32.83075
284	Daycare	21854	433	-117.09623	32.82930
285	School	21854	433	-117.09623	32.82930
286	Daycare	21856	344	-117.06922	32.80017
287	Daycare	21969	342	-117.07164	32.80123
288	Daycare	22147	368	-116.95745	32.84558
289	School	22209	688	-117.00197	32.79348
290	Daycare	22301	672	-117.02609	32.78873
291	Daycare	22460	622	-117.01798	32.78898
292	Daycare	22501	399	-117.09290	32.81910
293	Daycare	22535	640	-117.01531	32.78917
294	Daycare	22570	420	-117.09689	32.82538
295	Daycare	22576	634	-117.00687	32.79089
296	Daycare	22583	640	-117.02651	32.78793
297	School	22586	625	-117.01988	32.78840
298	Daycare	22640	368	-117.06938	32.79768
299	Daycare	22687	435	-117.09586	32.82272
300	Daycare	22820	484	-116.97952	32.80347
301	School	22830	663	-117.00297	32.79131
302	Daycare	22875	404	-117.10235	32.83719
303	Daycare	22900	672	-116.99872	32.79259
304	School	23044	204	-117.07816	32.80182

305	Hospital	23063	435	-116.95975	32.82623
306	Daycare	23131	384	-117.06840	32.79557
307	School	23131	384	-117.06840	32.79557
308	Daycare	23155	615	-117.02546	32.78640
309	Daycare	23198	374	-117.09624	32.82025
310	College	23200	404	-116.97339	32.80716
311	Daycare	23207	425	-117.09891	32.82492
312	Daycare	23215	417	-116.96046	32.82376
313	Daycare	23232	356	-117.07288	32.79770
314	Daycare	23245	588	-117.01918	32.78665
315	Daycare	23245	588	-117.01918	32.78665
316	Daycare	23249	396	-117.10137	32.83010
317	Daycare	23257	623	-116.98300	32.79944
318	Hospital	23261	402	-116.97248	32.80778
319	Hospital	23261	402	-116.97248	32.80778
320	Daycare	23271	399	-117.10109	32.82922
321	Daycare	23367	371	-117.10312	32.83401
322	Daycare	23416	315	-117.09711	32.82035
323	Daycare	23416	315	-117.09711	32.82035
324	Daycare	23416	315	-117.09711	32.82035
325	School	23416	315	-117.09711	32.82035
326	Daycare	23470	467	-117.06552	32.79311
327	School	23470	467	-117.06552	32.79311
328	Daycare	23494	367	-116.95288	32.84926
329	Daycare	23494	367	-116.95288	32.84926
330	Daycare	23494	367	-116.95288	32.84926
331	Hospital	23534	380	-117.09835	32.82172
332	Daycare	23634	347	-117.07519	32.79775
333	Daycare	23635	366	-117.07012	32.79483
334	Daycare	23656	227	-117.08079	32.80153
335	Daycare	23663	400	-117.09715	32.81897
336	Hospital	23679	403	-116.97067	32.80779
337	Daycare	23719	573	-117.01990	32.78526
338	Daycare	23761	617	-116.99861	32.79004
339	Daycare	23792	416	-117.10133	32.82564
340	Daycare	23828	349	-117.07414	32.79645
341	Daycare	23888	577	-116.95552	32.82939
342	Hospital	23908	414	-117.09867	32.81995
343	Daycare	23956	603	-117.01877	32.78472
344	Daycare	24007	429	-117.10575	32.83572
345	Daycare	24034	625	-117.02320	32.78410
346	Daycare	24076	700	-116.99398	32.79092
347	School	24076	700	-116.99398	32.79092
348	Daycare	24091	425	-117.10648	32.83756
349	Daycare	24110	598	-117.02195	32.78398
350	Daycare	24119	611	-117.02250	32.78392
351	Daycare	24130	600	-117.02213	32.78391
352	Daycare	24238	419	-116.95782	32.82188
353	Daycare	24258	470	-116.95074	32.84369
354	School	24282	418	-117.09991	32.81975
355	Daycare	24340	564	-117.03083	32.78306

356	Daycare	24342	427	-117.10293	32.82495
357	Hospital	24356	580	-117.02926	32.78301
358	Hospital	24356	580	-117.02926	32.78301
359	Nursing	24356	580	-117.02926	32.78301
360	Daycare	24359	452	-116.95609	32.82437
361	School	24522	418	-117.10706	32.83424
362	Hospital	24543	619	-116.99930	32.78746
363	Hospital	24543	619	-116.99930	32.78746
364	Hospital	24563	570	-117.02989	32.78244
365	School	24567	435	-117.10405	32.82566
366	School	24609	493	-116.95407	32.82687
367	Daycare	24618	350	-117.07353	32.79347
368	Hospital	24676	571	-117.00628	32.78500
369	Daycare	24680	340	-117.07836	32.79616
370	Daycare	24681	373	-116.94999	32.86057
371	Hospital	24736	546	-117.03425	32.78209
372	Hospital	24756	572	-117.00651	32.78471
373	Hospital	24756	572	-117.00651	32.78471
374	Hospital	24756	572	-117.00651	32.78471
375	Hospital	24756	572	-117.00651	32.78471
376	Hospital	24756	572	-117.00651	32.78471
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381	Hospital	24756	572	-117.00651	32.78471
382	Hospital	24756	572	-117.00651	32.78471
383	Hospital	24756	572	-117.00651	32.78471
384	Hospital	24756	572	-117.00651	32.78471
385	Hospital	24756	572	-117.00651	32.78471
386	Hospital	24756	572	-117.00651	32.78471
387	Hospital	24756	572	-117.00651	32.78471
388	Hospital	24756	572	-117.00651	32.78471
389	Hospital	24756	572	-117.00651	32.78471
390	Daycare	24862	502	-116.97850	32.79681
391	Daycare	24869	544	-117.03448	32.78173
392	Daycare	24869	544	-117.03448	32.78173
393	Daycare	24869	544	-117.03448	32.78173
394	Daycare	24943	427	-116.95686	32.81910
395	Daycare	24954	479	-116.95364	32.82513
396	Daycare	24954	479	-116.95364	32.82513
397	School	24954	479	-116.95364	32.82513
398	Daycare	25001	412	-116.96155	32.81198
399	School	25014	340	-117.07916	32.79552
400	Daycare	25151	427	-117.10472	32.82280
401	Daycare	25167	699	-116.98812	32.79020
402	Daycare	25176	699	-116.98812	32.79017
403	Daycare	25229	427	-117.10442	32.82168
404	Daycare	25327	326	-117.10867	32.83069
405	Daycare	25447	657	-116.99361	32.78687
406	School	25447	657	-116.99361	32.78687

407	Daycare	25458	503	-116.95173	32.82548
408	Hospital	25464	553	-116.97989	32.79381
409	Daycare	25555	421	-117.10589	32.82227
410	Hospital	25575	575	-116.98015	32.79327
411	Daycare	25587	419	-117.10598	32.82224
412	Daycare	25633	419	-116.95809	32.81333
413	Hospital	25651	627	-117.00809	32.78178
414	Hospital	25651	627	-117.00809	32.78178
415	Nursing	25651	627	-117.00809	32.78178
416	Hospital	25677	650	-117.00568	32.78227
417	Hospital	25677	650	-117.00568	32.78227
418	Hospital	25677	650	-117.00568	32.78227
419	Hospital	25677	650	-117.00568	32.78227
420	Hospital	25677	650	-117.00568	32.78227
421	Hospital	25677	650	-117.00568	32.78227
422	Hospital	25677	650	-117.00568	32.78227
423	Hospital	25677	650	-117.00568	32.78227
424	Hospital	25677	650	-117.00568	32.78227
425	Hospital	25677	650	-117.00568	32.78227
426	Hospital	25677	650	-117.00568	32.78227
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431	Hospital	25677	650	-117.00568	32.78227
432	Hospital	25677	650	-117.00568	32.78227
433	Hospital	25677	650	-117.00568	32.78227
434	Hospital	25677	650	-117.00568	32.78227
435	Hospital	25677	650	-117.00568	32.78227
436	Hospital	25677	650	-117.00568	32.78227
437	Hospital	25677	650	-117.00568	32.78227
438	Hospital	25677	650	-117.00568	32.78227
439	Hospital	25677	650	-117.00568	32.78227
440	Hospital	25677	650	-117.00568	32.78227
441	Hospital	25677	650	-117.00568	32.78227
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443	Hospital	25677	650	-117.00568	32.78227
444	Hospital	25677	650	-117.00568	32.78227
445	Hospital	25677	650	-117.00568	32.78227
446	Daycare	25735	512	-116.95088	32.82522
447	Hospital	25772	572	-117.01110	32.78082
448	Hospital	25772	572	-117.01110	32.78082
449	Daycare	25786	414	-117.10646	32.82179
450	Daycare	25929	330	-117.11052	32.83013
451	Daycare	26029	379	-116.94599	32.86282
452	Daycare	26037	547	-117.04503	32.77961
453	Daycare	26038	379	-116.94596	32.86283
454	Hospital	26053	601	-117.00998	32.78024
455	Hospital	26053	601	-117.00998	32.78024
456	Hospital	26053	601	-117.00998	32.78024
457	Hospital	26053	601	-117.00998	32.78024

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461	Hospital	26053	601	-117.00998	32.78024
462	Hospital	26053	601	-117.00998	32.78024
463	Hospital	26053	601	-117.00998	32.78024
464	Hospital	26053	601	-117.00998	32.78024
465	Hospital	26053	601	-117.00998	32.78024
466	Hospital	26053	601	-117.00998	32.78024
467	Hospital	26053	601	-117.00998	32.78024
468	Hospital	26053	601	-117.00998	32.78024
469	Hospital	26053	601	-117.00998	32.78024
470	Hospital	26053	601	-117.00998	32.78024
471	Hospital	26053	601	-117.00998	32.78024
472	Hospital	26053	504	-117.03510	32.77850
473	Daycare	26087	419	-116.95770	32.81150
474	Hospital	26139	603	-117.00977	32.78004
475	Hospital	26139	603	-117.00977	32.78004
476	Hospital	26139	603	-117.00977	32.78004
477	Hospital	26139	603	-117.00977	32.78004
478	Hospital	26139	603	-117.00977	32.78004
479	Hospital	26139	603	-117.00977	32.78004
480	Hospital	26139	603	-117.00977	32.78004
481	Hospital	26139	603	-117.00977	32.78004
482	Hospital	26139	603	-117.00977	32.78004
483	Nursing	26139	603	-117.00977	32.78004
484	Hospital	26153	531	-117.02296	32.77827
485	Hospital	26153	531	-117.02296	32.77827
486	Daycare	26173	326	-117.07794	32.79082
487	Hospital	26207	523	-117.02302	32.77812
488	Daycare	26227	422	-116.95714	32.81153
489	Daycare	26243	422	-116.96723	32.80046
490	Daycare	26243	422	-116.96723	32.80046
491	School	26243	422	-116.96723	32.80046
492	Daycare	26258	620	-116.99317	32.78458
493	Daycare	26310	543	-117.04748	32.77926
494	Daycare	26319	446	-116.94779	32.87217
495	Daycare	26347	482	-117.05492	32.78081
496	Hospital	26359	447	-116.95173	32.81911
497	Hospital	26359	447	-116.95173	32.81911
498	Hospital	26359	447	-116.95173	32.81911
499	Nursing	26359	447	-116.95173	32.81911
500	Daycare	26363	612	-117.08581	32.90464
501	School	26363	612	-117.08581	32.90464
502	Daycare	26364	522	-117.03361	32.77757
503	Hospital	26400	607	-117.00916	32.77942
504	Hospital	26400	607	-117.00916	32.77942
505	Hospital	26400	607	-117.00916	32.77942
506	Hospital	26400	607	-117.00916	32.77942
507	Hospital	26400	607	-117.00916	32.77942
508	Hospital	26400	607	-117.00916	32.77942

509	Hospital	26400	607	-117.00916	32.77942
510	Hospital	26441	118	-117.09164	32.79974
511	Hospital	26441	118	-117.09164	32.79974
512	Daycare	26441	546	-116.94823	32.82568
513	Daycare	26445	500	-117.03818	32.77764
514	School	26445	500	-117.03818	32.77764
515	Daycare	26449	323	-117.08275	32.79288
516	Daycare	26449	323	-117.08275	32.79288
517	Daycare	26455	416	-117.10817	32.82051
518	Daycare	26457	502	-116.94905	32.82369
519	Daycare	26464	330	-117.07925	32.79062
520	Daycare	26470	416	-117.10823	32.82051
521	Daycare	26507	440	-116.97324	32.79462
522	Daycare	26591	409	-117.10758	32.81853
523	Daycare	26591	409	-117.10758	32.81853
524	School	26591	409	-117.10758	32.81853
525	Daycare	26614	473	-117.06362	32.78274
526	Daycare	26617	429	-116.95523	32.81209
527	Hospital	26635	489	-117.01902	32.77726
528	Daycare	26642	416	-117.10843	32.81974
529	Daycare	26673	616	-117.08533	32.90610
530	Daycare	26700	435	-116.95404	32.81335
531	School	26700	435	-116.95404	32.81335
532	Daycare	26709	482	-117.06484	32.78290
533	School	26709	482	-117.06484	32.78290
534	Daycare	26736	417	-117.10664	32.81604
535	Daycare	26759	614	-117.08466	32.90688
536	Daycare	26766	670	-117.08735	32.90496
537	Daycare	26784	416	-117.10689	32.81615
538	Daycare	26790	416	-117.10689	32.81612
539	Daycare	26797	414	-117.10894	32.81965
540	Daycare	26804	411	-117.10997	32.82160
541	Daycare	26804	415	-117.10695	32.81614
542	Daycare	26809	415	-117.10701	32.81620
543	Hospital	26831	499	-117.01772	32.77686
544	Hospital	26831	499	-117.01772	32.77686
545	Daycare	26834	462	-116.94963	32.81983
546	School	26867	313	-117.08377	32.79209
547	Daycare	26880	429	-116.97094	32.79496
548	Daycare	26883	422	-117.10554	32.81349
549	Hospital	26887	429	-116.96416	32.80066
550	Hospital	26887	429	-116.96416	32.80066
551	Daycare	26902	635	-117.08349	32.90817
552	School	26902	635	-117.08349	32.90817
553	Hospital	26912	429	-116.96405	32.80066
554	Hospital	26912	429	-116.96405	32.80066
555	Hospital	26912	429	-116.96405	32.80066
556	Daycare	26932	217	-117.08896	32.79561
557	Daycare	26958	560	-117.09307	32.90103
558	Daycare	27032	409	-117.10997	32.82001
559	Daycare	27051	483	-117.04100	32.77624

560	Daycare	27053	373	-117.11117	32.82228
561	Daycare	27060	485	-117.04119	32.77624
562	Daycare	27070	553	-117.09615	32.89862
563	Hospital	27138	480	-117.02321	32.77554
564	Hospital	27138	480	-117.02321	32.77554
565	Hospital	27176	478	-117.02339	32.77542
566	Hospital	27202	435	-116.96226	32.80118
567	Daycare	27238	379	-116.94195	32.86262
568	School	27238	379	-116.94195	32.86262
569	Daycare	27247	795	-117.05159	32.92251
570	Daycare	27249	389	-116.94074	32.85354
571	Daycare	27262	518	-116.94652	32.82309
572	Daycare	27262	403	-117.11047	32.81942
573	Daycare	27267	388	-116.94070	32.85385
574	Hospital	27270	354	-117.11608	32.83359
575	Daycare	27274	338	-117.11120	32.82074
576	Daycare	27310	455	-116.97439	32.79097
577	Daycare	27340	675	-117.08042	32.91159
578	Daycare	27340	675	-117.08042	32.91159
579	Daycare	27351	710	-116.94163	32.83709
580	Hospital	27355	480	-117.02477	32.77486
581	Hospital	27359	432	-116.95567	32.80773
582	Hospital	27359	432	-116.95567	32.80773
583	Hospital	27359	432	-116.95567	32.80773
584	Daycare	27374	826	-117.05628	32.92174
585	Daycare	27403	432	-116.95818	32.80457
586	Hospital	27461	470	-117.02789	32.77448
587	Hospital	27461	470	-117.02789	32.77448
588	Daycare	27482	442	-116.97327	32.79112
589	Daycare	27493	222	-117.08970	32.79409
590	Daycare	27494	405	-117.11138	32.81956
591	Daycare	27500	331	-117.10872	32.81487
592	Daycare	27527	404	-117.11147	32.81952
593	Daycare	27533	647	-116.94038	32.84078
594	Hospital	27547	461	-117.02942	32.77423
595	Hospital	27547	461	-117.02942	32.77423
596	Hospital	27547	461	-117.02942	32.77423
597	Nursing	27547	461	-117.02942	32.77423
598	Hospital	27573	474	-117.03024	32.77416
599	Hospital	27573	474	-117.03024	32.77416
600	Nursing	27573	474	-117.03024	32.77416
601	Daycare	27587	406	-117.10669	32.81131
602	Hospital	27607	681	-117.07983	32.91282
603	Daycare	27651	345	-117.10953	32.81528
604	Daycare	27659	395	-117.10621	32.81025
605	Daycare	27698	451	-116.94975	32.81422
606	Hospital	27705	363	-117.05426	32.77674
607	Hospital	27705	363	-117.05426	32.77674
608	Hospital	27705	363	-117.05426	32.77674
609	Hospital	27705	363	-117.05426	32.77674
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612	Hospital	27705	363	-117.05426	32.77674
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615	Hospital	27705	363	-117.05426	32.77674
616	Hospital	27705	363	-117.05426	32.77674
617	Hospital	27705	363	-117.05426	32.77674
618	Hospital	27720	364	-117.05486	32.77685
619	Hospital	27720	364	-117.05486	32.77685
620	Hospital	27720	364	-117.05486	32.77685
621	Hospital	27720	364	-117.05486	32.77685
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627	Hospital	27720	364	-117.05486	32.77685
628	Hospital	27720	364	-117.05486	32.77685
629	Hospital	27720	364	-117.05486	32.77685
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631	Hospital	27720	364	-117.05486	32.77685
632	Hospital	27720	364	-117.05486	32.77685
633	Hospital	27720	364	-117.05486	32.77685
634	Hospital	27720	364	-117.05486	32.77685
635	Hospital	27720	364	-117.05486	32.77685
636	Hospital	27720	364	-117.05486	32.77685
637	Daycare	27766	382	-117.10991	32.81521
638	Hospital	27774	367	-117.05647	32.77710
639	Hospital	27774	367	-117.05647	32.77710
640	Hospital	27774	367	-117.05647	32.77710
641	College	27778	568	-117.01579	32.77446
642	Daycare	27783	408	-117.06899	32.78128
643	Daycare	27784	287	-117.08792	32.79171
644	Daycare	27784	287	-117.08792	32.79171
645	Hospital	27790	367	-117.05691	32.77717
646	Hospital	27790	367	-117.05691	32.77717
647	Hospital	27790	367	-117.05691	32.77717
648	Nursing	27790	367	-117.05691	32.77717
649	Hospital	27815	368	-117.05888	32.77765
650	Hospital	27815	368	-117.05888	32.77765
651	Hospital	27815	368	-117.05888	32.77765
652	Daycare	27818	663	-116.98248	32.78454
653	Daycare	27836	798	-117.06896	32.91884
654	Hospital	27838	357	-117.06062	32.77811
655	Daycare	27839	395	-117.10978	32.81455
656	Hospital	27842	355	-117.06093	32.77820
657	Hospital	27842	355	-117.06093	32.77820
658	Hospital	27842	355	-117.06093	32.77820
659	Hospital	27842	355	-117.06093	32.77820
660	Hospital	27842	355	-117.06093	32.77820
661	Hospital	27855	414	-117.04458	32.77446

662	Hospital	27855	414	-117.04458	32.77446
663	School	27860	432	-116.96227	32.79844
664	Daycare	27900	422	-117.04210	32.77401
665	Daycare	27930	435	-116.95629	32.80429
666	Hospital	27950	432	-116.96227	32.79807
667	Hospital	27950	432	-116.96227	32.79807
668	College	28006	427	-117.03844	32.77334
669	Daycare	28015	432	-116.95818	32.80183
670	Daycare	28026	398	-117.11326	32.81953
671	School	28032	383	-116.93829	32.85507
672	Hospital	28033	353	-117.05638	32.77634
673	Hospital	28033	353	-117.05638	32.77634
674	Hospital	28033	353	-117.05638	32.77634
675	Hospital	28033	353	-117.05638	32.77634
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693	Hospital	28033	353	-117.05638	32.77634
694	Hospital	28033	353	-117.05638	32.77634
695	Daycare	28053	395	-117.11054	32.81452
696	Daycare	28054	401	-117.11335	32.81953
697	Daycare	28062	435	-116.95546	32.80462
698	Hospital	28093	603	-117.00414	32.77573
699	College	28176	538	-117.10131	32.89812
700	Daycare	28184	406	-117.10708	32.80869
701	Hospital	28213	432	-116.96246	32.79683
702	Daycare	28215	406	-117.10778	32.80948
703	Daycare	28249	396	-117.10983	32.81227
704	Daycare	28255	432	-116.96157	32.79747
705	Daycare	28255	432	-116.96157	32.79747
706	Daycare	28255	432	-116.96157	32.79747
707	School	28255	432	-116.96157	32.79747
708	Hospital	28271	413	-117.04178	32.77294
709	Daycare	28318	414	-117.10567	32.80620
710	Daycare	28321	396	-117.10830	32.80964
711	Hospital	28339	433	-116.96682	32.79270
712	Hospital	28339	433	-116.96682	32.79270

713	Hospital	28339	433	-116.96682	32.79270
714	Nursing	28339	433	-116.96682	32.79270
715	Hospital	28344	342	-117.06219	32.77712
716	Hospital	28344	342	-117.06219	32.77712
717	Hospital	28344	342	-117.06219	32.77712
718	Hospital	28344	342	-117.06219	32.77712
719	Hospital	28344	342	-117.06219	32.77712
720	Daycare	28402	455	-116.94770	32.81336
721	Hospital	28405	341	-117.06184	32.77683
722	Hospital	28405	341	-117.06184	32.77683
723	Hospital	28405	341	-117.06184	32.77683
724	Hospital	28405	341	-117.06184	32.77683
725	Hospital	28405	341	-117.06184	32.77683
726	Hospital	28405	341	-117.06184	32.77683
727	Daycare	28411	375	-117.10711	32.80756
728	Hospital	28421	407	-117.04669	32.77320
729	Hospital	28429	432	-116.96361	32.79497
730	Hospital	28485	402	-117.04400	32.77262
731	Daycare	28487	204	-117.09030	32.79089
732	Hospital	28496	585	-117.00820	32.77369
733	School	28619	405	-116.93626	32.85332
734	Daycare	28704	192	-117.09123	32.79078
735	Daycare	28713	92	-117.09638	32.79489
736	Daycare	28713	92	-117.09638	32.79489
737	Daycare	28720	589	-117.00643	32.77342
738	Daycare	28770	463	-116.97460	32.78581
739	Daycare	28772	583	-117.00920	32.77272
740	Hospital	28773	278	-117.12042	32.83113
741	Hospital	28773	278	-117.12042	32.83113
742	Daycare	28776	483	-116.93569	32.84839
743	School	28788	435	-116.95804	32.79864
744	Hospital	28795	145	-117.09446	32.79296
745	Hospital	28795	145	-117.09446	32.79296
746	Hospital	28795	145	-117.09446	32.79296
747	Hospital	28795	145	-117.09446	32.79296
748	Hospital	28795	145	-117.09446	32.79296
749	Hospital	28795	145	-117.09446	32.79296
750	Daycare	28801	823	-116.93782	32.83280
751	Hospital	28822	588	-117.00509	32.77343
752	Hospital	28822	588	-117.00509	32.77343
753	Daycare	28836	444	-116.95100	32.80633
754	Daycare	28906	861	-117.08937	32.91125
755	Daycare	28926	404	-117.10652	32.80429
756	Daycare	28928	185	-117.09190	32.79046
757	Daycare	28971	406	-117.10658	32.80416
758	Daycare	29013	444	-116.95096	32.80550
759	Daycare	29052	473	-117.04044	32.77063
760	Daycare	29080	382	-117.11076	32.80905
761	Hospital	29084	389	-116.93489	32.85554
762	Hospital	29084	389	-116.93489	32.85554
763	Nursing	29084	389	-116.93489	32.85554

764	Daycare	29092	638	-117.10142	32.90197
765	Daycare	29092	638	-117.10142	32.90197
766	School	29103	374	-117.10805	32.80532
767	Hospital	29122	438	-116.96234	32.79335
768	Hospital	29124	517	-116.97842	32.78244
769	Daycare	29134	335	-117.10780	32.80486
770	Daycare	29145	438	-116.95470	32.80053
771	Daycare	29170	476	-116.94464	32.81374
772	Daycare	29176	566	-116.98056	32.78116
773	Daycare	29190	475	-116.94464	32.81362
774	School	29265	389	-116.93623	32.86702
775	Hospital	29277	580	-117.00587	32.77196
776	Hospital	29294	580	-117.00587	32.77191
777	Daycare	29296	449	-116.97091	32.78633
778	Hospital	29300	580	-117.00587	32.77189
779	Hospital	29300	580	-117.00587	32.77189
780	Hospital	29300	580	-117.00587	32.77189
781	Hospital	29300	580	-117.00587	32.77189
782	Hospital	29300	580	-117.00587	32.77189
783	Daycare	29305	760	-116.94522	32.88798
784	Hospital	29335	200	-117.11693	32.81764
785	Hospital	29335	200	-117.11693	32.81764
786	Hospital	29335	200	-117.11693	32.81764
787	Daycare	29338	839	-117.07677	32.92003
788	Daycare	29342	442	-116.96615	32.78950
789	Hospital	29390	197	-117.11695	32.81731
790	Daycare	29393	421	-117.12161	32.82825
791	Daycare	29393	421	-117.12161	32.82825
792	Hospital	29424	401	-117.12305	32.83279
793	Daycare	29434	614	-116.98295	32.77917
794	Hospital	29468	536	-117.02822	32.76895
795	Hospital	29468	536	-117.02822	32.76895
796	Daycare	29476	688	-116.93700	32.82797
797	Hospital	29478	189	-117.11693	32.81666
798	Hospital	29478	189	-117.11693	32.81666
799	Hospital	29478	189	-117.11693	32.81666
800	Hospital	29478	189	-117.11693	32.81666
801	Daycare	29507	339	-117.10745	32.80264
802	School	29511	797	-116.94747	32.89242
803	Daycare	29512	511	-117.04452	32.76983
804	Hospital	29533	356	-117.12358	32.83346
805	Hospital	29533	356	-117.12358	32.83346
806	Hospital	29533	356	-117.12358	32.83346
807	Hospital	29533	356	-117.12358	32.83346
808	Hospital	29533	356	-117.12358	32.83346
809	Hospital	29533	356	-117.12358	32.83346
810	Hospital	29539	353	-117.12362	32.83355
811	College	29548	188	-117.11643	32.81530
812	Hospital	29619	345	-117.12402	32.83409
813	Hospital	29625	442	-116.96234	32.79141
814	School	29630	549	-117.03184	32.76852

815	Daycare	29632	549	-117.03173	32.76851
816	Hospital	29638	561	-117.03006	32.76848
817	Hospital	29638	561	-117.03006	32.76848
818	Hospital	29638	561	-117.03006	32.76848
819	Hospital	29648	442	-116.95878	32.79438
820	Hospital	29648	442	-116.95878	32.79438
821	Nursing	29648	442	-116.95878	32.79438
822	Hospital	29680	498	-117.03883	32.76875
823	Hospital	29680	498	-117.03883	32.76875
824	Hospital	29680	498	-117.03883	32.76875
825	Hospital	29680	498	-117.03883	32.76875
826	Hospital	29680	498	-117.03883	32.76875
827	Daycare	29684	345	-117.11079	32.80593
828	Daycare	29704	452	-116.97089	32.78493
829	School	29704	452	-116.97089	32.78493
830	Hospital	29727	440	-116.96034	32.79269
831	Hospital	29731	498	-116.97639	32.78156
832	Hospital	29731	498	-116.97639	32.78156
833	Daycare	29734	482	-117.04817	32.76976
834	Hospital	29735	381	-117.12413	32.83296
835	Hospital	29735	381	-117.12413	32.83296
836	Hospital	29735	381	-117.12413	32.83296
837	Daycare	29739	361	-117.10669	32.80070
838	Daycare	29748	331	-117.11109	32.80600
839	Hospital	29749	587	-117.00998	32.76983
840	Daycare	29751	454	-116.94725	32.80660
841	Daycare	29780	464	-116.93254	32.84560
842	Hospital	29827	520	-117.03532	32.76810
843	School	29841	469	-117.04973	32.76973
844	Daycare	29849	453	-116.94886	32.80401
845	Daycare	29860	495	-116.94234	32.81338
846	Daycare	29860	495	-116.94234	32.81338
847	Daycare	29860	495	-116.94234	32.81338
848	Daycare	29912	450	-116.95096	32.80120
849	Hospital	29934	444	-116.95168	32.80028
850	Hospital	29937	120	-117.09778	32.79130
851	Hospital	29949	445	-116.96234	32.79018
852	Hospital	29949	445	-116.96234	32.79018
853	Daycare	29992	159	-117.09391	32.78805
854	Daycare	29998	442	-116.96819	32.78569
855	Daycare	29999	622	-117.00108	32.77102
856	Hospital	30017	442	-116.95903	32.79269
857	Daycare	30064	539	-116.93237	32.83882
858	Hospital	30076	445	-116.95116	32.80022
859	Daycare	30080	557	-117.01507	32.76815
860	Daycare	30080	557	-117.01507	32.76815
861	Daycare	30093	424	-117.12413	32.82873
862	Daycare	30140	501	-116.97635	32.78024
863	Daycare	30155	305	-117.11042	32.80311
864	Daycare	30174	453	-116.94766	32.80392
865	Daycare	30185	352	-117.11115	32.80387

866	Daycare	30190	422	-116.93107	32.84885
867	Daycare	30190	422	-116.93107	32.84885
868	Daycare	30196	468	-116.97200	32.78255
869	School	30206	449	-116.93108	32.84674
870	Daycare	30208	445	-116.96108	32.79021
871	Daycare	30215	448	-116.96359	32.78821
872	Daycare	30231	475	-117.04151	32.76747
873	Daycare	30241	353	-117.10860	32.80054
874	Daycare	30244	168	-117.09359	32.78689
875	Hospital	30247	353	-117.12665	32.83667
876	Hospital	30247	353	-117.12665	32.83667
877	Daycare	30249	732	-116.94067	32.88616
878	Daycare	30261	471	-116.94314	32.80973
879	Hospital	30268	442	-116.95763	32.79292
880	Hospital	30273	442	-116.95763	32.79290
881	Hospital	30279	448	-116.96401	32.78765
882	Hospital	30283	345	-117.12664	32.83599
883	Hospital	30307	448	-116.96387	32.78765
884	Daycare	30368	618	-116.93245	32.83342
885	Daycare	30397	752	-116.94478	32.89338
886	Daycare	30406	448	-116.95099	32.79891
887	School	30423	581	-117.00838	32.76822
888	Daycare	30424	600	-117.10146	32.90740
889	Daycare	30445	453	-116.96937	32.78335
890	Hospital	30448	448	-116.96230	32.78833
891	Hospital	30448	448	-116.96230	32.78833
892	Nursing	30448	448	-116.96230	32.78833
893	Daycare	30465	445	-116.96035	32.78981
894	Daycare	30478	413	-116.93012	32.85045
895	College	30483	559	-117.10395	32.90534
896	Daycare	30491	458	-116.94640	32.80395
897	School	30491	458	-116.94640	32.80395
898	Hospital	30501	385	-117.12668	32.83295
899	Hospital	30509	387	-117.12665	32.83274
900	Daycare	30534	481	-117.04430	32.76696
901	Daycare	30536	478	-116.97308	32.78077
902	Daycare	30545	408	-116.92992	32.85138
903	Daycare	30553	448	-116.96709	32.78447
904	Hospital	30556	450	-116.96230	32.78793
905	Daycare	30582	452	-117.05537	32.76878
906	Hospital	30600	348	-117.12762	32.83570
907	Hospital	30600	348	-117.12762	32.83570
908	Daycare	30624	423	-116.92966	32.84862
909	Daycare	30637	707	-117.09907	32.91030
910	School	30637	707	-117.09907	32.91030
911	Hospital	30675	582	-117.01602	32.76638
912	Hospital	30675	582	-117.01602	32.76638
913	Daycare	30683	480	-117.04561	32.76671
914	Daycare	30686	400	-116.93158	32.86733
915	Daycare	30699	400	-116.93149	32.86717
916	Daycare	30704	446	-116.95763	32.79119

917	Daycare	30721	399	-116.93137	32.86697
918	Daycare	30724	179	-117.09391	32.78540
919	Daycare	30757	445	-116.95640	32.79207
920	Daycare	30776	448	-116.95097	32.79728
921	Daycare	30777	452	-116.96234	32.78708
922	Hospital	30823	448	-116.95878	32.78974
923	Daycare	30829	461	-117.05273	32.76752
924	School	30829	461	-117.05273	32.76752
925	Daycare	30835	448	-116.95990	32.78877
926	Hospital	30858	454	-117.05502	32.76792
927	Daycare	30889	456	-117.07164	32.77288
928	Daycare	30889	456	-117.07164	32.77288
929	Hospital	30889	456	-117.07164	32.77288
930	College	30889	456	-117.07164	32.77288
931	Hospital	30893	584	-116.92976	32.83816
932	Daycare	30907	461	-117.04111	32.76556
933	Hospital	30961	326	-117.12490	32.82263
934	Daycare	30961	448	-116.95477	32.79273
935	Daycare	30973	681	-116.93119	32.83049
936	Daycare	30973	681	-116.93119	32.83049
937	School	30973	681	-116.93119	32.83049
938	Daycare	30991	584	-117.00891	32.76653
939	Daycare	30991	584	-117.00891	32.76653
940	Daycare	31008	455	-116.94741	32.80020
941	Daycare	31036	452	-116.96656	32.78313
942	School	31044	455	-116.94729	32.80017
943	Daycare	31051	479	-117.03704	32.76483
944	Daycare	31058	461	-117.06051	32.76871
945	Daycare	31059	553	-117.00497	32.76709
946	Daycare	31061	572	-116.93347	32.82286
947	Daycare	31061	572	-116.93347	32.82286
948	Daycare	31067	113	-117.09675	32.78623
949	School	31067	113	-117.09675	32.78623
950	Daycare	31072	552	-117.00491	32.76707
951	Daycare	31075	431	-116.92826	32.85347
952	Arena	31085	458	-117.07308	32.77286
953	Daycare	31107	455	-116.96660	32.78286
954	Daycare	31110	566	-116.93355	32.82224
955	Daycare	31158	750	-116.99458	32.76949
956	Daycare	31163	509	-117.11835	32.89127
957	Daycare	31163	509	-117.11835	32.89127
958	College	31163	100	-117.09775	32.78663
959	Daycare	31173	458	-116.94675	32.80019
960	Daycare	31173	458	-116.94675	32.80019
961	Daycare	31173	458	-116.94675	32.80019
962	School	31173	458	-116.94675	32.80019
963	Daycare	31194	94	-117.09100	32.78176
964	Daycare	31194	94	-117.09100	32.78176
965	Daycare	31199	466	-116.94275	32.80516
966	Hospital	31203	547	-117.02003	32.76453
967	Daycare	31204	461	-116.94459	32.80270

968	Hospital	31232	383	-117.11931	32.80981
969	Hospital	31232	383	-117.11931	32.80981
970	Hospital	31232	98	-117.09775	32.78637
971	Daycare	31233	662	-116.93089	32.82854
972	Daycare	31255	475	-117.04445	32.76497
973	Hospital	31270	523	-116.93574	32.81620
974	Hospital	31273	376	-117.11919	32.80937
975	Daycare	31304	334	-117.10756	32.79471
976	Daycare	31305	409	-116.92766	32.85579
977	Daycare	31322	502	-117.11336	32.89891
978	School	31322	502	-117.11336	32.89891
979	Hospital	31370	79	-117.10009	32.78770
980	Hospital	31370	79	-117.10009	32.78770
981	Hospital	31370	79	-117.10009	32.78770
982	Hospital	31390	396	-117.12629	32.82244
983	Hospital	31390	396	-117.12629	32.82244
984	Daycare	31450	560	-117.01842	32.76399
985	Daycare	31450	560	-117.01842	32.76399
986	Daycare	31451	493	-116.97182	32.77845
987	Daycare	31452	455	-116.95994	32.78641
988	Daycare	31464	455	-116.95829	32.78768
989	Daycare	31469	451	-117.04039	32.76393
990	Hospital	31474	529	-117.10957	32.90392
991	Hospital	31474	529	-117.10957	32.90392
992	Hospital	31491	526	-117.10976	32.90379
993	Hospital	31491	526	-117.10976	32.90379
994	Hospital	31491	526	-117.10976	32.90379
995	School	31495	465	-117.06197	32.76785
996	Daycare	31511	462	-116.94456	32.80122
997	Hospital	31517	96	-117.09441	32.78290
998	Hospital	31517	96	-117.09441	32.78290
999	Daycare	31521	452	-116.95094	32.79408
1000	Hospital	31561	431	-117.12479	32.81764
1001	Hospital	31622	497	-117.02868	32.76302

Table F.4-7 (15 Pages)

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES°

Substance	Chemical Abstract Number ▼	Noncancer Effects								Cancer Risk					
		Acute Inhalation ($\mu g/m^3$)	Date ◆ Value Reviewed [Added]	8-Hour Inhalation ($\mu g/m^3$)	Date ◆ Value Reviewed [Added]	Chronic Inhalation ($\mu g/m^3$)	Date ◆ Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date ◆ Value Reviewed [Added]	Inhalation * Unit Risk $(\mu g/m^3)^{-1}$	Inhalation * Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Date ◆ Value Reviewed [Added]	Oral Slope Factor $(mg/kg\text{-}d)^{-1}$	Date ◆ Value Reviewed [Added]	MWAF ♣
ACETALDEHYDE	75-07-0	4.7E+02	12/08	3.0E+02	12/08	1.4E+02	12/08			2.7E-06	1.0E-02	4/99 [5/93]			1
ACETAMIDE	60-35-5									2.0E-05	7.0E-02	4/99			1
ACROLEIN	107-02-8	2.5E+00	12/08	7.0E-01	12/08	3.5E-01	12/08								1
ACRYLAMIDE	79-06-1									1.3E-03	4.5E+00	4/99 [7/90]			1
ACRYLIC ACID	79-10-7	6.0E+03	4/99												1
ACRYLONITRILE	107-13-1					5.0E+00	12/01			2.9E-04	1.0E+00	4/99 [1/91]			1
ALLYL CHLORIDE	107-05-1									6.0E-06	2.1E-02	4/99			1
2-AMINOANTHRAQUINONE	117-79-3									9.4E-06	3.3E-02	4/99			1
AMMONIA	7664-41-7	3.2E+03	4/99			2.0E+02	2/00								1
ANILINE	62-53-3									1.6E-06	5.7E-03	4/99			1
ARSENIC AND COMPOUNDS (INORGANIC) TAC	7440-38-2 1016 [1015]	2.0E-01	12/08	1.5E-02	12/08	1.5E-02	12/08	3.5E-06	12/08	3.3E-03 TAC	1.2E+01	7/90	1.5E+00	10/00	1
ARSINE	7784-42-1	2.0E-01	12/08	1.5E-02	12/08	1.5E-02	12/08								1
ASBESTOS TAC ¤	1332-21-4									1.9E-04 TAC ¤	2.2E+02	3/86			333.33
BENZENE TAC	71-43-2	1.3E+03	4/99			6.0E+01	2/00			2.9E-05 TAC	1.0E-01	1/85			1
BENZIDINE (AND ITS SALTS) *values also apply to:*	92-87-5									1.4E-01	5.0E+02	4/99 [1/91]			1
Benzidine based dyes	*1020*									*1.4E-01*	*5.0E+02*	*4/99 [1/91]*			*1*
Direct Black 38	*1937-37-7*									*1.4E-01*	*5.0E+02*	*4/99 [1/91]*			*1*
Direct Blue 6	*2602-46-2*									*1.4E-01*	*5.0E+02*	*4/99 [1/91]*			*1*
Direct Brown 95 (technical grade)	*16071-86-6*									*1.4E-01*	*5.0E+02*	*4/99 [1/91]*			*1*
BENZYL CHLORIDE	100-44-7	2.4E+02	4/99							4.9E-05	1.7E-01	4/99			1
BERYLLIUM AND COMPOUNDS	7440-41-7 [1021]					7.0E-03	12/01	2.0E-03	12/01	2.4E-03	8.4E+00	4/99 [7/90]			1
BIS(2-CHLOROETHYL)ETHER (Dichloroethyl ether)	111-44-4									7.1E-04	2.5E+00	4/99			1
BIS(CHLOROMETHYL)ETHER	542-88-1									1.3E-02	4.6E+01	4/99 [1/91]			1
BROMINE AND COMPOUNDS	7726-95-6 [1040]														1
POTASSIUM BROMATE	7758-01-2									1.4E-04	4.9E-01	4/99 [10/93]			1

Table last updated: February 14, 2011

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES°

Substance	Chemical Abstract Number▼	Noncancer Effects								Cancer Risk					
		Acute Inhalation (µg/m³)	Date Value Reviewed [Added]◆	8-Hour Inhalation (µg/m³)	Date Value Reviewed [Added]◆	Chronic Inhalation (µg/m³)	Date Value Reviewed [Added]◆	Chronic Oral (mg/kg-d)	Date Value Reviewed [Added]◆	Inhalation Unit Risk (µg/m³)⁻¹*	Inhalation Cancer Potency Factor (mg/kg-d)⁻¹*	Date Value Reviewed [Added]◆	Oral Slope Factor (mg/kg-d)⁻¹	Date Value Reviewed [Added]◆	MWAF♣
1,3-BUTADIENE TAC	106-99-0					2.0E+01	1/01			1.7E-04 TAC	6.0E-01	7/92			1
CADMIUM AND COMPOUNDS TAC	7440-43-9 [1045]					2.0E-02	1/01	5.0E-04	10/00	4.2E-03 TAC	1.5E+01	1/87			1
CARBON DISULFIDE	75-15-0	6.2E+03	4/99			8.0E+02	5/02								1
CARBON MONOXIDE	630-08-0	2.3E+04	4/99												1
CARBON TETRACHLORIDE TAC (Tetrachloromethane)	56-23-5	1.9E+03	4/99			4.0E+01	1/01			4.2E-05 TAC	1.5E-01	9/87			1
CHLORINATED PARAFFINS	108171-26-2									2.5E-05	8.9E-02	4/99			1
CHLORINE	7782-50-5	2.1E+02	4/99			2.0E-01	2/00								1
CHLORINE DIOXIDE	10049-04-4					6.0E-01	1/01								1
4-CHLORO-O-PHENYLENEDIAMINE	95-83-0									4.6E-06	1.6E-02	4/99			1
CHLOROBENZENE	108-90-7					1.0E+03	1/01								1
CHLOROFORM TAC	67-66-3	1.5E+02	4/99			3.0E+02	4/00			5.3E-06 TAC	1.9E-02	12/90			1
Chlorophenols	*1060*														*1*
PENTACHLOROPHENOL	87-86-5									5.1E-06	1.8E-02	4/99			1
2,4,6-TRICHLOROPHENOL	88-06-2									2.0E-05	7.0E-02	4/99 [1/91]			1
CHLOROPICRIN	76-06-2	2.9E+01	4/99			4.0E-01	12/01								1
p-CHLORO-o-TOLUIDINE	95-69-2									7.7E-05	2.7E-01	4/99			1
CHROMIUM 6+ TAC *values also apply to:*	18540-29-9					2.0E-01	1/01	2.0E-02	10/00	1.5E-01 TAC	5.1E+02	1/86	Ø		1
Barium chromate	*10294-40-3*					*2.0E-01*	*1/01*	*2.0E-02*	*10/00*	*1.5E-01 TAC*	*5.1E+02*	*1/86*	Ø		*0.2053*
Calcium chromate	*13765-19-0*					*2.0E-01*	*1/01*	*2.0E-02*	*10/00*	*1.5E-01 TAC*	*5.1E+02*	*1/86*	Ø		*0.3332*
Lead chromate	*7758-97-6*					*2.0E-01*	*1/01*	*2.0E-02*	*10/00*	*1.5E-01 TAC*	*5.1E+02*	*1/86*	Ø		*0.1609*
Sodium dichromate	*10588-01-9*					*2.0E-01*	*1/01*	*2.0E-02*	*10/00*	*1.5E-01 TAC*	*5.1E+02*	*1/86*	Ø		*0.397*
Strontium chromate	*7789-06-2*					*2.0E-01*	*1/01*	*2.0E-02*	*10/00*	*1.5E-01 TAC*	*5.1E+02*	*1/86*	Ø		*0.2554*
CHROMIUM TRIOXIDE (as chromic acid mist)	1333-82-0					2.0E-03	1/01	2.0E-02	10/00	1.5E-01 TAC	5.1E+02	1/86	Ø		0.52
COPPER AND COMPOUNDS	7440-50-8 [1067]	1.0E+02	4/99												1
p-CRESIDINE	120-71-8									4.3E-05	1.5E-01	4/99			1
CRESOLS (mixtures of)	1319-77-3					6.0E+02	1/01								1
m-CRESOL	108-39-4					6.0E+02	1/01								1
o-CRESOL	95-48-7					6.0E+02	1/01								1

Table last updated: February 14, 2011

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES°

Substance	Chemical Abstract Number▼	Noncancer Effects								Cancer Risk					
		Acute Inhalation (µg/m³)	Date◆ Value Reviewed [Added]	8-Hour Inhalation (µg/m³)	Date◆ Value Reviewed [Added]	Chronic Inhalation (µg/m³)	Date◆ Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date◆ Value Reviewed [Added]	Inhalation* Unit Risk (µg/m³)⁻¹	Inhalation* Cancer Potency Factor (mg/kg-d)⁻¹	Date◆ Value Reviewed [Added]	Oral Slope Factor (mg/kg-d)⁻¹	Date◆ Value Reviewed [Added]	MWAF♣
p-CRESOL	106-44-5					6.0E+02	1/01								1
CUPFERRON	135-20-6									6.3E-05	2.2E-01	4/99			1
Cyanide Compounds (inorganic)	*57-12-5 1073*	*3.4E+02*	*4/99*			*9.0E+00*	*4/00*								*1*
HYDROGEN CYANIDE (Hydrocyanic acid)	74-90-8	3.4E+02	4/99			9.0E+00	4/00								1
2,4-DIAMINOANISOLE	615-05-4									6.6E-06	2.3E-02	4/99			1
2,4-DIAMINOTOLUENE	95-80-7									1.1E-03	4.0E+00	4/99			1
1,2-DIBROMO-3-CHLOROPROPANE (DBCP)	96-12-8									2.0E-03	7.0E+00	4/99 [1/92]			1
p-DICHLOROBENZENE	106-46-7					8.0E+02	1/01			1.1E-05	4.0E-02	4/99 [1/91]			1
3,3-DICHLOROBENZIDINE	91-94-1									3.4E-04	1.2E+00	4/99 [1/91]			1
1,1,-DICHLOROETHANE (Ethylidene dichloride)	75-34-3									1.6E-06	5.7E-03	4/99			1
1,1-DICHLOROETHYLENE ... (see Vinylidene Chloride)															
DI(2-ETHYLHEXYL)PHTHALATE (DEHP)	117-81-7									2.4E-06	8.4E-03	4/99 [1/92]	8.4E-03	10/00	1
DIESEL EXHAUST ... (see Particulate Emissions from Diesel-Fueled Engines)															
DIETHANOLAMINE	111-42-2					3.0E+00	12/01								
p-DIMETHYLAMINOAZOBENZENE	60-11-7									1.3E-03	4.6E+00	4/99			1
N,N-DIMETHYL FORMAMIDE	68-12-2					8.0E+01	1/01								1
2,4-DINITROTOLUENE	121-14-2									8.9E-05	3.1E-01	4/99			1
1,4-DIOXANE+ (1,4-Diethylene dioxide)	123-91-1	3.0E+03	4/99			3.0E+03	4/00			7.7E-06	2.7E-02	4/99 [1/91]			1
EPICHLOROHYDRIN (1-Chloro-2,3-epoxypropane)	106-89-8	1.3E+03	4/99			3.0E+00	1/01			2.3E-05	8.0E-02	4/99 [1/92]			1
1,2-EPOXYBUTANE	106-88-7					2.0E+01	1/01								1
ETHYL BENZENE	100-41-4					2.0E+03	2/00			2.5E-06	8.7E-3	11/07			1
ETHYL CHLORIDE (Chloroethane)	75-00-3					3.0E+04	4/00								1
ETHYLENE DIBROMIDE TAC (1,2-Dibromoethane)	106-93-4					8.0E-01	12/01			7.1E-05 TAC	2.5E-01	7/85			1
ETHYLENE DICHLORIDE TAC (1,2-Dichloroethane)	107-06-2					4.0E+02	1/01			2.1E-05 TAC	7.2E-02	9/85			1
ETHYLENE GLYCOL	107-21-1					4.0E+02	4/00								1
ETHYLENE GLYCOL BUTYL ETHER ... (see Glycol ethers)															

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Substance	Chemical Abstract Number ▼	Noncancer Effects								Cancer Risk					
		Acute Inhalation (µg/m³)	Date ◆ Value Reviewed [Added]	8-Hour Inhalation (µg/m³)	Date ◆ Value Reviewed [Added]	Chronic Inhalation (µg/m³)	Date ◆ Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date ◆ Value Reviewed [Added]	* Inhalation Unit Risk (µg/m³)⁻¹	* Inhalation Cancer Potency Factor (mg/kg-d)⁻¹	Date ◆ Value Reviewed [Added]	Oral Slope Factor (mg/kg-d)⁻¹	Date ◆ Value Reviewed [Added]	♣ MWAF
ETHYLENE OXIDE TAC (1,2-Epoxyethane)	75-21-8					3.0E+01	1/01			8.8E-05 TAC	3.1E-01	11/87			1
ETHYLENE THIOUREA	96-45-7									1.3E-05	4.5E-02	4/99			1
Fluorides	1101	*2.4E+02*	*4/99*			1.3E+01	8/03	4.0E-02	8/03						*1*
HYDROGEN FLUORIDE (Hydrofluoric acid)	7664-39-3	2.4E+02	4/99			1.4E+01	8/03	4.0E-02	8/03						1
FORMALDEHYDE TAC	50-00-0	5.5E+01	12/08	9.0E+00	12/08	9.0E+00	12/08			6.0E-06 TAC	2.1E-02	3/92			1
GLUTARALDEHYDE	111-30-8					8.0E-02	1/01								1
GLYCOL ETHERS	1115														1
ETHYLENE GLYCOL BUTYL ETHER – EGBE	111-76-2	1.4E+04	4/99												1
ETHYLENE GLYCOL ETHYL ETHER – EGEE	110-80-5	3.7E+02	4/99[1/92]			7.0E+01	2/00								1
ETHYLENE GLYCOL ETHYL ETHER ACETATE – EGEEA	111-15-9	1.4E+02	4/99			3.0E+02	2/00								1
ETHYLENE GLYCOL METHYL ETHER – EGME	109-86-4	9.3E+01	4/99			6.0E+01	2/00								1
ETHYLENE GLYCOL METHYL ETHER ACETATE – EGMEA	110-49-6					9.0E+01	2/00								1
HEXACHLOROBENZENE	118-74-1									5.1E-04	1.8E+00	4/99 [1/91]			1
HEXACHLOROCYCLOHEXANES (mixed or technical grade)	608-73-1									1.1E-03	4.0E+00	4/99 [1/91]	4.0E+00	10/00 [1/92]	1
alpha-HEXACHLOROCYCLOHEXANE	319-84-6									1.1E-03	4.0E+00	4/99 [1/91]	4.0E+00	10/00 [1/92]	1
beta-HEXACHLOROCYCLOHEXANE	319-85-7									1.1E-03	4.0E+00	4/99 [1/91]	4.0E+00	10/00 [1/92]	1
gamma-HEXACHLOROCYCLOHEXANE (Lindane)	58-89-9									3.1E-04	1.1E+00	4/99	1.1E+00	10/00	1
n-HEXANE	110-54-3					7.0E+03	4/00								1
HYDRAZINE	302-01-2					2.0E-01	1/01			4.9E-03	1.7E+01	4/99 [7/90]			1
HYDROCHLORIC ACID (Hydrogen chloride)	7647-01-0	2.1E+03	4/99			9.0E+00	2/00								1
HYDROGEN BROMIDE ... (see Bromine & Compounds)															
HYDROGEN CYANIDE ... (see Cyanide & Compounds)															
HYDROGEN FLUORIDE ... (see Fluorides & Compounds)															

Table last updated: February 14, 2011

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES°

Substance	Chemical Abstract Number ▼	Noncancer Effects								Cancer Risk					
		Acute Inhalation (µg/m³)	Date ◆ Value Reviewed [Added]	8-Hour Inhalation (µg/m³)	Date ◆ Value Reviewed [Added]	Chronic Inhalation (µg/m³)	Date ◆ Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date ◆ Value Reviewed [Added]	* Inhalation Unit Risk (µg/m³)⁻¹	* Inhalation Cancer Potency Factor (mg/kg-d)⁻¹	Date ◆ Value Reviewed [Added]	Oral Slope Factor (mg/kg-d)⁻¹	Date ◆ Value Reviewed [Added]	♣ MWAF
HYDROGEN SELENIDE ... (see Selenium & Compounds)															
HYDROGEN SULFIDE	7783-06-4	4.2E+01	4/99[7/90]			1.0E+01	4/00								1
ISOPHORONE	78-59-1					2.0E+03	12/01								
ISOPROPYL ALCOHOL (Isopropanol)	67-63-0	3.2E+03	4/99			7.0E+03	2/00								1
LEAD AND COMPOUNDS TAC ♫* (inorganic) *values also apply to:*	7439-92-1 1128 [1130]									1.2E-05 TAC	4.2E-02	4/97	8.5E-03	10/00	1
Lead acetate	*301-04-2*									*1.2E-05 TAC*	*4.2E-02*	*4/97*	*8.5E-03*	*10/00*	*0.637*
Lead phosphate	*7446-27-7*									*1.2E-05 TAC*	*4.2E-02*	*4/97*	*8.5E-03*	*10/00*	*0.7659*
Lead subacetate	*1335-32-6*									*1.2E-05 TAC*	*4.2E-02*	*4/97*	*8.5E-03*	*10/00*	*0.7696*
LINDANE ... (see gamma-Hexachlorocyclohexane)															
MALEIC ANHYDRIDE	108-31-6					7.0E-01	12/01								1
MANGANESE AND COMPOUNDS	7439-96-5 [1132]			1.7E-01	12/08	9.0E-02	12/08								1
MERCURY AND COMPOUNDS (INORGANIC)	7439-97-6 [1133]	6.0E-01	12/08	6.0E-02	12/08	3.0E-02	12/08	1.6E-04	12/08						1
Mercuric chloride	*7487-94-7*	*6.0E-01*	*12/08*	*6.0E-02*	*12/08*	*3.0E-02*	*12/08*	*1.6E-04*	*12/08*						*1*
METHANOL	67-56-1	2.8E+04	4/99			4.0E+03	4/00								1
METHYL BROMIDE (Bromomethane)	74-83-9	3.9E+03	4/99			5.0E+00	2/00								1
METHYL tertiary-BUTYL ETHER	1634-04-4					8.0E+03	2/00			2.6E-07	1.8E-03	11/99			1
METHYL CHLOROFORM (1,1,1-Trichloroethane)	71-55-6	6.8E+04	4/99			1.0E+03	2/00								1
METHYL ETHYL KETONE (2-Butanone)	78-93-3	1.3E+04	4/99												1
METHYL ISOCYANATE	624-83-9					1.0E+00	12/01								1
METHYL MERCURY ... (see Mercury & Compounds)															
4,4'-METHYLENE BIS (2-CHLOROANILINE) (MOCA)	101-14-4									4.3E-04	1.5E+00	4/99			1
METHYLENE CHLORIDE TAC (Dichloromethane)	75-09-2	1.4E+04	4/99			4.0E+02	2/00			1.0E-06 TAC	3.5E-03	7/89			1
4,4'-METHYLENE DIANILINE (AND ITS DICHLORIDE)	101-77-9					2.0E+01	12/01			4.6E-04	1.6E+00	4/99	1.6E+00	10/00	1
METHYLENE DIPHENYL ISOCYANATE	101-68-8					7.0E-01	1/01								1
MICHLER'S KETONE (4,4'-Bis(dimethylamino)benzophenone)	90-94-8									2.5E-04	8.6E-01	4/99			1

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Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES°

Substance	Chemical Abstract Number ▼	Noncancer Effects								Cancer Risk					
		Acute Inhalation (µg/m³)	Date ◆ Value Reviewed [Added]	8-Hour Inhalation (µg/m³)	Date ◆ Value Reviewed [Added]	Chronic Inhalation (µg/m³)	Date ◆ Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date ◆ Value Reviewed [Added]	Inhalation Unit Risk (µg/m³)⁻¹ *	Inhalation Cancer Potency Factor (mg/kg-d)⁻¹ *	Date ◆ Value Reviewed [Added]	Oral Slope Factor (mg/kg-d)⁻¹	Date ◆ Value Reviewed [Added]	MWAF ♣
N-NITROSODI-n-BUTYLAMINE	924-16-3									3.1E-03	1.1E+01	4/99 [1/92]			1
N-NITROSODI-n-PROPYLAMINE	621-64-7									2.0E-03	7.0E+00	4/99 [1/91]			1
N-NITROSODIETHYLAMINE	55-18-5									1.0E-02	3.6E+01	4/99 [1/91]			1
N-NITROSODIMETHYLAMINE	62-75-9									4.6E-03	1.6E+01	4/99 [1/91]			1
N-NITROSODIPHENYLAMINE	86-30-6									2.6E-06	9.0E-03	4/99			1
N-NITROSO-N-METHYLETHYLAMINE	10595-95-6									6.3E-03	2.2E+01	4/99 [7/90]			1
N-NITROSOMORPHOLINE	59-89-2									1.9E-03	6.7E+00	4/99 [7/92]			1
N-NITROSOPIPERIDINE	100-75-4									2.7E-03	9.4E+00	4/99 [7/92]			1
N-NITROSOPYRROLIDINE	930-55-2									6.0E-04	2.1E+00	4/99 [7/90]			1
NAPHTHALENE ... (see Polycyclic aromatic hydrocarbons)															
NICKEL AND COMPOUNDS TAC *values also apply to:*	7440-02-0 [1145]	6.0E+00	4/99			5.0E-02	2/00	5.0E-02	10/00	2.6E-04 TAC	9.1E-01	8/91			1
Nickel acetate	*373-02-4*	*6.0E+00*	*4/99*			*5.0E-02*	*2/00*	*5.0E-02*	*10/00*	*2.6E-04 TAC*	*9.1E-01*	*8/91*			*0.3321*
Nickel carbonate	*3333-67-3*	*6.0E+00*	*4/99*			*5.0E-02*	*2/00*	*5.0E-02*	*10/00*	*2.6E-04 TAC*	*9.1E-01*	*8/91*			*0.4945*
Nickel carbonyl	*13463-39-3*	*6.0E+00*	*4/99*			*5.0E-02*	*2/00*	*5.0E-02*	*10/00*	*2.6E-04 TAC*	*9.1E-01*	*8/91*			*0.3438*
Nickel hydroxide	*12054-48-7*	*6.0E+00*	*4/99*			*5.0E-02*	*2/00*	*5.0E-02*	*10/00*	*2.6E-04 TAC*	*9.1E-01*	*8/91*			*0.6332*
Nickelocene	*1271-28-9*	*6.0E+00*	*4/99*			*5.0E-02*	*2/00*	*5.0E-02*	*10/00*	*2.6E-04 TAC*	*9.1E-01*	*8/91*			*0.4937*
NICKEL OXIDE	1313-99-1	6.0E+00	4/99			1.0E-01	2/00	5.0E-02	10/00	2.6E-04 TAC	9.1E-01	8/91			0.7859
Nickel refinery dust from the pyrometallurgical process	*1146*	*6.0E+00*	*4/99*			*5.0E-02*	*2/00*	*5.0E-02*	*10/00*	*2.6E-04 TAC*	*9.1E-01*	*8/91*			*1*
Nickel subsulfide	*12035-72-2*	*6.0E+00*	*4/99*			*5.0E-02*	*2/00*	*5.0E-02*	*10/00*	*2.6E-04 TAC*	*9.1E-01*	*8/91*			*0.2443*
NITRIC ACID	7697-37-2	8.6E+01	4/99												1
NITROGEN DIOXIDE	10102-44-0	4.7E+02	4/99[1/92]												1
p-NITROSODIPHENYLAMINE	156-10-5									6.3E-06	2.2E-02	4/99			1
OZONE	10028-15-6	1.8E+02	4/99[1/92]												1
PARTICULATE EMISSIONS FROM DIESEL-FUELED ENGINES TAC ■¶	9901					5.0E+00 TAC	8/98			3.0E-04 TAC	1.1E+00	8/98			1

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Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES°

Substance	Chemical Abstract Number ▼	Noncancer Effects								Cancer Risk					
		Acute Inhalation (µg/m³)	Date ◆ Value Reviewed [Added]	8-Hour Inhalation (µg/m³)	Date ◆ Value Reviewed [Added]	Chronic Inhalation (µg/m³)	Date ◆ Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date ◆ Value Reviewed [Added]	Inhalation * Unit Risk (µg/m³)⁻¹	Inhalation * Cancer Potency Factor (mg/kg-d)⁻¹	Date ◆ Value Reviewed [Added]	Oral Slope Factor (mg/kg-d)⁻¹	Date ◆ Value Reviewed [Added]	M♣ W A F
PENTACHLOROPHENOL ... (see Chlorophenols)															
PERCHLOROETHYLENE TAC (Tetrachloroethylene)	127-18-4	2.0E+04	4/99			3.5E+01 TAC	10/91			5.9E-06 TAC	2.1E-02	10/91			1
PHENOL	108-95-2	5.8E+03	4/99			2.0E+02	4/00								1
PHOSGENE	75-44-5	4.0E+00	4/99												1
PHOSPHINE	7803-51-2					8.0E-01	9/02								1
PHOSPHORIC ACID	7664-38-2					7.0E+00	2/00								1
PHTHALIC ANHYDRIDE	85-44-9					2.0E+01	1/01								1
PCB (POLYCHLORINATED BIPHENYLS) (unspeciated mixture) [lowest risk] ☼*	1336-36-3									2.0E-05	7.0E-02	4/99	7.0E-02	10/00	1
PCB (POLYCHLORINATED BIPHENYLS) (unspeciated mixture) [low risk] ☼*	1336-36-3									1.1E-04	4.0E-01*		4.0E-01*		1
PCB (POLYCHLORINATED BIPHENYLS) (unspeciated mixture) [high risk] ☼*	1336-36-3									5.7E-04	2.0E+00	4/99	2.0E+00	10/00	1
PCB (POLYCHLORINATED BIPHENYLS (speciated) ϖ															
3,3',4,4'-TETRACHLOROBIPHENYL (PCB 77)	32598-13-3					4.0E-01	8/03	1.0E-04	8/03	3.8E-03	1.3E+01	8/03	1.3E+01	8/03	1
3,4,4',5-TETRACHLOROBIPHENYL (PCB 81)	70362-50-4					1.3E-01	1/11	3.3E-05	1/11	1.1E-02	3.9E+01	1/11	3.9E+01	1/11	1
2,3,3',4,4'-PENTACHLOROBIPHENYL (PCB 105)	32598-14-4					1.3E+00	1/11	3.3E-04	1/11	1.1E-03	3.9E+00	1/11	3.9E+00	1/11	1
2,3,4,4',5-PENTACHLOROBIPHENYL (PCB 114)	74472-37-0					1.3E+00	1/11	3.3E-04	1/11	1.1E-03	3.9E+00	1/11	3.9E+00	1/11	1
2,3',4,4',5-PENTACHLOROBIPHENYL (PCB 118)	31508-00-6					1.3E+00	1/11	3.3E-04	1/11	1.1E-03	3.9E+00	1/11	3.9E+00	1/11	1
2,3',4,4',5'-PENTACHLOROBIPHENYL (PCB 123)	65510-44-3					1.3E+00	1/11	3.3E-04	1/11	1.1E-03	3.9E+00	1/11	3.9E+00	1/11	1
3,3',4,4',5-PENTACHLOROBIPHENYL (PCB 126)	57465-28-8					4.0E-04	8/03	1.0E-07	8/03	3.8E+00	1.3E+04	8/03	1.3E+04	8/03	1
2,3,3',4,4',5-HEXACHLOROBIPHENYL (PCB 156)	38380-08-4					1.3E+00	1/11	3.3E-04	1/11	1.1E-03	3.9E+00	1/11	3.9E+00	1/11	1

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Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES°

Substance	Chemical Abstract Number▼	Noncancer Effects								Cancer Risk					
		Acute Inhalation (µg/m³)	Date Value Reviewed [Added]◆	8-Hour Inhalation (µg/m³)	Date Value Reviewed [Added]◆	Chronic Inhalation (µg/m³)	Date Value Reviewed [Added]◆	Chronic Oral (mg/kg-d)	Date Value Reviewed [Added]◆	Inhalation Unit Risk (µg/m³)⁻¹*	Inhalation Cancer Potency Factor (mg/kg-d)⁻¹*	Date Value Reviewed [Added]◆	Oral Slope Factor (mg/kg-d)⁻¹	Date Value Reviewed [Added]◆	MWAF♣
2,3,3',4,4',5'-HEXACHLOROBIPHENYL (PCB 157)	69782-90-7					1.3E+00	1/11	3.3E-04	1/11	1.1E-03	3.9E+00	1/11	3.9E+00	1/11	1
2,3',4,4',5,5'-HEXACHLOROBIPHENYL (PCB 167)	52663-72-6					1.3E+00	1/11	3.3E-04	1/11	1.1E-03	3.9E+00	1/11	3.9E+00	1/11	1
3,3',4,4',5,5'-HEXACHLOROBIPHENYL (PCB 169)	32774-16-6					1.3E-03	1/11	3.3E-07	1/11	1.1E+00	3.9E+03	1/11	3.9E+03	1/11	1
2,3,3',4,4',5,5'-HEPTACHLOROBIPHENYL (PCB 189)	39635-31-9					1.3E+00	1/11	3.3E-04	1/11	1.1E-03	3.9E+00	1/11	3.9E+00	1/11	1
POLYCHLORINATED DIBENZO-*P*-DIOXINS (PCDD) (Treated as 2,3,7,8-TCDD for HRA)[TAC] ●	1085 1086					4.0E-05	2/00	1.0E-08	10/00	3.8E+01 TAC	1.3E+05	8/86	1.3E+05 TAC	8/86	1
2,3,7,8-TETRACHLORODIBENZO-*P*-DIOXIN[TAC]	1746-01-6					4.0E-05	2/00	1.0E-08	10/00	3.8E+01 TAC	1.3E+05	8/86	1.3E+05 TAC	8/86	1
1,2,3,7,8-PENTACHLORODIBENZO-*P*-DIOXIN	40321-76-4					4.0E-05	8/03	1.0E-08	8/03	3.8E+01	1.3E+05	8/03	1.3E+05	8/03	1
1,2,3,4,7,8-HEXACHLORODIBENZO-*P*-DIOXIN	39227-28-6					4.0E-04	2/00	1.0E-07	10/00	3.8E+00	1.3E+04	4/99	1.3E+04	10/00	1
1,2,3,6,7,8-HEXACHLORODIBENZO-*P*-DIOXIN	57653-85-7					4.0E-04	2/00	1.0E-07	10/00	3.8E+00	1.3E+04	4/99	1.3E+04	10/00	1
1,2,3,7,8,9-HEXACHLORODIBENZO-*P*-DIOXIN	19408-74-3					4.0E-04	2/00	1.0E-07	10/00	3.8E+00	1.3E+04	4/99	1.3E+04	10/00	1
1,2,3,4,6,7,8-HEPTACHLORODIBENZO-*P*-DIOXIN	35822-46-9					4.0E-03	2/00	1.0E-06	10/00	3.8E-01	1.3E+03	4/99	1.3E+03	10/00	1
1,2,3,4,6,7,8,9-OCTACHLORODIBENZO-*P*-DIOXIN	3268-87-9					1.3E-01	1/11	3.3E-05	1/11	1.1E-02	3.9E+01	1/11	3.9E+01	1/11	1
POLYCHLORINATED DIBENZOFURANS (PCDF)[TAC] ● (Treated as 2,3,7,8-TCDD for HRA)	1080					4.0E-05	2/00	1.0E-08	10/00	3.8E+01 TAC	1.3E+05	8/86	1.3E+05 TAC	8/86	1
2,3,7,8-TETRACHLORODIBENZOFURAN	5120-73-19					4.0E-04	2/00	1.0E-07	10/00	3.8E+00	1.3E+04	4/99	1.3E+04	10/00	1
1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6					1.3E-03	1/11	3.3E-07	1/11	1.1E+00	3.9E +03	1/11	3.9E +03	1/11	1

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Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES°

Substance	Chemical Abstract Number ▼	Noncancer Effects								Cancer Risk					
		Acute Inhalation ($\mu g/m^3$)	Date ◆ Value Reviewed [Added]	8-Hour Inhalation ($\mu g/m^3$)	Date ◆ Value Reviewed [Added]	Chronic Inhalation ($\mu g/m^3$)	Date ◆ Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date ◆ Value Reviewed [Added]	Inhalation * Unit Risk $(\mu g/m^3)^{-1}$	Inhalation * Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Date ◆ Value Reviewed [Added]	Oral Slope Factor $(mg/kg\text{-}d)^{-1}$	Date ◆ Value Reviewed [Added]	MWAF ♣
2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4					1.3E-04	1/11	3.3E-08	1/11	1.1E+01	3.9E +04	1/11	3.9E +04	1/11	1
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9					4.0E-04	2/00	1.0E-07	10/00	3.8E+00	1.3E+04	4/99	1.3E+04	10/00	1
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9					4.0E-04	2/00	1.0E-07	10/00	3.8E+00	1.3E+04	4/99	1.3E+04	10/00	1
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9					4.0E-04	2/00	1.0E-07	10/00	3.8E+00	1.3E+04	4/99	1.3E+04	10/00	1
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5					4.0E-04	2/00	1.0E-07	10/00	3.8E+00	1.3E+04	4/99	1.3E+04	10/00	1
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4					4.0E-03	2/00	1.0E-06	10/00	3.8E-01	1.3E+03	4/99	1.3E+03	10/00	1
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7					4.0E-03	2/00	1.0E-06	10/00	3.8E-01	1.3E+03	4/99	1.3E+03	10/00	1
1,2,3,4,6,7,8,9-OCTACHLORODIBENZOFURAN	39001-02-0					1.3E-01	1/11	3.3E-05	1/11	1.1E-02	3.9E +01	1/11	3.9E +01	1/11	1
POLYCYCLIC AROMATIC HYDROCARBON (PAH) Φ [Treated as B(a)P for HRA] ❖	1150 1151									1.1E-03	3.9E+00	4/99 [4/94]	1.2E+01	10/00 [4/94]	1
BENZ(A)ANTHRACENE ❖	56-55-3									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
BENZO(A)PYRENE ❖	50-32-8									1.1E-03	3.9E+00	4/99 [4/94]	1.2E+01	10/00 [4/94]	1
BENZO(B)FLUORANTHENE ❖	205-99-2									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
BENZO(J)FLUORANTHENE ❖	205-82-3									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
BENZO(K)FLUORANTHENE ❖	207-08-9									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
CHRYSENE ❖	218-01-9									1.1E-05	3.9E-02	4/99 [4/94]	1.2E-01	10/00 [4/94]	1
DIBENZ(A,H)ACRIDINE ❖	226-36-8									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
DIBENZ(A,H)ANTHRACENE ❖	53-70-3									1.2E-03	4.1E+00	4/99 [4/94]	4.1E+00	10/00 [4/94]	1
DIBENZ(A,J)ACRIDINE ❖	224-42-0									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
DIBENZO(A,E)PYRENE ❖	192-65-4									1.1E-03	3.9E+00	4/99 [4/94]	1.2E+01	10/00 [4/94]	1
DIBENZO(A,H)PYRENE ❖	189-64-0									1.1E-02	3.9E+01	4/99 [4/94]	1.2E+02	10/00 [4/94]	1

Table last updated: February 14, 2011

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES°

Substance	Chemical Abstract Number	Noncancer Effects								Cancer Risk					
		Acute Inhalation (µg/m³)	Date Value Reviewed [Added]	8-Hour Inhalation (µg/m³)	Date Value Reviewed [Added]	Chronic Inhalation (µg/m³)	Date Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date Value Reviewed [Added]	Inhalation Unit Risk (µg/m³)⁻¹	Inhalation Cancer Potency Factor (mg/kg-d)⁻¹	Date Value Reviewed [Added]	Oral Slope Factor (mg/kg-d)⁻¹	Date Value Reviewed [Added]	MWAF
DIBENZO(A,I)PYRENE	189-55-9									1.1E-02	3.9E+01	4/99 [4/94]	1.2E+02	10/00 [4/94]	1
DIBENZO(A,L)PYRENE	191-30-0									1.1E-02	3.9E+01	4/99 [4/94]	1.2E+02	10/00 [4/94]	1
7H-DIBENZO(C,G)CARBAZOLE	194-59-2									1.1E-03	3.9E+00	4/99 [4/94]	1.2E+01	10/00 [4/94]	1
7,12-DIMETHYLBENZ(A)ANTHRACENE	57-97-6									7.1E-02	2.5E+02	4/99 [4/94]	2.5E+02	10/00 [4/94]	1
1,6-DINITROPYRENE	42397-64-8									1.1E-02	3.9E+01	4/99 [4/94]	1.2E+02	10/00 [4/94]	1
1,8-DINITROPYRENE	42397-65-9									1.1E-03	3.9E+00	4/99 [4/94]	1.2E+01	10/00 [4/94]	1
INDENO(1,2,3-C,D)PYRENE	193-39-5									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
3-METHYLCHOLANTHRENE	56-49-5									6.3E-03	2.2E+01	4/99 [4/94]	2.2E+01	10/00 [4/94]	1
5-METHYLCHRYSENE	3697-24-3									1.1E-03	3.9E+00	4/99 [4/94]	1.2E+01	10/00 [4/94]	1
NAPHTHALENE	91-20-3					9.0E+00	4/00			3.4E-05	1.2E-01	8/04			1
5-NITROACENAPHTHENE	602-87-9									3.7E-05	1.3E-01	4/99 [4/94]	1.3E-01	10/00 [4/94]	1
6-NITROCHRYSENE	7496-02-8									1.1E-02	3.9E+01	4/99 [4/94]	1.2E+02	10/00 [4/94]	1
2-NITROFLUORENE	607-57-8									1.1E-05	3.9E-02	4/99 [4/94]	1.2E-01	10/00 [4/94]	1
1-NITROPYRENE	5522-43-0									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
4-NITROPYRENE	57835-92-4									1.1E-04	3.9E-01	4/99 [4/94]	1.2E+00	10/00 [4/94]	1
POTASSIUM BROMATE.... ... (see Bromine & Compounds)															
1,3-PROPANE SULTONE	1120-71-4									6.9E-04	2.4E+00	4/99			1
PROPYLENE (PROPENE)	115-07-1					3.0E+03	4/00								1
PROPYLENE GLYCOL MONOMETHYL ETHER	107-98-2					7.0E+03	2/00								1
PROPYLENE OXIDE	75-56-9	3.1E+03	4/99			3.0E+01	2/00			3.7E-06	1.3E-02	4/99 [7/90]			1
SELENIUM AND COMPOUNDS	7782-49-2 [1170]					2.0E+01	12/01								1
HYDROGEN SELENIDE	7783-07-5	5.0E+00	4/99												1

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Substance	Chemical Abstract Number▼	Noncancer Effects								Cancer Risk					
		Acute Inhalation ($\mu g/m^3$)	Date◆ Value Reviewed [Added]	8-Hour Inhalation ($\mu g/m^3$)	Date◆ Value Reviewed [Added]	Chronic Inhalation ($\mu g/m^3$)	Date◆ Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date◆ Value Reviewed [Added]	Inhalation* Unit Risk $(\mu g/m^3)^{-1}$	Inhalation* Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Date◆ Value Reviewed [Added]	Oral Slope Factor $(mg/kg\text{-}d)^{-1}$	Date◆ Value Reviewed [Added]	M♣ W A F
Selenium sulfide	*7446-34-6*					*2.0E+01*	*12/01*								*1*
SILICA [CRYSTALLINE, RESPIRABLE]	1175					3.0E+00	2/05								1
SODIUM HYDROXIDE	1310-73-2	8.0E+00	4/99												1
STYRENE	100-42-5	2.1E+04	4/99			9.0E+02	4/00								1
SULFATES	9960	1.2E+02	4/99												1
SULFUR DIOXIDE	7446-09-5	6.6E+02	4/99[1/92]												1
SULFURIC ACID AND OLEUM	9961	1.2E+02	4/99			*1.0E+00*	*12/01*								1
SULFURIC ACID	*7664-93-9*	*1.2E+02*	*4/99*			1.0E+00	12/01								*1*
SULFUR TRIOXIDE	*7446-71-9*	*1.2E+02*	*4/99*			*1.0E+00*	*12/01*								*1*
OLEUM	*8014-95-7*	*1.2E+02*	*4/99*			*1.0E+00*	*12/01*								*1*
1,1,2,2-TETRACHLOROETHANE	79-34-5									5.8E-05	2.0E-01	4/99			1
TETRACHLOROPHENOLS ... (see Chlorophenols)															
2,4,5-TRICHLOROPHENOL ... (see Chlorophenols)															
2,4,6-TRICHLOROPHENOL ... (see Chlorophenols)															
THIOACETAMIDE	62-55-5									1.7E-03	6.1E+00	4/99			1
TOLUENE	108-88-3	3.7E+04	4/99			3.0E+02	4/00								1
Toluene diisocyantates	*26471-62-5*					*7.0E-02*	*1/01*			*1.1E-05*	*3.9E-02*	*4/99*			*1*
TOLUENE-2,4-DIISOCYANATE	584-84-9					7.0E-02	1/01			1.1E-05	3.9E-02	4/99			1
TOLUENE-2,6-DIISOCYANATE	91-08-7					7.0E-02	1/01			1.1E-05	3.9E-02	4/99			1
1,1,2-TRICHLOROETHANE (Vinyl trichloride)	79-00-5									1.6E-05	5.7E-02	4/99			1
TRICHLOROETHYLENE[TAC]	79-01-6					6.0E+02	4/00			2.0E-06 TAC	7.0E-03	10/90			1
TRIETHYLAMINE	121-44-8	2.8E+03	4/99			2.0E+02	9/02								1
URETHANE (Ethyl carbamate)	51-79-6									2.9E-04	1.0E+00	4/99 [7/90]			1
Vanadium Compounds	*N/A*														*1*
Vanadium (fume or dust)	*7440-62-2*	*3.0E+01*	*4/99*												*1*
VANADIUM PENTOXIDE	1314-62-1	3.0E+01	4/99												1
VINYL ACETATE	108-05-4					2.0E+02	12/01								1
VINYL CHLORIDE[TAC] (Chloroethylene)	75-01-4	1.8E+05	4/99							7.8E-05 TAC	2.7E-01	12/90			1
VINYLIDENE CHLORIDE (1,1-Dichloroethylene)	75-35-4					7.0E+01	1/01								1

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Table 1
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Substance	Chemical Abstract Number ▼	Noncancer Effects								Cancer Risk					
		Acute Inhalation ($\mu g/m^3$)	Date ◆ Value Reviewed [Added]	8-Hour Inhalation ($\mu g/m^3$)	Date ◆ Value Reviewed [Added]	Chronic Inhalation ($\mu g/m^3$)	Date ◆ Value Reviewed [Added]	Chronic Oral (mg/kg-d)	Date ◆ Value Reviewed [Added]	* Inhalation Unit Risk $(\mu g/m^3)^{-1}$	* Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Date ◆ Value Reviewed [Added]	Oral Slope Factor $(mg/kg\text{-}d)^{-1}$	Date ◆ Value Reviewed [Added]	♣ MWAF
XYLENES (mixed isomers)	1330-20-7	2.2E+04	4/99			7.0E+02	4/00								1
m-XYLENE	108-38-3	2.2E+04	4/99			7.0E+02	4/00								1
o-XYLENE	95-47-6	2.2E+04	4/99			7.0E+02	4/00								1
p-XYLENE	106-42-3	2.2E+04	4/99			7.0E+02	4/00								1

Table 1
CONSOLIDATED TABLE OF OEHHA/ARB APPROVED RISK ASSESSMENT HEALTH VALUES°

Purpose: The purpose of this reference table is to provide a quick list of all health values that have been approved by the Office of Environmental Health Hazard Assessment (OEHHA) and the Air Resources Board (ARB) for use in facility health risk assessments conducted for the AB 2588 Air Toxics Hot Spots Program. The OEHHA has developed and adopted new risk assessment guidelines that update and replace the California Air Pollution Control Officers Association's (CAPCOA) *Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines, October 1993.* The OEHHA has adopted four technical support documents for these guidelines, which can be found on their website (http://www.oehha.ca.gov/air/hot_spots/index.html). This table lists the OEHHA adopted inhalation and oral cancer slope factors, noncancer acute Reference Exposure Levels (RELs), and inhalation and oral noncancer chronic RELs. OEHHA is still in the process of adopting new health values. Therefore, new health values will periodically be added to, or deleted from, this table. Users of this table are advised to monitor the OEHHA website (*www.oehha.ca.gov*) for any updates to the health values.

May 2008 update: The Air Resources Board adopted amendments to the AB 2588 Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines Regulation (Title 17, California Code of Regulations, Section 93300.5) on November 16, 2006. The amendments became effective on September 26, 2007, after approval from the Office of Administrative Law. Under the new amendments, the substances previously listed in Appendix A-I *(Substances For Which Emissions Must Be Quantified)* and Appendix F (*Criteria For Inputs For Risk Assessment Using Screening Air Dispersion Modeling*) of the ARB's *Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines (EICG) (July 1997)* have been removed from this table.

✪ Substances written in *italics* do not have explicit OEHHA approved health values, but are included in this table to clarify applicability of OEHHA adopted heath effects values to individual or grouped substances listed in the *Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines*, Appendix A-I list of *"Substances For Which Emissions Must Be Quantified"*.

▼ Chemical Abstract Service Number (CAS): For chemical groupings and mixtures where a CAS number is not applicable, the 4-digit code used in the *Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines (EICG) Report* is listed. The 4-digit codes enclosed in brackets [ ] are codes that have been phased out, but may still appear on previously reported Hot Spots emissions. For information on the origin and use of the 4-digit code, see the EICG report.

◆ Date Value Reviewed [Added]: These columns list the date that the health value was last reviewed by OEHHA and the Scientific Review Panel, and/or approved for use in the AB 2588 Air Toxics Hot Spots Program. If the health value is unchanged since it was first approved for use in the Hot Spots Program, then the date that the value was first approved for use by CAPCOA is listed within the brackets [ ].

- April 1999 is listed for the cancer potency values and noncancer acute RELs, which have been adopted by the OEHHA as part of the AB 2588 Hot Spot Risk Assessment Guidelines.
- February 2000, April 2000, January 2001, and December 2001 are listed for the first set of 22, the second set of 16, the third set of 22, and the fourth set of 12 noncancer chronic RELs, respectively. The chronic REL for carbon disulfide was adopted in May 2002. Chronic RELs for phosphine and triethylamine were adopted in September 2002. Chronic RELs for fluorides including hydrogen fluoride were adopted August 2003. Chronic REL for silica [crystalline respirable] was adopted February 2005.
- October 2000 is listed for the oral chronic RELs and oral cancer slope factors.
- Cancer potency value adopted for naphthalene in August 2004. The inhalation and oral cancer potency values for ethyl benzene were adopted in November 2007.
- For the substances identified as Toxic Air Contaminants, the Air Resources Board hearing date is listed. The dates for acetaldehyde, benzo[a]pyrene, and methyl tertiary-butyl ether represent the dates the values were approved by the Scientific Review Panel.
- On December 19, 2008, OEHHA adopted new acute, 8-hour, and chronic RELs for acetaldehyde, acrolein, arsenic, formaldehyde, manganese, and mercury. The most current health values can be found at: http://www.oehha.ca.gov/air/allrels.html. Note that the 8-hour RELs are not included in the HARP program. These health factors will be added after OEHHA approves the Guidelines Manual (Part V).

  Note: 1. OEHHA presents the new oral RELs in micrograms (µg/kg-d) and we converted them to milligrams (mg/kg-d) for consistency.

  2. Acute RELs with longer averaging periods (i.e., 4-hour, 6-hour, and 7-hour) will now use the 1-hour averaging period. The affected chemicals are: arsenic & inorganic arsenic compounds, benzene, carbon disulfide, carbon tetrachloride, chloroform, ethylene glycol monoethyl ether, ethylene glycol monoethyl ether acetate, and ethylene glycol monomethyl ether.

  3. At OEHHA's direction, the chronic oral REL for arsenic does not apply to arsine because arsine is a gas and not particle associated.
- January 2011 is listed to reflect OEHHA's adoption of the World Health Organization's 2005 Toxicity Equivalency Factors for polychlorinated dibenzo-p-dioxins (PCDDs), dibenzofurans (PCDFs), and dioxin-like polychlorinated biphenyls (PCBs). See Appendix C of OEHHA's *Air Toxics Hot Spots Program Technical Support Document for Cancer Potencies* at http://www.oehha.ca.gov/air/hot_spots/pdf/AppCdioxinTEFs013111.pdf for more information.

* Inhalation cancer potency factor: The "unit risk factor" has been replaced in the new risk assessment algorithms by a factor called the "inhalation cancer potency factor". Inhalation cancer potency factors are expressed as units of inverse dose [i.e., $(mg/kg\text{-}day)^{-1}$]. They were derived from unit risk factors [units = $(ug/m^3)^{-1}$] by assuming that a receptor weighs 70 kilograms and breathes 20 cubic meters of air per day. The inhalation potency factor is used to calculate a potential inhalation cancer risk using the new risk assessment algorithms defined in the OEHHA, *Air Toxics Hot Spots Program; Part IV; Technical Support Document for Exposure Assessment and Stochastic Analysis (September 2000).*

Table 1
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♣	Molecular Weight Adjustment Factor: Molecular weight adjustment factors (MWAF) are only to be used when a toxic metal has a cancer potency factor. For most of the Hot Spots toxic metals, the OEHHA cancer potency factor applies to the weight of the toxic metal atom contained in the overall compound. Some of the Hot Spots compounds contain various elements along with the toxic metal atom (e.g., "Nickel hydroxide", CAS number 12054-48-7, has a formula of H_2NiO_2). Therefore, an adjustment to the reported pounds of the overall compound is needed before applying the OEHHA cancer potency factor for "Nickel and compounds" to such a compound. This ensures that the cancer potency factor is applied only to the fraction of the overall weight of the emissions that are associated with health effects of the metal. In other cases, the Hot Spots metals are already reported as the metal atom equivalent (e.g., CAS 7440-02-0, "Nickel"), and these cases do not use any further molecular weight adjustment. (Refer to Note [7] in Appendix A, List of Substances in the EICG Report for further information on how the emissions of various Hot Spots metal compounds are reported.) The appropriate molecular weight adjustment factors (MWAF) to be used along with the OEHHA cancer potency factors for Hot Spots metals can be found in the MWAF column of this table. So, for example, assume 100 pounds of "Nickel hydroxide" emissions are reported under CAS number 12054-48-7. To get the Nickel atom equivalent of these emissions, multiply by the listed MWAF (0.6332) for Nickel hydroxide: • 100 pounds x 0.6332 = 63.32 pounds of Nickel atom equivalent *This step should be completed prior to applying the OEHHA cancer potency factor for "Nickel and compounds" in a calculation for a prioritization score or risk assessment calculation.* (For more information see Chapter 8 of OEHHA's document, *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments.*) Note: The value listed in the MWAF column for Asbestos is not a molecular weight adjustment. This is a conversion factor for adjusting mass to fibers or structures. See Appendix C of OEHHA's document *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* for more information on Asbestos, or see the EICG report for reporting guidance. Also see the Asbestos footnote (designated by the symbol ¤)
N/A	Not Applicable
TAC	Toxic Air Contaminant: The Air Resources Board has identified this substance as a Toxic Air Contaminant.
¤	Asbestos: The units for the Inhalation Cancer Potency factor for asbestos are (100 PCM fibers/m^3)$^{-1}$. A conversion factor of 100 fibers/0.003 µg can be multiplied by a receptor concentration of asbestos expressed in µg/m^3. Unless other information necessary to estimate the concentration (fibers/m^3) of asbestos at receptors of interest is available. A unit risk factor of 1.9 E 10^{-4} (µg/m^3)$^{-1}$ and an inhalation cancer potency factor of 2.2 E 10^{+2} (mg/kg BW * day)$^{-1}$ are available. For more information on asbestos quantity conversion factors, see Appendix C of OEHHA's *The Air Toxics Hot Spots Program Risk Assessment Guidelines; Part II; Technical Support Document for Describing Available Cancer Potency Factors*, and Appendix C of OEHHA's document *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments.*
∅	Hexavalent Chromium: The oral cancer slope factor for chromium 6+ and compounds has been withdrawn by the Office of Environmental Health Hazard Assessment.
♫	Inorganic Lead: Inorganic Lead was identified by the Air Resources Board as a Toxic Air Contaminant in April 1997. Since information on noncancer health effects show no identified threshold, no Reference Exposure Level has been developed. The document, *Risk Management Guidelines for New, Modified, and Existing Sources of Lead, March 2001*, has been developed by ARB and OEHHA staff for assessing noncancer health impacts from sources of lead. See Appendix F of OEHHA's document *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* for an overview of how to evaluate noncancer impacts from exposure to lead using these risk management guidelines.
Φ	Polycyclic Aromatic Hydrocarbons (PAHs): These substances are PAH or PAH-derivatives that have OEHHA-developed Potency Equivalency Factors (PEFs) which were approved by the Scientific Review Panel in April 1994 (see ARB document entitled *Benzo[a]pyrene as a Toxic Air Contaminant*). PAH inhalation slope factors listed here have been adjusted by the PEFs. See OEHHA's Technical Support Document: Methodologies for Derivation, Listing of Available Values, and Adjustments to Allow for Early Life Exposures (2009) for more information about the scheme. Section 8.2.3 and Appendix G of OEHHA's *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (2003) also contain information on PAHs. The two numbers (i.e., 1150 and 1151) in the column listing Chemical Abstracts Numbers are used for reporting and risk assessment purposes. Be sure to input emissions under the proper code when using the HARP software. ID code 1150 has no health values associated with it in the HARP software; therefore, no health impacts will be calculated when using ID 1150. See the Emissions Inventory Criteria and Guidelines for more information on reporting emissions.
☼	Polychlorinated Biphenyls: (unspeciated mixtures) Lowest Risk: For use in cases where congeners with more than four chlorines comprise less than one-half percent of total polychlorinated biphenyls. High Risk: For use in cases where congeners with more than four chlorines do not comprise less than one-half percent of total polychlorinated biphenyls. Low Risk: This number would not ordinarily be used in the Hot Spots program. Chronic Oral: The chronic oral value is U.S. EPA's 1996 oral Reference Dose for Aroclor-1254.
ϖ	Polychlorinated Biphenyls (speciated): OEHHA has adopted the World Health Organization 2005 (WHO-2005) Toxicity Equivalency Factors (TEFs) scheme for evaluating the cancer risk due to exposure to samples containing mixtures of polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF) and determining cancer risks for a number of dioxin-like PCBs. See Appendix C of OEHHA's Technical Support Document: Methodologies for Derivation, Listing of Available Values, and Adjustments to Allow for Early Life Exposures (2009) for more information about the scheme.
•	Polychlorinated Dibenzo-*p*-dioxins and Polychlorinated Dibenzofurans (also referred to as chlorinated dioxins and dibenzofurans): OEHHA has adopted the World Health Organization 2005 (WHO-2005) Toxicity Equivalency Factors (TEFs) scheme for evaluating the cancer risk due to exposure to samples containing mixtures of polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF) and determining cancer risks for a number of specific PCB congeners. See Appendix C of OEHHA's Technical Support Document: Methodologies for Derivation, Listing of Available Values, and Adjustments to Allow for Early Life Exposures (2009) for more information about the scheme. See section 8.2.3 of OEHHA's The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments for conducting health risks when total (unspeciated) chlorinated dioxins and furans are reported. The two numbers (i.e., 1085 and 1086) in the column listing Chemical Abstracts Numbers are used for reporting and risk assessment purposes. Be sure to input emissions under the proper code when using the HARP software. ID code 1085 has no health values associated with it in the HARP software; therefore, no health impacts will be calculated when using ID 1085. See the Emissions Inventory Criteria and Guidelines for more information on reporting emissions.

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¶ Particulate Emissions from Diesel-Fueled Engines: The inhalation cancer potency factor and chronic REL were derived from whole diesel exhaust and should be used only for impacts from the inhalation pathway. The inhalation impacts from speciated emissions from diesel-fueled engines are already accounted for in the inhalation cancer potency factor and REL. However, at the discretion of the risk assessor, speciated emissions from diesel-fueled engines may be used to estimate acute noncancer health impacts or the contribution to cancer risk or chronic noncancer health impacts for the non-inhalation exposure pathway. See Appendix D of OEHHA's document *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* for more information.

Other Changes:

- 10/18/2010, removed CHLORODIFLUOROMETHANE, which should have been removed in May 2008.

Table F.4-8 Construction Screening Diesel PM Risk Calculations

Project ID:	QBPP		
Phase:	Construction		
Current DPM URF:	0.0003	ug/m3^-1	Cancer
Current DPM REL:	5	ug/m3^-1	Chronic

Receptor Data:

Receptor ID	1	2
Exposure Scenario	Annual	Annual
Receptor Type	Fenceline	Residence
UTM Em	497471	497856
UTM Nm	3634785	3634188
Annual Conc (ug/m3):	0.60542	0.03562
Exposure Adjustment Factor:	0.0086	0.0086

Construction Period Exposure Values

hrs/day	12
days/week	6
weeks/yr	52
years	1.40

Predicted Risk Data

Cancer Risk per million	*1.56*	*0.09*
Chronic HI	*0.121*	*0.007*
Acute HI	*n/a*	*n/a*

Receptor 1 - The risks presented are for MIR-1 at the project fencline, which is a non-habitable receptor.(see other fencline data below)
Receptor 2 - The risks presented are for the MIR at the ***nearest residence****, which are more representative of offsite population risks.*

Rank	Type	ID	UTM E	UTM N	Elev, ft.
1st High	Fenceline	MIR 1	497471.43	3634785.24	538.3
2nd High	Fenceline	MIR 2	497468.22	3634755.81	540.8
3rd High	Fenceline	MIR 3	497471.43	3634785.24	538.3
Residential	Residence	n/a	497856	3634188	381

Ref: Health Risk Assessment Guidance for Analyzing Cancer Risks
from Mobile Source Diesel Emissions, SCAQMD, 8/03.
Ref: HARP Users Manual, Version 1.4d, Appendix K, 12/2003.
Ref: OEHHA, Air Toxics Hot Spots Program Risk Assessment Guidelines, 8/03, 8.2.2, p. 8-4.
Ref: CARB/OEHHA Consolidated Risk Value Table, 2/2011.

Figure F.4-1 Census Bureau Tract Map

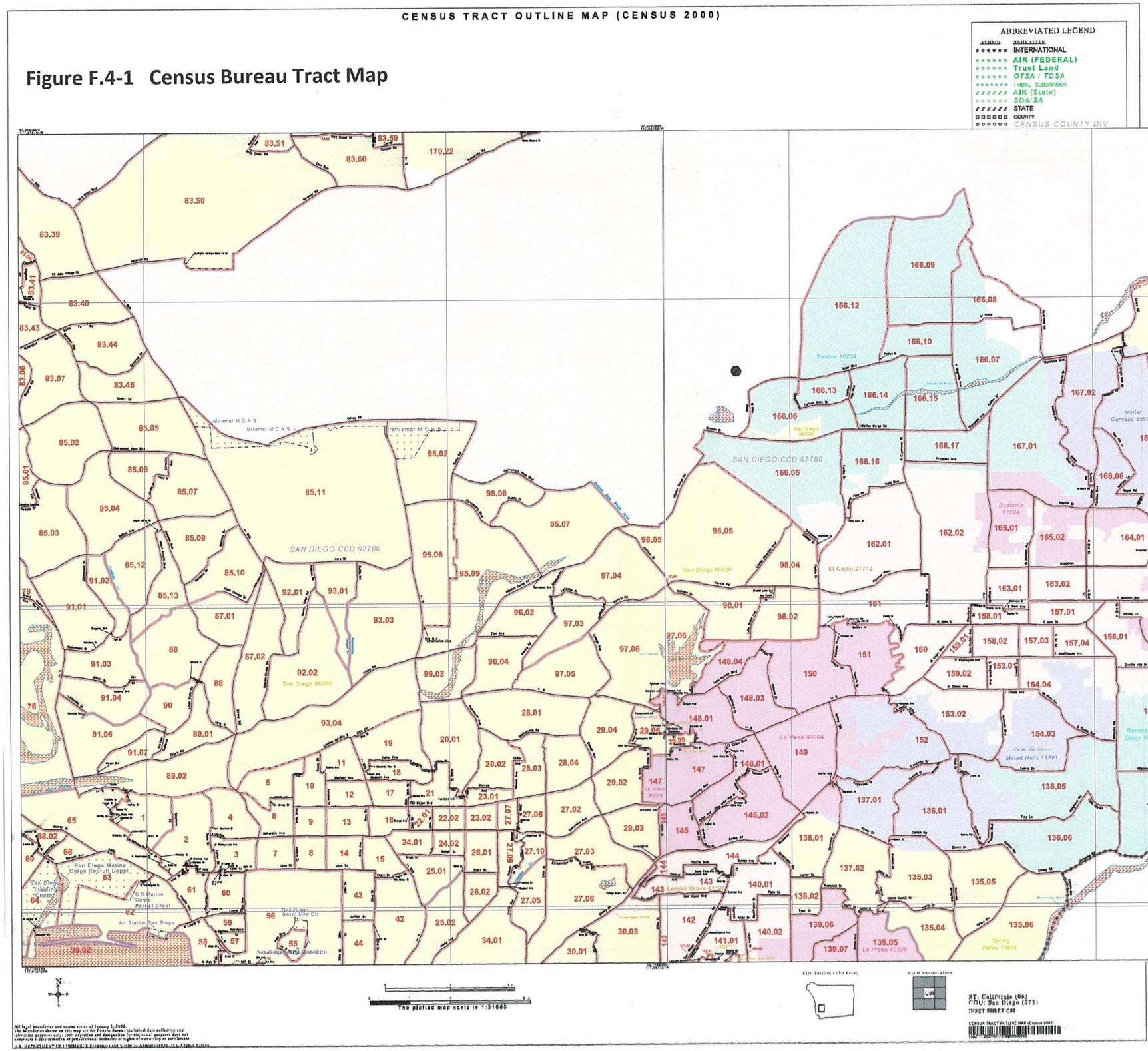
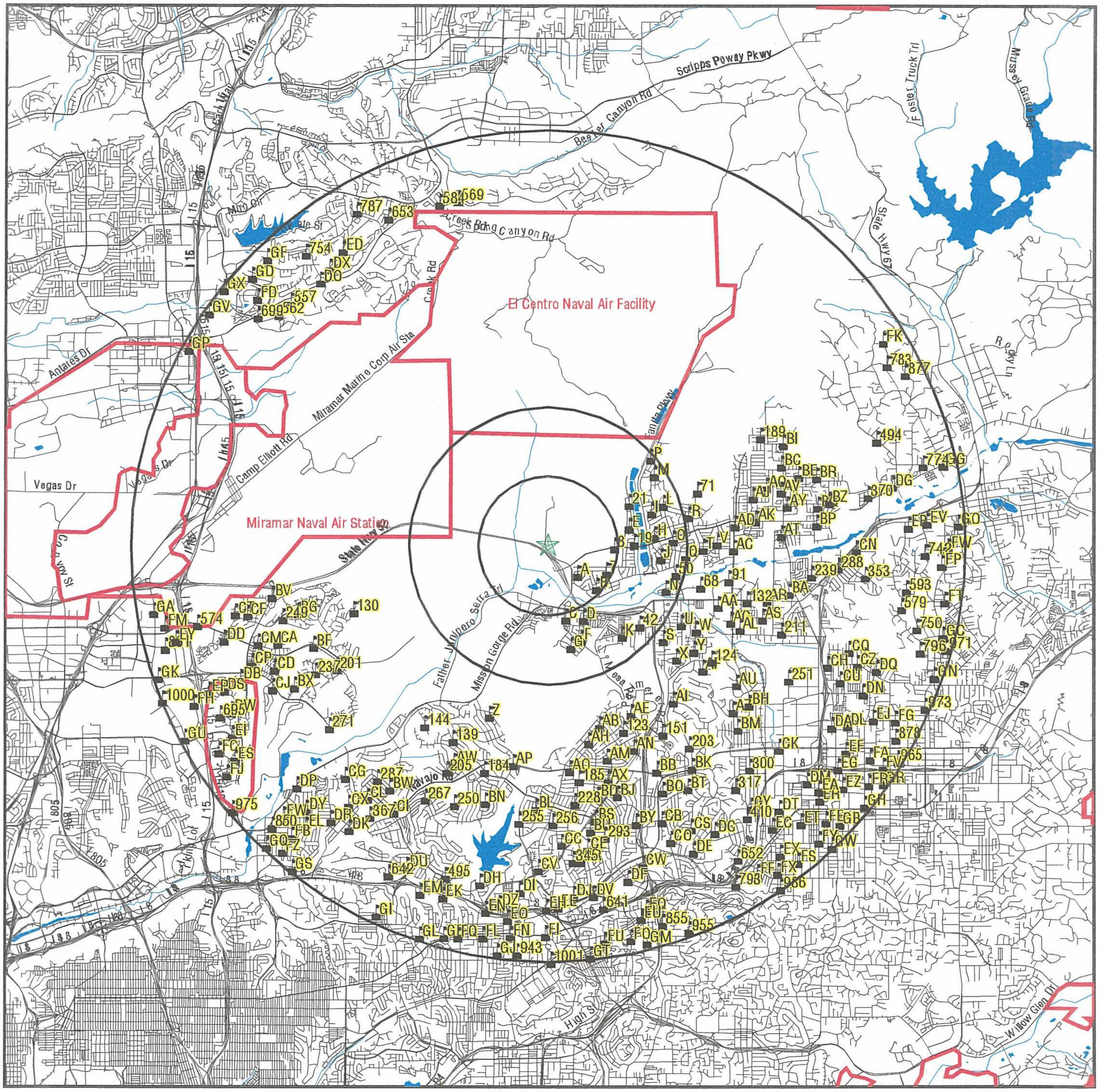


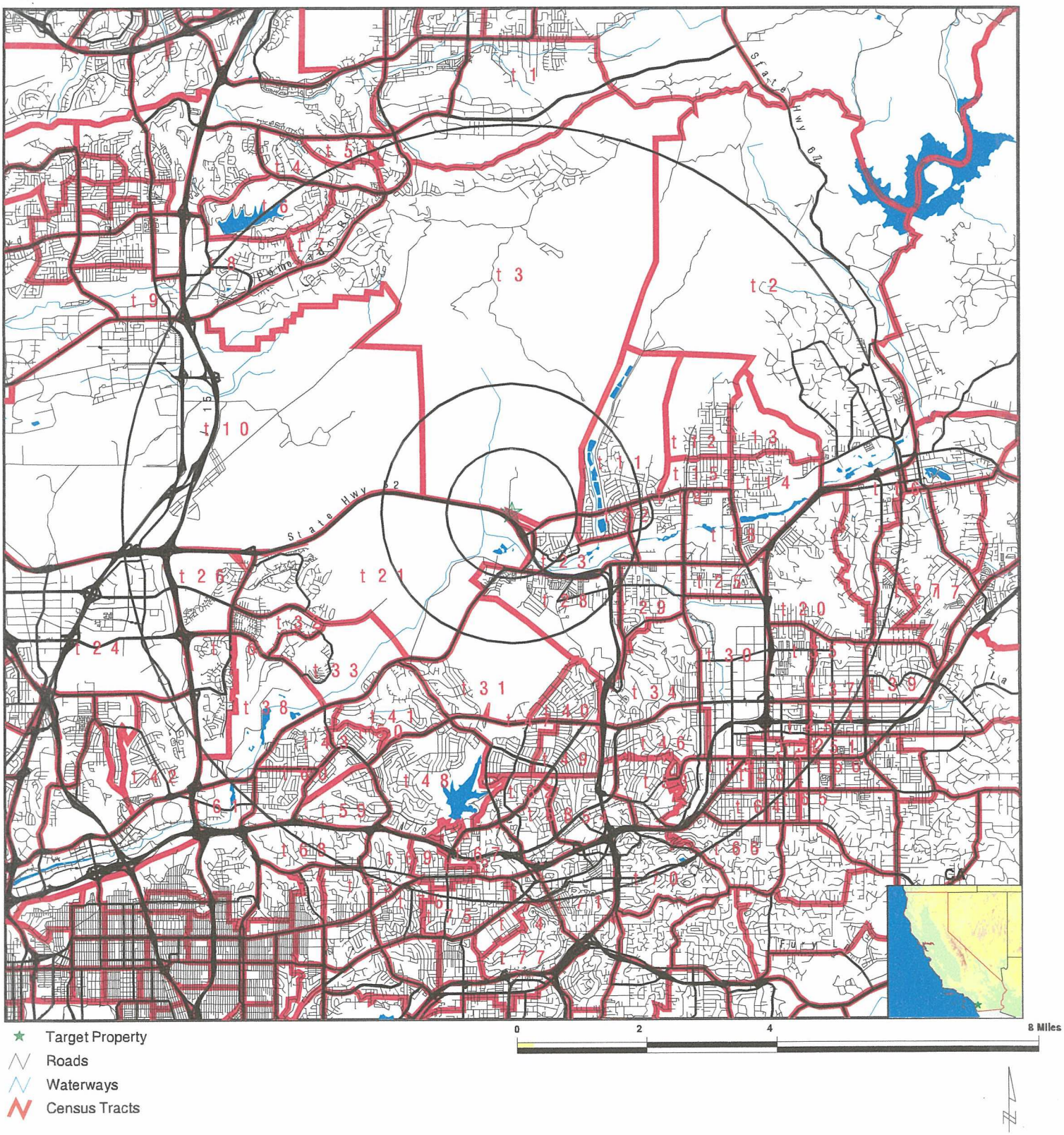
Figure F.4-2 Sensitive Receptor Plot for 6-Mile Radius



0 2 4 8 Miles

- Target Property
- Roads
- Waterways
- Environmental or Public Receptor
- Federal Lands Linear Features
- Federal Lands Area

Figure F.4-3 Census Tract Plot for 6-Mile Radius



Attachment F.4-1

Sycamore Landfill Emissions Inventory Data

(3 Pages)

SAN DIEGO APCD
EMISSIONS INVENTORY REQUEST FORM
LANDFILL OPERATIONS

SYCAMORE LANDFILL INC
8514 MAST BL , SANTEE , CA-92071
Source ID: 8719 **Facility ID: 6257C**

SITE MGR AUSTIN BOB
PHONE NUMBER: (619) 562-9426
Reporting Year: 2005

PERMIT INFORMATION: 971111

AN ACTIVE NON-HAZARDOUS WASTE LANDFILL OPERATION THAT INCLUDES QUARRYING, MUNICIPAL WASTE DISPOSAL, WASTE COMPACTION, COVER MATERIAL APPLICATION, HAUL ROAD ACTIVITIES, AND A LANDFILL GAS MONITORING, COLLECTION, AND FLARE SYSTEM CONSISTING OF: LANDFILL GAS (LFG) COLLECTION WELLS WITH ASSOCIATED FITTINGS, PIPING AND INDIVIDUAL WELL SHUT OFF VALVES; OFFSITE LFG MIGRATIONPROBES WITH ASSOCIATED FITTINGS AND SAMPLING PORTS; 2 LFG BLOWERS WITH ASSOCIATED FITTINS, VALVES AND PIPING; FLAME

DEVICE INFORMATION: 971111

ACTIVE LANDFILL OPERATIONS - INCLUDES 1,223,570,000 FT3 LANDFILL GAS RECOVERED BY LANDFILL GENERATING PARTNERS (ID 6257A) IN 2005

STACK INFORMATION (DUCTED EMISSIONS)

Height Above Ground (ft):	0.00
Diameter (ft):	0.00
Gas Temperature (F):	0.00
Gas Flowrate (CFM):	0.00
Control Device:	
Capture Efficiency (%):	0.00
Volatile Control Efficiency (%):	0.00
Non-Volatile Control Efficiency (%):	0.00

RELEASE INFORMATION (FUGITIVE EMISSIONS)

Emission Control Method:	
Volatile Control Efficiency (%):	0.00
Non-Volatile Control Efficiency (%):	0.00
Additional Information:	

PROCESS INFORMATION

Landfill Status (active/inactive):	ACTIVE
Current Landfill Area (acres):	340.00
Avg. Landfill Depth (feet):	100.00
Start of Operation (calendar year):	1967.00
Closure Date (calendar year):	0.00
Total Years of Operation:	38.00
Initial Landfill Size (tons in place):	12821342.00
Solid Waste Received (tons/year):	1345843.00
Final Landfill Size (tons in place):	14167185.00
Landfill Gas Flared (ft3/year):	335040173.00
Landfill Gas Recovered (ft3/year):	1223570000.00
Soil Cover:	
- Annual Usage (tons/year):	243864.00
- Max. Daily Usage (tons/day):	1500.00
Device Operating Schedule:	
- Daily Operation (hours/day):	24.00
- Weekly Operation (days/week):	7.00
- Annual Operation (days/year):	365.00
Additional Information:	

EMISSION FACTORS (ppm)

Acrylonitrile	5.50e-001

Prepared By: TOM GARDNER **Date:** 4/14/06

FACILITY EMISSIONS
2005 EMISSIONS INVENTORY REPORT

SYCAMORE LANDFILL INC
8514 MAST BL
SANTEE , CA 92071-0

Facility ID: 6257C
Contact:
Phone Number: (619) 562-9426

The San Diego Air Pollution Control District has prepared emission estimates for the above facility.

Criteria Pollutant	Annual Emissions (tons/yr)	Max Hourly Emissions (lbs/hr)
Carbon Monoxide (CO)	0.4	0.2
Nitrogen Oxides (NOx)	6.7	4.3
Particulate Matter (PM10)	284.1	185.0
Reactive Organic Gases (ROG)	2.6	0.8
Sulfur Oxides (SOx)	1.2	0.8
Total Organic Gases (TOG)	277.7	64.5
Total Particulates (TSP)	705.6	459.2

Toxic Air Contaminant	Annual Emissions (lbs/yr)	Max Hourly Emissions (lbs/hr)
1,1,1-Trichloroethane	6.61	< 0.001
Acetone	42.08	0.006
Acrylonitrile	3.01	< 0.001
Arsenic	11.30	0.004
Benzene	15.43	0.002
Beryllium	0.56	< 0.001
Cadmium	0.56	< 0.001
Carbon Disulfide	4.56	< 0.001
Carbonyl Sulfide	3.03	< 0.001
Chlorobenzene	2.92	< 0.001
Chlorofluorocarbons	14.77	0.002
Chloroform	0.37	< 0.001
Chromium, Non-Hexavalent	28.24	0.009
Copper	56.49	0.018
Dimethyl Sulfide	50.19	0.007
Ethyl Benzene	50.56	0.008
Ethylene Dichloride	4.19	< 0.001
Formaldehyde	45.23	0.014
Hexane	58.50	0.009
Hydrogen Chloride	2489.35	0.791
Hydrogen Sulfide	124.99	0.019
Lead	28.24	0.009
Manganese	282.45	0.092
Mercury	0.03	< 0.001
Methyl Ethyl Ketone	52.85	0.008
Methyl Isobutyl Ketone	19.34	0.003
Methylene Chloride	125.49	0.019
Nickel	11.30	0.004

06-Jul-2011

FACILITY EMISSIONS
2005 EMISSIONS INVENTORY REPORT

SYCAMORE LANDFILL INC
8514 MAST BL
SANTEE , CA 92071-0

Facility ID: 6257C
Contact:
Phone Number: (619) 562-9426

Toxic Air Contaminant	Annual Emissions (lbs/yr)	Max Hourly Emissions (lbs/hr)
Perchloroethylene	63.90	0.009
Selenium	2.82	< 0.001
Silica, Crystalline	56489.14	18.395
Toluene	374.18	0.056
Trichloroethylene	38.27	0.006
Vinyl Chloride	47.39	0.007
Vinylidene Chloride	1.67	< 0.001
Xylenes	132.72	0.020
Zinc	112.98	0.037

06-Jul-2011

APPENDIX F.5

CONSTRUCTION EMISSIONS ANALYSIS AND SUPPORT DATA

APPENDIX F.5

Construction Emissions and Impact Analysis

Construction Phases

Construction of the Project is expected to last approximately 16 months. The construction will occur in the following two main phases:

- Site preparation-Phase 1,
- Foundation work, construction/installation of major structures, and installation of major equipment-Phase 2.

The site is approximately 21.7 acres in size and is located in gently rolling hills. Only 16 acres of the total 21.7 acres will actually be disturbed during the construction phase, with only 3 acres subject to construction activities on any given day. The site is currently vacant. As such, the site will require moderate grading and leveling prior to construction of the power blocks, support systems, and site buildings. Site preparation (Phase 1) includes initial and finish grading, excavation of footings and foundations, and backfilling operations. Phase 1 will last approximately 1.5 months. After site preparation is finished, the construction (Phase 2) of the foundations and structures is expected to begin. Phase 2 is expected to last for 14.5 months. Once the foundations and structures are finished, installation and assembly of the mechanical and electrical equipment are scheduled to commence.

Fugitive dust emissions from the construction of the Project will result from:

- Dust entrained during site preparation and finish grading/excavation at the construction site;
- Dust entrained during onsite travel on paved and unpaved surfaces;
- Dust entrained during aggregate and soil loading and unloading operations; and
- Wind erosion of areas disturbed during construction activities.

Combustion emissions during construction will result from:

- Exhaust from the Diesel construction equipment used for site preparation, grading, excavation, and construction of onsite structures;
- Exhaust from water trucks used to control construction dust emissions;
- Exhaust from Diesel-powered welding machines, electric generators, air compressors, and water pumps;
- Exhaust from pickup trucks and Diesel trucks used to transport workers and materials around the construction site;
- Exhaust from Diesel trucks used to deliver concrete, fuel, and construction supplies to the construction site; and,
- Exhaust from automobiles used by workers to commute to the construction site.

To determine the potential worst-case daily construction impacts, exhaust and dust emission rates have been evaluated for each source of emissions. Worst-case daily dust emissions are expected to occur during the first 2 months of construction when site

preparation occurs. The worst-case daily exhaust emissions are expected to occur during Phase 2 of the construction schedule during the installation of the major mechanical equipment.

Construction related fugitive dust emissions are based on a modified version of the EPA AP-42, Section 13.2.3 procedure, as implemented in the MRI Level II analysis. This procedure essentially uses an emissions factor in terms of tons/acre/month of construction activity. The MRI Level II analysis also includes an estimation procedure for quantifying fugitive dust emissions from construction related cut and fill activities. This procedure is widely used (and approved for use) per the following documents and programs:

- MRI Report No. 95040, SCAQMD Project, March 1996.
- URBEMIS Model, Version 9.2.4, Users Manual, Appendix A, Page A-6.
- CARB Area Source Methodology Manual, Section 7.7, 9/02.
- Western Regional Air Partnership, Fugitive Dust Handbook, 9/06.
- USEPA, AP-42, Section 13.2.3, 2/10.
- Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.

This estimation procedure has been used in numerous AFC construction related analyses, as well as a wide range of CEQA and NEPA analyses for projects ranging in size from less than 5 acres to large power (thermal, solar, and wind) and transmission line construction projects involving site or project acreages from 300 to over 6000 acres.

Available Mitigation Measures

The following mitigation measures are proposed to control exhaust emissions from the Diesel heavy equipment used during construction of QBPP:

- Operational measures, such as limiting time spent with the engine idling by shutting down equipment when not in use;
- Regular preventive maintenance to prevent emission increases due to engine problems;
- Use of low sulfur and low aromatic fuel meeting California standards for motor vehicle Diesel fuel; and
- Use of low-emitting gas and diesel engines meeting state and federal emissions standards (Tier I, II, or III based on HP rating and mfg year) for construction equipment, including, but not limited to catalytic converter systems and particulate filter systems.

The following mitigation measures are proposed to control fugitive dust emissions during construction of the project:

- Use either water application or chemical dust suppressant application to control dust emissions from on-site unpaved road travel and unpaved parking areas;
- Use vacuum sweeping and/or water flushing of paved road surface to remove buildup of loose material to control dust emissions from travel on the paved access road (including adjacent public streets impacted by construction activities) and paved parking areas;
- Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard;
- Limit traffic speeds on all unpaved site areas to 5 mph;
- Install sandbags or other erosion control measures to prevent silt runoff to roadways;

- Replant vegetation in disturbed areas as quickly as possible;
- Use wheel washers or wash off tires of all trucks exiting construction site; and
- Mitigate fugitive dust emissions from wind erosion of areas disturbed from construction activities (including storage piles) by application of either water or chemical dust suppressant.

Estimation of Emissions with Mitigation Measures

Tables F.5-1 through F.5-3 show the estimated daily, period, and annualized heavy equipment exhaust and fugitive dust emissions. Detailed emission calculations are included in Table F.5-6.

Table F.5-1 Fugitive Dust Emissions Estimates	PM10	PM2.5
Fugitive Dust Source	Lbs/day	Lbs/day
Main Construction Site/Linears Phase I	5.85	1.23
Main Construction Site/Linears Phase 2	.78	.16
Main Construction Site Unpaved Roads	6.63	.66
Main Construction Site Paved Roads	.07	.01
Main Construction Site Trackout	.255	.043
Off Site Paved Roads	3.37	.57
Max Total Onsite Fugitive Dust Emissions	*12.55*	*1.9*
Max Total Offsite Fugitive Dust Emissions	*3.63*	*.61*
Fugitive Dust Source	Tons/Period	Tons/Period
Main Construction Site/Linears Phase I	.1144	.024
Main Construction Site/Linears Phase 2	.1315	.0276
Main Construction Site Unpaved Roads	.43	.04
Main Construction Site Paved Roads	.01	.0017
Main Construction Site Trackout	.05	.008
Off Site Paved Roads	.70	.12
Max Total Onsite Fugitive Dust Emissions	*.69*	*.093*
Max Total Offsite Fugitive Dust Emissions	*.75*	*.128*
Fugitive Dust Source	Normalized Tons/Year	Normalized Tons/Year
Max Total Onsite Fugitive Dust Emissions	*.52*	*.07*
Max Total Offsite Fugitive Dust Emissions	*.56*	*.096*

Table F.5-2 Construction Exhaust Emissions Estimates						
Exhaust Sources, lbs/day	NOx	CO	VOC	SOx	PM10	PM2.5
Main Construction Site/Linears Phase I	174.4	75.6	22.6	.2	9.43	9.34
Main Construction Site/Linears Phase 2	151.2	127.9	25.3	.2	11	10.9
Construction Delivery	39.06	13.2	2.94	.048	1.78	1.76
Construction Worker Travel	3.33	33.24	2.76	.03	.27	.27
Max Total Onsite Exhaust Emissions	*174.4*	*127.9*	*25.3*	*.2*	*11*	*10.9*
Max Total Offsite Exhaust Emissions	*44.2*	*46.4*	*5.7*	*.08*	*2.1*	*2.0*
Exhaust Sources, Tons/Period	NOx	CO	VOC	SOx	PM10	PM2.5
Main Construction Site/Linears Phase I	3.8	1.7	.5	.004	.21	.21
Main Construction Site/Linears Phase 2	28.5	24.1	4.8	.037	2.07	2.06
Construction Delivery	8.3	2.8	.62	.01	.38	.37
Construction Worker Travel	.70	7.0	.581	.006	.057	.057
Max Total Onsite Exhaust Emissions	*32.3*	*25.8*	*5.3*	*.041*	*2.28*	*2.27*
Max Total Offsite Exhaust Emissions	*9*	*9.8*	*1.2*	*.016*	*.44*	*.43*
Exhaust Sources, Normalized Tons/Yr	NOx	CO	VOC	SOx	PM10	PM2.5
Max Total Onsite Exhaust Emissions	*24.2*	*19.35*	*3.98*	*.031*	*1.71*	*1.7*
Max Total Offsite Exhaust Emissions	*6.68*	*7.2*	*.9*	*.012*	*.32*	*.32*

Table F.5-3 presents the estimates of GHGs for the construction phase.

Table F.5-3 GHG Construction Emissions Estimates	
Total CO2e, short tons/period	5179
Total CO2e, metric tons/period	4708
Total CO2e, normalized short tons/yr	3884
Total CO2e, normalized metric tons/yr	3531

Construction emissions are well below the federal general conformity levels for those pollutants for which the project area is deemed non-attainment, i.e., ozone (NOx and VOC precursors), therefore a conformity determination for construction emissions is not required.

Analysis of Ambient Impacts from Facility Construction

Ambient air quality impacts from emissions during the construction of the Project were estimated using an air quality dispersion modeling analysis. The modeling analysis considers the construction site location, the surrounding topography, and the sources of emissions during construction, including vehicle and equipment exhaust emissions and fugitive dust.

Existing Ambient Levels

As with the modeling analysis of project operating impacts (Section 4.7), monitoring stations delineated in Section 4.7 were used to establish the ambient background levels for the construction impact modeling analysis. Table 4.7-16 showed the maximum concentrations of

NO_x, SO_2, CO, PM10, and PM2.5 recorded for 2007 through 2010 at those monitoring stations.

Dispersion Model

As in the analysis of project operating impacts, the USEPA-approved AERMOD model was used to estimate ambient impacts from construction activities. A detailed discussion of the AERMOD dispersion model is included in Section 4.7.

The emission sources for the construction site were grouped into two categories: exhaust emissions and dust emissions. Exhaust emissions were modeled as point sources with a height of 10 feet (3.05 meters), exit velocity of 64.681 m/s, temperature of 750K, and exit diameter of 0.1524 meters. This is based on survey data derived from several construction equipment manufacturers websites (7/11) for a wide range of equipment types, which indicated that the average exhaust stack was 3.14m (10.3 ft) above ground level, the average stack diameter varied between 4-6 inches, and the average exhaust temperature was well above 700 deg F. For construction dust emissions, an effective plume height of 0.5 meters was used in the modeling analysis and dust emissions were modeled as a single area source that covered the expected areas of the construction site – a 3 acre area centered on the eventual plant site for short-term impacts and a 16 acre area covering most of the property boundary. The construction impacts modeling analysis used essentially the same receptor locations as used for the project operating impact analysis except that, due to the sizes of the construction areas, the area inside the property boundary was excluded from analyses and the eventual 10-meter spaced property fenceline receptor grid was replaced with a 10-meter spaced property boundary grid. Also, since maximum impacts will occur in close proximity to the property boundary, only the 20-meter and 50-meter receptor grids were modeled. A detailed discussion of the receptor locations is included in Section 4.7. Due to the runtime requirements for modeling a large number of point sources for exhaust emissions (32 stacks for the 3 acre area and 43 stacks for the 16 acre area) and area sources for fugitive dust emissions, the FASTALL model options was used to reduce model run time

To determine the construction impacts on short-term ambient standards (24 hours and less), the worst-case daily onsite construction emission levels shown in Tables F.5-1 and F.5-2 were used. For pollutants with annual average ambient standards, the annual onsite emission levels shown in Tables F.5-2 and F.5-6 were used, based on the worst-case 12-month period (2 months of Phase 1 and 10 months of Phase 2 vs. 12 months of Phase 2, based on lb/month emission rates). As with the project operating impact analysis, the meteorological data set used for the construction emission impacts analysis is data collected from the APCD Kearney Mesa station for 2003-2005.

Modeling Results

Based on the emission rates of NO_x, SO_2, CO, PM10, and PM2.5 and the meteorological data, the AERMOD model calculates hourly and annual ambient impacts for each pollutant. As mentioned above, the modeled 1-hour, 3-hour 8-hour, and 24-hour ambient impacts are based on the worst-case daily emission rates of NO_x, SO_2, CO, PM10, and PM2.5. The annual impacts are based on the annual emission rates of these pollutants.

The one-hour and annual average concentrations of NO_2 were computed following the revised USEPA and SDAPCD guidance for computing these concentrations (see AFC Section 4.7). The annual average was calculated using the ambient ratio method (ARM)

with the national default value of 0.75 for the annual average NO_2/NO_x ratio. The 1-hour NO2 impacts for comparison to the CAAQS were calculated based on the maximum 1-hour impact using the ozone limiting method (OLM) with Kearny Mesa ozone data for the same time period as the modeled meteorological data and concurrent background Kearny Mesa NO2 data. Both the ozone and NO2 background data files were supplied by SDAPCD. The 1-hour NO2 impacts for comparison to the NAAQS were calculated based on the 3-year average of the eighth highest 1-hour daily maximum NO2 impact using OLM with Kearny Mesa ozone data and 3-year average of the 3rd highest seasonal background NO2 concentrations by hour of day for Kearny Mesa for 2008-2010 following the latest USEPA guidance and CAPCOA guidance for filling in missing data.

The modeling analysis results are shown in Table F.5-4. Also included in the table are the maximum background levels that have occurred in the last three years and the resulting total ambient impacts. As shown in Table F.5-4, modeled construction impacts for all modeled pollutants are expected to be below the most stringent state and national standards except the new 1-hour federal NO2 standard and 24-hour California PM10 standard. Total (i.e., modeled plus background) impacts are also greater than the state's annual PM10 and PM2.5 CAAQS because these standards are equaled or even exceeded by background ambient concentrations even in the absence of the construction emissions from the Project.

TABLE F.5-4 MODELED MAXIMUM CONSTRUCTION IMPACTS

Pollutant	Averaging Time	Maximum Construction Impacts (µg/m³)	Background (µg/m³)	Total Impact (µg/m³)	State Standard (µg/m³)	Federal Standard (µg/m³)
NO_2[a]	1-hour State 1-hour Fed Annual	283 212 6.5	N/A N/A 26.4	283 212 32.9	339 57	 188 100
SO_2	1-hour 3-hour 24-hour Annual	0.71 0.29 0.06 0.01	49.8 36.4 18.4 7.9	50.5 36.7 18.5 7.9	655 - 105 -	196 1300 365 80
CO	1-hour 8-hour	452 77	5290 3600	5742 3677	23,000 10,000	40,000 10,000
PM10	24-hour Annual[b]	66 2.4	50 25	116 27.4	50 20	150 -
PM2.5	24 Hour Annual	10.1 0.8	23.7 12	33.8 12.8	- 12	35 15.0

Notes:
[a]ARM applied for annual average, using national default 0.75 ratio. NO2 background already included in 1-hour averages calculated by AERMOD as described above
[b]Annual Arithmetic Mean.

The AERMOD model is expected over predict construction emission impacts due to the cold plume (i.e., ambient temperature) effect of dust emissions. Most of the plume dispersion characteristics in the AERMOD model are derived from observations of hot plumes

associated with typical smoke stacks. The AERMOD model does compensate for plume temperature; however, for ambient temperature plumes the model assumes negligible buoyancy and dispersion. Consequently, the ambient concentrations in cold plumes remain high even at significant distances from a source. Project construction site impacts are not unusual in comparison to most construction sites; construction sites that use good dust suppression techniques and low-emitting vehicles typically do not cause violations of air quality standards. The input and output modeling files are being provided electronically.

Tables and Figures included in this Appendix are as follows:

Table F.5-5 Construction Equipment Types and Use Rates

Table F.5-6 Construction Emissions Calculations (20 pages)

Table F.5-7 EMFAC Composite Factors for 2013

Table F.5-8 EMFAC Output for 2013 (2 pages)

Table F.5-9 Offroad 2007 Raw Data Output (13 pages)

Table F.5-10 Offroad 2007 Emissions Factor Calculations (16 pages)

Table F.5-11 Construction Modeling Impact Summary

Table F.5-12 Construction Manpower Estimates

Table F.5-5 Construction Equipment List (supplied by Applicant)

Equipment Category**	Phase	# of Units Used for Project	Avg Use Rate Hrs/day	# of Days On Site (each)
Bore Rigs/Drill Rigs/Pile Drivers	2	2	8	50
Cement Mixers	2	10	4	180
Industrial/Concrete Saws		0	0	0
Cranes				
Heavy Lift/Crawler	2	2	8	210
Rough Terrain	2	4	8	270
Crawler Tractors/Dozers	2	2	8	150
Crawler Tractors/Dozers	1	2	8	90
Crushing/Processing Eq.		0	0	0
Dump and Tender Trucks	1	6	8	270
Excavators	2	4	8	210
Forklifts/Aerial Lifts/Booms				
Forklifts	2	1	8	120
Man Lifts	2	10	8	150
Generators/Compressors	2	4	8	120
Graders	2	1	8	180
	1	1	8	90
Off Highway Tractors	1	1	8	90
Off Highway Trucks	1	1	8	90
Other Const. Eq.-DIESEL	2	3	8	90
Pavers	2	1	8	10
Paving Eq./Surfacing Eq.	2	4	8	10
Plate Compactors	2	4	8	150
Rollers/Compactors	1	2	8	90
Rollers/Compactors	2	2	8	180
Rough Terrain Forklifts	2	4	8	240
Rubber Tired Dozers		0	0	0
Rubber Tired Loaders	2	2	8	150
Scrapers	1	3	8	60
Signal Boards/Light Sets	2	2	4	90
Skid Steer Loaders	2	4	8	180
Tractors/Loaders/Backhoes	2	2	8	180
Trenchers	2	2	8	90
Welders	2	10	8	150
Other Const. Eq.- GASOLINE	2	5	5	90

Potential phases:

1. main site and linears earthwork and grading phase
2. main site and linears construction/erection phase

** diesel equipment unless otherwise specified.

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

TABLE F.5-6 (20 pages)

Project: Quail Brush Power **Main Site Construction-Grading Phase**

Assumptions:

1. The average engines employed in construction equipment use consumes fuel at a rate of:

diesel	0.06	gal/hp-hr
gasoline	0.11	gal/hp-hr

Ref: EPA, NR-009b Publication, November 2002.
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD (12/2006) will be used to establish the various equipment categories. Data produced by the Sacramento APCD was used to establish the average HP ratings for each equipment category. HP rating data was supplemented by data from SCAQMD CEQA Handbook (Table A9-8-C) if not available from Sacramento APCD.

4. Construction Schedule:	10	hrs/day	Construction Totals:	220	hrs/month
	5	days/week		440	hrs/const period
	22	days/month		44	days/const period
	2	months			

5. Anticipated Construction Start Year: 2013

6. Maximum anticipated equipment use month is: n/a

Equipment types and use rates supplied by the Applicant.

Equipment Category**	Avg HP	# of Units Used for Project	Avg Use Rate Hrs/day	# of Days On Site (each)	Total Hrs/Day	Total Hp-Hrs per Day	Total Hrs per Const Period	Total Hp-Hrs per Const Period
Bore/Drill Rigs/Pile Drivers	209	0	0	0	0	0	0	0
Cement Mixers	25	0	0	0	0	0	0	0
Industrial/Concrete Saws	56	0	0	0	0	0	0	0
Cranes	194	0	0	0	0	0	0	0
Crawler Tractors/Dozers	120	2	10	60	20	2400	1200	144000
Crushing/Processing Eq.	127	0	0	0	0	0	0	0
Dump and Tender Trucks	25	3	10	60	30	750	1800	45000
Excavators	152	0	0	0	0	0	0	0
Forklifts/Aerial Lifts/Booms	120	0	0	0	0	0	0	0
Generators/Compressors	50	0	0	0	0	0	0	0
Graders	157	1	10	60	10	1570	600	94200
Off Highway Tractors	120	1	10	60	10	1200	600	72000
Off Highway Trucks	250	1	10	60	10	2500	600	150000
Other Const. Eq.-DIESEL	175	0	0	0	0	0	0	0
Pavers	99	0	0	0	0	0	0	0
Paving Eq./Surfacing Eq.	91	0	0	0	0	0	0	0
Plate Compactors	15	0	0	0	0	0	0	0
Rollers/Compactors	99	2	10	60	20	1980	1200	118800
Rough Terrain Forklifts	120	0	0	0	0	0	0	0
Rubber Tired Dozers	356	0	0	0	0	0	0	0
Rubber Tired Loaders	175	0	0	0	0	0	0	0
Scrapers	267	3	10	60	30	8010	1800	480600
Signal Boards/Light Sets	15	0	0	0	0	0	0	0
Skid Steer Loaders	50	0	0	0	0	0	0	0
Tractors/Loaders/Backhoes	120	0	0	0	0	0	0	0
Trenchers	120	0	0	0	0	0	0	0
Welders	50	0	0	0	0	0	0	0
Other Const. Eq.- GASOLINE	175	0	0	0	0	0	0	0

*includes equipment and use rates for proposed offsite linears.
** diesel equipment unless otherwise specified.

Const Period Diesel Hp-Hrs =	1104600	
Const Period Gasoline Hp-Hrs =	0	
Const Period Diesel Fuel Use =	66276	gals
Const Period Gasoline Fuel Use =	0	gals

Offroad equipment emissions factors derived Offroad 2007, San Diego County, for 2013.
EFs are for the anticipated construction start year of 2013.

Emissions factors for each category of equipment were either HP class specific, or they represent the highest of the two bounding factors for the HP listing.

2013 Equipment Emissions Factors

Equip. Type	HP	lbs/hp-hr CO	lbs/hp-hr VOC as ROG	lbs/hp-hr NOx	lbs/hp-hr SOx	lbs/hp-hr PM10	lbs/hp-hr CO2	lbs/hp-hr CH4	lbs/hp-hr N2O
Bore/Drill Rigs/Pile Drivers	209	0.004300	0.000402	0.003960	0.000009	0.000172	0.805000	0.000036	0.000000
Cement Mixers	25	0.003250	0.001080	0.006040	0.000009	0.000332	0.702000	0.000098	0.000000
Industrial/Concrete Saws	56	0.005840	0.001910	0.005710	0.000008	0.000494	0.604000	0.000173	0.000000
Cranes	194	0.002750	0.000590	0.004440	0.000005	0.000255	0.459000	0.000053	0.000000
Crawler Tractors/Dozers	120	0.004050	0.001080	0.006400	0.000006	0.000565	0.548000	0.000097	0.000000
Crushing/Processing Eq.	127	0.004800	0.001170	0.007130	0.000008	0.000651	0.692000	0.000106	0.000000
Dump and Tender Trucks	25	0.001280	0.000386	0.002400	0.000004	0.000116	0.305000	0.000035	0.000000
Excavators	152	0.004310	0.000907	0.005660	0.000007	0.000490	0.613000	0.000082	0.000000
Forklifts/Aerial Lifts/Booms	120	0.002010	0.000453	0.003090	0.000004	0.000244	0.317000	0.000041	0.000000
Generators/Compressors	50	0.005210	0.001690	0.005660	0.000008	0.000460	0.612000	0.000153	0.000000
Graders	157	0.004190	0.000840	0.006400	0.000008	0.000362	0.707000	0.000076	0.000000
Off Highway Tractors	120	0.005990	0.001760	0.010300	0.000009	0.000899	0.780000	0.000159	0.000000
Off Highway Trucks	250	0.001530	0.000560	0.004950	0.000007	0.000165	0.666000	0.000051	0.000000
Other Const. Eq.-Diesel	175	0.003350	0.000536	0.004580	0.000007	0.000240	0.608000	0.000048	0.000000
Pavers	99	0.004210	0.001160	0.006960	0.000007	0.000608	0.576000	0.000104	0.000000
Paving Eq./Surfacing Eq.	91	0.003510	0.000809	0.005440	0.000006	0.000431	0.531000	0.000073	0.000000
Plate Compactors	15	0.001750	0.000334	0.002090	0.000004	0.000082	0.287000	0.000030	0.000000
Rollers/Compactors	99	0.003380	0.000823	0.005210	0.000006	0.000445	0.491000	0.000074	0.000000
Rough Terrain Forklifts	120	0.003600	0.000797	0.005000	0.000006	0.000442	0.520000	0.000072	0.000000
Rubber Tired Dozers	356	0.002730	0.000972	0.008320	0.000008	0.000351	0.733000	0.000088	0.000000
Rubber Tired Loaders	175	0.003580	0.000708	0.005430	0.000007	0.000306	0.607000	0.000064	0.000000
Scrapers	267	0.002560	0.000900	0.008190	0.000009	0.000316	0.873000	0.000081	0.000000
Signal Boards/Light Sets	15	0.002510	0.000478	0.003000	0.000006	0.000117	0.411000	0.000043	0.000000
Skid Steer Loaders	50	0.004530	0.001040	0.004550	0.000007	0.000314	0.510000	0.000094	0.000000
Tractors/Loaders/Backhoes	120	0.002940	0.000580	0.003810	0.000005	0.000320	0.431000	0.000052	0.000000
Trenchers	120	0.003900	0.001070	0.006550	0.000006	0.000558	0.540000	0.000096	0.000000
Welders	50	0.005430	0.001900	0.005040	0.000007	0.000471	0.519000	0.000172	0.000000
Other Const. Eq.-Gasoline	175	0.018900	0.000256	0.000899	0.000006	0.000046	0.574000	0.000015	0.000051
Avg Offroad Diesel EFs		*0.0036*	*0.0009*	*0.0054*	*0.000007*	*0.0004*	*0.5721*	*0.0001*	*0.0000*

Construction Period Emissions, lbs

Equip. Type	CO	VOC as ROG	NOx	SOx	PM10	CO2	CH4	N2O
Bore/Drill Rigs/Pile Drivers	0	0	0	0	0	0	0	0
Cement Mixers	0	0	0	0	0	0	0	0
Industrial/Concrete Saws	0	0	0	0	0	0	0	0
Cranes	0	0	0	0	0	0	0	0
Crawler Tractors/Dozers	583	156	922	1	81	78912	14	0
Crushing/Processing Eq.	0	0	0	0	0	0	0	0
Dump and Tender Trucks	58	17	108	0	5	13725	2	0
Excavators	0	0	0	0	0	0	0	0
Forklifts/Aerial Lifts/Booms	0	0	0	0	0	0	0	0
Generators/Compressors	0	0	0	0	0	0	0	0
Graders	395	79	603	1	34	66599	7	0
Off Highway Tractors	431	127	742	1	65	56160	11	0
Off Highway Trucks	230	84	743	1	25	99900	8	0
Other Const. Eq.-Diesel	0	0	0	0	0	0	0	0
Pavers	0	0	0	0	0	0	0	0
Paving Eq./Surfacing Eq.	0	0	0	0	0	0	0	0
Plate Compactors	0	0	0	0	0	0	0	0
Rollers/Compactors	402	98	619	1	53	58331	9	0
Rough Terrain Forklifts	0	0	0	0	0	0	0	0
Rubber Tired Dozers	0	0	0	0	0	0	0	0
Rubber Tired Loaders	0	0	0	0	0	0	0	0
Scrapers	1230	433	3936	5	152	419564	39	0
Signal Boards/Light Sets	0	0	0	0	0	0	0	0
Skid Steer Loaders	0	0	0	0	0	0	0	0
Tractors/Loaders/Backhoes	0	0	0	0	0	0	0	0
Trenchers	0	0	0	0	0	0	0	0
Welders	0	0	0	0	0	0	0	0
Other Const. Eq.-Gasoline	0	0	0	0	0	0	0	0

Totals	**CO**	**VOC**	**NOx**	**SOx**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**
lbs per const. period	3328	993	7672	9	415	411.16	793191	90	0
tons per const. period	1.7	0.5	3.8	0.004	0.21	0.21	396.60	0.04	0.00
Average lbs/day =	75.6	22.6	174.4	0.201	9.43	9.34	18027.07	2.04	0.00
Estimated Maximum lbs/day =	*90.8*	*27.1*	*209.2*	*0.2*	*11.3*	*11.2*	*21632.5*	*2.4*	*0.0*
Average lbs/month =	1664.1	496.5	3835.8	4.4	207.45	205.58	396595.50	44.80	0.00

CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable. Some projects provide estimated manpower and equipment use schedules, but even this data usually leads to a wide range of assumptions being made in order to estimate equipment exhaust emissions for a maximum work day.
   All of the above noted equipment will essentially be on site each day during the grading phase, therefore the avg daily emissions will also approximate the max daily emissions. There will be some overlap of equipment on site as the transition from Phase 1 to Phase 2 is made. In order to account for this this overlap, the avg daily emissions have been multiplied by a factor of 1.2 to arrive at resonable values for max daily emissions.
4. Construction schedule note: most equipment use and emissions are based on 10 hrs of activity in a 12 hr workday.
   a. 1 hour for lunch break, plus two 15 minute periods of labor inactivity (one in morning and one in afternoon)
   b. a 30 minute period each day for each piece of equipment for re-fueling, maintenance, and normal downtime

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: Quail Brush Power **Main Site Construction-Building Phase**

Assumptions:

1. The average engines employed in construction equipment use consumes fuel at a rate of:

diesel	0.06	gal/hp-hr
gasoline	0.11	gal/hp-hr

Ref: EPA, NR-009b Publication, November 2002.
Ref: Sacramento County APCD Const. Program Data, V. 6.0.3, 3/2007.
Ref: EPA, NR-009c Publication, EPA 420-P-04-009, April 2004.
Ref: Niland Energy Project, IID, AFC Vol 2, App A.
Ref: South Coast AQMD PR XXI, Draft Staff Report, 3-15-95, and SCAQMD CEQA Manual, 11/03.
The above noted references present fuel consumption values which range from 0.050 to 0.064 gal/hp-hr for diesel engines used in construction related equipment. The value of 0.060 gal/hp-hr was chosen as a reasonable upper mid-range value for construction diesel emissions calculations.
For gasoline the mid-range value from SCAQMD of 0.11 gal/hp-hr was used.

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to daily values based on the estimated construction period time on site.

3. The equipment list derived from the South Coast AQMD (12/2006) will be used to establish the various equipment categories. Data produced by the Sacramento APCD was used to establish the average HP ratings for each equipment category. HP rating data was supplemented by data from SCAQMD CEQA Handbook (Table A9-8-C) if not available from Sacramento APCD.

4. Construction Schedule:	10	hrs/day	Construction Totals:	260	hrs/month
	6	days/week		3770	hrs/const period
	26	days/month		377	days/const period
	14.5	months			

5. Anticipated Construction Start Year: 2013

6. Maximum anticipated equipment use month is: n/a

Equipment types and use rates supplied by the Applicant.

Equipment Category**	Avg HP	# of Units Used for Project	Avg Use Rate Hrs/day	# of Days On Site (each)	Total Hrs/Day	Total Hp-Hrs per Day	Total Hrs per Const Period	Total Hp-Hrs per Const Period
Bore/Drill Rigs/Pile Drivers	209	2	10	50	20	4180	1000	209000
Cement Mixers	25	10	4	180	40	1000	7200	180000
Industrial/Concrete Saws	56	0	0	0	0	0	0	0
Cranes	194	6	10	250	60	11640	15000	2910000
Crawler Tractors/Dozers	120	2	10	150	20	2400	3000	360000
Crushing/Processing Eq.	127	3	10	0	30	3810	0	0
Dump and Tender Trucks	25	0	0	0	0	0	0	0
Excavators	152	4	10	210	40	6080	8400	1276800
Forklifts/Aerial Lifts/Booms	120	11	10	140	110	13200	15400	1848000
Generators/Compressors	50	4	10	120	40	2000	4800	240000
Graders	157	2	10	180	20	3140	3600	565200
Off Highway Tractors	120	0	0	0	0	0	0	0
Off Highway Trucks	489	0	0	0	0	0	0	0
Other Const. Eq.-DIESEL	175	3	10	90	30	5250	2700	472500
Pavers	99	1	10	10	10	990	100	9900
Paving Eq./Surfacing Eq.	91	4	10	10	40	3640	400	36400
Plate Compactors	15	4	10	150	40	600	6000	90000
Rollers/Compactors	99	2	10	180	20	1980	3600	356400
Rough Terrain Forklifts	120	4	10	240	40	4800	9600	1152000
Rubber Tired Dozers	356	0	0	0	0	0	0	0
Rubber Tired Loaders	175	2	10	150	20	3500	3000	525000
Scrapers	267	0	0	0	0	0	0	0
Signal Boards/Light Sets	15	2	4	90	8	120	720	10800
Skid Steer Loaders	50	4	10	180	40	2000	7200	360000
Tractors/Loaders/Backhoes	120	2	10	180	20	2400	3600	432000
Trenchers	120	2	10	90	20	2400	1800	216000
Welders	50	10	10	150	100	5000	15000	750000
Other Const. Eq.- GASOLINE	175	5	5	90	25	4375	2250	393750

*includes equipment and use rates for proposed offsite linears.
** diesel equipment unless otherwise specified.

Const Period Diesel Hp-Hrs =	12000000	
Const Period Gasoline Hp-Hrs =	393750	
Const Period Diesel Fuel Use =	720000	gals
Const Period Gasoline Fuel Use =	43312.5	gals

Offroad equipment emissions factors derived Offroad 2007, San Diego County, for 2013.
EFs are for the anticipated construction start year of 2013.

Emissions factors for each category of equipment were either HP class specific, or they represent the highest of the two bounding factors for the HP listing.

2013 Equipment Emissions Factors

Equip. Type	HP	lbs/hp-hr CO	lbs/hp-hr VOC as ROG	lbs/hp-hr NOx	lbs/hp-hr SOx	lbs/hp-hr PM10	lbs/hp-hr CO2	lbs/hp-hr CH4	lbs/hp-hr N2O
Bore/Drill Rigs/Pile Drivers	209	0.004300	0.000402	0.003960	0.000009	0.000172	0.805000	0.000036	0.000000
Cement Mixers	25	0.003250	0.001080	0.006040	0.000009	0.000332	0.702000	0.000098	0.000000
Industrial/Concrete Saws	56	0.005840	0.001910	0.005710	0.000008	0.000494	0.604000	0.000173	0.000000
Cranes	194	0.002750	0.000590	0.004440	0.000005	0.000255	0.459000	0.000053	0.000000
Crawler Tractors/Dozers	120	0.004050	0.001080	0.006400	0.000006	0.000565	0.548000	0.000097	0.000000
Crushing/Processing Eq.	127	0.004800	0.001170	0.007130	0.000008	0.000651	0.692000	0.000106	0.000000
Dump and Tender Trucks	25	0.001280	0.000386	0.002400	0.000004	0.000116	0.305000	0.000035	0.000000
Excavators	152	0.004310	0.000907	0.005660	0.000007	0.000490	0.613000	0.000082	0.000000
Forklifts/Aerial Lifts/Booms	120	0.002010	0.000453	0.003090	0.000004	0.000244	0.317000	0.000041	0.000000
Generators/Compressors	50	0.005210	0.001690	0.005660	0.000008	0.000460	0.612000	0.000153	0.000000
Graders	157	0.004190	0.000840	0.006400	0.000008	0.000362	0.707000	0.000076	0.000000
Off Highway Tractors	120	0.005990	0.001760	0.010300	0.000009	0.000899	0.780000	0.000159	0.000000
Off Highway Trucks	489	0.001270	0.000434	0.003570	0.000005	0.000127	0.544000	0.000039	0.000000
Other Const. Eq.-Diesel	175	0.003350	0.000536	0.004580	0.000007	0.000240	0.608000	0.000048	0.000000
Pavers	99	0.004210	0.001160	0.006960	0.000007	0.000608	0.576000	0.000104	0.000000
Paving Eq./Surfacing Eq.	91	0.003510	0.000809	0.005440	0.000006	0.000431	0.531000	0.000073	0.000000
Plate Compactors	15	0.001750	0.000334	0.002090	0.000004	0.000082	0.287000	0.000030	0.000000
Rollers/Compactors	99	0.003380	0.000823	0.005210	0.000006	0.000445	0.491000	0.000074	0.000000
Rough Terrain Forklifts	120	0.003600	0.000797	0.005000	0.000006	0.000442	0.520000	0.000072	0.000000
Rubber Tired Dozers	356	0.002730	0.000972	0.008320	0.000008	0.000351	0.733000	0.000088	0.000000
Rubber Tired Loaders	175	0.003580	0.000708	0.005430	0.000007	0.000306	0.607000	0.000064	0.000000
Scrapers	267	0.002560	0.000900	0.008190	0.000009	0.000316	0.873000	0.000081	0.000000
Signal Boards/Light Sets	15	0.002510	0.000478	0.003000	0.000006	0.000117	0.411000	0.000043	0.000000
Skid Steer Loaders	50	0.004530	0.001040	0.004550	0.000007	0.000314	0.510000	0.000094	0.000000
Tractors/Loaders/Backhoes	120	0.002940	0.000580	0.003810	0.000005	0.000320	0.431000	0.000052	0.000000
Trenchers	120	0.003900	0.001070	0.006550	0.000006	0.000558	0.540000	0.000096	0.000000
Welders	50	0.005430	0.001900	0.005040	0.000007	0.000471	0.519000	0.000172	0.000000
Other Const. Eq.-Gasoline	175	0.018900	0.000256	0.000899	0.000006	0.000046	0.574000	0.000015	0.000051
Avg Offroad Diesel EFs		*0.0036*	*0.0009*	*0.0054*	*0.000007*	*0.0004*	*0.5676*	*0.0001*	*0.0000*

Construction Period Emissions, lbs

Equip. Type	CO	VOC as ROG	NOx	SOx	PM10	CO2	CH4	N2O
Bore/Drill Rigs/Pile Drivers	899	84	828	2	36	168245	8	0
Cement Mixers	585	194	1087	2	60	126360	18	0
Industrial/Concrete Saws	0	0	0	0	0	0	0	0
Cranes	8003	1717	12920	15	742	1335690	155	0
Crawler Tractors/Dozers	1458	389	2304	2	203	197280	35	0
Crushing/Processing Eq.	0	0	0	0	0	0	0	0
Dump and Tender Trucks	0	0	0	0	0	0	0	0
Excavators	5503	1158	7227	9	626	782678	104	0
Forklifts/Aerial Lifts/Booms	3714	837	5710	7	451	585816	76	0
Generators/Compressors	1250	406	1358	2	110	146880	37	0
Graders	2368	475	3617	4	205	399596	43	0
Off Highway Tractors	0	0	0	0	0	0	0	0
Off Highway Trucks	0	0	0	0	0	0	0	0
Other Const. Eq.-Diesel	1583	253	2164	3	113	287280	23	0
Pavers	42	11	69	0	6	5702	1	0
Paving Eq./Surfacing Eq.	128	29	198	0	16	19328	3	0
Plate Compactors	158	30	188	0	7	25830	3	0
Rollers/Compactors	1205	293	1857	2	159	174992	26	0
Rough Terrain Forklifts	4147	918	5760	7	509	599040	83	0
Rubber Tired Dozers	0	0	0	0	0	0	0	0
Rubber Tired Loaders	1880	372	2851	4	161	318675	34	0
Scrapers	0	0	0	0	0	0	0	0
Signal Boards/Light Sets	27	5	32	0	1	4439	0	0
Skid Steer Loaders	1631	374	1638	2	113	183600	34	0
Tractors/Loaders/Backhoes	1270	251	1646	2	138	186192	23	0
Trenchers	842	231	1415	1	121	116640	21	0
Welders	4073	1425	3780	5	353	389250	129	0
Other Const. Eq.-Gasoline	7442	101	354	2	18	226013	6	20

Totals	**CO**	**VOC**	**NOx**	**SOx**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**
lbs per const. period	48206	9554	57004	73	4148	4110.61	6279527	859	20
tons per const. period	24.1	4.8	28.5	0.037	2.07	2.06	3139.76	0.43	0.01
Average lbs/day =	127.9	25.3	151.2	0.194	11.00	10.90	16656.57	2.28	0.05
Estimated Maximum lbs/day =	*153.4*	*30.4*	*181.4*	*0.2*	*13.2*	*13.1*	*19987.9*	*2.7*	*0.1*
Average lbs/month =	3324.6	658.9	3931.3	5.0	286.06	283.49	433070.85	59.24	1.38

CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM2.5 = 0.991 of PM10 : Diesel Vehicle Exhaust

Other Assumptions and References:

1. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
   Optimum trench construction progress rate is 80m (260ft) per day.
   Non-optimum trench construction progress rate is 30m (100 ft) per day.
   An average progress of 180 ft/day is used where applicable.
2. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness.
   A minium paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable.
   The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr.
   Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.
3. Estimation of maximum daily emissions is extremely variable. Some projects provide estimated manpower and equipment use schedules, but even this data usually leads to a wide range of assumptions being made in order to estimate equipment exhaust emissions for a maximum work day. The applicant's civil engineer has estimated that the max daily equipment use will be approximately 20% more than an average daily use rate, as such the avg daily emissions have been multiplied by a factor of 1.2 to account for maximum daily use rates. This is a reasonable assumption given the small footprint of the site during the erection phase.
4. Construction schedule note: most equipment use and emissions are based on 10 hrs of activity in a 12 hr workday.
   a. 1 hour for lunch break, plus two 15 minute periods of labor inactivity (one in morning and one in afternoon)
   b. a 30 minute period each day for each piece of equipment for re-fueling, maintenance, and normal downtime

CONSTRUCTION PHASE- Main Site Activity-Grading
MRI Level 2 Analysis (Refs 1, 3-7)

Acres Subject to Construction Disturbance Activites:		16	
Max Acres Subject to Construction Disturbance Activites on any day:		3	***
Emissions Factor for PM10 Uncontrolled, tons/acre/month:		0.0144	
PM2.5 fraction of PM10 (per CARB CEIDARS Profiles):		0.21	
Activity Levels:	Hrs/Day:	10	
	Days/Wk:	5	
	Days/Month:	22	
	Const Period, Months:	2	0.2 years
	Const Period, Days:	44	
Wet Season Adjustment:	(Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03)		
	Mean # days/year with rain > = 0.01 inch:	40	
	Mean # months/yr with rain > = 0.01 inch:	1.33	
	Adjusted Const Period, Months:	1.78	
	Adjusted Const Period, Days:	37	
Controls for Fugitive Dust:			
	Proposed watering cycle:	4	times per construction shift

SCAQMD Mitigation Measures, Table XI-A, 4/07
3 watering cycles/10 hour construction shift yields a 61% reduction, 4 watering cycles/12 hour shift should yield a 70% + reduction.
Speed control of onsite const traffic from 35 to 15 mph yields a 57% reduction.

Calculated % control based on mitigations proposed:	87	% control
Conservative control % used for emissions estimates:	85	% control
	0.15	release fraction

Emissions: Controlled	PM10	PM2.5
tons/month	0.006	0.001
tons/period	0.012	0.002
Max lbs/day	0.6	0.124

Soil Handling Emissions (Cut and Fill): (2)

Total cu.yds of soil handled:		300000	***	Mean annual wind speed, mph:		6.8
Total tons of soil handled:		1551600		Avg. Soil moisture, %:		4
Total days soil handled:		37		Avg. Soil density, tons/cu.yd:		1.3
Tons soil/day:		41561		k factor for PM10:		0.35
Control Eff, watering, %		80		Number of Drops per ton:		4
Release Fraction:		0.2		Calc 1	wind	1.491
				Calc 2	moisture	2.639
Emissions:	PM10	PM2.5		Calc 3	int	0.565
tons/period	0.10	0.02		Calc 4	PM10 lb/ton	0.0006
tons/month	0.06	0.01		PM2.5 fraction of PM10:		0.210
max lbs/day	5.26	1.10				

Emissions Totals:	**PM10**	**PM2.5**
tons/period	**0.1144**	**0.0240**
tons/month	**0.0644**	**0.0135**
max lbs/day	**5.85**	**1.23**

Methodology References:

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report factor of 0.011 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of 220 hrs/month, the adjusted EF would be 0.0144 tons/acre/month.
*** includes surface area and trench cut and fill for proposed offsite linears.
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06, and Appendix E-2, Palen Solar PP, 8/09.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for San Diego, US DoC, NOAA, Comparative Climatic Data, 1985.
(9) Soil data: San Diego County Soil Survey-1973, UC Kearney AG Center, Redding Soil Series
4-6% moisture content, avg silt 34.7%, density 1.534 gm/cc

CONSTRUCTION PHASE- Main Site Activity-Erection
MRI Level 2 Analysis (Refs 1, 3-7)

Acres Subject to Construction Disturbance Activites:		16	
Max Acres Subject to Construction Disturbance Activites on any day:		4	***
Emissions Factor for PM10 Uncontrolled, tons/acre/month:		0.017	
PM2.5 fraction of PM10 (per CARB CEIDARS Profiles):		0.21	
Activity Levels:	Hrs/Day:	10	
	Days/Wk:	6	
	Days/Month:	26	
	Const Period, Months:	14.5	1.2 years
	Const Period, Days:	377	
Wet Season Adjustment:	(Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03)		
	Mean # days/year with rain > = 0.01 inch:	40	
	Mean # months/yr with rain > = 0.01 inch:	1.33	
	Adjusted Const Period, Months:	12.89	
	Adjusted Const Period, Days:	329	
Controls for Fugitive Dust:			
	Proposed watering cycle:	4	times per construction shift

SCAQMD Mitigation Measures, Table XI-A, 4/07
3 watering cycles/10 hour construction shift yields a 61% reduction, 4 watering cycles/12 hour shift should yield a 70%+ reduction.
Speed control of onsite const traffic from 35 to 15 mph yields a 57% reduction.

Calculated % control based on mitigations proposed:	87	% control
Conservative control % used for emissions estimates:	85	% control
	0.15	release fraction

Emissions: Controlled	PM10	PM2.5
tons/month	0.010	0.002
tons/period	0.131	0.028
Max lbs/day	0.8	0.165

Soil Handling Emissions (Cut and Fill): (2)

Total cu.yds of soil handled:		0	***	Mean annual wind speed, mph:	6.8
Total tons of soil handled:		0		Avg. Soil moisture, %:	4
Total days soil handled:		329		Avg. Soil density, tons/cu.yd:	1.3
Tons soil/day:		0		k factor for PM10:	0.35
Control Eff, watering, %		80		Number of Drops per ton:	4
Release Fraction:		0.2		Calc 1 wind	1.491
				Calc 2 moisture	2.639
Emissions:	PM10	PM2.5		Calc 3 int	0.565
tons/period	0.00	0.00		Calc 4 PM10 lb/ton	0.0006
tons/month	0.00	0.00		PM2.5 fraction of PM10:	0.210
max lbs/day	0.00	0.00			

Emissions Totals:	**PM10**	**PM2.5**
tons/period	**0.1315**	**0.0276**
tons/month	**0.0102**	**0.0021**
max lbs/day	**0.78**	**0.16**

Methodology References:

(1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report factor of 0.011 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of 260 hrs/month, the adjusted EF would be 0.017 tons/acre/month.
*** includes surface area and trench cut and fill for proposed offsite linears, and travel surface in the laydown yard.
(2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06, and Appendix E-2, Palen Solar PP, 8/09.
(3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
(4) CARB Area Source Methodology, Section 7.7, 9/02.
(5) WRAP Fugitive Dust Handbook, 9/06.
(6) USEPA, AP-42, Section 13.2.3, 2/10.
(7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
(8) Wind speed data for San Diego, US DoC, NOAA, Comparative Climatic Data, 1985.
(9) Soil data: San Diego County Soil Survey-1973, UC Kearney AG Center, Redding Soil Series
4-6% moisture content, avg silt 34.7%, density 1.534 gm/cc

ONSITE UNPAVED ROAD FUGITIVE DUST

Length of Unpaved Road used for/by Construction Access:		0.5	miles*			
Avg weight of construction vehicular equipment on road:		10.9	tons (range 2 - 42 tons)			
Road surface silt content:		34.7	% (range 1.8 - 35%)			
Road surface material moisture content:		5	% (range 0.03 - 13%)			
		k	a	c	d	
Particle size multiplier factors:	PM10	1.8	1	0.2	0.5	
	PM2.5	0.18	1	0.2	0.5	
C factors (brake and tire wear):	PM10	0.00047	lb/VMT			
	PM2.5	0.00036	lb/VMT			
Avg construction vehicle speed on road:		5	mph (range 10-55 mph)			
Number of construction vehicles per day:		66	**	VMT/day:	33	
				VMT/month:	858	
Number of construction work days per month:		26		VMT/period:	4290	
Total vehicles per month:		1716				
Number of construction work months:		5	onsite roads to be paved by end of month 5			
Total vehicles per const period:		8580				
Control reduction due to watering, speed control, etc. =		85	(assumed same control as main site controls)			
		0.85				
Release Fraction =		0.15				

	PM10	PM2.5
Calc 1	2.892	2.892
Calc 2	0.408	0.408
Calc 3	1.585	1.585
Calc 4	1.341	0.134
Calc 5	1.340	0.134

Emissions	PM10	PM2.5
lbs/day	6.63	0.66
lbs/month	172.49	17.21
lbs/period	862.46	86.05
tons/period	0.43	0.04

EPA, AP-42, Section 13.2.2, March 2006
Soil moisture is the value achieved subsequent to initiation/continuation of watering program, and use of soil stabilization agents.
*mileage for travel on site from entry point across site and back to exit point plus const equipment movements
** delivery vehicles plus onsite const equipment (30+36=66)
90 pieces/const eq during Phase 2, with approx 40% on site on any given day = 36

ONSITE PAVED ROAD FUGITIVE DUST EMISSIONS
(associated with construction traffic)

Length of Paved Road used for/by Construction Access:		0.5	miles, roundtrip distance*
Avg weight of construction vehicular equipment on road:		10.9	tons (range 2 - 42 tons)
Road surface silt loading factor:		0.06	g/m2 (range 0.03 - 400 g/m2)
Particle size multiplier factors:	PM10	0.016	lb/VMT
	PM2.5	0.0024	lb/VMT
C factors (brake and tire wear):	PM10	0.00047	lb/VMT
	PM2.5	0.00036	lb/VMT
Avg construction vehicle speed on road:		10	mph (range 10-55 mph)
Number of construction vehicles per day:		62	**
Number of construction work days per month:		26	
Total vehicles per month:		1612	
Number of construction work months:		11	road is paved after month 5
Total vehicles per const period:		17732	

VMT/day:	31		
VMT/month:	806		
VMT/period:	8866		

	PM10	
Calc 1	0.060	
Calc 2	2.807	
Calc 3	0.0022	lb/VMT

Emissions	PM10	PM2.5
lbs/day	0.07	0.01
lbs/month	1.81	0.31
lbs/period	19.92	3.37
tons/period	0.01	0.00

*mileage for travel on site from entry point across site and back to exit point plus onsite const equipment movements
** delivery vehicles plus onsite const equipment (30+32 = 62)
EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169

CONSTRUCTION PHASE - Trackout Emissions

Paved Road Length (miles):	0.1	estimated roundtrip trackout distance				
Daily # of Vehicles:	188					
Avg Vehicle Weight (tons):	10.9			**PM10**	**PM2.5***	
Total Unadjusted VMT/day	18.8			0.207		
Particle Size Multipliers	PM10			2.807		
lb/VMT	0.023			0.002	0.0003	lb/VMT
C factor, lb/VMT	0.00047			0.255	0.0431	**lbs/day**
Road Sfc Silt Loading (g/m^2):	0.28			0.003	0.0006	**tons/month**
# of Active Trackout Points:	1	**		0.05	0.0080	**tons/period**
Added Trackout Miles:	PM10					
Trackout VMT/day:	113		*Default Silt Load Values for Paved Road Types*			
Final Adjusted VMT/day	132			Freeway	0.02 g/m2	
Final Adjusted VMT/month	3422			Arterial	0.036 g/m2	
Final Adjusted VMT/period	48655			Collector	0.036 g/m2	
Construction days/month:	26.0			Local	0.28 g/m2	
Adj. Construction months/period:	14.22			Rural	1.6 g/m2	
Control Applied to Trackout:	Sweeping and Cleaning (water washing)					
Control Efficiency, %	85	0.85	Release Factor =		0.15	

* PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.
** 1 controlled ingress/egress point is planned for site construction
EPA, AP-42, Section 13.2.1, Proposed revisions dated 9/2008.
Use silt loading factor from default values for road type if no site specific data is available.
Trackout effects approximately 260 ft of roadway arriving and departing from the site access point.
Remaining paved road fugitives are on the Paved Road tab.
Trackout will be minimal after month 5 when onsite roads are expected to be paved.

OFFSITE PAVED ROAD FUGITIVE DUST EMISSIONS
(associated with construction traffic)

Average mileage for construction related vehicles:		42	miles, roundtrip distance***
Avg weight of vehicular equipment on road:		10.9	tons (range 2 - 42 tons)
Road surface silt loading factor:		0.015	g/m2 (range 0.03 - 400 g/m2)
			Limited Access Freeway >10,000 ADT
Particle size multiplier factors:	PM10	0.016	lb/VMT
	PM2.5	0.0024	lb/VMT
C factors (brake and tire wear):	PM10	0.00047	lb/VMT
	PM2.5	0.00036	lb/VMT
Avg vehicle speed on road:		55	mph (range 10-55 mph)
Number of vehicles per day:		188	
Number of work days per month:		26	
Total vehicles per month:		4888	
Number of work months:		16	
Total vehicles per const period:		78208	

VMT/day:	7896
VMT/month:	205296
VMT/period:	3284736

	PM10	
Calc 1	0.020	
Calc 2	2.807	
Calc 3	0.0004	lb/VMT

Emissions	PM10	PM2.5
lbs/day	3.37	0.57
lbs/month	87.50	14.79
lbs/period	1400.01	236.60
tons/period	0.70	0.12

EPA, AP-42, Section 13.2.1, March 2006, updated 9/2008.
PM2.5 fraction of PM10 per CARB CEIDARs is 0.169
*** Note: avg roundtrip distance traveled by delivery or worker vehicles on limited access freeways.
Delivery Route: BNSF Railyard at Port of San Diego to Hwy 75 to I-5, I-5 S to I-15, I-15 N to Hwy 52 E to site exit at Sycamore Landfill Road.

CONSTRUCTION PHASE - Truck Hauling/Delivery and Site Support Vehicle Emissions

Delivery/Hauling Vehicle Use Rates											
					Emissions Factors (lbs/vmt)						
Delivery Roundtrip Distance:	42	miles		NOx	CO	VOC	SOx	PM10	CO2		
Const Days per Period:	421			0.03422	0.009532	0.002411	0.00004	0.001556	4.04823	Diesel	
Avg Deliveries per Day:	30			0.00202	0.01296	0.001125	0.000015	0.000098	1.4488	MD Gas	
Fraction of Deliveries-Diesel:	0.90	HDD				Daily Emissions (lbs)					
Fraction of Deliveries-Gas:	0.10	MDG		**NOx**	**CO**	**VOC**	**SOx**	**PM10**	**CO2**	**PM2.5**	
Total Delivery VMT:	530460			**38.805**	**10.809**	**2.734**	**0.045**	**1.765**	**4590.693**	**1.749**	Diesel
Total Daily VMT-Diesel	1134			0.255	1.633	0.142	0.002	0.012	182.549	0.012	MD Gas
Total Daily VMT-Gasoline	126					Tons per Const Period					
Total Period VMT-Diesel	477414			8.169	2.275	0.576	0.010	0.371	966.3	0.368	Diesel
Total Period VMT-Gasoline	53046			0.054	0.344	0.030	0.000	0.003	38.4	0.003	MD Gas

Construction Site Support Vehicle Use Rates (LDTs)										
			Daily Emissions, lbs							
Gasoline Vehicle VMT Period:	35200	**NOx**	**CO**	**VOC**	**SOx**	**PM10**	**CO2**			**PM2.5**
Avg Daily Gasoline VMT:	84	0.000791	0.008821	0.000769	0.000009	0.000075	0.825741	lbs/vmt*	LDT gasoline	
Diesel Vehicle VMT Period:	17600	0.000006	0.000003	0.000001	0.000001	0.000001	0.001446	lbs/vmt*	LDT diesel	
Avg Daily Diesel VMT:	42	**0.0661**	**0.7375**	**0.0643**	**0.0008**	**0.0063**	**69.0406**	**lbs/day**	**gasoline**	**0.0063**
		0.0003	**0.0001**	**0.0000**	**0.0000**	**0.0000**	**0.0605**	**lbs/day**	**diesel**	**0.0000**
Ref: SDAB, Emfac 2007, V2.3, Nov 2006				Tons per Const Period						
On-Road Heavy Duty Diesels (1969-2013)		0.0139	0.1552	0.0135	0.0002	0.0013	14.5	**tons/period**	**gasoline**	0.0013
On Road Medium Duty Gas (1969-2013)		0.0001	0.0000	0.0000	0.0000	0.0000	0.0	**tons/period**	**diesel**	0.0000
LDTs (1969-2013)										

Notes ***

VMT for delivery/hauling for diesel vehicles includes: (1) materials deliveries to site, (2) materials removal from site, other VMT as specified below.
Support Vehicle VMT: (a) 2 gasoline LDTs at 50 miles/day each, (b) 1 diesel LDT at 50 miles/day
Delivery Route: BNSF Railyard at/or Port of San Diego to Hwy 75 to I-5, I-5 S to I-15, I-15 N to Hwy 52 E to site exit at Sycamore Landfill Road.
CARB-CEIDARS, Updated Fractions for PM Profiles: PM2.5 = 0.991 of PM10 for Diesel Exhaust, and 0.998 for Gasoline Vehicles.

It should be noted that these emissions are not necessarily new emissions to the regional air shed. A significant portion of the truck services will be derived from the existing regional truck services vehicle pool, and as such these truck emissions would most likely be involved in deliveries in the area regardless of whether or not the proposed facility is constructed. As such, a major portion of the above estimated emissions would not be considered as additions to the air shed.

CONSTRUCTION PHASE - Worker Travel - Emissions

Ref: SDAB, Emfac 2007, V2.3, Nov 2006
On Road Vehicles (1969-2013)
LDP/LDT Weighted Avg Efs

Worker Travel to Site

Avg Occupancy/Vehicle:	1.2	
Avg Roundtrip Distance, miles:	40	
Avg # of Workers at Site, per day:	90	*
Avg Daily Worker VMT:	3000	
Max # of Workers at Site, per day:	150	*
Max Daily Worker VMT:	5000	
Total Const Days:	421	
Total Const Period Worker VMT:	1263000	

Emissions Factors (lbs/VMT)

NOx	CO	VOC	SOx	PM10	CO2
0.00111	0.01108	0.00092	0.00001	0.00009	0.91102

Daily Emissions (lbs)

	NOx	CO	VOC	SOx	PM10	CO2	PM2.5
Avg	3.33	33.24	2.76	0.03	0.27	2733.06	0.27
Max	5.55	55.40	4.60	0.05	0.45	4555.10	0.45

Tons per Const Period

Avg	0.701	6.997	0.581	0.006	0.057	575.3	0.057

Worker Travel by Busing from Staging Area

Total Bus VMT/Const Period:	0	Bus Round Trips/Day:	0	max	Ref: SDAB, Emfac 2007, V2.3, Nov 2006
Avg Bus VMT/Const Day:	0	Bus Occupancy/Trip:	0		On Road Vehicles (1969-2013)
Max Bus VMT/Const Day:	0				Bus Carriers
Distance to site from Bus staging area:	0	miles (roundtrip)			
(AFC Traffic and Transportation Section)					

Emissions Factors (lbs/VMT)

NOx	CO	VOC	SOx	PM10	CO2
0.013846	0.016154	0.002308	0.000077	0.000077	3.846

*From applicant's manpower schedule

Daily Emissions (lbs)

	NOx	**CO**	**VOC**	**SOx**	**PM10**	**CO2**	**PM2.5**
Avg	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Tons per Const Period

Avg	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Round trip distance: 40 miles, or a one-way distance of 20 miles (a 20 mile radius around the site encompasses a majority of the San Diego urban area).

It should be noted that these emissions are not necessarily new emissions to the regional air shed. A significant portion of the workers will be derived from the existing work force pool in the urban regional area, and as such these workers would most likely be involved in projects in the area regardless of whether or not the proposed facility is constructed. As such, a major portion of the above estimated emissions would not be considered as additions to the air shed.

CO2e Emissions Estimates

For CO2 Estimated Emissions Only

Total CO2 emisisons from diesel combustion:	966.3	tons/period
Total CO2 emissions from gasoline combustion:	628.2	tons/period
Approximate methane fraction of CO2 for diesel combustion:		0.000051
Approximate N2O fraction of CO2 for diesel combustion:		0.000032
Approximate methane fraction of CO2 for gasoline combustion:		0.000213
Approximate N2O fraction of CO2 for gasoline combustion:		0.000113
Estimated methane from diesel combustion:	0.0492813	tons/period
Estimated N2O from diesel combustion:	0.0309216	tons/period
Estimated methane from gasoline combustion:	0.1338066	tons/period
Estimated N2O from diesel combustion:	0.0709866	tons/period
Estimated methane CO2e from diesel combustion:	1.0349073	tons/period
Estimated N2O CO2e from diesel combustion:	9.585696	tons/period
Estimated methane CO2e from gasoline combustion:	2.8099386	tons/period
Estimated N2O CO2e from gasoline combustion:	22.005846	tons/period

Partial CO2e emissions from construction: 1630 tons/period

For GHG Where All Species are Estimated

CO2	3536.36	tons/period
CH4	0.47	tons/period
N2O	0.01	tons/period

Adjusted GWP Rates

CO2	3536.36	tons/period
CH4	9.87	tons/period
N2O	3.1	tons/period
CO2e	3549.33	tons/period

Total CO2e emissions from construction: 5179 tons/period

4708 metric tons/period

CCAR General Protocol, January 2009, Version 3.1.
IPCC SAR values for methane and N2O.

Average Vehicle Weight Estimate for Construction Period

Vehicle Type	Weight tons	# Vehicles per day	Frac. of total vehicles
Passenger Cars	2	128	0.681
HDD Loaded	40	30	0.160
HDD Unloaded	20	30	0.160
		188	1.000

Weighted Avg Vehicle Weight, tons : 10.9

Ref: AP-42, Section 13.2.2, 11/06, mean vehicle weight guidance, p.13.2.2-6.

Table F.5-7

EMFAC Composite Emissions Factor Conversion

EMFAC 2007, V2.3, Nov 2006

County: San Diego
Year: 2013
Model Years: 1969-2013

EMFAC Burden Output

		LDP(gas)	LDP(diesel)	LDT(gas)	LDT(diesel)	MDT(gas)	MDT(diesel)	HDT(gas)	HDT(diesel)	Buses	Motorcycles
Daily VMT/1000		44269	68	29126	275	10442	702	629	2802	127	813
Daily VMT		44269000	68000	29126000	275000	10442000	702000	629000	2802000	127000	813000
ROG, tpd		15.2	0.01	11.91	0.02	6.44	0.19	1.29	2.17	0.14	4.22
CO, tpd		139.74	0.06	113.13	0.18	57.63	0.91	16.06	9.54	0.84	33.84
NOx, tpd		12.22	0.11	12.35	0.47	8.52	2.96	2.34	30.22	1.98	1.11
CO2, tpd	(x 1000) >	19280	30	15880	110	8380	400	490	5340	320	150
PM10, tpd		1.68	0.01	1.61	0.02	0.61	0.06	0.02	1.33	0.04	0.04
SOx, tpd		0.19	0.005	0.15	0.01	0.08	0.01	0.01	0.05	0.005	0.005

Composite Efs

	LDP(gas) g/VMT	LDP(diesel) g/VMT	LDT(gas) g/VMT	LDT(diesel) g/VMT	MDT(gas) g/VMT	MDT(diesel) g/VMT	HDT(gas) g/VMT	HDT(diesel) g/VMT	Buses g/VMT	Motorcycles g/VMT
ROG	0.3115	0.0002	0.3710	0.0006	0.5595	0.0039	1.8605	0.7026	1.0000	4.7089
CO	2.8636	0.0012	3.5236	0.0056	5.0068	0.0186	23.1627	3.0887	6.0002	37.7601
NOx	0.2504	0.0023	0.3847	0.0146	0.7402	0.0607	3.3749	9.7841	14.1434	1.2386
CO2	395.1	0.6	494.6	3.4	728.0	8.2	706.7	1728.9	2285.8	167.4
PM10	0.0344	0.0002	0.0501	0.0006	0.0530	0.0012	0.0288	0.4306	0.2857	0.0446
SOx	0.0039	0.0001	0.0047	0.0003	0.0070	0.0002	0.0144	0.0162	0.0357	0.0056

Composite Efs

	LDP(gas) lb/VMT	LDP(diesel) lb/VMT	LDT(gas) lb/VMT	LDT(diesel) lb/VMT	MDT(gas) lb/VMT	MDT(diesel) lb/VMT	HDT(gas) lb/VMT	HDT(diesel) lb/VMT	Buses lb/VMT	Motorcycles lb/VMT
ROG	0.000687	0.000000	0.000818	0.000001	0.001233	0.000009	0.004102	0.001549	0.002205	0.010381
CO	0.006313	0.000003	0.007768	0.000012	0.011038	0.000041	0.051065	0.006809	0.013228	0.083247
NOx	0.000552	0.000005	0.000848	0.000032	0.001632	0.000134	0.007440	0.021570	0.031181	0.002731
CO2	0.8710	0.0014	1.0904	0.0076	1.6051	0.0181	1.5580	3.8116	5.0394	0.3690
PM10	0.000076	0.000000	0.000111	0.000001	0.000117	0.000003	0.000064	0.000949	0.000630	0.000098
SOx	0.000009	0.000000	0.000010	0.000001	0.000015	0.000000	0.000032	0.000036	0.000079	0.000012

Weighted Avg LDP/LDT Gasoline

	g/VMT	lb/VMT	Calc 1	0.397
ROG	0.335	0.00074	Calc 2	0.603
CO	3.126	0.00689		
NOx	0.304	0.00067		
CO2	434.6	0.95810		
PM10	0.041	0.00009		
SOx	0.004	0.00001		

	LDP(gas)	LDP(diesel)	LDT(gas)	LDT(diesel)	MDT(gas)	MDT(diesel)	HDT(gas)	HDT(diesel)	Buses	Motorcycles
Annual VMT	1.62E+10	2.48E+07	1.06E+10	1.00E+08	3.81E+09	2.56E+08	2.30E+08	1.02E+09	4.64E+07	2.97E+08
Daily Fuel Use, 10^3 gal	1999	2.41	1645.72	9.48	868.46	36.12	52.62	480.72	28.77	21.9
Daily Fuel Use, gals	1999000	2410	1645720	9480	868460	36120	52620	480720	28770	21900
Annual Fuel Use, gals	729635000	879650	600687800	3460200	316987900	13183800	19206300	175462800	10501050	7993500
Average Miles/gallon	22.1	28.2	17.7	29.0	12.0	19.4	12.0	5.8	4.4	37.1

Table F.5-8 EMFAC Output (2 Pages)

Title : SanDiego2013a
Version : Emfac2007 V2.3 Nov 1 2006
Run Date : 2011/03/23 09:46:52
Scen Year: 2013 -- All model years in the range 1969 to 2013 selected
Season : Annual
Area : San Diego County
I/M Stat : Enhanced Interim (2005)
Emissions: Tons Per Day

	Light Duty Passenger Cars				Light Duty Trucks				Medium Duty Trucks				Heavy Duty Trucks: Gasoline Trucks			Heavy Duty Trucks: Diesel Trucks	Heavy Duty Trucks: Total HD Trucks	Urban Buses	Motor-cycles	All Vehicles
	Non-cat	Cat	Diesel	Total	Non-cat	Cat	Diesel	Total	Non-cat	Cat	Diesel	Total	Non-cat	Cat	Total					
Vehicles	6133.	1214610.	2903.	1223650.	4297.	762570.	8939.	775806.	1432.	256373.	16243.	274047.	872.	30905.	31777.	30116.	61893.	898.	86284.	2422580.
VMT/1000	99.	44170.	68.	44337.	82.	29044.	275.	29402.	33.	10409.	702.	11143.	10.	618.	629.	2802.	3431.	127.	813.	89252.
Trips	23814.	7616120.	15346.	7655280.	16762.	4772440.	53565.	4842760.	10360.	2623250.	199209.	2832810.	13616.	224591.	238208.	515802.	754009.	3592.	172552.	16261000.
Total Organic Gas Emissions																				
Run Exh	0.75	4.01	0.01	4.78	0.64	2.71	0.02	3.38	0.33	1.83	0.19	2.35	0.08	0.43	0.51	1.97	2.47	0.13	3.15	16.26
Idle Exh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.06	0.00	0.01	0.01	0.21	0.22	0.00	0.00	0.28
Start Ex	0.15	3.62	0.00	3.77	0.10	2.37	0.00	2.48	0.08	1.69	0.00	1.77	0.15	0.39	0.54	0.00	0.54	0.00	0.45	9.01
Total Ex	0.89	7.64	0.01	8.54	0.75	5.08	0.02	5.85	0.40	3.58	0.19	4.18	0.23	0.83	1.06	2.17	3.24	0.14	3.59	25.54
Diurnal	0.04	0.77	0.00	0.81	0.03	0.50	0.00	0.53	0.00	0.13	0.00	0.14	0.00	0.00	0.01	0.00	0.01	0.00	0.16	1.64
Hot Soak	0.08	1.37	0.00	1.45	0.06	0.90	0.00	0.96	0.01	0.30	0.00	0.31	0.01	0.01	0.02	0.00	0.02	0.00	0.07	2.81
Running	0.44	3.32	0.00	3.76	0.17	3.98	0.00	4.15	0.04	1.84	0.00	1.88	0.06	0.13	0.20	0.00	0.20	0.00	0.29	10.28
Resting	0.03	0.62	0.00	0.65	0.02	0.43	0.00	0.45	0.00	0.12	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.10	1.33
Total	1.49	13.71	0.01	15.21	1.03	10.88	0.02	11.93	0.46	5.98	0.19	6.63	0.30	0.98	1.29	2.17	3.46	0.14	4.22	41.58
Carbon Monoxide Emissions																				
Run Exh	8.63	89.56	0.06	98.25	7.24	75.51	0.18	82.92	5.05	33.22	0.90	39.17	1.79	7.09	8.88	8.74	17.62	0.80	31.98	270.74
Idle Exh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.02	0.33	0.01	0.08	0.08	0.81	0.89	0.00	0.00	1.22
Start Ex	0.78	40.77	0.00	41.55	0.56	29.82	0.00	30.38	0.56	18.49	0.00	19.05	1.17	5.93	7.10	0.00	7.10	0.03	1.85	99.97
Total Ex	9.42	130.32	0.06	139.80	7.80	105.33	0.18	113.30	5.61	52.02	0.91	58.55	2.96	13.10	16.06	9.54	25.61	0.84	33.84	371.92
Oxides of Nitrogen Emissions																				
Run Exh	0.48	9.09	0.11	9.68	0.40	9.23	0.47	10.10	0.24	4.84	2.92	7.99	0.04	1.49	1.53	28.19	29.73	1.97	1.06	60.52
Idle Exh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.05	0.00	0.00	0.00	2.03	2.03	0.00	0.00	2.08
Start Ex	0.04	2.61	0.00	2.65	0.03	2.69	0.00	2.72	0.02	3.43	0.00	3.44	0.02	0.78	0.80	0.00	0.80	0.01	0.06	9.68
Total Ex	0.52	11.70	0.11	12.33	0.42	11.93	0.47	12.82	0.25	8.27	2.96	11.49	0.06	2.28	2.34	30.22	32.56	1.98	1.11	72.28
Carbon Dioxide Emissions (000)																				
Run Exh	0.06	18.62	0.03	18.70	0.05	15.36	0.11	15.51	0.02	8.10	0.40	8.52	0.01	0.46	0.47	5.22	5.70	0.32	0.14	48.88
Idle Exh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.12	0.12	0.00	0.00	0.13
Start Ex	0.01	0.60	0.00	0.61	0.00	0.47	0.00	0.48	0.00	0.24	0.00	0.25	0.00	0.01	0.01	0.00	0.01	0.00	0.01	1.35
Total Ex	0.06	19.22	0.03	19.31	0.05	15.83	0.11	15.99	0.03	8.35	0.40	8.78	0.01	0.47	0.49	5.34	5.83	0.32	0.15	50.37
PM10 Emissions																				
Run Exh	0.00	0.61	0.01	0.63	0.00	0.86	0.01	0.88	0.00	0.34	0.04	0.38	0.00	0.01	0.01	1.16	1.17	0.03	0.03	3.11
Idle Exh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.03
Start Ex	0.00	0.06	0.00	0.06	0.00	0.08	0.00	0.08	0.00	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18
Total Ex	0.00	0.67	0.01	0.69	0.00	0.94	0.01	0.96	0.00	0.37	0.04	0.41	0.00	0.01	0.01	1.19	1.20	0.03	0.03	3.31
TireWear	0.00	0.39	0.00	0.39	0.00	0.26	0.00	0.26	0.00	0.10	0.01	0.11	0.00	0.01	0.01	0.08	0.09	0.00	0.00	0.85
BrakeWr	0.00	0.61	0.00	0.61	0.00	0.40	0.00	0.41	0.00	0.14	0.01	0.15	0.00	0.01	0.01	0.07	0.08	0.00	0.01	1.26
Total	0.01	1.67	0.01	1.69	0.01	1.60	0.02	1.62	0.00	0.61	0.06	0.67	0.00	0.02	0.02	1.33	1.36	0.04	0.04	5.42
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.19	0.00	0.19	0.00	0.15	0.00	0.16	0.00	0.08	0.00	0.09	0.00	0.00	0.00	0.05	0.06	0.00	0.00	0.49
Fuel Consumption (000 gallons)																				
Gasoline	8.17	1990.83	0.00	1999.00	6.71	1639.01	0.00	1645.72	3.84	864.62	0.00	868.46	1.70	50.92	52.62	0.00	52.62	2.27	21.90	4589.98
Diesel	0.00	0.00	2.41	2.41	0.00	0.00	9.48	9.48	0.00	0.00	36.12	36.12	0.00	0.00	0.00	480.72	480.72	26.50	0.00	555.22

Title : SanDiego2013
Version : Emfac2007 V2.3 Nov 1 2006
Run Date : 2011/03/23 09:36:00
Scen Year: 2013 -- All model years in the range 1969 to 2013 selected
Season : Annual
Area : San Diego County
I/M Stat : Enhanced Interim (2005)
Emissions: Tons Per Day

	Light Duty Trucks 1 (T1)				Light Duty Trucks 2 (T2)				Medium Duty Trucks (T3)				Light-Heavy Duty Trucks 1 (T4)				Light-Heavy Duty Trucks 2 (T5)				Medium-Heavy Duty Trucks (T6)				HH Duty	School Buses		Urban Buses		Total
	Non-cat	Cat	Diesel	Total	Non-cat	Cat	Diesel	Total	Non-cat	Cat	Diesel	Total	Non-cat	Cat	Diesel	Total	Non-cat	Cat	Diesel	Total	Non-cat	Cat	Diesel	Total	Diesel Trks	Gas	Diesel	Gas	Diesel	Buses
Vehicles	2520.	198764.	8083.	209366.	1777.	563806.	857.	566440.	1278.	218550.	790.	220618.	116.	31854.	9550.	41520.	38.	5969.	5903.	11909.	776.	29388.	18803.	48967.	8517.	293.	1854.	183.	715.	4796.
VMT/1000	48.	7648.	251.	7947.	34.	21396.	24.	21454.	29.	8750.	27.	8807.	3.	1404.	433.	1840.	1.	254.	242.	496.	8.	525.	1053.	1585.	1600.	14.	88.	26.	101.	328.
Trips	9800.	1244220.	48651.	1302670.	6962.	3528220.	4914.	3540100.	5278.	1372570.	4833.	1382680.	3839.	1053300.	120128.	1177270.	1242.	197374.	74247.	272864.	11394.	165373.	438847.	615614.	43101.	1171.	7414.	733.	2859.	75551.
Total Organic Gas Emissions																														
Run Exh	0.38	0.57	0.02	0.97	0.26	2.14	0.00	2.40	0.30	1.17	0.00	1.47	0.02	0.59	0.11	0.72	0.01	0.08	0.08	0.16	0.05	0.22	0.27	0.54	1.65	0.04	0.04	0.04	0.10	0.26
Idle Exh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.05	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.20	0.00	0.00	0.00	0.00	0.01
Start Ex	0.06	0.49	0.00	0.55	0.04	1.89	0.00	1.93	0.04	0.97	0.00	1.01	0.03	0.61	0.00	0.64	0.01	0.11	0.00	0.12	0.12	0.22	0.00	0.34	0.00	0.01	0.00	0.00	0.00	0.07
Total Ex	0.44	1.06	0.02	1.52	0.31	4.02	0.00	4.33	0.34	2.14	0.00	2.48	0.05	1.24	0.11	1.40	0.01	0.20	0.08	0.30	0.17	0.45	0.27	0.89	1.84	0.05	0.05	0.04	0.10	0.35
Diurnal	0.02	0.12	0.00	0.13	0.01	0.38	0.00	0.39	0.00	0.13	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Hot Soak	0.03	0.22	0.00	0.25	0.02	0.68	0.00	0.71	0.01	0.24	0.00	0.24	0.00	0.05	0.00	0.06	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Running	0.10	0.92	0.00	1.02	0.07	3.06	0.00	3.13	0.01	1.00	0.00	1.02	0.02	0.70	0.00	0.72	0.01	0.14	0.00	0.14	0.05	0.10	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.03
Resting	0.01	0.10	0.00	0.12	0.01	0.32	0.00	0.33	0.00	0.12	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.61	2.41	0.02	3.04	0.42	8.47	0.00	8.89	0.37	3.63	0.00	3.99	0.07	2.00	0.11	2.18	0.02	0.35	0.08	0.45	0.23	0.56	0.27	1.06	1.84	0.06	0.05	0.04	0.10	0.37
Carbon Monoxide Emissions																														
Run Exh	4.27	17.33	0.16	21.76	2.97	58.18	0.02	61.16	4.54	26.64	0.02	31.20	0.40	5.78	0.55	6.72	0.11	0.80	0.34	1.25	1.15	4.30	2.32	7.77	5.99	0.68	0.32	0.43	0.38	2.37
Idle Exh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.01	0.27	0.00	0.05	0.01	0.06	0.00	0.05	0.04	0.09	0.73	0.02	0.03	0.00	0.00	0.06
Start Ex	0.33	6.66	0.00	6.99	0.23	23.16	0.00	23.39	0.34	10.48	0.00	10.82	0.17	6.86	0.00	7.03	0.05	1.15	0.00	1.21	0.74	3.53	0.00	4.28	0.00	0.07	0.00	0.03	0.00	1.05
Total Ex	4.60	23.99	0.16	28.74	3.20	81.34	0.02	84.56	4.88	37.12	0.02	42.02	0.56	12.90	0.56	14.01	0.17	2.00	0.34	2.51	1.89	7.89	2.36	12.14	6.72	0.78	0.34	0.46	0.38	3.48
Oxides of Nitrogen Emissions																														
Run Exh	0.23	1.53	0.43	2.20	0.16	7.70	0.04	7.90	0.23	3.92	0.05	4.19	0.01	0.79	1.72	2.52	0.00	0.14	1.15	1.29	0.03	0.78	7.44	8.25	19.34	0.05	1.05	0.07	1.90	3.55
Idle Exh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.02	0.02	0.00	0.00	0.13	0.13	1.82	0.00	0.08	0.00	0.00	0.09
Start Ex	0.02	0.43	0.00	0.44	0.01	2.26	0.00	2.27	0.01	1.05	0.00	1.06	0.00	2.00	0.00	2.00	0.00	0.38	0.00	0.38	0.01	0.46	0.00	0.47	0.00	0.00	0.00	0.01	0.00	0.14
Total Ex	0.25	1.96	0.43	2.64	0.17	9.96	0.04	10.18	0.24	4.97	0.05	5.25	0.01	2.80	1.75	4.55	0.00	0.51	1.17	1.68	0.04	1.25	7.57	8.85	21.16	0.05	1.13	0.08	1.90	3.78
Carbon Dioxide Emissions (000)																														
Run Exh	0.03	4.03	0.10	4.16	0.02	11.32	0.01	11.35	0.02	6.33	0.01	6.36	0.00	1.50	0.25	1.75	0.00	0.27	0.14	0.41	0.01	0.40	1.75	2.15	3.23	0.01	0.15	0.02	0.29	0.60
Idle Exh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.10	0.00	0.00	0.00	0.00	0.01
Start Ex	0.00	0.12	0.00	0.13	0.00	0.35	0.00	0.35	0.00	0.19	0.00	0.19	0.00	0.05	0.00	0.05	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Total Ex	0.03	4.16	0.10	4.28	0.02	11.67	0.01	11.70	0.02	6.51	0.01	6.55	0.00	1.56	0.25	1.81	0.00	0.28	0.14	0.42	0.01	0.40	1.75	2.17	3.34	0.01	0.15	0.02	0.29	0.61
PM10 Emissions																														
Run Exh	0.00	0.12	0.01	0.13	0.00	0.74	0.00	0.74	0.00	0.31	0.00	0.31	0.00	0.02	0.02	0.05	0.00	0.00	0.02	0.02	0.00	0.00	0.27	0.28	0.83	0.00	0.04	0.00	0.03	0.09
Idle Exh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
Start Ex	0.00	0.01	0.00	0.01	0.00	0.07	0.00	0.07	0.00	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Ex	0.00	0.13	0.01	0.15	0.00	0.81	0.00	0.81	0.00	0.33	0.00	0.34	0.00	0.03	0.02	0.05	0.00	0.01	0.02	0.02	0.00	0.00	0.27	0.28	0.85	0.00	0.05	0.00	0.03	0.10
TireWear	0.00	0.07	0.00	0.07	0.00	0.19	0.00	0.19	0.00	0.08	0.00	0.08	0.00	0.02	0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.02	0.06	0.00	0.00	0.00	0.00	0.00
BrakeWr	0.00	0.11	0.00	0.11	0.00	0.30	0.00	0.30	0.00	0.12	0.00	0.12	0.00	0.02	0.01	0.03	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.02	0.05	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.31	0.02	0.33	0.00	1.29	0.00	1.30	0.00	0.53	0.00	0.54	0.00	0.07	0.03	0.10	0.00	0.01	0.02	0.03	0.00	0.02	0.30	0.32	0.97	0.00	0.05	0.00	0.04	0.10
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOx	0.00	0.04	0.00	0.04	0.00	0.11	0.00	0.11	0.00	0.06	0.00	0.06	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.03	0.00	0.00	0.00	0.00	0.01
Fuel Consumption (000 gallons)																														
Gasoline	3.93	429.56	0.00	433.49	2.78	1209.45	0.00	1212.23	3.20	673.56	0.00	676.76	0.49	161.86	0.00	162.35	0.15	29.20	0.00	29.35	1.21	42.80	0.00	44.01	0.00	1.41	0.00	2.27	0.00	7.12
Diesel	0.00	0.00	8.63	8.63	0.00	0.00	0.85	0.85	0.00	0.00	0.93	0.93	0.00	0.00	22.44	22.44	0.00	0.00	12.74	12.74	0.00	0.00	157.80	157.80	300.18	0.00	13.54	0.00	26.50	49.24

Table F.5-9 Offoad 2007-Raw Data Output (13 Pages)

Equipment	Fuel	MaxHP	Class	Population	Activity	Consumption	ROG Exhaust	CO Exhaust	NOX Exhaust	CO2 Exhaust	SO2 Exhaust	PM Exhaust	N2O Exhaust	CH4 Exhaust
Off-Road Motorcycles Inactive	G2	15	Recreational Equipment	8.11E+02	2.96E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G2	25	Recreational Equipment	6.98E+02	2.55E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G2	50	Recreational Equipment	5.68E+03	2.07E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G2	120	Recreational Equipment	2.72E+03	9.91E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowmobiles Inactive	G2	25	Recreational Equipment	3.83E+00	5.94E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowmobiles Inactive	G2	50	Recreational Equipment	1.80E+01	2.80E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowmobiles Inactive	G2	120	Recreational Equipment	3.28E+01	5.09E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G2	15	Recreational Equipment	1.07E+03	3.91E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G2	25	Recreational Equipment	6.97E+02	2.54E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G2	50	Recreational Equipment	9.17E+02	3.35E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G4	15	Recreational Equipment	1.58E+03	5.77E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G4	25	Recreational Equipment	2.55E+03	9.31E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G4	50	Recreational Equipment	2.66E+03	9.70E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G4	15	Recreational Equipment	8.73E+02	3.19E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G4	25	Recreational Equipment	1.21E+04	4.43E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G4	50	Recreational Equipment	5.48E+02	2.00E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Active	G2	15	Recreational Equipment	2.02E+03	7.38E+03	2.80E+02	2.82E-01	4.40E-01	8.37E-05	9.35E-01	7.58E-04	3.42E-03	3.16E-04	1.75E-02
Off-Road Motorcycles Active	G2	25	Recreational Equipment	1.74E+03	6.35E+03	2.41E+02	2.42E-01	3.79E-01	7.20E-05	8.05E-01	1.22E-03	2.94E-03	2.72E-04	1.51E-02
Off-Road Motorcycles Active	G2	50	Recreational Equipment	1.42E+04	5.17E+04	1.96E+03	1.97E+00	3.08E+00	5.86E-04	6.55E+00	1.57E-02	2.39E-02	2.21E-03	1.23E-01
Off-Road Motorcycles Active	G2	120	Recreational Equipment	6.78E+03	2.47E+04	9.38E+02	9.44E-01	1.48E+00	2.80E-04	3.13E+00	1.11E-02	1.15E-02	1.06E-03	5.87E-02
Snowmobiles Active	G2	25	Recreational Equipment	1.10E+01	1.71E+00	1.65E+00	1.24E-03	3.63E-03	4.04E-05	5.49E-03	9.57E-08	3.80E-05	4.27E-06	7.72E-05
Snowmobiles Active	G2	50	Recreational Equipment	5.18E+01	8.05E+00	1.48E+01	1.11E-02	3.25E-02	3.62E-04	4.92E-02	8.57E-07	3.40E-04	2.83E-05	6.92E-04
Snowmobiles Active	G2	120	Recreational Equipment	9.42E+01	1.46E+01	4.32E+01	3.10E-02	9.28E-02	1.21E-03	1.53E-01	2.67E-06	1.02E-03	7.18E-05	1.93E-03
All Terrain Vehicles (ATVs) Active	G2	15	Recreational Equipment	3.53E+03	1.29E+04	4.88E+02	4.91E-01	7.67E-01	1.46E-04	1.63E+00	1.63E-03	5.96E-03	5.50E-04	3.05E-02
All Terrain Vehicles (ATVs) Active	G2	25	Recreational Equipment	2.30E+03	8.37E+03	3.17E+02	3.20E-01	4.99E-01	9.49E-05	1.06E+00	1.45E-03	3.88E-03	3.58E-04	1.99E-02
All Terrain Vehicles (ATVs) Active	G2	50	Recreational Equipment	3.02E+03	1.10E+04	4.18E+02	4.21E-01	6.57E-01	1.25E-04	1.40E+00	2.50E-03	5.10E-03	4.72E-04	2.61E-02
Golf Carts	G2	15	Recreational Equipment	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Specialty Vehicles Carts	G2	15	Recreational Equipment	7.06E+03	1.27E+03	4.66E+02	1.68E-02	1.27E+00	1.25E-02	2.43E+00	1.00E-04	9.14E-04	2.00E-03	1.04E-03
Tampers/Rammers	G2	15	Construction and Mining	3.28E+02	1.88E+02	3.79E+01	2.39E-03	1.02E-01	1.80E-03	1.96E-01	8.06E-06	1.64E-03	2.92E-04	1.48E-04
Plate Compactors	G2	15	Construction and Mining	2.81E+01	1.82E+01	3.68E+00	2.31E-04	9.94E-03	1.74E-04	1.90E-02	7.83E-07	1.59E-04	2.84E-05	1.44E-05
Other General Industrial Equipmen	G2	15	Industrial Equipment	6.42E+00	7.58E+00	2.98E+00	1.34E-04	8.11E-03	9.83E-05	1.55E-02	6.39E-07	7.22E-06	1.39E-05	8.35E-06
Lawn Mowers	G2	15	Lawn and Garden Equip	4.71E+03	4.13E+03	4.67E+02	5.29E-02	9.50E-01	1.37E-02	2.82E+00	1.16E-04	8.88E-03	3.65E-03	3.29E-03
Lawn Mowers	G2	15	Lawn and Garden Equip	3.54E+04	1.58E+03	2.22E+02	4.76E-02	5.62E-01	5.83E-03	1.08E+00	4.44E-05	3.67E-03	1.41E-03	2.96E-03
Chainsaws	G2	2	Lawn and Garden Equip	8.44E+03	9.36E+03	5.58E+02	4.67E-01	8.45E-01	7.15E-03	2.28E+00	9.40E-05	1.33E-03	3.79E-03	2.90E-02
Chainsaws	G2	2	Lawn and Garden Equip	9.50E+04	1.34E+03	7.35E+01	3.76E-02	1.53E-01	1.08E-03	3.27E-01	1.35E-05	6.59E-04	5.53E-04	2.33E-03
Chainsaws	G2	15	Lawn and Garden Equip	5.95E+03	6.60E+03	9.51E+02	7.95E-01	1.44E+00	1.22E-02	3.89E+00	1.60E-04	2.26E-03	4.27E-03	4.94E-02
Chainsaws	G2	15	Lawn and Garden Equip	6.69E+04	9.44E+02	1.20E+02	5.81E-02	2.44E-01	1.81E-03	5.56E-01	2.29E-05	1.24E-03	6.17E-04	3.61E-03
Chainsaws Preempt	G2	15	Lawn and Garden Equip	7.40E+03	8.21E+03	1.18E+03	9.90E-01	1.79E+00	1.51E-02	4.84E+00	1.99E-04	2.82E-03	5.31E-03	6.15E-02
Chainsaws Preempt	G2	15	Lawn and Garden Equip	8.33E+04	1.17E+03	1.69E+02	9.70E-02	3.63E-01	1.86E-03	6.92E-01	2.85E-05	8.67E-04	6.97E-04	6.03E-03
Trimmers/Edgers/Brush Cutters	G2	2	Lawn and Garden Equip	2.75E+04	1.28E+04	5.68E+02	3.07E-01	1.01E+00	8.54E-03	2.73E+00	1.12E-04	1.59E-03	4.82E-03	1.91E-02
Trimmers/Edgers/Brush Cutters	G2	2	Lawn and Garden Equip	3.07E+05	1.90E+04	8.06E+02	3.63E-01	1.50E+00	1.30E-02	4.05E+00	1.67E-04	2.36E-03	7.22E-03	2.26E-02
Leaf Blowers/Vacuums	G2	2	Lawn and Garden Equip	4.11E+04	3.10E+04	1.65E+03	1.14E+00	2.71E+00	2.29E-02	7.33E+00	3.02E-04	4.27E-03	1.23E-02	7.08E-02
Leaf Blowers/Vacuums	G2	2	Lawn and Garden Equip	1.06E+05	1.46E+03	7.80E+01	3.97E-02	1.62E-01	1.15E-03	3.47E-01	1.43E-05	7.00E-04	5.95E-04	2.47E-03
Shredders	G2	15	Lawn and Garden Equip	2.08E+02	1.08E+02	4.74E+01	2.67E-03	1.28E-01	2.01E-03	2.46E-01	1.01E-05	2.06E-03	2.40E-04	1.66E-04
Shredders	G2	15	Lawn and Garden Equip	7.40E+03	1.92E+01	9.45E+00	1.99E-03	2.55E-02	2.78E-04	4.36E-02	1.79E-06	3.65E-04	3.65E-05	1.23E-04
Commercial Turf Equipment	G2	15	Lawn and Garden Equip	1.10E+02	3.38E+02	1.38E+02	6.29E-03	3.77E-01	4.62E-03	7.20E-01	2.96E-05	3.35E-04	6.35E-04	3.91E-04
Commercial Turf Equipment	G2	25	Lawn and Garden Equip	5.44E+01	1.67E+02	1.48E+02	6.53E-03	4.16E-01	4.85E-03	7.50E-01	3.09E-05	3.49E-04	4.69E-04	4.06E-04
Other Lawn & Garden Equipment	G2	2	Lawn and Garden Equip	4.65E+01	1.22E+01	6.83E-01	3.36E-04	1.24E-03	1.05E-05	3.36E-03	1.38E-07	1.96E-06	5.27E-06	2.09E-05
Other Lawn & Garden Equipment	G2	2	Lawn and Garden Equip	1.43E+03	1.77E+01	1.09E+00	5.48E-04	2.27E-03	1.60E-05	4.85E-03	2.00E-07	9.79E-06	7.77E-06	3.40E-05
Other Lawn & Garden Equipment	G2	15	Lawn and Garden Equip	2.03E+01	5.33E+00	1.49E+00	7.30E-04	2.71E-03	2.29E-05	7.31E-03	3.01E-07	4.26E-06	5.41E-06	4.54E-05
Other Lawn & Garden Equipment	G2	15	Lawn and Garden Equip	6.21E+02	7.69E+00	2.28E+00	1.08E-03	4.64E-03	3.43E-05	1.06E-02	4.35E-07	2.35E-05	7.89E-06	6.72E-05
Generator Sets	G2	2	Light Commercial Equip	1.93E+02	5.53E+01	3.33E+00	7.84E-04	7.22E-03	1.31E-04	1.78E-02	7.33E-07	6.86E-05	4.02E-05	4.87E-05
Generator Sets	G2	2	Light Commercial Equip	1.52E+02	2.92E+01	1.90E+00	5.42E-04	4.39E-03	6.85E-05	9.40E-03	3.87E-07	3.87E-05	2.10E-05	3.37E-05
Generator Sets	G2	15	Light Commercial Equip	1.95E+00	5.57E-01	3.15E-01	1.83E-05	8.64E-04	1.19E-05	1.61E-03	6.65E-08	7.57E-07	1.32E-06	1.14E-06
Generator Sets	G2	15	Light Commercial Equip	1.48E+00	2.86E-01	1.73E-01	2.43E-05	4.76E-04	5.89E-06	8.27E-04	3.41E-08	9.37E-07	6.59E-07	1.51E-06
Pumps	G2	2	Light Commercial Equip	7.68E+02	4.22E+02	2.23E+01	3.24E-03	4.16E-02	9.64E-04	1.38E-01	5.67E-06	4.84E-04	3.02E-04	2.01E-04

Pumps	G2	2	Light Commercial Equip	6.03E+02	2.23E+02	1.31E+01	2.74E-03	2.72E-02	5.37E-04	7.28E-02	3.00E-06	2.73E-04	1.64E-04	1.70E-04
Pumps	G2	15	Light Commercial Equip	2.07E+02	1.14E+02	5.77E+01	3.76E-03	1.56E-01	2.77E-03	2.97E-01	1.22E-05	2.49E-03	2.91E-04	2.34E-04
Pumps	G2	15	Light Commercial Equip	1.63E+02	6.01E+01	3.11E+01	2.63E-03	8.49E-02	1.42E-03	1.57E-01	6.47E-06	1.32E-03	1.51E-04	1.64E-04
Pumps	G2	25	Light Commercial Equip	2.51E+00	1.38E+00	1.52E+00	1.00E-04	4.24E-03	6.61E-05	7.64E-03	3.15E-07	6.41E-05	5.06E-06	6.23E-06
Pumps	G2	25	Light Commercial Equip	1.95E+00	7.20E-01	8.00E-01	5.34E-05	2.24E-03	3.38E-05	4.00E-03	1.65E-07	3.35E-05	2.62E-06	3.32E-06
Off-Road Motorcycles Active	G4	15	Recreational Equipment	3.95E+03	1.44E+04	2.69E+02	1.93E-02	4.42E-01	8.43E-03	1.82E+00	1.48E-03	9.52E-04	4.91E-03	1.09E-03
Off-Road Motorcycles Active	G4	25	Recreational Equipment	6.37E+03	2.32E+04	4.33E+02	3.12E-02	7.13E-01	1.36E-02	2.94E+00	4.45E-03	1.54E-03	7.92E-03	1.75E-03
Off-Road Motorcycles Active	G4	50	Recreational Equipment	6.63E+03	2.42E+04	4.51E+02	3.25E-02	7.43E-01	1.42E-02	3.07E+00	7.34E-03	1.60E-03	8.25E-03	1.83E-03
All Terrain Vehicles (ATVs) Active	G4	15	Recreational Equipment	2.88E+03	1.05E+04	1.97E+02	1.48E-02	3.30E-01	8.02E-03	1.33E+00	1.33E-03	6.94E-04	4.13E-03	8.31E-04
All Terrain Vehicles (ATVs) Active	G4	25	Recreational Equipment	4.00E+04	1.46E+05	2.75E+03	2.06E-01	4.59E+00	1.12E-01	1.85E+01	2.52E-02	9.66E-03	5.74E-02	1.16E-02
All Terrain Vehicles (ATVs) Active	G4	50	Recreational Equipment	1.81E+03	6.59E+03	1.24E+02	9.29E-03	2.07E-01	5.04E-03	8.35E-01	1.49E-03	4.36E-04	2.59E-03	5.22E-04
Minibikes	G4	5	Recreational Equipment	1.58E+03	5.87E+02	1.31E+02	8.55E-02	5.49E-01	2.09E-03	7.43E-02	2.38E-05	2.29E-03	5.26E-04	4.85E-03
Golf Carts	G4	15	Recreational Equipment	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Specialty Vehicles Carts	G4	5	Recreational Equipment	2.19E+02	3.92E+01	1.03E+01	7.77E-04	2.74E-02	1.87E-04	5.38E-02	1.86E-06	1.27E-04	4.09E-05	4.41E-05
Specialty Vehicles Carts	G4	15	Recreational Equipment	2.96E+03	5.31E+02	2.07E+02	7.70E-03	6.00E-01	5.48E-03	1.02E+00	2.91E-05	3.84E-04	8.39E-04	4.37E-04
Specialty Vehicles Carts	G4	25	Recreational Equipment	1.63E+03	2.92E+02	3.17E+02	1.18E-02	9.50E-01	7.84E-03	1.52E+00	3.86E-05	5.72E-04	7.68E-04	6.69E-04
Asphalt Pavers	G4	15	Construction and Minin	7.15E+00	8.92E+00	5.16E+00	3.89E-04	1.48E-02	2.80E-04	2.51E-02	7.15E-07	2.10E-04	2.55E-05	2.21E-05
Asphalt Pavers	G4	25	Construction and Minin	1.22E+01	1.53E+01	2.22E+01	1.72E-03	6.55E-02	1.08E-03	1.05E-01	2.66E-06	8.79E-04	6.74E-05	9.75E-05
Asphalt Pavers	G4	50	Construction and Minin	6.29E+00	7.76E+00	1.80E+01	6.09E-04	1.91E-02	8.62E-04	1.42E-01	1.72E-06	1.08E-05	4.05E-05	3.45E-05
Asphalt Pavers	G4	120	Construction and Minin	3.46E+00	4.26E+00	1.66E+01	4.07E-04	7.68E-03	1.17E-03	1.47E-01	1.42E-06	1.14E-05	3.37E-05	2.31E-05
Tampers/Rammers	G4	15	Construction and Minin	1.51E+01	8.67E+00	4.19E+00	3.19E-04	1.20E-02	2.23E-04	2.03E-02	5.79E-07	1.70E-04	2.23E-05	1.81E-05
Plate Compactors	G4	5	Construction and Minin	5.56E+02	3.15E+02	5.70E+01	8.03E-03	1.22E-01	3.51E-03	3.28E-01	1.13E-05	1.07E-04	5.18E-04	4.56E-04
Plate Compactors	G4	15	Construction and Minin	5.89E+02	3.82E+02	1.64E+02	1.23E-02	4.68E-01	8.80E-03	7.96E-01	2.27E-05	6.67E-03	9.26E-04	6.96E-04
Rollers	G4	5	Construction and Minin	6.19E+01	1.62E+01	4.36E+00	5.23E-04	1.04E-02	2.29E-04	2.37E-02	8.20E-07	7.74E-06	3.02E-05	2.97E-05
Rollers	G4	15	Construction and Minin	1.00E+02	9.77E+01	5.30E+01	3.96E-03	1.52E-01	2.86E-03	2.58E-01	7.36E-06	2.16E-03	2.69E-04	2.25E-04
Rollers	G4	25	Construction and Minin	6.76E+01	6.60E+01	7.79E+01	5.97E-03	2.30E-01	3.76E-03	3.68E-01	9.32E-06	3.08E-03	2.59E-04	3.39E-04
Rollers	G4	50	Construction and Minin	4.43E+00	8.66E+00	2.31E+01	1.04E-03	3.05E-02	1.25E-03	1.72E-01	2.09E-06	1.31E-05	5.31E-05	5.88E-05
Rollers	G4	120	Construction and Minin	8.33E+00	1.63E+01	7.55E+01	2.58E-03	4.61E-02	6.18E-03	6.46E-01	6.24E-06	5.01E-05	1.59E-04	1.46E-04
Paving Equipment	G4	5	Construction and Minin	7.78E+02	4.16E+02	8.12E+01	1.13E-02	1.75E-01	4.94E-03	4.65E-01	1.61E-05	1.52E-04	7.08E-04	6.42E-04
Paving Equipment	G4	15	Construction and Minin	1.32E+03	8.28E+02	4.75E+02	3.55E-02	1.36E+00	2.55E-02	2.31E+00	6.60E-05	1.94E-02	2.34E-03	2.02E-03
Paving Equipment	G4	25	Construction and Minin	2.92E+01	1.84E+01	2.39E+01	1.83E-03	7.06E-02	1.15E-03	1.13E-01	2.87E-06	9.48E-04	7.60E-05	1.04E-04
Paving Equipment	G4	50	Construction and Minin	1.72E+01	9.47E+00	2.13E+01	4.04E-04	1.63E-02	6.68E-04	1.78E-01	2.17E-06	1.37E-05	3.81E-05	2.30E-05
Paving Equipment	G4	120	Construction and Minin	4.43E+00	2.44E+00	8.85E+00	1.05E-04	2.45E-03	3.55E-04	8.11E-02	7.84E-07	6.29E-06	1.30E-05	5.95E-06
Surfacing Equipment	G4	5	Construction and Minin	1.43E+02	8.99E+01	1.80E+01	2.59E-03	3.78E-02	1.13E-03	1.04E-01	3.60E-06	3.40E-05	1.58E-04	1.47E-04
Surfacing Equipment	G4	15	Construction and Minin	4.24E+02	6.72E+02	2.57E+02	2.01E-02	7.35E-01	1.45E-02	1.25E+00	3.55E-05	1.05E-02	1.57E-03	1.14E-03
Surfacing Equipment	G4	25	Construction and Minin	5.81E+00	9.19E+00	8.60E+00	6.91E-04	2.54E-02	4.35E-04	4.05E-02	1.03E-06	3.40E-04	3.27E-05	3.91E-05
Signal Boards	G4	5	Construction and Minin	1.76E+00	7.21E-01	2.33E-01	2.98E-05	5.36E-04	1.30E-05	1.30E-03	4.48E-08	4.23E-07	1.54E-06	1.69E-06
Signal Boards	G4	15	Construction and Minin	1.25E+01	1.12E+01	6.63E+00	4.92E-04	1.90E-02	3.55E-04	3.23E-02	9.20E-07	2.71E-04	3.22E-05	2.80E-05
Trenchers	G4	15	Construction and Minin	1.16E+02	1.59E+02	1.02E+02	7.80E-03	2.92E-01	5.62E-03	4.95E-01	1.41E-05	4.15E-03	4.84E-04	4.42E-04
Trenchers	G4	25	Construction and Minin	8.99E+01	1.23E+02	1.71E+02	1.34E-02	5.04E-01	8.45E-03	8.06E-01	2.04E-05	6.75E-03	5.34E-04	7.60E-04
Trenchers	G4	50	Construction and Minin	4.03E+01	5.10E+01	1.13E+02	4.35E-03	1.28E-01	6.01E-03	8.72E-01	1.06E-05	6.68E-05	2.78E-04	2.47E-04
Trenchers	G4	120	Construction and Minin	1.34E+01	1.69E+01	7.21E+01	2.07E-03	3.72E-02	5.82E-03	6.30E-01	6.08E-06	4.88E-05	1.55E-04	1.17E-04
Bore/Drill Rigs	G4	15	Construction and Minin	3.32E+00	1.30E+00	9.98E-01	7.36E-05	2.87E-03	5.14E-05	4.84E-03	1.38E-07	4.06E-05	4.19E-06	4.18E-06
Bore/Drill Rigs	G4	25	Construction and Minin	1.65E+01	6.44E+00	9.18E+00	6.89E-04	2.71E-02	4.25E-04	4.33E-02	1.10E-06	3.63E-04	2.73E-05	3.92E-05
Bore/Drill Rigs	G4	50	Construction and Minin	1.95E+00	6.57E-01	1.75E+00	5.11E-05	1.49E-03	9.08E-05	1.43E-02	1.74E-07	1.10E-06	3.84E-06	2.90E-06
Bore/Drill Rigs	G4	120	Construction and Minin	8.95E+00	3.01E+00	1.99E+01	4.16E-04	7.61E-03	1.58E-03	1.79E-01	1.73E-06	1.39E-05	3.41E-05	2.36E-05
Bore/Drill Rigs	G4	175	Construction and Minin	2.21E+00	7.46E-01	6.74E+00	8.28E-05	1.97E-03	6.15E-04	6.17E-02	6.13E-07	4.91E-06	1.07E-05	4.70E-06
Concrete/Industrial Saws	G4	5	Construction and Minin	6.09E+01	2.49E+01	6.62E+00	8.46E-04	1.52E-02	3.70E-04	3.68E-02	1.27E-06	1.20E-05	4.77E-05	4.81E-05
Concrete/Industrial Saws	G4	15	Construction and Minin	2.74E+02	2.67E+02	1.82E+02	1.36E-02	5.22E-01	9.82E-03	8.88E-01	2.53E-05	7.44E-03	8.31E-04	7.74E-04
Concrete/Industrial Saws	G4	25	Construction and Minin	8.56E+01	8.36E+01	1.11E+02	8.51E-03	3.27E-01	5.37E-03	5.25E-01	1.33E-05	4.40E-03	3.50E-04	4.83E-04
Concrete/Industrial Saws	G4	50	Construction and Minin	7.27E+00	1.40E+01	3.87E+01	4.03E-04	2.72E-02	5.76E-04	3.29E-01	4.00E-06	2.52E-05	4.61E-05	2.28E-05
Concrete/Industrial Saws	G4	120	Construction and Minin	4.16E+00	8.00E+00	3.77E+01	1.66E-04	7.42E-03	3.69E-04	3.51E-01	3.40E-06	2.72E-05	2.80E-05	9.39E-06
Cement and Mortar Mixers	G4	5	Construction and Minin	1.11E+03	3.20E+02	8.12E+01	1.01E-02	1.89E-01	4.41E-03	4.47E-01	1.54E-05	1.46E-04	5.89E-04	5.74E-04
Cement and Mortar Mixers	G4	15	Construction and Minin	1.87E+03	5.42E+02	2.64E+02	2.53E-02	7.91E-01	1.18E-02	1.21E+00	3.45E-05	9.96E-03	1.27E-03	1.43E-03
Cement and Mortar Mixers	G4	25	Construction and Minin	7.88E+00	2.28E+00	3.51E+00	3.19E-04	1.06E-02	1.40E-04	1.59E-02	4.04E-07	1.31E-04	9.27E-06	1.81E-05
Cranes	G4	50	Construction and Minin	2.21E+00	2.89E+00	5.64E+00	2.20E-04	6.44E-03	3.00E-04	4.34E-02	5.28E-07	3.33E-06	1.48E-05	1.25E-05
Cranes	G4	120	Construction and Minin	4.43E+00	5.79E+00	1.97E+01	5.71E-04	1.03E-02	1.59E-03	1.72E-01	1.66E-06	1.33E-05	4.72E-05	3.24E-05

Cranes	G4	175	Construction and Minin	1.77E-01	2.31E-01	1.24E+00	1.82E-05	4.04E-04	1.21E-04	1.13E-02	1.12E-07	8.99E-07	2.65E-06	1.03E-06
Crushing/Proc. Equipment	G4	15	Construction and Minin	3.01E+00	2.74E+00	2.03E+00	1.51E-04	5.82E-03	1.09E-04	9.91E-03	2.82E-07	8.30E-05	8.88E-06	8.59E-06
Crushing/Proc. Equipment	G4	25	Construction and Minin	1.97E+00	1.79E+00	2.44E+00	1.86E-04	7.20E-03	1.17E-04	1.15E-02	2.92E-07	9.67E-05	7.58E-06	1.06E-05
Crushing/Proc. Equipment	G4	120	Construction and Minin	2.57E+00	1.95E+00	1.53E+01	3.75E-04	6.78E-03	1.22E-03	1.36E-01	1.31E-06	1.05E-05	2.45E-05	2.13E-05
Rough Terrain Forklifts	G4	50	Construction and Minin	8.86E-01	1.15E+00	3.82E+00	1.49E-04	4.35E-03	2.04E-04	2.94E-02	3.58E-07	2.26E-06	7.81E-06	8.42E-06
Rough Terrain Forklifts	G4	120	Construction and Minin	1.26E+01	1.64E+01	8.57E+01	2.48E-03	4.46E-02	6.92E-03	7.48E-01	7.22E-06	5.79E-05	1.68E-04	1.41E-04
Rough Terrain Forklifts	G4	175	Construction and Minin	4.43E-01	5.76E-01	4.71E+00	6.90E-05	1.53E-03	4.58E-04	4.28E-02	4.25E-07	3.41E-06	8.26E-06	3.92E-06
Rubber Tired Loaders	G4	50	Construction and Minin	2.21E+00	3.57E+00	8.74E+00	3.46E-04	1.04E-02	4.51E-04	6.66E-02	8.09E-07	5.10E-06	2.02E-05	1.96E-05
Rubber Tired Loaders	G4	120	Construction and Minin	1.47E+01	2.37E+01	9.06E+01	2.68E-03	4.90E-02	6.99E-03	7.87E-01	7.60E-06	6.10E-05	1.99E-04	1.52E-04
Tractors/Loaders/Backhoes	G4	120	Construction and Minin	7.80E+00	2.14E+01	6.27E+01	1.03E-03	3.19E-02	2.38E-03	5.51E-01	5.33E-06	4.27E-05	1.05E-04	5.81E-05
Skid Steer Loaders	G4	15	Construction and Minin	5.91E+00	5.93E+00	4.69E+00	3.55E-04	1.34E-02	2.56E-04	2.28E-02	6.50E-07	1.91E-04	2.01E-05	2.02E-05
Skid Steer Loaders	G4	25	Construction and Minin	3.95E+02	3.97E+02	4.38E+02	3.40E-02	1.29E+00	2.15E-02	2.07E+00	5.25E-05	1.74E-02	1.52E-03	1.93E-03
Skid Steer Loaders	G4	50	Construction and Minin	6.04E+01	5.90E+01	1.13E+02	1.41E-03	8.79E-02	2.12E-03	9.45E-01	1.15E-05	7.24E-05	1.75E-04	8.02E-05
Skid Steer Loaders	G4	120	Construction and Minin	3.61E+01	3.53E+01	1.51E+02	9.21E-04	3.54E-02	2.50E-03	1.40E+00	1.35E-05	1.08E-04	1.41E-04	5.23E-05
Dumpers/Tenders	G4	5	Construction and Minin	5.64E+01	2.65E+01	3.55E+00	5.09E-04	7.50E-03	2.22E-04	2.05E-02	7.09E-07	6.70E-06	3.74E-05	2.89E-05
Dumpers/Tenders	G4	15	Construction and Minin	1.20E+02	5.64E+01	2.12E+01	1.97E-03	6.29E-02	1.01E-03	9.85E-02	2.81E-06	8.15E-04	1.19E-04	1.12E-04
Dumpers/Tenders	G4	25	Construction and Minin	2.23E+01	1.05E+01	8.43E+00	7.53E-04	2.54E-02	3.60E-04	3.86E-02	9.77E-07	3.19E-04	3.12E-05	4.28E-05
Dumpers/Tenders	G4	120	Construction and Minin	1.59E+00	6.38E-01	1.64E+00	3.52E-05	6.43E-04	1.30E-04	1.47E-02	1.42E-07	1.14E-06	4.37E-06	2.00E-06
Other Construction Equipment	G4	175	Construction and Minin	6.20E+00	7.24E+00	3.97E+01	1.62E-04	1.19E-02	5.70E-04	3.64E-01	3.61E-06	2.90E-05	3.21E-05	9.20E-06
Aerial Lifts	G4	15	Industrial Equipment	1.24E+00	1.46E+00	8.52E-01	6.38E-05	2.44E-03	4.60E-05	4.15E-03	1.18E-07	3.48E-05	4.19E-06	3.62E-06
Aerial Lifts	G4	25	Industrial Equipment	5.29E+01	6.25E+01	5.48E+01	4.30E-03	1.61E-01	2.71E-03	2.58E-01	6.55E-06	2.17E-03	2.12E-04	2.44E-04
Aerial Lifts	G4	50	Industrial Equipment	6.47E+01	7.35E+01	1.17E+02	1.70E-03	1.00E-01	2.58E-03	9.63E-01	1.17E-05	7.38E-05	2.12E-04	9.63E-05
Aerial Lifts	G4	120	Industrial Equipment	6.47E+01	7.35E+01	2.10E+02	1.63E-03	5.73E-02	4.64E-03	1.93E+00	1.87E-05	1.50E-04	2.67E-04	9.23E-05
Forklifts	G4	25	Industrial Equipment	1.24E+00	3.52E+00	2.42E+00	1.29E-04	7.23E-03	9.62E-05	1.15E-02	2.91E-07	6.42E-06	9.32E-06	7.27E-06
Forklifts	G4	50	Industrial Equipment	2.16E+02	1.22E+03	1.96E+03	3.86E-02	3.70E+00	7.70E-02	1.30E+01	1.58E-04	9.94E-04	4.88E-03	2.14E-03
Forklifts	G4	120	Industrial Equipment	7.57E+02	4.29E+03	9.03E+03	9.51E-02	6.29E+00	3.57E-01	7.69E+01	7.43E-04	5.96E-03	2.00E-02	5.28E-03
Forklifts	G4	175	Industrial Equipment	2.77E+01	1.57E+02	6.32E+02	4.84E-03	2.40E-01	2.39E-02	5.70E+00	5.66E-05	4.54E-04	1.01E-03	2.69E-04
Sweepers/Scrubbers	G4	15	Industrial Equipment	3.60E+01	3.06E+01	1.67E+01	8.53E-04	4.83E-02	5.95E-04	8.22E-02	2.34E-06	4.17E-05	6.77E-05	4.85E-05
Sweepers/Scrubbers	G4	25	Industrial Equipment	3.51E+01	2.98E+01	3.78E+01	1.89E-03	1.13E-01	1.40E-03	1.81E-01	4.58E-06	9.46E-05	1.05E-04	1.08E-04
Sweepers/Scrubbers	G4	50	Industrial Equipment	6.01E+01	9.77E+01	2.56E+02	3.03E-03	2.33E-01	5.93E-03	2.10E+00	2.55E-05	1.61E-04	3.93E-04	1.72E-04
Sweepers/Scrubbers	G4	120	Industrial Equipment	5.02E+01	8.16E+01	3.65E+02	1.84E-03	1.00E-01	9.99E-03	3.36E+00	3.25E-05	2.60E-04	4.80E-04	1.04E-04
Sweepers/Scrubbers	G4	175	Industrial Equipment	2.92E-01	4.74E-01	4.28E+00	1.48E-05	1.32E-03	1.21E-04	3.91E-02	3.89E-07	3.12E-06	4.12E-06	8.40E-07
Other General Industrial Equipmen	G4	15	Industrial Equipment	7.13E+01	8.42E+01	3.51E+01	1.87E-03	1.01E-01	1.30E-03	1.72E-01	4.91E-06	9.14E-05	1.65E-04	1.06E-04
Other General Industrial Equipmen	G4	25	Industrial Equipment	2.34E+01	3.16E+01	3.05E+01	1.59E-03	9.10E-02	1.19E-03	1.45E-01	3.69E-06	7.97E-05	9.94E-05	9.04E-05
Other General Industrial Equipmen	G4	50	Industrial Equipment	2.07E+01	4.64E+01	8.29E+01	1.17E-03	9.39E-02	2.29E-03	6.48E-01	7.88E-06	4.97E-05	1.65E-04	6.62E-05
Other General Industrial Equipmen	G4	120	Industrial Equipment	6.79E+00	1.52E+01	6.13E+01	4.10E-04	2.23E-02	1.91E-03	5.55E-01	5.36E-06	4.30E-05	8.96E-05	2.32E-05
Other General Industrial Equipmen	G4	175	Industrial Equipment	6.57E-01	1.47E+00	1.26E+01	5.71E-05	4.04E-03	3.98E-04	1.15E-01	1.14E-06	9.16E-06	1.31E-05	3.23E-06
Other Material Handling Equipment	G4	50	Industrial Equipment	2.92E-01	3.55E-01	8.60E-01	2.64E-05	9.82E-04	4.05E-05	6.66E-03	8.09E-08	5.10E-07	1.92E-06	1.50E-06
Other Material Handling Equipment	G4	120	Industrial Equipment	1.29E+01	1.57E+01	4.35E+01	9.57E-04	2.05E-02	3.01E-03	3.84E-01	3.71E-06	2.97E-05	1.09E-04	5.43E-05
Lawn Mowers	G4	5	Lawn and Garden Equip	2.79E+04	2.45E+04	2.89E+03	3.42E-01	6.30E+00	8.49E-02	1.67E+01	5.76E-04	5.26E-02	2.16E-02	1.95E-02
Lawn Mowers	G4	5	Lawn and Garden Equip	4.42E+05	1.97E+04	2.70E+03	2.67E-01	7.36E+00	7.41E-02	1.35E+01	4.65E-04	3.22E-02	1.75E-02	1.52E-02
Tillers	G4	5	Lawn and Garden Equip	2.90E+03	6.21E+02	8.74E+01	7.77E-03	2.19E-01	1.91E-03	4.70E-01	1.62E-05	1.24E-03	5.10E-04	4.42E-04
Tillers	G4	5	Lawn and Garden Equip	1.12E+04	5.83E+02	8.87E+01	9.51E-03	2.40E-01	2.50E-03	4.42E-01	1.53E-05	1.10E-03	5.55E-04	5.40E-04
Trimmers/Edgers/Brush Cutters	G4	5	Lawn and Garden Equip	5.09E+03	2.65E+03	8.08E+01	1.05E-02	1.83E-01	4.59E-03	4.52E-01	1.56E-05	1.47E-04	1.62E-03	5.97E-04
Trimmers/Edgers/Brush Cutters	G4	5	Lawn and Garden Equip	2.37E+04	1.47E+03	5.16E+01	7.39E-03	1.40E-01	2.16E-03	2.50E-01	8.65E-06	3.56E-04	8.20E-04	4.20E-04
Leaf Blowers/Vacuums	G4	5	Lawn and Garden Equip	1.30E+03	3.09E+02	2.03E+01	1.50E-03	5.41E-02	3.61E-04	1.05E-01	3.64E-06	2.47E-04	1.53E-04	8.54E-05
Leaf Blowers/Vacuums	G4	5	Lawn and Garden Equip	1.12E+03	1.54E+01	1.16E+00	1.08E-04	3.51E-03	2.52E-05	5.26E-03	1.81E-07	1.04E-05	8.85E-06	6.11E-06
Rear Engine Riding Mowers	G4	15	Lawn and Garden Equip	1.53E+04	1.59E+04	5.23E+03	2.43E-01	1.51E+01	1.70E-01	2.57E+01	7.34E-04	1.19E-02	2.56E-02	1.38E-02
Rear Engine Riding Mowers	G4	15	Lawn and Garden Equip	1.34E+04	1.09E+03	3.61E+02	1.81E-02	1.05E+00	1.18E-02	1.76E+00	5.02E-05	7.02E-04	1.75E-03	1.03E-03
Rear Engine Riding Mowers	G4	25	Lawn and Garden Equip	6.99E+01	7.27E+01	4.65E+01	2.09E-03	1.39E-01	1.49E-03	2.22E-01	5.64E-06	1.03E-04	1.65E-04	1.18E-04
Rear Engine Riding Mowers	G4	25	Lawn and Garden Equip	6.03E+01	4.89E+00	3.15E+00	1.56E-04	9.43E-03	9.38E-05	1.50E-02	3.79E-07	5.96E-06	1.07E-05	8.89E-06
Front Mowers	G4	15	Lawn and Garden Equip	7.00E+02	7.29E+02	3.83E+02	1.78E-02	1.11E+00	1.25E-02	1.88E+00	5.37E-05	8.74E-04	1.51E-03	1.01E-03
Front Mowers	G4	15	Lawn and Garden Equip	2.26E+04	1.84E+03	9.74E+02	4.88E-02	2.84E+00	3.18E-02	4.75E+00	1.36E-04	1.89E-03	3.79E-03	2.77E-03
Front Mowers	G4	25	Lawn and Garden Equip	5.49E+02	5.71E+02	4.03E+02	1.81E-02	1.20E+00	1.29E-02	1.93E+00	4.89E-05	8.95E-04	1.37E-03	1.03E-03
Front Mowers	G4	25	Lawn and Garden Equip	1.77E+04	1.44E+03	1.02E+03	5.09E-02	3.07E+00	3.05E-02	4.87E+00	1.23E-04	1.94E-03	3.31E-03	2.89E-03
Shredders	G4	5	Lawn and Garden Equip	5.50E+02	2.86E+02	7.76E+01	1.01E-02	1.76E-01	4.41E-03	4.34E-01	1.50E-05	1.41E-04	5.59E-04	5.73E-04
Shredders	G4	5	Lawn and Garden Equip	2.05E+04	5.30E+01	1.81E+01	1.67E-03	5.57E-02	5.22E-04	8.03E-02	2.77E-06	1.61E-04	8.16E-05	9.47E-05

Lawn & Garden Tractors	G4	15	Lawn and Garden Equip	2.80E+03	1.38E+03	8.74E+02	3.41E-02	2.54E+00	2.42E-02	4.32E+00	1.23E-04	1.69E-03	2.89E-03	1.94E-03
Lawn & Garden Tractors	G4	15	Lawn and Garden Equip	1.82E+04	7.65E+02	4.88E+02	2.18E-02	1.42E+00	1.48E-02	2.39E+00	6.82E-05	8.69E-04	1.67E-03	1.24E-03
Lawn & Garden Tractors	G4	25	Lawn and Garden Equip	1.10E+03	5.45E+02	5.48E+02	2.12E-02	1.64E+00	1.43E-02	2.63E+00	6.67E-05	1.03E-03	1.42E-03	1.20E-03
Lawn & Garden Tractors	G4	25	Lawn and Garden Equip	7.18E+03	3.02E+02	3.06E+02	1.37E-02	9.17E-01	8.34E-03	1.46E+00	3.69E-05	5.30E-04	8.00E-04	7.77E-04
Lawn & Garden Tractors	G4	50	Lawn and Garden Equip	1.60E+01	4.49E+00	6.94E+00	1.32E-04	5.28E-03	2.53E-04	5.81E-02	7.07E-07	4.45E-06	1.64E-05	7.53E-06
Wood Splitters	G4	5	Lawn and Garden Equip	9.41E+02	4.64E+02	1.35E+02	1.43E-02	3.15E-01	3.52E-03	7.58E-01	2.62E-05	2.22E-03	6.19E-04	8.11E-04
Wood Splitters	G4	5	Lawn and Garden Equip	2.35E+04	7.45E+01	2.69E+01	2.07E-03	8.30E-02	5.43E-04	1.22E-01	4.20E-06	2.17E-04	9.48E-05	1.17E-04
Chippers/Stump Grinders	G4	15	Lawn and Garden Equip	1.33E+01	6.42E+01	5.42E+01	4.27E-03	1.57E-01	3.06E-03	2.61E-01	7.43E-06	2.19E-03	2.28E-04	2.39E-04
Chippers/Stump Grinders	G4	15	Lawn and Garden Equip	2.37E+01	1.13E+00	9.90E-01	7.34E-05	2.99E-03	3.62E-05	4.57E-03	1.30E-07	3.52E-05	3.26E-06	4.17E-06
Chippers/Stump Grinders	G4	25	Lawn and Garden Equip	7.53E+01	3.65E+02	5.20E+02	4.19E-02	1.55E+00	2.63E-02	2.42E+00	6.14E-05	2.03E-02	1.62E-03	2.34E-03
Chippers/Stump Grinders	G4	25	Lawn and Garden Equip	1.34E+02	6.37E+00	9.31E+00	6.58E-04	2.87E-02	3.04E-04	4.23E-02	1.07E-06	3.26E-04	2.27E-05	3.74E-05
Commercial Turf Equipment	G4	15	Lawn and Garden Equip	9.92E+02	3.04E+03	1.62E+03	9.25E-02	4.71E+00	6.41E-02	7.92E+00	2.26E-04	4.43E-03	7.01E-03	5.21E-03
Commercial Turf Equipment	G4	25	Lawn and Garden Equip	4.89E+02	1.50E+03	1.42E+03	7.66E-02	4.25E+00	5.69E-02	6.74E+00	1.71E-04	3.77E-03	4.73E-03	4.32E-03
Commercial Turf Equipment	G4	50	Lawn and Garden Equip	1.97E+02	3.90E+02	6.47E+02	1.80E-02	9.32E-01	2.75E-02	4.71E+00	5.73E-05	3.61E-04	1.65E-03	1.02E-03
Commercial Turf Equipment	G4	120	Lawn and Garden Equip	1.30E+00	2.58E+00	6.30E+00	2.82E-05	1.52E-03	1.64E-04	5.83E-02	5.63E-07	4.52E-06	1.07E-05	1.60E-06
Other Lawn & Garden Equipment	G4	5	Lawn and Garden Equip	8.71E+02	2.29E+02	4.68E+01	4.14E-03	1.17E-01	1.01E-03	2.52E-01	8.69E-06	6.61E-04	2.29E-04	2.35E-04
Other Lawn & Garden Equipment	G4	5	Lawn and Garden Equip	2.67E+04	3.31E+02	8.01E+01	7.26E-03	2.43E-01	1.73E-03	3.63E-01	1.25E-05	7.12E-04	3.52E-04	4.12E-04
Other Lawn & Garden Equipment	G4	15	Lawn and Garden Equip	3.87E+02	1.02E+02	4.53E+01	1.79E-03	1.31E-01	1.27E-03	2.23E-01	6.37E-06	8.87E-05	1.78E-04	1.01E-04
Other Lawn & Garden Equipment	G4	15	Lawn and Garden Equip	1.19E+04	1.47E+02	6.78E+01	3.41E-03	2.03E-01	2.06E-03	3.22E-01	9.19E-06	1.11E-04	2.72E-04	1.94E-04
Other Lawn & Garden Equipment	G4	25	Lawn and Garden Equip	8.17E+00	2.15E+00	2.09E+00	8.15E-05	6.26E-03	5.53E-05	1.00E-02	2.54E-07	3.98E-06	5.52E-06	4.63E-06
Other Lawn & Garden Equipment	G4	25	Lawn and Garden Equip	2.52E+02	3.12E+00	3.14E+00	1.55E-04	9.61E-03	8.43E-05	1.46E-02	3.69E-07	5.01E-06	8.19E-06	8.79E-06
Other Lawn & Garden Equipment	G4	50	Lawn and Garden Equip	5.92E-01	9.75E-02	2.09E-01	4.35E-06	1.54E-04	8.52E-06	1.76E-03	2.14E-08	1.35E-07	4.47E-07	2.47E-07
Other Lawn & Garden Equipment	G4	120	Lawn and Garden Equip	1.42E+00	2.34E-01	1.30E+00	1.78E-05	3.90E-04	7.95E-05	1.18E-02	1.14E-07	9.16E-07	2.19E-06	1.01E-06
2-Wheel Tractors	G4	5	Agricultural Equipment	3.94E+01	1.99E+01	4.09E+00	5.62E-04	8.91E-03	2.46E-04	2.33E-02	8.05E-07	7.60E-06	3.45E-05	3.19E-05
2-Wheel Tractors	G4	15	Agricultural Equipment	4.58E+01	4.79E+01	2.31E+01	1.74E-03	6.62E-02	1.25E-03	1.13E-01	3.21E-06	9.44E-04	1.24E-04	9.87E-05
2-Wheel Tractors	G4	25	Agricultural Equipment	1.23E+00	1.29E+00	1.28E+00	9.85E-05	3.77E-03	6.22E-05	6.04E-03	1.53E-07	5.06E-05	4.63E-06	5.60E-06
Agricultural Tractors	G4	120	Agricultural Equipment	1.54E+01	2.67E+01	1.34E+02	4.36E-03	7.80E-02	1.09E-02	1.16E+00	1.12E-05	8.96E-05	2.71E-04	2.47E-04
Agricultural Tractors	G4	175	Agricultural Equipment	2.11E+00	3.65E+00	2.60E+01	4.08E-04	8.81E-03	2.59E-03	2.35E-01	2.34E-06	1.87E-05	4.96E-05	2.31E-05
Combines	G4	120	Agricultural Equipment	3.85E+00	1.52E+00	1.06E+01	7.96E-05	2.24E-03	2.69E-04	9.88E-02	9.54E-07	7.65E-06	9.14E-06	4.52E-06
Combines	G4	175	Agricultural Equipment	2.14E+00	8.43E-01	9.26E+00	4.41E-05	2.71E-03	2.61E-04	8.50E-02	8.44E-07	6.77E-06	6.83E-06	2.50E-06
Combines	G4	250	Agricultural Equipment	3.95E-01	1.56E-01	1.97E+00	8.19E-06	5.91E-04	7.25E-05	1.80E-02	1.84E-07	1.48E-06	1.78E-06	4.65E-07
Balers	G4	50	Agricultural Equipment	5.62E+01	1.20E+01	2.42E+01	6.75E-04	1.97E-02	1.25E-03	2.00E-01	2.43E-06	1.53E-05	6.02E-05	3.83E-05
Balers	G4	120	Agricultural Equipment	2.87E+01	6.15E+00	2.05E+01	4.07E-04	7.46E-03	1.62E-03	1.85E-01	1.79E-06	1.43E-05	4.81E-05	2.31E-05
Agricultural Mowers	G4	15	Agricultural Equipment	4.09E+01	2.32E+01	8.74E+00	6.86E-04	2.52E-02	4.61E-04	4.22E-02	1.20E-06	3.54E-04	5.19E-05	3.90E-05
Agricultural Mowers	G4	25	Agricultural Equipment	3.35E+01	1.90E+01	1.65E+01	1.31E-03	4.89E-02	7.82E-04	7.76E-02	1.97E-06	6.51E-04	6.26E-05	7.44E-05
Sprayers	G4	5	Agricultural Equipment	1.55E+02	4.79E+01	8.02E+00	1.08E-03	1.78E-02	4.72E-04	4.54E-02	1.57E-06	1.48E-05	7.37E-05	6.13E-05
Sprayers	G4	15	Agricultural Equipment	4.83E+01	1.49E+01	5.49E+00	5.67E-04	1.66E-02	2.37E-04	2.47E-02	7.04E-07	1.99E-04	2.95E-05	3.22E-05
Sprayers	G4	25	Agricultural Equipment	1.25E+02	3.86E+01	3.47E+01	3.36E-03	1.06E-01	1.34E-03	1.55E-01	3.93E-06	1.25E-03	1.16E-04	1.91E-04
Sprayers	G4	50	Agricultural Equipment	1.06E+01	2.66E+00	4.61E+00	1.30E-04	3.81E-03	2.39E-04	3.80E-02	4.62E-07	2.91E-06	1.23E-05	7.40E-06
Sprayers	G4	120	Agricultural Equipment	1.78E+01	4.49E+00	1.45E+01	2.92E-04	5.35E-03	1.14E-03	1.30E-01	1.26E-06	1.01E-05	3.45E-05	1.66E-05
Sprayers	G4	175	Agricultural Equipment	4.02E+00	1.01E+00	6.43E+00	7.76E-05	1.86E-03	5.84E-04	5.89E-02	5.85E-07	4.69E-06	1.20E-05	4.41E-06
Tillers	G4	15	Agricultural Equipment	5.28E+03	1.18E+03	5.99E+02	5.08E-02	1.79E+00	2.37E-02	2.78E+00	7.93E-05	1.42E-03	2.63E-03	2.89E-03
Swathers	G4	120	Agricultural Equipment	5.76E+01	1.72E+01	7.50E+01	1.54E-03	2.82E-02	5.92E-03	6.73E-01	6.50E-06	5.22E-05	1.56E-04	8.75E-05
Swathers	G4	175	Agricultural Equipment	4.41E+01	1.32E+01	8.04E+01	9.80E-04	2.34E-02	7.32E-03	7.36E-01	7.31E-06	5.86E-05	1.54E-04	5.57E-05
Hydro Power Units	G4	5	Agricultural Equipment	9.36E+00	5.16E+00	1.19E+00	1.67E-04	2.56E-03	7.29E-05	6.84E-03	2.36E-07	2.23E-06	9.63E-06	9.47E-06
Hydro Power Units	G4	15	Agricultural Equipment	1.87E+01	2.73E+01	1.19E+01	9.22E-04	3.41E-02	6.64E-04	5.79E-02	1.65E-06	4.85E-04	6.81E-05	5.23E-05
Hydro Power Units	G4	25	Agricultural Equipment	7.12E+00	1.04E+01	9.95E+00	7.89E-04	2.93E-02	4.97E-04	4.69E-02	1.19E-06	3.93E-04	3.72E-05	4.47E-05
Hydro Power Units	G4	50	Agricultural Equipment	5.27E-01	7.47E-01	1.65E+00	1.84E-05	1.32E-03	2.62E-05	1.37E-02	1.67E-07	1.05E-06	2.25E-06	1.04E-06
Hydro Power Units	G4	120	Agricultural Equipment	6.59E-02	9.34E-02	3.16E-01	1.39E-06	6.19E-05	3.08E-06	2.95E-03	2.85E-08	2.28E-07	2.74E-07	7.86E-08
Other Agricultural Equipment	G4	5	Agricultural Equipment	6.52E+00	2.98E+00	5.49E-01	7.35E-05	1.22E-03	3.21E-05	3.10E-03	1.07E-07	1.01E-06	4.82E-06	4.18E-06
Other Agricultural Equipment	G4	15	Agricultural Equipment	5.70E+00	2.60E+00	1.41E+00	1.14E-04	4.10E-03	7.27E-05	6.78E-03	1.93E-07	5.68E-05	6.98E-06	6.45E-06
Other Agricultural Equipment	G4	25	Agricultural Equipment	1.45E+00	6.64E-01	9.24E-01	7.42E-05	2.74E-03	4.26E-05	4.32E-03	1.10E-07	3.62E-05	2.77E-06	4.21E-06
Other Agricultural Equipment	G4	50	Agricultural Equipment	1.75E+00	6.82E-01	1.13E+00	2.78E-05	9.01E-04	4.85E-05	9.39E-03	1.14E-07	7.19E-07	2.75E-06	1.58E-06
Other Agricultural Equipment	G4	120	Agricultural Equipment	1.01E+01	3.95E+00	1.37E+01	2.31E-04	4.51E-03	8.45E-04	1.24E-01	1.20E-06	9.63E-06	2.64E-05	1.31E-05
Other Agricultural Equipment	G4	175	Agricultural Equipment	1.15E+00	4.50E-01	3.06E+00	3.03E-05	8.95E-04	2.15E-04	2.80E-02	2.78E-07	2.23E-06	4.62E-06	1.72E-06
Other Agricultural Equipment	G4	250	Agricultural Equipment	4.28E-01	1.67E-01	2.00E+00	1.63E-05	6.02E-04	1.26E-04	1.83E-02	1.87E-07	1.50E-06	2.41E-06	9.26E-07
Generator Sets	G4	5	Light Commercial Equip	2.54E+03	7.25E+02	1.77E+02	3.18E-02	4.18E-01	7.28E-03	9.34E-01	3.23E-05	3.22E-03	1.11E-03	1.80E-03

Generator Sets	G4	5	Light Commercial Equip	1.99E+03	3.83E+02	9.94E+01	1.88E-02	2.51E-01	3.84E-03	4.94E-01	1.70E-05	1.68E-03	5.86E-04	1.07E-03
Generator Sets	G4	15	Light Commercial Equip	6.97E+03	1.99E+03	1.20E+03	8.29E-02	3.49E+00	5.08E-02	5.77E+00	1.65E-04	3.05E-03	5.06E-03	4.71E-03
Generator Sets	G4	15	Light Commercial Equip	5.47E+03	1.05E+03	6.63E+02	5.91E-02	1.99E+00	2.61E-02	3.05E+00	8.70E-05	1.59E-03	2.63E-03	3.36E-03
Generator Sets	G4	25	Light Commercial Equip	3.74E+03	1.07E+03	1.39E+03	9.30E-02	4.16E+00	5.57E-02	6.55E+00	1.66E-04	3.46E-03	3.98E-03	5.28E-03
Generator Sets	G4	25	Light Commercial Equip	2.94E+03	5.66E+02	7.59E+02	6.31E-02	2.31E+00	2.76E-02	3.46E+00	8.77E-05	1.81E-03	2.03E-03	3.58E-03
Generator Sets	G4	50	Light Commercial Equip	1.25E+03	3.05E+02	6.93E+02	1.64E-02	5.74E-01	3.06E-02	5.73E+00	6.96E-05	4.39E-04	1.52E-03	9.32E-04
Generator Sets	G4	120	Light Commercial Equip	2.41E+02	5.89E+01	3.14E+02	5.06E-03	1.08E-01	2.08E-02	2.84E+00	2.74E-05	2.20E-04	5.65E-04	2.88E-04
Generator Sets	G4	175	Light Commercial Equip	2.27E+01	5.56E+00	5.01E+01	4.77E-04	1.45E-02	3.73E-03	4.59E-01	4.56E-06	3.65E-05	7.48E-05	2.71E-05
Pumps	G4	5	Light Commercial Equip	8.99E+02	4.94E+02	8.24E+01	1.36E-02	1.65E-01	5.53E-03	4.84E-01	1.67E-05	3.22E-04	8.15E-04	7.72E-04
Pumps	G4	5	Light Commercial Equip	7.07E+02	2.61E+02	4.81E+01	8.99E-03	1.11E-01	2.75E-03	2.56E-01	8.84E-06	4.02E-04	4.15E-04	5.11E-04
Pumps	G4	15	Light Commercial Equip	9.75E+02	5.36E+02	2.89E+02	2.25E-02	8.28E-01	1.57E-02	1.40E+00	3.99E-05	1.17E-02	1.48E-03	1.28E-03
Pumps	G4	15	Light Commercial Equip	7.66E+02	2.83E+02	1.55E+02	1.30E-02	4.51E-01	8.01E-03	7.39E-01	2.11E-05	6.15E-03	7.64E-04	7.37E-04
Pumps	G4	25	Light Commercial Equip	2.50E+02	1.37E+02	1.61E+02	1.25E-02	4.75E-01	7.88E-03	7.62E-01	1.93E-05	6.39E-03	5.41E-04	7.10E-04
Pumps	G4	25	Light Commercial Equip	1.96E+02	7.25E+01	8.57E+01	6.77E-03	2.54E-01	4.05E-03	4.02E-01	1.02E-05	3.37E-03	2.81E-04	3.85E-04
Pumps	G4	50	Light Commercial Equip	9.96E+01	4.68E+01	1.05E+02	2.54E-03	9.01E-02	4.06E-03	8.65E-01	1.05E-05	6.62E-05	2.11E-04	1.44E-04
Pumps	G4	120	Light Commercial Equip	1.26E+02	5.94E+01	3.59E+02	5.82E-03	1.21E-01	1.92E-02	3.25E+00	3.14E-05	2.52E-04	4.94E-04	3.31E-04
Pumps	G4	175	Light Commercial Equip	3.80E+00	1.79E+00	1.61E+01	1.49E-04	4.83E-03	9.94E-04	1.48E-01	1.47E-06	1.18E-05	1.98E-05	8.49E-06
Air Compressors	G4	5	Light Commercial Equip	3.25E+02	3.91E+02	8.58E+01	1.38E-02	1.63E-01	6.04E-03	5.18E-01	1.79E-05	1.69E-04	7.66E-04	7.84E-04
Air Compressors	G4	5	Light Commercial Equip	2.55E+02	2.07E+02	4.53E+01	7.29E-03	8.62E-02	3.19E-03	2.74E-01	9.46E-06	8.93E-05	4.05E-04	4.14E-04
Air Compressors	G4	15	Light Commercial Equip	1.65E+02	1.98E+02	7.56E+01	5.92E-03	2.16E-01	4.27E-03	3.67E-01	1.05E-05	3.08E-03	4.63E-04	3.36E-04
Air Compressors	G4	15	Light Commercial Equip	1.29E+02	1.05E+02	3.99E+01	3.06E-03	1.14E-01	2.20E-03	1.94E-01	5.53E-06	1.63E-03	2.42E-04	1.74E-04
Air Compressors	G4	25	Light Commercial Equip	2.22E+01	2.67E+01	2.55E+01	2.05E-03	7.52E-02	1.29E-03	1.20E-01	3.05E-06	1.01E-03	9.61E-05	1.16E-04
Air Compressors	G4	25	Light Commercial Equip	1.74E+01	1.41E+01	1.35E+01	1.06E-03	3.97E-02	6.71E-04	6.36E-02	1.61E-06	5.33E-04	5.04E-05	6.04E-05
Air Compressors	G4	50	Light Commercial Equip	3.79E+01	3.90E+01	8.55E+01	3.18E-03	9.74E-02	4.13E-03	6.60E-01	8.02E-06	5.06E-05	1.99E-04	1.80E-04
Air Compressors	G4	120	Light Commercial Equip	1.23E+02	1.26E+02	4.83E+02	1.32E-02	2.44E-01	3.45E-02	4.23E+00	4.09E-05	3.28E-04	1.01E-03	7.50E-04
Air Compressors	G4	175	Light Commercial Equip	8.26E+00	8.51E+00	5.83E+01	7.90E-04	1.89E-02	5.01E-03	5.30E-01	5.27E-06	4.22E-05	1.02E-04	4.49E-05
Welders	G4	15	Light Commercial Equip	6.35E+02	2.81E+02	1.58E+02	1.38E-02	4.62E-01	8.09E-03	7.47E-01	2.13E-05	6.16E-03	7.66E-04	7.81E-04
Welders	G4	25	Light Commercial Equip	2.30E+03	1.02E+03	8.92E+02	7.28E-02	2.65E+00	4.22E-02	4.17E+00	1.06E-04	3.49E-02	3.37E-03	4.13E-03
Welders	G4	50	Light Commercial Equip	1.98E+02	8.76E+01	2.14E+02	6.30E-03	1.92E-01	1.01E-02	1.74E+00	2.11E-05	1.33E-04	4.63E-04	3.58E-04
Welders	G4	120	Light Commercial Equip	2.02E+02	8.94E+01	3.04E+02	6.37E-03	1.18E-01	2.12E-02	2.72E+00	2.63E-05	2.11E-04	6.51E-04	3.62E-04
Welders	G4	175	Light Commercial Equip	1.39E+01	6.16E+00	3.71E+01	4.30E-04	1.11E-02	3.01E-03	3.39E-01	3.37E-06	2.70E-05	6.59E-05	2.44E-05
Pressure Washers	G4	5	Light Commercial Equip	6.81E+02	1.95E+02	6.80E+01	1.03E-02	1.43E-01	2.90E-03	3.92E-01	1.35E-05	1.34E-03	3.68E-04	5.83E-04
Pressure Washers	G4	5	Light Commercial Equip	5.35E+02	1.03E+02	4.07E+01	7.44E-03	1.00E-01	1.60E-03	2.07E-01	7.15E-06	7.02E-04	1.99E-04	4.22E-04
Pressure Washers	G4	15	Light Commercial Equip	6.08E+02	1.74E+02	1.02E+02	7.03E-03	2.96E-01	4.31E-03	4.90E-01	1.40E-05	2.59E-04	4.35E-04	3.99E-04
Pressure Washers	G4	15	Light Commercial Equip	4.77E+02	9.19E+01	5.62E+01	5.02E-03	1.69E-01	2.21E-03	2.59E-01	7.38E-06	1.35E-04	2.26E-04	2.85E-04
Pressure Washers	G4	25	Light Commercial Equip	1.14E+02	3.26E+01	5.00E+01	3.17E-03	1.49E-01	1.99E-03	2.36E-01	5.99E-06	1.24E-04	1.32E-04	1.80E-04
Pressure Washers	G4	25	Light Commercial Equip	8.96E+01	1.72E+01	2.72E+01	2.15E-03	8.24E-02	1.00E-03	1.25E-01	3.17E-06	6.50E-05	6.78E-05	1.22E-04
Pressure Washers	G4	50	Light Commercial Equip	1.11E+01	2.73E+00	6.92E+00	1.51E-04	5.24E-03	2.63E-04	5.80E-02	7.05E-07	4.44E-06	1.29E-05	8.56E-06
Cargo Tractor	G4	120	Airport Ground Support	5.96E+01	2.21E+02	1.15E+03	2.20E-02	8.28E-01	5.98E-02	9.67E+00	7.98E-05	7.49E-04	1.88E-03	1.24E-03
A/C Tug Narrow Body	G4	175	Airport Ground Support	5.69E+00	1.13E+01	1.08E+02	1.30E-03	3.73E-02	8.23E-03	9.80E-01	9.73E-06	7.80E-05	1.60E-04	7.36E-05
A/C Tug Wide Body	G4	500	Airport Ground Support	1.87E+00	2.65E+00	9.36E+01	3.74E-04	2.98E-02	2.90E-03	8.55E-01	8.74E-06	7.01E-05	4.96E-05	2.12E-05
Air Conditioner	G4	175	Airport Ground Support	1.80E-01	1.08E-02	9.56E-02	7.45E-07	2.69E-05	6.13E-06	8.78E-04	8.72E-09	6.99E-08	1.33E-07	4.23E-08
Air Start Unit	G4	175	Airport Ground Support	4.13E+00	8.55E-01	9.05E+00	7.34E-05	2.59E-03	5.87E-04	8.30E-02	8.25E-07	6.61E-06	1.16E-05	4.17E-06
Baggage Tug	G4	120	Airport Ground Support	7.66E+01	1.84E+02	9.56E+02	5.67E-03	3.55E-01	2.83E-02	8.65E+00	8.36E-05	6.70E-04	1.22E-03	3.21E-04
Belt Loader	G4	120	Airport Ground Support	3.62E+01	8.05E+01	2.29E+02	1.57E-03	8.87E-02	7.23E-03	2.06E+00	1.99E-05	1.60E-04	3.96E-04	8.88E-05
Bobtail	G4	120	Airport Ground Support	1.23E+01	2.96E+01	1.54E+02	9.12E-04	5.70E-02	4.55E-03	1.39E+00	1.34E-05	1.08E-04	1.96E-04	5.15E-05
Cargo Loader	G4	120	Airport Ground Support	9.65E+00	1.90E+01	6.32E+01	5.12E-04	2.47E-02	2.16E-03	5.69E-01	5.50E-06	4.41E-05	1.05E-04	2.90E-05
Cart	G4	15	Airport Ground Support	3.29E+00	1.35E+00	7.82E-01	4.07E-05	2.26E-03	2.85E-05	3.84E-03	1.10E-07	1.94E-06	3.12E-06	2.31E-06
Deicer	G4	120	Airport Ground Support	4.67E+00	2.82E-01	2.32E+00	2.88E-05	6.46E-04	1.37E-04	2.13E-02	2.06E-07	1.65E-06	3.18E-06	1.64E-06
Forklift	G4	50	Airport Ground Support	9.12E+00	1.82E+01	2.96E+01	3.78E-04	3.11E-02	7.51E-04	2.35E-01	2.86E-06	1.80E-05	5.94E-05	2.14E-05
Fuel Truck	G4	175	Airport Ground Support	5.64E+00	3.40E-01	1.00E+00	8.04E-06	2.81E-04	6.64E-05	9.19E-03	9.13E-08	7.32E-07	2.36E-06	4.57E-07
Ground Power Unit	G4	175	Airport Ground Support	7.18E+00	1.57E+01	1.60E+02	5.78E-04	5.05E-02	4.49E-03	1.47E+00	1.46E-05	1.17E-04	1.45E-04	3.27E-05
Lav Cart	G4	15	Airport Ground Support	2.84E-01	1.17E-01	6.77E-02	3.52E-06	1.96E-04	2.47E-06	3.33E-04	9.48E-09	1.67E-07	2.70E-07	2.00E-07
Lav Truck	G4	175	Airport Ground Support	8.78E+00	2.92E+01	8.70E+01	7.13E-04	3.11E-02	3.81E-03	7.88E-01	7.83E-06	6.28E-05	1.70E-04	4.01E-05
Lift	G4	120	Airport Ground Support	1.60E+01	1.65E+01	7.94E+01	1.55E-03	3.48E-02	5.02E-03	7.05E-01	6.81E-06	5.46E-05	1.47E-04	8.78E-05
Maint. Truck	G4	175	Airport Ground Support	1.12E+01	1.39E+01	8.20E+01	6.76E-04	2.60E-02	4.61E-03	7.48E-01	7.43E-06	5.96E-05	1.30E-04	3.83E-05
Other GSE	G4	50	Airport Ground Support	1.66E+01	8.34E+00	2.20E+01	5.16E-04	1.94E-02	9.13E-04	1.80E-01	2.19E-06	1.38E-05	4.36E-05	2.93E-05

Passenger Stand	G4	175	Airport Ground Support	7.66E+00	3.94E+00	2.64E+01	2.36E-04	7.81E-03	1.80E-03	2.41E-01	2.14E-06	1.92E-05	4.32E-05	1.34E-05
Sweeper	G4	120	Airport Ground Support	7.38E-01	7.33E-01	1.91E+00	3.66E-05	8.27E-04	1.20E-04	1.70E-02	1.40E-07	1.32E-06	4.69E-06	2.08E-06
Generator	G4	120	Airport Ground Support	4.61E-01	1.14E+00	9.55E+00	2.77E-04	6.34E-03	6.56E-04	8.12E-02	6.70E-07	6.29E-06	1.43E-05	1.57E-05
Service Truck	G4	250	Airport Ground Support	3.24E+01	7.47E+01	2.40E+02	3.13E-03	8.79E-02	1.92E-02	2.17E+00	2.22E-05	1.78E-04	6.05E-04	1.77E-04
Catering Truck	G4	250	Airport Ground Support	6.53E+00	1.82E+01	1.73E+02	2.43E-03	6.62E-02	1.42E-02	1.56E+00	1.36E-05	1.28E-04	2.67E-04	1.37E-04
Water Truck	G4	175	Airport Ground Support	2.85E+00	2.42E+00	6.60E+00	6.36E-05	2.03E-03	4.62E-04	6.03E-02	5.99E-07	4.80E-06	1.67E-05	3.61E-06
Hydrant truck	G4	175	Airport Ground Support	5.47E+00	2.29E+01	1.81E+02	3.01E-03	7.63E-02	1.58E-02	1.62E+00	1.38E-05	1.29E-04	3.14E-04	1.69E-04
Transport Refrigeration Units	G4	15	Transport Refrigeration	4.16E+02	8.57E+02	4.98E+02	2.80E-02	1.44E+00	1.94E-02	2.43E+00	6.94E-05	1.36E-03	2.06E-03	1.59E-03
Aerial Lifts	C4	15	Industrial Equipment	1.39E+00	1.64E+00	1.31E+00	3.04E-06	1.18E-03	3.21E-05	7.28E-03	0.00E+00	3.34E-06	0.00E+00	2.55E-05
Aerial Lifts	C4	25	Industrial Equipment	5.95E+01	7.02E+01	8.36E+01	2.94E-04	7.77E-02	2.14E-03	4.56E-01	0.00E+00	2.35E-04	0.00E+00	2.46E-03
Forklifts	C4	25	Industrial Equipment	5.84E-01	2.30E+00	2.25E+00	1.43E-05	2.26E-03	6.32E-05	1.18E-02	0.00E+00	7.77E-06	0.00E+00	1.20E-04
Forklifts	C4	50	Industrial Equipment	3.96E+02	2.24E+03	2.99E+03	2.36E-03	3.30E-01	1.01E-01	2.05E+01	0.00E+00	1.82E-03	0.00E+00	1.98E-02
Forklifts	C4	120	Industrial Equipment	1.39E+03	7.87E+03	1.87E+04	1.42E-02	5.56E+00	6.36E-01	1.23E+02	0.00E+00	1.09E-02	0.00E+00	1.19E-01
Forklifts	C4	175	Industrial Equipment	5.08E+01	2.88E+02	1.41E+03	6.96E-04	3.26E-01	3.41E-02	9.38E+00	0.00E+00	8.34E-04	0.00E+00	5.84E-03
Generator Sets	C4	120	Light Commercial Equip	1.79E+01	4.38E+00	2.75E+01	2.02E-05	5.78E-03	1.33E-03	1.84E-01	0.00E+00	1.64E-05	0.00E+00	1.69E-04
Generator Sets	C4	175	Light Commercial Equip	1.48E+01	3.63E+00	3.97E+01	2.31E-05	6.93E-03	1.92E-03	2.68E-01	0.00E+00	2.39E-05	0.00E+00	1.94E-04
Gas Compressors	C4	50	Light Commercial Equip	2.78E+00	6.48E+01	2.22E+02	1.26E-04	2.23E-02	4.58E-03	1.52E+00	0.00E+00	1.17E-04	0.00E+00	1.06E-03
Gas Compressors	C4	120	Light Commercial Equip	5.75E+00	1.34E+02	1.30E+03	6.88E-04	3.57E-01	2.71E-02	8.55E+00	0.00E+00	6.63E-04	0.00E+00	5.77E-03
Gas Compressors	C4	175	Light Commercial Equip	9.28E-01	2.16E+01	3.33E+02	1.92E-04	7.27E-02	7.25E-03	2.23E+00	0.00E+00	1.77E-04	0.00E+00	1.61E-03
Gas Compressors	C4	250	Light Commercial Equip	7.42E-01	1.73E+01	3.45E+02	1.48E-04	8.37E-02	7.02E-03	2.29E+00	0.00E+00	2.04E-04	0.00E+00	1.24E-03
Gas Compressors	C4	500	Light Commercial Equip	6.49E-01	1.51E+01	4.86E+02	2.08E-04	1.18E-01	9.88E-03	3.23E+00	0.00E+00	2.87E-04	0.00E+00	1.74E-03
Cargo Tractor	C4	175	Airport Ground Support	6.46E+00	2.76E+00	2.56E+01	1.38E-05	4.52E-03	1.13E-03	1.72E-01	0.00E+00	1.53E-05	0.00E+00	1.16E-04
Air Conditioner	C4	175	Airport Ground Support	1.08E+00	6.50E-02	6.97E-01	3.41E-07	1.16E-04	3.00E-05	4.72E-03	0.00E+00	4.19E-07	0.00E+00	2.86E-06
Baggage Tug	C4	120	Airport Ground Support	1.53E+01	3.47E+01	2.17E+02	3.09E-04	6.25E-02	1.16E-02	1.42E+00	0.00E+00	1.26E-04	0.00E+00	2.59E-03
Belt Loader	C4	120	Airport Ground Support	4.06E+00	6.14E+00	2.07E+01	2.34E-05	5.34E-03	1.03E-03	1.37E-01	0.00E+00	1.22E-05	0.00E+00	1.96E-04
Bobtail	C4	120	Airport Ground Support	3.48E-01	8.38E-01	5.15E+00	1.95E-06	1.23E-03	1.18E-04	3.43E-02	0.00E+00	3.05E-06	0.00E+00	1.63E-05
Cargo Loader	C4	120	Airport Ground Support	1.64E+00	4.64E+00	1.86E+01	3.03E-05	5.74E-03	1.04E-03	1.21E-01	0.00E+00	1.07E-05	0.00E+00	2.54E-04
Forklift	C4	50	Airport Ground Support	2.13E+01	4.25E+01	6.87E+01	2.34E-05	5.87E-03	1.67E-03	4.75E-01	0.00E+00	4.22E-05	0.00E+00	1.96E-04
Fuel Truck	C4	175	Airport Ground Support	7.16E-01	1.11E+00	4.31E+00	2.98E-06	8.91E-04	2.07E-04	2.89E-02	0.00E+00	2.57E-06	0.00E+00	2.50E-05
Lav Truck	C4	175	Airport Ground Support	6.42E-01	6.81E-01	2.45E+00	1.53E-06	4.75E-04	1.14E-04	1.65E-02	0.00E+00	1.46E-06	0.00E+00	1.28E-05
Lift	C4	120	Airport Ground Support	6.00E-01	5.61E-01	3.14E+00	2.84E-06	7.36E-04	1.48E-04	2.09E-02	0.00E+00	1.86E-06	0.00E+00	2.38E-05
Other	C4	50	Airport Ground Support	3.14E+00	8.76E+00	2.39E+01	3.75E-05	2.74E-03	1.58E-03	1.63E-01	0.00E+00	1.45E-05	0.00E+00	3.14E-04
Passenger Stand	C4	175	Airport Ground Support	2.77E-01	9.11E-03	9.75E-02	4.73E-08	1.62E-05	4.19E-06	6.60E-04	0.00E+00	5.87E-08	0.00E+00	3.97E-07
Sweeper	C4	50	Airport Ground Support	2.77E-01	2.11E-01	5.23E-01	3.49E-07	4.32E-05	2.56E-05	3.60E-03	0.00E+00	3.21E-07	0.00E+00	2.92E-06
Service Truck	C4	250	Airport Ground Support	3.17E+00	1.13E+01	4.55E+01	3.14E-05	1.07E-02	1.63E-03	3.03E-01	0.00E+00	2.69E-05	0.00E+00	2.63E-04
Catering Truck	C4	250	Airport Ground Support	1.21E+00	1.50E+00	1.78E+01	1.15E-05	3.53E-03	8.36E-04	1.19E-01	0.00E+00	1.06E-05	0.00E+00	9.67E-05
Pavers	D	25	Construction and Minin	1.67E+00	4.32E+00	3.67E+00	5.33E-05	1.73E-04	3.24E-04	4.03E-02	5.12E-07	1.62E-05	0.00E+00	4.81E-06
Pavers	D	50	Construction and Minin	9.73E+01	2.55E+02	3.34E+02	1.74E-02	4.58E-02	3.76E-02	3.57E+00	4.61E-05	3.93E-03	0.00E+00	1.57E-03
Pavers	D	120	Construction and Minin	1.15E+02	3.01E+02	9.55E+02	2.09E-02	7.60E-02	1.26E-01	1.04E+01	1.22E-04	1.10E-02	0.00E+00	1.89E-03
Pavers	D	175	Construction and Minin	7.13E+01	1.87E+02	1.10E+03	1.66E-02	7.27E-02	1.29E-01	1.20E+01	1.35E-04	7.20E-03	0.00E+00	1.50E-03
Pavers	D	250	Construction and Minin	8.59E+00	2.25E+01	1.99E+02	2.33E-03	6.84E-03	2.19E-02	2.19E+00	2.46E-05	8.50E-04	0.00E+00	2.10E-04
Pavers	D	500	Construction and Minin	8.81E+00	2.31E+01	2.45E+02	2.63E-03	1.07E-02	2.44E-02	2.69E+00	2.64E-05	9.44E-04	0.00E+00	2.37E-04
Plate Compactors	D	15	Construction and Minin	3.59E+01	6.79E+01	1.34E+01	1.70E-04	8.93E-04	1.07E-03	1.46E-01	2.28E-06	4.18E-05	0.00E+00	1.54E-05
Rollers	D	15	Construction and Minin	6.75E+01	1.48E+02	4.26E+01	5.43E-04	2.85E-03	3.40E-03	4.66E-01	7.25E-06	1.32E-04	0.00E+00	4.90E-05
Rollers	D	25	Construction and Minin	2.82E+01	6.18E+01	3.75E+01	4.98E-04	1.69E-03	3.16E-03	4.12E-01	5.22E-06	1.26E-04	0.00E+00	4.49E-05
Rollers	D	50	Construction and Minin	8.78E+01	1.94E+02	2.34E+02	9.94E-03	2.82E-02	2.50E-02	2.52E+00	3.25E-05	2.37E-03	0.00E+00	8.97E-04
Rollers	D	120	Construction and Minin	4.71E+02	1.04E+03	2.81E+03	5.14E-02	2.11E-01	3.25E-01	3.07E+01	3.60E-04	2.78E-02	0.00E+00	4.64E-03
Rollers	D	175	Construction and Minin	1.90E+02	4.19E+02	2.06E+03	2.61E-02	1.30E-01	2.12E-01	2.26E+01	2.54E-04	1.15E-02	0.00E+00	2.36E-03
Rollers	D	250	Construction and Minin	2.69E+01	5.94E+01	4.12E+02	3.75E-03	1.15E-02	3.90E-02	4.54E+00	5.11E-05	1.34E-03	0.00E+00	3.38E-04
Rollers	D	500	Construction and Minin	1.89E+01	4.16E+01	4.14E+02	3.44E-03	1.31E-02	3.50E-02	4.56E+00	4.47E-05	1.23E-03	0.00E+00	3.10E-04
Scrapers	D	120	Construction and Minin	4.35E+00	1.52E+01	6.56E+01	1.43E-03	5.29E-03	8.48E-03	7.15E-01	8.38E-06	7.50E-04	0.00E+00	1.29E-04
Scrapers	D	175	Construction and Minin	3.98E+01	1.39E+02	9.43E+02	1.44E-02	6.34E-02	1.09E-01	1.03E+01	1.16E-04	6.17E-03	0.00E+00	1.30E-03
Scrapers	D	250	Construction and Minin	3.88E+01	1.36E+02	1.29E+03	1.53E-02	4.35E-02	1.39E-01	1.42E+01	1.60E-04	5.37E-03	0.00E+00	1.38E-03
Scrapers	D	500	Construction and Minin	1.07E+02	3.74E+02	5.47E+03	5.95E-02	2.26E-01	5.29E-01	6.01E+01	5.90E-04	2.05E-02	0.00E+00	5.37E-03
Scrapers	D	750	Construction and Minin	4.28E+00	1.50E+01	3.78E+02	4.13E-03	1.56E-02	3.73E-02	4.15E+00	4.18E-05	1.43E-03	0.00E+00	3.73E-04
Paving Equipment	D	25	Construction and Minin	2.90E+00	7.57E+00	4.35E+00	5.78E-05	1.97E-04	3.66E-04	4.78E-02	6.06E-07	1.47E-05	0.00E+00	5.21E-06
Paving Equipment	D	50	Construction and Minin	2.45E+00	6.46E+00	7.23E+00	3.77E-04	9.85E-04	8.11E-04	7.72E-02	9.98E-07	8.50E-05	0.00E+00	3.40E-05

Paving Equipment	D	120	Construction and Minin	3.54E+01	9.31E+01	2.33E+02	5.07E-03	1.84E-02	3.05E-02	2.53E+00	2.97E-05	2.67E-03	0.00E+00	4.57E-04
Paving Equipment	D	175	Construction and Minin	1.66E+01	4.38E+01	2.02E+02	3.04E-03	1.33E-02	2.37E-02	2.21E+00	2.48E-05	1.32E-03	0.00E+00	2.74E-04
Paving Equipment	D	250	Construction and Minin	4.69E+00	1.23E+01	6.85E+01	7.87E-04	2.32E-03	7.53E-03	7.53E-01	8.48E-06	2.88E-04	0.00E+00	7.10E-05
Surfacing Equipment	D	50	Construction and Minin	2.23E+00	3.18E+00	2.08E+00	7.58E-05	2.23E-04	2.16E-04	2.24E-02	2.90E-07	1.89E-05	0.00E+00	6.84E-06
Surfacing Equipment	D	120	Construction and Minin	4.46E-01	6.36E-01	1.85E+00	3.09E-05	1.34E-04	2.07E-04	2.03E-02	2.38E-07	1.64E-05	0.00E+00	2.79E-06
Surfacing Equipment	D	175	Construction and Minin	3.35E-01	4.77E-01	1.86E+00	2.13E-05	1.13E-04	1.85E-04	2.04E-02	2.30E-07	9.35E-06	0.00E+00	1.93E-06
Surfacing Equipment	D	250	Construction and Minin	6.69E-01	9.54E-01	5.83E+00	4.88E-05	1.61E-04	5.33E-04	6.43E-02	7.23E-07	1.79E-05	0.00E+00	4.41E-06
Surfacing Equipment	D	500	Construction and Minin	5.58E+00	7.95E+00	7.97E+01	6.08E-04	2.54E-03	6.59E-03	8.78E-01	8.62E-06	2.25E-04	0.00E+00	5.49E-05
Surfacing Equipment	D	750	Construction and Minin	8.17E-01	1.16E+00	1.83E+01	1.42E-04	5.85E-04	1.55E-03	2.02E-01	2.03E-06	5.24E-05	0.00E+00	1.28E-05
Signal Boards	D	15	Construction and Minin	3.14E+02	7.41E+02	2.09E+02	2.66E-03	1.40E-02	1.67E-02	2.29E+00	3.56E-05	6.50E-04	0.00E+00	2.40E-04
Signal Boards	D	50	Construction and Minin	1.56E+00	2.63E+00	4.40E+00	1.52E-04	4.54E-04	4.49E-04	4.76E-02	6.15E-07	3.90E-05	0.00E+00	1.37E-05
Signal Boards	D	120	Construction and Minin	2.55E+01	4.30E+01	1.58E+02	2.53E-03	1.12E-02	1.68E-02	1.72E+00	2.02E-05	1.39E-03	0.00E+00	2.29E-04
Signal Boards	D	175	Construction and Minin	1.58E+01	2.67E+01	1.88E+02	2.05E-03	1.11E-02	1.78E-02	2.06E+00	2.32E-05	9.15E-04	0.00E+00	1.85E-04
Signal Boards	D	250	Construction and Minin	3.35E+00	5.64E+00	6.51E+01	4.60E-04	1.51E-03	5.63E-03	7.19E-01	8.09E-06	1.63E-04	0.00E+00	4.15E-05
Trenchers	D	15	Construction and Minin	8.37E+00	1.63E+01	6.29E+00	8.01E-05	4.20E-04	5.02E-04	6.88E-02	1.07E-06	1.96E-05	0.00E+00	7.23E-06
Trenchers	D	25	Construction and Minin	8.81E+00	1.71E+01	2.57E+01	3.40E-04	1.16E-03	2.15E-03	2.82E-01	3.58E-06	8.34E-05	0.00E+00	3.07E-05
Trenchers	D	50	Construction and Minin	3.35E+02	6.66E+02	1.03E+03	5.22E-02	1.36E-01	1.14E-01	1.10E+01	1.42E-04	1.18E-02	0.00E+00	4.71E-03
Trenchers	D	120	Construction and Minin	4.55E+02	9.03E+02	2.69E+03	5.79E-02	2.11E-01	3.55E-01	2.93E+01	3.43E-04	3.02E-02	0.00E+00	5.22E-03
Trenchers	D	175	Construction and Minin	4.98E+01	9.88E+01	6.49E+02	9.67E-03	4.26E-02	7.67E-02	7.11E+00	7.99E-05	4.20E-03	0.00E+00	8.72E-04
Trenchers	D	250	Construction and Minin	4.46E+00	8.86E+00	8.97E+01	1.04E-03	3.13E-03	9.96E-03	9.87E-01	1.11E-05	3.89E-04	0.00E+00	9.40E-05
Trenchers	D	500	Construction and Minin	5.69E+00	1.13E+01	1.60E+02	1.68E-03	7.33E-03	1.61E-02	1.76E+00	1.73E-05	6.23E-04	0.00E+00	1.52E-04
Trenchers	D	750	Construction and Minin	1.63E-01	3.25E-01	8.66E+00	9.19E-05	3.97E-04	8.87E-04	9.52E-02	9.57E-07	3.41E-05	0.00E+00	8.29E-06
Bore/Drill Rigs	D	15	Construction and Minin	1.12E+00	2.85E+00	1.34E+00	1.71E-05	8.99E-05	1.07E-04	1.47E-02	2.29E-07	4.16E-06	0.00E+00	1.55E-06
Bore/Drill Rigs	D	25	Construction and Minin	3.35E+00	8.54E+00	6.22E+00	8.25E-05	2.81E-04	5.23E-04	6.82E-02	8.66E-07	2.10E-05	0.00E+00	7.45E-06
Bore/Drill Rigs	D	50	Construction and Minin	1.46E+01	3.88E+01	5.50E+01	5.60E-04	4.42E-03	4.97E-03	6.01E-01	7.77E-06	2.32E-04	0.00E+00	5.05E-05
Bore/Drill Rigs	D	120	Construction and Minin	4.48E+01	1.19E+02	4.18E+02	2.65E-03	2.79E-02	2.72E-02	4.58E+00	5.38E-05	1.53E-03	0.00E+00	2.39E-04
Bore/Drill Rigs	D	175	Construction and Minin	1.04E+01	2.75E+01	1.77E+02	9.67E-04	1.04E-02	9.53E-03	1.94E+00	2.18E-05	4.15E-04	0.00E+00	8.73E-05
Bore/Drill Rigs	D	250	Construction and Minin	8.93E+00	2.37E+01	2.01E+02	9.39E-04	4.06E-03	9.02E-03	2.23E+00	2.50E-05	2.61E-04	0.00E+00	8.48E-05
Bore/Drill Rigs	D	500	Construction and Minin	1.99E+01	5.27E+01	7.41E+02	3.41E-03	1.45E-02	3.08E-02	8.19E+00	8.04E-05	9.49E-04	0.00E+00	3.07E-04
Bore/Drill Rigs	D	750	Construction and Minin	2.53E+00	6.72E+00	1.87E+02	8.62E-04	3.66E-03	7.85E-03	2.07E+00	2.08E-05	2.40E-04	0.00E+00	7.77E-05
Bore/Drill Rigs	D	1000	Construction and Minin	4.25E+00	7.63E+00	3.20E+02	1.59E-03	6.36E-03	2.27E-02	3.54E+00	3.56E-05	5.89E-04	0.00E+00	1.43E-04
Excavators	D	25	Construction and Minin	4.13E+00	1.81E+01	1.36E+01	1.80E-04	6.13E-04	1.14E-03	1.49E-01	1.89E-06	4.25E-05	0.00E+00	1.62E-05
Excavators	D	50	Construction and Minin	1.55E+02	6.96E+02	8.08E+02	2.84E-02	9.88E-02	8.55E-02	8.69E+00	1.12E-04	7.39E-03	0.00E+00	2.57E-03
Excavators	D	120	Construction and Minin	4.22E+02	1.89E+03	6.36E+03	1.03E-01	4.89E-01	6.42E-01	6.95E+01	8.15E-04	5.55E-02	0.00E+00	9.28E-03
Excavators	D	175	Construction and Minin	8.14E+02	3.64E+03	1.87E+04	2.20E-01	1.21E+00	1.63E+00	2.04E+02	2.30E-03	9.35E-02	0.00E+00	1.99E-02
Excavators	D	250	Construction and Minin	3.31E+02	1.48E+03	1.07E+04	9.20E-02	2.62E-01	8.43E-01	1.17E+02	1.32E-03	2.76E-02	0.00E+00	8.31E-03
Excavators	D	500	Construction and Minin	2.39E+02	1.07E+03	1.13E+04	9.27E-02	2.81E-01	7.89E-01	1.25E+02	1.23E-03	2.76E-02	0.00E+00	8.36E-03
Excavators	D	750	Construction and Minin	1.28E+00	5.73E+00	1.01E+02	8.29E-04	2.50E-03	7.23E-03	1.11E+00	1.12E-05	2.49E-04	0.00E+00	7.48E-05
Concrete/Industrial Saws	D	25	Construction and Minin	4.46E-01	8.32E-01	6.24E-01	8.26E-06	2.82E-05	5.22E-05	6.85E-03	8.69E-08	2.03E-06	0.00E+00	7.45E-07
Concrete/Industrial Saws	D	50	Construction and Minin	3.90E+00	7.13E+00	9.96E+00	3.41E-04	1.04E-03	1.02E-03	1.08E-01	1.39E-06	8.80E-05	0.00E+00	3.08E-05
Concrete/Industrial Saws	D	120	Construction and Minin	6.81E+00	1.24E+01	4.21E+01	6.63E-04	3.00E-03	4.45E-03	4.60E-01	5.40E-06	3.67E-04	0.00E+00	5.98E-05
Concrete/Industrial Saws	D	175	Construction and Minin	2.23E-01	4.07E-01	2.97E+00	3.20E-05	1.77E-04	2.77E-04	3.26E-02	3.67E-07	1.44E-05	0.00E+00	2.89E-06
Cement and Mortar Mixers	D	15	Construction and Minin	5.70E+01	5.38E+01	1.55E+01	2.00E-04	1.04E-03	1.26E-03	1.70E-01	2.65E-06	5.74E-05	0.00E+00	1.81E-05
Cement and Mortar Mixers	D	25	Construction and Minin	5.13E+00	4.85E+00	3.88E+00	6.54E-05	1.97E-04	3.66E-04	4.25E-02	5.39E-07	2.01E-05	0.00E+00	5.90E-06
Cranes	D	50	Construction and Minin	3.79E+00	1.53E+01	1.66E+01	7.77E-04	2.21E-03	1.83E-03	1.77E-01	2.29E-06	1.83E-04	0.00E+00	7.01E-05
Cranes	D	120	Construction and Minin	4.16E+01	1.68E+02	3.86E+02	7.72E-03	3.03E-02	4.62E-02	4.20E+00	4.93E-05	4.14E-03	0.00E+00	6.96E-04
Cranes	D	175	Construction and Minin	4.16E+01	1.68E+02	6.15E+02	8.66E-03	4.04E-02	6.52E-02	6.73E+00	7.58E-05	3.74E-03	0.00E+00	7.81E-04
Cranes	D	250	Construction and Minin	8.07E+01	3.25E+02	1.65E+03	1.69E-02	4.78E-02	1.62E-01	1.82E+01	2.05E-04	5.70E-03	0.00E+00	1.52E-03
Cranes	D	500	Construction and Minin	2.96E+01	1.19E+02	9.73E+02	9.23E-03	3.15E-02	8.48E-02	1.07E+01	1.05E-04	3.08E-03	0.00E+00	8.33E-04
Cranes	D	750	Construction and Minin	5.31E+00	2.14E+01	2.94E+02	2.81E-03	9.51E-03	2.63E-02	3.24E+00	3.26E-05	9.46E-04	0.00E+00	2.53E-04
Cranes	D	9999	Construction and Minin	6.67E+00	1.82E+01	8.03E+02	8.64E-03	3.03E-02	9.43E-02	8.83E+00	8.88E-05	2.90E-03	0.00E+00	7.79E-04
Graders	D	50	Construction and Minin	1.56E+00	4.67E+00	5.99E+00	2.53E-04	7.63E-04	6.48E-04	6.43E-02	8.31E-07	6.13E-05	0.00E+00	2.28E-05
Graders	D	120	Construction and Minin	1.04E+02	3.12E+02	1.07E+03	1.96E-02	8.27E-02	1.21E-01	1.17E+01	1.37E-04	1.06E-02	0.00E+00	1.77E-03
Graders	D	175	Construction and Minin	3.56E+02	1.07E+03	6.02E+03	7.83E-02	3.91E-01	5.97E-01	6.59E+01	7.42E-04	3.37E-02	0.00E+00	7.06E-03
Graders	D	250	Construction and Minin	2.21E+02	6.61E+02	5.16E+03	4.93E-02	1.43E-01	4.69E-01	5.68E+01	6.39E-04	1.63E-02	0.00E+00	4.45E-03
Graders	D	500	Construction and Minin	6.25E+00	1.87E+01	1.94E+02	1.73E-03	5.87E-03	1.57E-02	2.14E+00	2.10E-05	5.68E-04	0.00E+00	1.56E-04
Graders	D	750	Construction and Minin	8.17E-02	2.45E-01	5.38E+00	4.83E-05	1.62E-04	4.48E-04	5.93E-02	5.97E-07	1.60E-05	0.00E+00	4.35E-06

Off-Highway Trucks	D	175	Construction and Minin	7.25E+00	4.54E+01	2.59E+02	3.28E-03	1.72E-02	2.34E-02	2.84E+00	3.19E-05	1.37E-03	0.00E+00	2.96E-04
Off-Highway Trucks	D	250	Construction and Minin	5.36E+01	3.35E+02	2.53E+03	2.34E-02	6.42E-02	2.08E-01	2.79E+01	3.14E-04	6.91E-03	0.00E+00	2.12E-03
Off-Highway Trucks	D	500	Construction and Minin	7.54E+01	4.72E+02	5.82E+03	5.12E-02	1.50E-01	4.22E-01	6.42E+01	6.30E-04	1.49E-02	0.00E+00	4.62E-03
Off-Highway Trucks	D	750	Construction and Minin	1.71E+01	1.07E+02	2.15E+03	1.90E-02	5.53E-02	1.60E-01	2.37E+01	2.38E-04	5.60E-03	0.00E+00	1.71E-03
Off-Highway Trucks	D	1000	Construction and Minin	8.04E+00	3.40E+01	9.64E+02	9.33E-03	2.84E-02	1.02E-01	1.06E+01	1.07E-04	3.05E-03	0.00E+00	8.42E-04
Crushing/Proc. Equipment	D	50	Construction and Minin	1.79E+01	5.37E+01	1.10E+02	4.68E-03	1.34E-02	1.17E-02	1.18E+00	1.53E-05	1.13E-03	0.00E+00	4.22E-04
Crushing/Proc. Equipment	D	120	Construction and Minin	5.03E+01	1.51E+02	5.76E+02	1.06E-02	4.36E-02	6.47E-02	6.28E+00	7.37E-05	5.90E-03	0.00E+00	9.59E-04
Crushing/Proc. Equipment	D	175	Construction and Minin	2.13E+01	6.41E+01	4.89E+02	6.23E-03	3.08E-02	4.88E-02	5.35E+00	6.02E-05	2.77E-03	0.00E+00	5.62E-04
Crushing/Proc. Equipment	D	250	Construction and Minin	2.12E+00	6.37E+00	7.06E+01	5.89E-04	1.73E-03	6.44E-03	7.78E-01	8.76E-06	1.98E-04	0.00E+00	5.31E-05
Crushing/Proc. Equipment	D	500	Construction and Minin	1.19E+01	3.59E+01	6.07E+02	4.68E-03	1.52E-02	4.86E-02	6.70E+00	6.57E-05	1.58E-03	0.00E+00	4.22E-04
Crushing/Proc. Equipment	D	750	Construction and Minin	1.36E-01	4.09E-01	1.09E+01	8.48E-05	2.70E-04	9.09E-04	1.20E-01	1.21E-06	2.90E-05	0.00E+00	7.65E-06
Crushing/Proc. Equipment	D	9999	Construction and Minin	1.36E-01	4.09E-01	2.43E+01	2.31E-04	7.52E-04	2.72E-03	2.68E-01	2.69E-06	7.94E-05	0.00E+00	2.08E-05
Rough Terrain Forklifts	D	50	Construction and Minin	1.24E+01	4.41E+01	6.94E+01	2.61E-03	8.34E-03	7.32E-03	7.47E-01	9.65E-06	6.64E-04	0.00E+00	2.36E-04
Rough Terrain Forklifts	D	120	Construction and Minin	5.93E+02	2.11E+03	6.04E+03	1.01E-01	4.57E-01	6.34E-01	6.60E+01	7.74E-04	5.61E-02	0.00E+00	9.13E-03
Rough Terrain Forklifts	D	175	Construction and Minin	7.60E+01	2.71E+02	1.54E+03	1.83E-02	9.82E-02	1.42E-01	1.69E+01	1.90E-04	8.03E-03	0.00E+00	1.65E-03
Rough Terrain Forklifts	D	250	Construction and Minin	4.24E+00	1.51E+01	1.17E+02	9.78E-04	2.87E-03	9.80E-03	1.29E+00	1.45E-05	3.14E-04	0.00E+00	8.82E-05
Rough Terrain Forklifts	D	500	Construction and Minin	2.79E+00	9.94E+00	1.15E+02	9.06E-04	2.84E-03	8.50E-03	1.27E+00	1.25E-05	2.90E-04	0.00E+00	8.18E-05
Rubber Tired Loaders	D	25	Construction and Minin	1.56E+00	4.71E+00	3.62E+00	4.80E-05	1.64E-04	3.04E-04	3.98E-02	5.05E-07	1.18E-05	0.00E+00	4.33E-06
Rubber Tired Loaders	D	50	Construction and Minin	3.03E+01	9.31E+01	1.35E+02	5.60E-03	1.70E-02	1.45E-02	1.45E+00	1.87E-05	1.36E-03	0.00E+00	5.05E-04
Rubber Tired Loaders	D	120	Construction and Minin	8.25E+02	2.53E+03	6.83E+03	1.23E-01	5.25E-01	7.62E-01	7.45E+01	8.74E-04	6.66E-02	0.00E+00	1.11E-02
Rubber Tired Loaders	D	175	Construction and Minin	4.65E+02	1.43E+03	6.92E+03	8.85E-02	4.47E-01	6.79E-01	7.58E+01	8.53E-04	3.83E-02	0.00E+00	7.98E-03
Rubber Tired Loaders	D	250	Construction and Minin	4.62E+02	1.42E+03	9.58E+03	8.93E-02	2.61E-01	8.61E-01	1.06E+02	1.19E-03	2.96E-02	0.00E+00	8.06E-03
Rubber Tired Loaders	D	500	Construction and Minin	1.92E+02	5.91E+02	6.34E+03	5.51E-02	1.89E-01	5.07E-01	6.99E+01	6.86E-04	1.81E-02	0.00E+00	4.97E-03
Rubber Tired Loaders	D	750	Construction and Minin	3.30E+00	1.01E+01	2.23E+02	1.95E-03	6.62E-03	1.83E-02	2.45E+00	2.47E-05	6.44E-04	0.00E+00	1.76E-04
Rubber Tired Loaders	D	1000	Construction and Minin	3.54E-01	7.36E-01	1.98E+01	1.91E-04	6.76E-04	2.19E-03	2.18E-01	2.19E-06	6.60E-05	0.00E+00	1.72E-05
Rubber Tired Dozers	D	175	Construction and Minin	1.12E+00	5.72E+00	3.39E+01	6.06E-04	2.42E-03	4.45E-03	3.70E-01	4.16E-06	2.55E-04	0.00E+00	5.47E-05
Rubber Tired Dozers	D	250	Construction and Minin	2.73E+01	1.40E+02	1.17E+03	1.70E-02	4.77E-02	1.46E-01	1.28E+01	1.45E-04	6.16E-03	0.00E+00	1.54E-03
Rubber Tired Dozers	D	500	Construction and Minin	4.21E+01	2.16E+02	2.60E+03	3.45E-02	1.53E-01	2.94E-01	2.85E+01	2.80E-04	1.22E-02	0.00E+00	3.12E-03
Rubber Tired Dozers	D	750	Construction and Minin	3.62E+00	1.86E+01	3.38E+02	4.50E-03	1.98E-02	3.88E-02	3.70E+00	3.72E-05	1.59E-03	0.00E+00	4.06E-04
Rubber Tired Dozers	D	1000	Construction and Minin	2.45E-01	8.51E-01	2.30E+01	3.19E-04	1.46E-03	3.17E-03	2.52E-01	2.53E-06	1.10E-04	0.00E+00	2.88E-05
Tractors/Loaders/Backhoes	D	25	Construction and Minin	3.15E+01	9.33E+01	6.73E+01	9.09E-04	3.06E-03	5.76E-03	7.39E-01	9.38E-06	2.63E-04	0.00E+00	8.21E-05
Tractors/Loaders/Backhoes	D	50	Construction and Minin	1.88E+02	5.72E+02	8.03E+02	2.56E-02	9.15E-02	8.27E-02	8.67E+00	1.12E-04	6.82E-03	0.00E+00	2.31E-03
Tractors/Loaders/Backhoes	D	120	Construction and Minin	2.51E+03	7.65E+03	1.81E+04	2.66E-01	1.35E+00	1.75E+00	1.98E+02	2.32E-03	1.47E-01	0.00E+00	2.40E-02
Tractors/Loaders/Backhoes	D	175	Construction and Minin	1.88E+02	5.71E+02	2.64E+03	2.82E-02	1.67E-01	2.20E-01	2.89E+01	3.25E-04	1.22E-02	0.00E+00	2.55E-03
Tractors/Loaders/Backhoes	D	250	Construction and Minin	6.07E+01	1.85E+02	1.44E+03	1.11E-02	3.38E-02	1.08E-01	1.58E+01	1.78E-04	3.42E-03	0.00E+00	1.00E-03
Tractors/Loaders/Backhoes	D	500	Construction and Minin	9.80E+01	2.98E+02	4.65E+03	3.41E-02	1.11E-01	3.08E-01	5.13E+01	5.78E-04	1.04E-02	0.00E+00	3.08E-03
Tractors/Loaders/Backhoes	D	750	Construction and Minin	1.65E+01	5.01E+01	1.17E+03	8.67E-03	2.80E-02	8.01E-02	1.30E+01	1.46E-04	2.68E-03	0.00E+00	7.82E-04
Crawler Tractors	D	50	Construction and Minin	1.56E+00	5.15E+00	5.99E+00	3.03E-04	8.36E-04	6.76E-04	6.40E-02	8.27E-07	6.96E-05	0.00E+00	2.73E-05
Crawler Tractors	D	120	Construction and Minin	8.86E+02	2.92E+03	8.82E+03	1.89E-01	7.09E-01	1.12E+00	9.60E+01	1.13E-03	9.91E-02	0.00E+00	1.71E-02
Crawler Tractors	D	175	Construction and Minin	3.00E+02	9.88E+02	5.47E+03	8.28E-02	3.68E-01	6.20E-01	5.98E+01	6.73E-04	3.53E-02	0.00E+00	7.47E-03
Crawler Tractors	D	250	Construction and Minin	2.58E+02	8.49E+02	6.41E+03	7.48E-02	2.12E-01	6.78E-01	7.05E+01	7.93E-04	2.60E-02	0.00E+00	6.75E-03
Crawler Tractors	D	500	Construction and Minin	1.77E+02	5.82E+02	6.86E+03	7.39E-02	2.76E-01	6.51E-01	7.54E+01	7.40E-04	2.52E-02	0.00E+00	6.67E-03
Crawler Tractors	D	750	Construction and Minin	2.18E+00	7.18E+00	1.52E+02	1.64E-03	6.10E-03	1.47E-02	1.67E+00	1.68E-05	5.64E-04	0.00E+00	1.48E-04
Crawler Tractors	D	1000	Construction and Minin	2.18E+00	4.86E+00	1.46E+02	1.68E-03	6.56E-03	1.79E-02	1.60E+00	1.61E-05	5.74E-04	0.00E+00	1.51E-04
Skid Steer Loaders	D	25	Construction and Minin	2.14E+02	5.62E+02	3.54E+02	5.66E-03	1.74E-02	3.28E-02	3.88E+00	4.92E-05	1.77E-03	0.00E+00	5.11E-04
Skid Steer Loaders	D	50	Construction and Minin	1.94E+03	5.19E+03	6.09E+03	1.34E-01	5.87E-01	5.91E-01	6.61E+01	8.55E-04	4.08E-02	0.00E+00	1.21E-02
Skid Steer Loaders	D	120	Construction and Minin	1.02E+03	2.72E+03	5.30E+03	5.84E-02	3.73E-01	4.44E-01	5.81E+01	6.81E-04	3.33E-02	0.00E+00	5.27E-03
Off-Highway Tractors	D	120	Construction and Minin	1.12E-01	3.92E-01	1.69E+00	4.15E-05	1.41E-04	2.42E-04	1.84E-02	2.15E-07	2.12E-05	0.00E+00	3.74E-06
Off-Highway Tractors	D	175	Construction and Minin	1.36E+02	4.80E+02	2.86E+03	4.91E-02	2.00E-01	3.68E-01	3.12E+01	3.52E-04	2.09E-02	0.00E+00	4.43E-03
Off-Highway Tractors	D	250	Construction and Minin	1.29E+02	4.53E+02	2.69E+03	3.71E-02	1.06E-01	3.27E-01	2.95E+01	3.32E-04	1.36E-02	0.00E+00	3.35E-03
Off-Highway Tractors	D	750	Construction and Minin	1.37E+01	4.81E+01	1.24E+03	1.57E-02	6.93E-02	1.40E-01	1.36E+01	1.37E-04	5.65E-03	0.00E+00	1.42E-03
Off-Highway Tractors	D	1000	Construction and Minin	1.44E+00	3.44E+00	1.28E+02	1.69E-03	7.73E-03	1.73E-02	1.40E+00	1.41E-05	5.90E-04	0.00E+00	1.52E-04
Dumpers/Tenders	D	25	Construction and Minin	2.68E+00	5.58E+00	1.94E+00	2.69E-05	8.92E-05	1.67E-04	2.13E-02	2.70E-07	8.07E-06	0.00E+00	2.43E-06
Other Construction Equipment	D	15	Construction and Minin	3.69E+01	8.02E+01	3.70E+01	4.71E-04	2.47E-03	2.95E-03	4.05E-01	6.30E-06	1.15E-04	0.00E+00	4.25E-05
Other Construction Equipment	D	25	Construction and Minin	6.25E+00	1.36E+01	8.16E+00	1.08E-04	3.69E-04	6.87E-04	8.96E-02	1.14E-06	2.75E-05	0.00E+00	9.78E-06
Other Construction Equipment	D	50	Construction and Minin	9.59E+00	2.12E+01	2.74E+01	8.00E-04	2.81E-03	2.74E-03	2.96E-01	3.83E-06	2.18E-04	0.00E+00	7.22E-05
Other Construction Equipment	D	120	Construction and Minin	1.58E+01	3.50E+01	1.29E+02	1.76E-03	9.23E-03	1.23E-02	1.41E+00	1.66E-05	9.95E-04	0.00E+00	1.59E-04

Other Construction Equipment	D	175	Construction and Mining	2.19E+01	4.83E+01	2.34E+02	2.26E-03	1.42E-02	1.94E-02	2.57E+00	2.89E-05	1.02E-03	0.00E+00	2.04E-04
Other Construction Equipment	D	500	Construction and Mining	5.08E+01	1.12E+02	1.29E+03	8.14E-03	2.93E-02	8.52E-02	1.42E+01	1.40E-04	2.75E-03	0.00E+00	7.35E-04
Aerial Lifts	D	15	Industrial Equipment	3.05E+01	3.83E+01	1.51E+01	1.94E-04	1.01E-03	1.22E-03	1.66E-01	2.58E-06	5.15E-05	0.00E+00	1.75E-05
Aerial Lifts	D	25	Industrial Equipment	4.98E+01	6.26E+01	3.13E+01	5.12E-04	1.56E-03	2.92E-03	3.42E-01	4.35E-06	1.59E-04	0.00E+00	4.62E-05
Aerial Lifts	D	50	Industrial Equipment	1.82E+02	2.20E+02	1.99E+02	6.29E-03	1.90E-02	2.01E-02	2.15E+00	2.79E-05	1.68E-03	0.00E+00	5.67E-04
Aerial Lifts	D	120	Industrial Equipment	1.61E+02	1.95E+02	3.39E+02	5.30E-03	2.35E-02	3.61E-02	3.71E+00	4.35E-05	2.85E-03	0.00E+00	4.78E-04
Aerial Lifts	D	500	Industrial Equipment	2.07E+01	2.50E+01	2.41E+02	1.45E-03	5.73E-03	1.87E-02	2.66E+00	2.61E-05	5.49E-04	0.00E+00	1.31E-04
Aerial Lifts	D	750	Industrial Equipment	1.66E+00	2.01E+00	3.50E+01	2.18E-04	8.33E-04	2.81E-03	3.86E-01	3.88E-06	8.14E-05	0.00E+00	1.96E-05
Forklifts	D	50	Industrial Equipment	5.52E+01	3.13E+02	2.12E+02	6.87E-03	2.53E-02	2.23E-02	2.29E+00	2.96E-05	1.88E-03	0.00E+00	6.20E-04
Forklifts	D	120	Industrial Equipment	8.65E+01	4.90E+02	7.00E+02	1.07E-02	5.33E-02	6.80E-02	7.65E+00	8.97E-05	5.87E-03	0.00E+00	9.62E-04
Forklifts	D	175	Industrial Equipment	8.70E+01	4.93E+02	1.26E+03	1.40E-02	8.14E-02	1.04E-01	1.38E+01	1.55E-04	6.01E-03	0.00E+00	1.26E-03
Forklifts	D	250	Industrial Equipment	8.63E+01	4.89E+02	1.71E+03	1.39E-02	3.93E-02	1.28E-01	1.88E+01	2.12E-04	4.08E-03	0.00E+00	1.25E-03
Forklifts	D	500	Industrial Equipment	3.69E+01	2.09E+02	1.05E+03	8.15E-03	2.30E-02	6.85E-02	1.16E+01	1.14E-04	2.38E-03	0.00E+00	7.35E-04
Sweepers/Scrubbers	D	15	Industrial Equipment	4.05E+00	8.28E+00	4.51E+00	5.12E-05	3.02E-04	3.60E-04	4.94E-02	7.69E-07	1.41E-05	0.00E+00	4.62E-06
Sweepers/Scrubbers	D	25	Industrial Equipment	4.05E+00	8.28E+00	7.39E+00	9.79E-05	3.34E-04	6.19E-04	8.11E-02	1.03E-06	2.41E-05	0.00E+00	8.84E-06
Sweepers/Scrubbers	D	50	Industrial Equipment	7.89E+01	3.03E+02	4.43E+02	1.57E-02	5.16E-02	4.62E-02	4.77E+00	6.17E-05	4.08E-03	0.00E+00	1.41E-03
Sweepers/Scrubbers	D	120	Industrial Equipment	1.30E+02	5.01E+02	1.72E+03	2.75E-02	1.29E-01	1.74E-01	1.88E+01	2.20E-04	1.55E-02	0.00E+00	2.48E-03
Sweepers/Scrubbers	D	175	Industrial Equipment	6.01E+01	2.31E+02	1.46E+03	1.65E-02	9.22E-02	1.28E-01	1.60E+01	1.80E-04	7.29E-03	0.00E+00	1.48E-03
Sweepers/Scrubbers	D	250	Industrial Equipment	9.61E+00	3.69E+01	2.71E+02	2.11E-03	6.21E-03	2.16E-02	2.99E+00	3.36E-05	6.65E-04	0.00E+00	1.90E-04
Other General Industrial Equipmen	D	15	Industrial Equipment	1.06E+01	4.77E+01	1.39E+01	1.58E-04	9.30E-04	1.11E-03	1.52E-01	2.37E-06	4.33E-05	0.00E+00	1.42E-05
Other General Industrial Equipmen	D	25	Industrial Equipment	1.42E+01	6.39E+01	4.46E+01	5.91E-04	2.02E-03	3.73E-03	4.90E-01	6.21E-06	1.40E-04	0.00E+00	5.33E-05
Other General Industrial Equipmen	D	50	Industrial Equipment	1.76E+01	7.91E+01	8.03E+01	3.77E-03	1.07E-02	8.83E-03	8.59E-01	1.11E-05	9.05E-04	0.00E+00	3.40E-04
Other General Industrial Equipmen	D	120	Industrial Equipment	7.05E+01	3.16E+02	9.00E+02	1.83E-02	7.07E-02	1.06E-01	9.81E+00	1.15E-04	1.00E-02	0.00E+00	1.65E-03
Other General Industrial Equipmen	D	175	Industrial Equipment	7.08E+01	3.17E+02	1.39E+03	1.96E-02	9.08E-02	1.46E-01	1.52E+01	1.71E-04	8.56E-03	0.00E+00	1.77E-03
Other General Industrial Equipmen	D	250	Industrial Equipment	7.05E+01	3.16E+02	1.94E+03	1.83E-02	4.96E-02	1.87E-01	2.14E+01	2.41E-04	5.91E-03	0.00E+00	1.65E-03
Other General Industrial Equipmen	D	500	Industrial Equipment	7.03E+01	3.15E+02	3.79E+03	3.33E-02	9.90E-02	3.19E-01	4.18E+01	4.11E-04	1.08E-02	0.00E+00	3.00E-03
Other General Industrial Equipmen	D	750	Industrial Equipment	1.76E+01	7.88E+01	1.56E+03	1.38E-02	4.07E-02	1.36E-01	1.72E+01	1.73E-04	4.52E-03	0.00E+00	1.25E-03
Other General Industrial Equipmen	D	1000	Industrial Equipment	1.07E+01	3.25E+01	8.25E+02	8.37E-03	2.65E-02	9.65E-02	9.08E+00	9.13E-05	2.88E-03	0.00E+00	7.55E-04
Other Material Handling Equipment	D	50	Industrial Equipment	5.06E-01	2.10E+00	2.97E+00	1.39E-04	3.93E-04	3.26E-04	3.18E-02	4.11E-07	3.33E-05	0.00E+00	1.25E-05
Other Material Handling Equipment	D	120	Industrial Equipment	3.04E+00	1.26E+01	3.50E+01	7.06E-04	2.74E-03	4.12E-03	3.82E-01	4.48E-06	3.89E-04	0.00E+00	6.37E-05
Other Material Handling Equipment	D	175	Industrial Equipment	3.25E+00	1.35E+01	7.52E+01	1.05E-03	4.89E-03	7.87E-03	8.23E-01	9.26E-06	4.61E-04	0.00E+00	9.50E-05
Other Material Handling Equipment	D	250	Industrial Equipment	7.73E+00	3.21E+01	2.11E+02	1.96E-03	5.36E-03	2.03E-02	2.32E+00	2.62E-05	6.38E-04	0.00E+00	1.77E-04
Other Material Handling Equipment	D	500	Industrial Equipment	1.45E+00	6.00E+00	5.21E+01	4.50E-04	1.35E-03	4.38E-03	5.74E-01	5.64E-06	1.47E-04	0.00E+00	4.06E-05
Other Material Handling Equipment	D	9999	Industrial Equipment	4.34E-01	1.80E+00	6.05E+01	6.20E-04	1.94E-03	7.07E-03	6.66E-01	6.54E-06	2.11E-04	0.00E+00	5.60E-05
Leaf Blowers/Vacuums	D	15	Lawn and Garden Equip	9.47E-01	3.07E-01	4.21E-02	4.83E-07	2.82E-06	3.39E-06	4.61E-04	7.18E-09	1.43E-07	0.00E+00	4.35E-08
Leaf Blowers/Vacuums	D	120	Lawn and Garden Equip	8.29E-01	2.69E-01	5.96E-01	7.25E-06	3.84E-05	5.73E-05	6.53E-03	7.66E-08	3.86E-06	0.00E+00	6.54E-07
Leaf Blowers/Vacuums	D	250	Lawn and Garden Equip	2.37E-01	7.67E-02	3.48E-01	1.84E-06	7.42E-06	2.71E-05	3.85E-03	4.33E-08	7.02E-07	0.00E+00	1.66E-07
Lawn & Garden Tractors	D	15	Lawn and Garden Equip	2.29E+03	3.36E+03	1.42E+03	1.65E-02	9.52E-02	1.16E-01	1.56E+01	2.43E-04	5.28E-03	0.00E+00	1.49E-03
Lawn & Garden Tractors	D	25	Lawn and Garden Equip	1.79E+03	2.63E+03	1.71E+03	2.28E-02	7.73E-02	1.45E-01	1.88E+01	2.38E-04	6.24E-03	0.00E+00	2.05E-03
Chippers/Stump Grinders	D	25	Lawn and Garden Equip	1.07E+00	1.34E+00	1.23E+00	1.62E-05	5.54E-05	1.03E-04	1.35E-02	1.71E-07	3.99E-06	0.00E+00	1.47E-06
Chippers/Stump Grinders	D	120	Lawn and Garden Equip	2.94E+01	3.69E+01	1.28E+02	1.92E-03	8.93E-03	1.33E-02	1.40E+00	1.64E-05	1.06E-03	0.00E+00	1.74E-04
Chippers/Stump Grinders	D	175	Lawn and Garden Equip	2.01E+00	2.53E+00	1.52E+01	1.55E-04	8.84E-04	1.40E-03	1.66E-01	1.87E-06	6.96E-05	0.00E+00	1.40E-05
Chippers/Stump Grinders	D	250	Lawn and Garden Equip	4.74E-01	5.95E-01	5.99E+00	4.10E-05	1.40E-04	5.06E-04	6.61E-02	7.44E-07	1.50E-05	0.00E+00	3.70E-06
Chippers/Stump Grinders	D	500	Lawn and Garden Equip	4.38E+00	5.50E+00	6.15E+01	3.81E-04	1.48E-03	4.64E-03	6.79E-01	6.67E-06	1.44E-04	0.00E+00	3.44E-05
Chippers/Stump Grinders	D	750	Lawn and Garden Equip	4.97E+00	6.24E+00	1.68E+02	1.07E-03	4.05E-03	1.31E-02	1.86E+00	1.87E-05	3.99E-04	0.00E+00	9.66E-05
Chippers/Stump Grinders	D	1000	Lawn and Garden Equip	9.47E+00	9.38E+00	3.60E+02	2.91E-03	1.04E-02	3.83E-02	3.97E+00	3.99E-05	1.06E-03	0.00E+00	2.63E-04
Commercial Turf Equipment	D	15	Lawn and Garden Equip	5.76E+01	1.66E+02	7.31E+01	8.30E-04	4.89E-03	5.84E-03	8.00E-01	1.25E-05	2.29E-04	0.00E+00	7.49E-05
Commercial Turf Equipment	D	25	Lawn and Garden Equip	1.08E+03	3.12E+03	2.06E+03	2.72E-02	9.29E-02	1.72E-01	2.26E+01	2.86E-04	6.45E-03	0.00E+00	2.46E-03
Other Lawn & Garden Equipment	D	15	Lawn and Garden Equip	8.29E-01	9.69E-01	5.40E-01	6.15E-06	3.61E-05	4.32E-05	5.92E-03	9.21E-08	1.76E-06	0.00E+00	5.55E-07
Other Lawn & Garden Equipment	D	25	Lawn and Garden Equip	1.18E-01	1.38E-01	1.03E-01	1.36E-06	4.64E-06	8.60E-06	1.13E-03	1.43E-08	3.34E-07	0.00E+00	1.23E-07
Agricultural Tractors	D	15	Agricultural Equipment	4.14E+02	6.94E+02	3.34E+02	4.25E-03	2.23E-02	2.66E-02	3.65E+00	5.68E-05	1.03E-03	0.00E+00	3.84E-04
Agricultural Tractors	D	25	Agricultural Equipment	5.11E+02	8.56E+02	7.86E+02	1.04E-02	3.55E-02	6.63E-02	8.63E+00	1.10E-04	2.68E-03	0.00E+00	9.43E-04
Agricultural Tractors	D	50	Agricultural Equipment	1.19E+03	1.78E+03	2.83E+03	1.07E-01	3.02E-01	2.94E-01	3.05E+01	3.94E-04	2.65E-02	0.00E+00	9.62E-03
Agricultural Tractors	D	120	Agricultural Equipment	1.38E+03	2.06E+03	6.87E+03	1.19E-01	4.92E-01	7.78E-01	7.50E+01	8.80E-04	6.33E-02	0.00E+00	1.07E-02
Agricultural Tractors	D	175	Agricultural Equipment	7.76E+02	1.16E+03	6.59E+03	7.72E-02	3.91E-01	6.65E-01	7.22E+01	8.13E-04	3.38E-02	0.00E+00	6.97E-03
Agricultural Tractors	D	250	Agricultural Equipment	5.01E+02	7.49E+02	6.05E+03	4.68E-02	1.50E-01	5.58E-01	6.67E+01	7.51E-04	1.69E-02	0.00E+00	4.22E-03
Agricultural Tractors	D	500	Agricultural Equipment	9.95E+01	1.49E+02	1.96E+03	1.38E-02	5.21E-02	1.63E-01	2.17E+01	2.13E-04	5.11E-03	0.00E+00	1.24E-03

Combines	D	120	Agricultural Equipment	2.91E+01	1.37E+01	5.94E+01	8.41E-04	3.92E-03	6.21E-03	6.50E-01	7.63E-06	4.31E-04	0.00E+00	7.58E-05
Combines	D	175	Agricultural Equipment	4.31E+01	2.04E+01	1.16E+02	1.09E-03	6.33E-03	1.07E-02	1.27E+00	1.43E-05	4.65E-04	0.00E+00	9.86E-05
Combines	D	250	Agricultural Equipment	4.61E+01	2.18E+01	1.73E+02	1.06E-03	3.90E-03	1.47E-02	1.91E+00	2.15E-05	3.88E-04	0.00E+00	9.53E-05
Combines	D	500	Agricultural Equipment	1.84E+00	8.71E-01	9.50E+00	5.26E-05	2.20E-04	7.42E-04	1.05E-01	1.03E-06	2.03E-05	0.00E+00	4.74E-06
Balers	D	50	Agricultural Equipment	5.50E-02	1.65E-02	2.75E-02	6.38E-07	2.11E-06	2.69E-06	2.99E-04	3.87E-09	1.92E-07	0.00E+00	5.76E-08
Balers	D	120	Agricultural Equipment	3.87E+01	1.16E+01	2.88E+01	3.92E-04	1.88E-03	2.97E-03	3.16E-01	3.70E-06	1.99E-04	0.00E+00	3.54E-05
Agricultural Mowers	D	120	Agricultural Equipment	1.82E+00	2.08E+00	3.33E+00	5.39E-05	2.32E-04	3.67E-04	3.63E-02	4.26E-07	2.84E-05	0.00E+00	4.86E-06
Sprayers	D	25	Agricultural Equipment	8.53E+00	2.95E+00	1.61E+00	3.42E-05	9.40E-05	1.60E-04	1.76E-02	2.23E-07	1.02E-05	0.00E+00	3.09E-06
Sprayers	D	50	Agricultural Equipment	1.93E+00	5.46E-01	5.65E-01	1.30E-05	4.31E-05	5.53E-05	6.15E-03	7.95E-08	3.92E-06	0.00E+00	1.17E-06
Sprayers	D	120	Agricultural Equipment	1.84E+01	5.22E+00	1.36E+01	1.84E-04	8.83E-04	1.40E-03	1.49E-01	1.75E-06	9.35E-05	0.00E+00	1.66E-05
Sprayers	D	175	Agricultural Equipment	7.76E+00	2.20E+00	9.47E+00	8.55E-05	5.10E-04	8.66E-04	1.04E-01	1.17E-06	3.61E-05	0.00E+00	7.71E-06
Sprayers	D	250	Agricultural Equipment	4.84E+00	1.37E+00	9.65E+00	5.59E-05	2.14E-04	8.05E-04	1.07E-01	1.20E-06	2.06E-05	0.00E+00	5.05E-06
Sprayers	D	500	Agricultural Equipment	8.25E-01	2.34E-01	1.80E+00	9.44E-06	4.04E-05	1.39E-04	1.99E-02	1.95E-07	3.68E-06	0.00E+00	8.52E-07
Tillers	D	15	Agricultural Equipment	1.93E-01	1.59E-01	4.98E-02	5.72E-07	3.33E-06	4.02E-06	5.45E-04	8.49E-09	1.71E-07	0.00E+00	5.16E-08
Tillers	D	250	Agricultural Equipment	2.75E-02	1.49E-02	1.62E-01	1.00E-06	3.67E-06	1.38E-05	1.78E-03	2.01E-08	3.68E-07	0.00E+00	9.06E-08
Tillers	D	500	Agricultural Equipment	8.25E-02	4.47E-02	8.64E-01	4.87E-06	2.03E-05	6.78E-05	9.54E-03	9.37E-08	1.87E-06	0.00E+00	4.39E-07
Swathers	D	120	Agricultural Equipment	2.09E+02	7.25E+01	1.78E+02	2.45E-03	1.16E-02	1.84E-02	1.95E+00	2.29E-05	1.25E-03	0.00E+00	2.21E-04
Swathers	D	175	Agricultural Equipment	1.87E+00	6.48E-01	3.05E+00	2.80E-05	1.65E-04	2.80E-04	3.35E-02	3.77E-07	1.18E-05	0.00E+00	2.52E-06
Hydro Power Units	D	15	Agricultural Equipment	1.60E+00	4.09E+00	1.12E+00	1.43E-05	7.51E-05	8.96E-05	1.23E-02	1.91E-07	3.48E-06	0.00E+00	1.29E-06
Hydro Power Units	D	25	Agricultural Equipment	4.81E+00	1.23E+01	6.42E+00	8.53E-05	2.90E-04	5.41E-04	7.05E-02	8.94E-07	2.19E-05	0.00E+00	7.70E-06
Hydro Power Units	D	50	Agricultural Equipment	5.39E+00	1.34E+01	1.32E+01	6.06E-04	1.64E-03	1.42E-03	1.41E-01	1.82E-06	1.42E-04	0.00E+00	5.47E-05
Hydro Power Units	D	120	Agricultural Equipment	4.95E-01	1.23E+00	2.38E+00	4.63E-05	1.80E-04	2.83E-04	2.59E-02	3.04E-07	2.52E-05	0.00E+00	4.18E-06
Other Agricultural Equipment	D	15	Agricultural Equipment	5.83E+00	8.19E+00	2.87E+00	3.66E-05	1.92E-04	2.29E-04	3.14E-02	4.89E-07	9.39E-06	0.00E+00	3.30E-06
Other Agricultural Equipment	D	25	Agricultural Equipment	1.62E+01	2.28E+01	1.46E+01	2.29E-04	7.14E-04	1.33E-03	1.60E-01	2.03E-06	7.10E-05	0.00E+00	2.07E-05
Other Agricultural Equipment	D	50	Agricultural Equipment	1.42E+01	1.70E+01	2.01E+01	6.90E-04	2.01E-03	2.07E-03	2.18E-01	2.81E-06	1.77E-04	0.00E+00	6.23E-05
Other Agricultural Equipment	D	120	Agricultural Equipment	4.79E+01	5.75E+01	1.34E+02	2.20E-03	9.42E-03	1.49E-02	1.47E+00	1.72E-05	1.16E-03	0.00E+00	1.99E-04
Other Agricultural Equipment	D	175	Agricultural Equipment	3.99E+00	4.79E+00	2.02E+01	2.24E-04	1.17E-03	1.99E-03	2.22E-01	2.49E-06	9.73E-05	0.00E+00	2.02E-05
Other Agricultural Equipment	D	250	Agricultural Equipment	3.99E+00	4.79E+00	2.91E+01	2.12E-04	7.04E-04	2.63E-03	3.21E-01	3.61E-06	7.70E-05	0.00E+00	1.91E-05
Other Agricultural Equipment	D	500	Agricultural Equipment	9.63E-01	1.16E+00	1.01E+01	6.66E-05	2.61E-04	8.26E-04	1.11E-01	1.09E-06	2.50E-05	0.00E+00	6.01E-06
Generator Sets	D	15	Light Commercial Equip	4.67E+02	3.36E+02	1.57E+02	2.47E-03	1.14E-02	1.69E-02	1.71E+00	2.67E-05	9.58E-04	0.00E+00	2.23E-04
Generator Sets	D	25	Light Commercial Equip	3.42E+02	2.46E+02	1.98E+02	3.23E-03	1.10E-02	1.95E-02	2.17E+00	2.75E-05	1.10E-03	0.00E+00	2.91E-04
Generator Sets	D	50	Light Commercial Equip	4.17E+02	3.00E+02	4.24E+02	1.27E-02	3.91E-02	4.25E-02	4.59E+00	5.94E-05	3.46E-03	0.00E+00	1.15E-03
Generator Sets	D	120	Light Commercial Equip	6.34E+02	4.56E+02	1.63E+03	2.47E-02	1.11E-01	1.71E-01	1.78E+01	2.08E-04	1.32E-02	0.00E+00	2.23E-03
Generator Sets	D	175	Light Commercial Equip	3.75E+01	2.70E+01	1.74E+02	1.77E-03	9.94E-03	1.64E-02	1.91E+00	2.15E-05	7.84E-04	0.00E+00	1.60E-04
Generator Sets	D	250	Light Commercial Equip	2.10E+01	1.51E+01	1.45E+02	9.42E-04	3.25E-03	1.25E-02	1.60E+00	1.80E-05	3.44E-04	0.00E+00	8.50E-05
Generator Sets	D	500	Light Commercial Equip	4.66E+01	3.35E+01	5.11E+02	2.97E-03	1.19E-02	3.95E-02	5.64E+00	5.54E-05	1.14E-03	0.00E+00	2.68E-04
Generator Sets	D	750	Light Commercial Equip	2.89E+01	2.08E+01	5.12E+02	3.09E-03	1.20E-02	4.09E-02	5.66E+00	5.69E-05	1.16E-03	0.00E+00	2.79E-04
Generator Sets	D	9999	Light Commercial Equip	7.54E+00	5.42E+00	2.58E+02	2.11E-03	7.41E-03	2.75E-02	2.84E+00	2.85E-05	7.56E-04	0.00E+00	1.90E-04
Pumps	D	15	Light Commercial Equip	3.51E+02	3.01E+02	1.02E+02	1.85E-03	7.44E-03	1.12E-02	1.12E+00	1.74E-05	7.29E-04	0.00E+00	1.67E-04
Pumps	D	25	Light Commercial Equip	1.05E+02	8.99E+01	8.01E+01	1.58E-03	4.45E-03	7.87E-03	8.75E-01	1.11E-05	4.81E-04	0.00E+00	1.42E-04
Pumps	D	50	Light Commercial Equip	1.83E+02	1.57E+02	2.49E+02	8.01E-03	2.41E-02	2.52E-02	2.69E+00	3.48E-05	2.12E-03	0.00E+00	7.22E-04
Pumps	D	120	Light Commercial Equip	3.58E+02	3.07E+02	1.10E+03	1.73E-02	7.63E-02	1.17E-01	1.20E+01	1.40E-04	9.32E-03	0.00E+00	1.56E-03
Pumps	D	175	Light Commercial Equip	3.88E+01	3.33E+01	2.12E+02	2.25E-03	1.23E-02	2.02E-02	2.33E+00	2.62E-05	9.98E-04	0.00E+00	2.03E-04
Pumps	D	250	Light Commercial Equip	2.79E+01	2.40E+01	2.18E+02	1.48E-03	4.98E-03	1.91E-02	2.41E+00	2.71E-05	5.39E-04	0.00E+00	1.34E-04
Pumps	D	500	Light Commercial Equip	5.51E-01	4.73E-01	7.39E+00	4.51E-05	1.77E-04	5.77E-04	8.15E-02	8.00E-07	1.70E-05	0.00E+00	4.07E-06
Pumps	D	750	Light Commercial Equip	9.19E-02	7.88E-02	2.04E+00	1.28E-05	4.87E-05	1.64E-04	2.25E-02	2.26E-07	4.79E-06	0.00E+00	1.16E-06
Pumps	D	9999	Light Commercial Equip	2.02E+00	1.73E+00	1.06E+02	8.94E-04	3.13E-03	1.15E-02	1.17E+00	1.18E-05	3.18E-04	0.00E+00	8.06E-05
Air Compressors	D	15	Light Commercial Equip	4.78E+00	8.29E+00	2.74E+00	4.95E-05	1.99E-04	2.99E-04	2.99E-02	4.65E-07	1.95E-05	0.00E+00	4.46E-06
Air Compressors	D	25	Light Commercial Equip	9.47E+00	1.64E+01	1.08E+01	2.13E-04	6.02E-04	1.06E-03	1.18E-01	1.50E-06	6.51E-05	0.00E+00	1.92E-05
Air Compressors	D	50	Light Commercial Equip	8.60E+01	1.49E+02	1.55E+02	6.68E-03	1.87E-02	1.65E-02	1.66E+00	2.15E-05	1.61E-03	0.00E+00	6.02E-04
Air Compressors	D	120	Light Commercial Equip	5.73E+02	9.94E+02	2.14E+03	4.01E-02	1.61E-01	2.45E-01	2.33E+01	2.73E-04	2.22E-02	0.00E+00	3.62E-03
Air Compressors	D	175	Light Commercial Equip	2.17E+01	3.76E+01	1.52E+02	1.95E-03	9.48E-03	1.55E-02	1.66E+00	1.87E-05	8.72E-04	0.00E+00	1.76E-04
Air Compressors	D	250	Light Commercial Equip	3.05E+01	5.29E+01	3.14E+02	2.62E-03	7.72E-03	2.95E-02	3.47E+00	3.90E-05	9.02E-04	0.00E+00	2.36E-04
Air Compressors	D	500	Light Commercial Equip	3.98E+01	6.90E+01	7.24E+02	5.52E-03	1.83E-02	5.98E-02	7.99E+00	7.84E-05	1.93E-03	0.00E+00	4.98E-04
Air Compressors	D	750	Light Commercial Equip	1.49E+01	2.58E+01	4.19E+02	3.23E-03	1.06E-02	3.57E-02	4.62E+00	4.65E-05	1.14E-03	0.00E+00	2.92E-04
Air Compressors	D	1000	Light Commercial Equip	3.68E-01	6.38E-01	1.41E+01	1.31E-04	4.41E-04	1.60E-03	1.55E-01	1.56E-06	4.62E-05	0.00E+00	1.18E-05
Welders	D	15	Light Commercial Equip	1.59E+02	2.17E+02	6.17E+01	1.11E-03	4.48E-03	6.74E-03	6.73E-01	1.05E-05	4.40E-04	0.00E+00	1.01E-04

Welders	D	25	Light Commercial Equip	1.40E+02	1.91E+02	9.85E+01	1.94E-03	5.47E-03	9.69E-03	1.08E+00	1.37E-05	5.93E-04	0.00E+00	1.75E-04
Welders	D	50	Light Commercial Equip	4.30E+02	5.88E+02	7.09E+02	2.80E-02	7.98E-02	7.41E-02	7.63E+00	9.86E-05	6.92E-03	0.00E+00	2.52E-03
Welders	D	120	Light Commercial Equip	3.34E+02	4.57E+02	8.26E+02	1.46E-02	6.04E-02	9.24E-02	9.02E+00	1.06E-04	8.04E-03	0.00E+00	1.32E-03
Welders	D	175	Light Commercial Equip	1.65E+00	2.26E+00	1.01E+01	1.22E-04	6.15E-04	1.01E-03	1.11E-01	1.25E-06	5.45E-05	0.00E+00	1.10E-05
Welders	D	250	Light Commercial Equip	3.68E-01	5.03E-01	2.71E+00	2.11E-05	6.50E-05	2.48E-04	2.99E-02	3.37E-07	7.43E-06	0.00E+00	1.90E-06
Welders	D	500	Light Commercial Equip	9.19E-01	1.26E+00	9.54E+00	6.73E-05	2.37E-04	7.74E-04	1.05E-01	1.03E-06	2.43E-05	0.00E+00	6.07E-06
Pressure Washers	D	15	Light Commercial Equip	2.17E+01	6.69E+00	1.50E+00	2.36E-05	1.09E-04	1.61E-04	1.64E-02	2.54E-07	9.14E-06	0.00E+00	2.13E-06
Pressure Washers	D	25	Light Commercial Equip	5.05E+00	1.56E+00	5.09E-01	8.30E-06	2.83E-05	5.01E-05	5.57E-03	7.07E-08	2.83E-06	0.00E+00	7.49E-07
Pressure Washers	D	50	Light Commercial Equip	1.00E+01	3.09E+00	2.03E+00	4.74E-05	1.59E-04	1.97E-04	2.21E-02	2.85E-07	1.42E-05	0.00E+00	4.28E-06
Pressure Washers	D	120	Light Commercial Equip	4.14E+00	1.28E+00	1.40E+00	1.89E-05	9.18E-05	1.41E-04	1.53E-02	1.80E-07	9.89E-06	0.00E+00	1.70E-06
Cargo Tractor	D	120	Airport Ground Support	4.75E+00	1.71E+01	4.66E+01	9.00E-04	3.62E-03	5.39E-03	5.08E-01	5.72E-06	4.93E-04	0.00E+00	8.12E-05
A/C Tug Narrow Body	D	250	Airport Ground Support	2.57E+01	4.41E+01	3.58E+02	4.94E-03	1.46E-02	4.64E-02	3.94E+00	4.43E-05	1.92E-03	0.00E+00	4.46E-04
A/C Tug Wide Body	D	500	Airport Ground Support	6.37E+00	1.33E+01	2.02E+02	2.56E-03	1.21E-02	2.39E-02	2.21E+00	2.17E-05	9.71E-04	0.00E+00	2.31E-04
Air Conditioner	D	175	Airport Ground Support	4.11E+00	9.11E+00	6.02E+01	3.69E-04	3.50E-03	3.74E-03	6.61E-01	7.44E-06	1.75E-04	0.00E+00	3.33E-05
Air Conditioner	D	250	Airport Ground Support	3.24E-01	7.19E-01	6.75E+00	3.25E-05	1.35E-04	3.70E-04	7.46E-02	8.39E-07	1.07E-05	0.00E+00	2.93E-06
Air Conditioner	D	500	Airport Ground Support	2.16E-01	4.79E-01	8.99E+00	4.16E-05	1.75E-04	4.38E-04	9.94E-02	1.12E-06	1.39E-05	0.00E+00	3.76E-06
Air Start Unit	D	175	Airport Ground Support	1.08E-01	9.88E-02	6.82E-01	6.28E-06	3.85E-05	5.99E-05	7.48E-03	7.34E-08	2.82E-06	0.00E+00	5.67E-07
Air Start Unit	D	250	Airport Ground Support	3.24E-01	2.96E-01	2.90E+00	1.77E-05	6.45E-05	2.34E-04	3.21E-02	3.15E-07	6.56E-06	0.00E+00	1.60E-06
Air Start Unit	D	500	Airport Ground Support	1.27E+01	1.17E+01	2.28E+02	1.25E-03	5.17E-03	1.65E-02	2.52E+00	2.48E-05	4.85E-04	0.00E+00	1.13E-04
Air Start Unit	D	750	Airport Ground Support	1.84E+00	1.68E+00	4.93E+01	2.80E-04	1.12E-03	3.68E-03	5.45E-01	5.35E-06	1.07E-04	0.00E+00	2.53E-05
Baggage Tug	D	120	Airport Ground Support	5.18E+01	1.98E+02	4.44E+02	1.10E-02	3.67E-02	6.34E-02	4.83E+00	5.67E-05	5.75E-03	0.00E+00	9.94E-04
Belt Loader	D	120	Airport Ground Support	2.50E+01	6.67E+01	1.04E+02	2.36E-03	8.28E-03	1.39E-02	1.13E+00	1.33E-05	1.26E-03	0.00E+00	2.13E-04
Bobtail	D	120	Airport Ground Support	1.84E+00	3.44E+00	1.23E+01	2.62E-04	9.47E-04	1.60E-03	1.34E-01	1.57E-06	1.39E-04	0.00E+00	2.37E-05
Cargo Loader	D	120	Airport Ground Support	3.05E+01	7.58E+01	2.19E+02	4.23E-03	1.67E-02	2.58E-02	2.39E+00	2.80E-05	2.32E-03	0.00E+00	3.82E-04
Forklift	D	175	Airport Ground Support	4.21E+00	8.59E+00	2.29E+01	2.62E-04	1.40E-03	2.17E-03	2.51E-01	2.83E-06	1.18E-04	0.00E+00	2.36E-05
Fuel Truck	D	250	Airport Ground Support	2.27E+00	3.89E+00	1.04E+01	7.61E-05	2.46E-04	8.90E-04	1.15E-01	1.29E-06	2.71E-05	0.00E+00	6.86E-06
Ground Power Unit	D	175	Airport Ground Support	3.38E+01	8.99E+01	6.29E+02	7.28E-03	3.92E-02	5.83E-02	6.89E+00	7.75E-05	3.26E-03	0.00E+00	6.57E-04
Lav Truck	D	175	Airport Ground Support	5.40E-01	1.94E+00	4.64E+00	5.98E-05	2.98E-04	4.54E-04	5.08E-02	5.72E-07	2.62E-05	0.00E+00	5.40E-06
Lift	D	120	Airport Ground Support	5.62E+00	1.22E+01	4.03E+01	6.78E-04	2.96E-03	4.34E-03	4.40E-01	5.16E-06	3.79E-04	0.00E+00	6.12E-05
Other GSE	D	175	Airport Ground Support	1.00E+01	2.54E+01	1.02E+02	1.57E-03	6.68E-03	1.22E-02	1.12E+00	1.45E-05	6.86E-04	0.00E+00	1.42E-04
Passenger Stand	D	120	Airport Ground Support	8.64E-01	1.66E-01	5.62E-01	6.47E-06	3.57E-05	5.27E-05	6.16E-03	7.22E-08	3.45E-06	0.00E+00	5.84E-07
Sweeper	D	120	Airport Ground Support	2.49E+00	1.97E+00	2.95E+00	2.85E-05	1.90E-04	2.51E-04	3.23E-02	3.64E-07	1.66E-05	0.00E+00	2.57E-06
Generator	D	120	Airport Ground Support	1.62E+00	7.25E+00	2.73E+01	5.11E-04	2.13E-03	3.04E-03	2.98E-01	3.35E-06	2.80E-04	0.00E+00	4.61E-05
Generator	D	175	Airport Ground Support	8.86E+00	3.96E+01	2.80E+02	3.72E-03	1.83E-02	2.75E-02	3.07E+00	3.45E-05	1.61E-03	0.00E+00	3.36E-04
Generator	D	250	Airport Ground Support	9.18E+00	4.11E+01	4.17E+02	3.87E-03	1.06E-02	3.76E-02	4.60E+00	5.17E-05	1.23E-03	0.00E+00	3.49E-04
Generator	D	500	Airport Ground Support	9.72E-01	4.35E+00	7.00E+01	6.08E-04	1.77E-03	5.53E-03	7.72E-01	8.68E-06	1.92E-04	0.00E+00	5.49E-05
Generator	D	750	Airport Ground Support	1.30E+00	5.80E+00	1.51E+02	1.32E-03	3.82E-03	1.23E-02	1.66E+00	1.87E-05	4.21E-04	0.00E+00	1.19E-04
Service Truck	D	175	Airport Ground Support	3.57E+00	4.94E+00	9.80E+00	1.00E-04	5.74E-04	8.94E-04	1.07E-01	1.21E-06	4.52E-05	0.00E+00	9.05E-06
Catering Truck	D	250	Airport Ground Support	8.64E-01	8.78E-01	6.21E+00	2.92E-05	1.24E-04	4.13E-04	6.86E-02	7.72E-07	1.10E-05	0.00E+00	2.64E-06
Hydrant Truck	D	175	Airport Ground Support	1.73E+00	2.96E+00	2.07E+01	2.39E-04	1.25E-03	2.02E-03	2.27E-01	2.55E-06	1.07E-04	0.00E+00	2.16E-05
Compressor (GSE)	D	120	Airport Ground Support	5.40E-01	9.38E-01	2.45E+00	4.16E-05	1.81E-04	2.65E-04	2.68E-02	3.14E-07	2.33E-05	0.00E+00	3.76E-06
Compressor (GSE)	D	250	Airport Ground Support	1.08E-01	1.88E-01	9.92E-01	7.83E-06	2.41E-05	8.70E-05	1.09E-02	1.23E-07	2.71E-06	0.00E+00	7.07E-07
Compressor (GSE)	D	500	Airport Ground Support	4.32E-01	7.50E-01	8.18E+00	5.94E-05	2.00E-04	6.31E-04	9.03E-02	8.86E-07	2.08E-05	0.00E+00	5.36E-06
Compressor (GSE)	D	750	Airport Ground Support	1.40E+00	2.44E+00	3.93E+01	2.89E-04	9.60E-04	3.13E-03	4.33E-01	4.36E-06	1.02E-04	0.00E+00	2.61E-05
Transport Refrigeration Units	D	15	Transport Refrigeration	5.78E+02	1.65E+03	6.03E+02	7.06E-03	4.04E-02	4.96E-02	6.61E+00	8.38E-05	2.33E-03	0.00E+00	6.37E-04
Transport Refrigeration Units	D	25	Transport Refrigeration	2.01E+02	5.72E+02	3.55E+02	4.76E-03	1.61E-02	3.04E-02	3.90E+00	4.95E-05	1.35E-03	0.00E+00	4.29E-04
Transport Refrigeration Units	D	50	Transport Refrigeration	4.32E+03	1.74E+04	2.06E+04	2.82E-01	1.86E+00	1.94E+00	2.25E+02	2.91E-03	1.05E-01	0.00E+00	2.54E-02
A/C unit	D	120	Military Tactical Suppor	6.82E+01	5.61E+01	1.95E+02	2.86E-03	1.32E-02	2.03E-02	2.13E+00	2.50E-05	1.53E-03	0.00E+00	2.58E-04
A/C unit	D	250	Military Tactical Suppor	2.85E+01	2.34E+01	1.66E+02	1.09E-03	3.87E-03	1.42E-02	1.83E+00	2.06E-05	4.06E-04	0.00E+00	9.87E-05
A/C unit	D	500	Military Tactical Suppor	1.13E+01	9.26E+00	9.93E+01	5.89E-04	2.42E-03	7.68E-03	1.10E+00	1.08E-05	2.28E-04	0.00E+00	5.32E-05
Aircraft Support	D	120	Military Tactical Suppor	1.85E+01	1.53E+01	3.57E+01	5.23E-04	2.42E-03	3.72E-03	3.90E-01	4.57E-06	2.80E-04	0.00E+00	4.72E-05
Aircraft Support	D	175	Military Tactical Suppor	2.65E+01	2.18E+01	1.05E+02	1.03E-03	5.92E-03	9.69E-03	1.15E+00	1.29E-05	4.55E-04	0.00E+00	9.29E-05
Cart	D	120	Military Tactical Suppor	7.94E+00	6.54E+00	1.82E+01	2.67E-04	1.24E-03	1.90E-03	1.99E-01	2.34E-06	1.43E-04	0.00E+00	2.41E-05
Cart	D	175	Military Tactical Suppor	1.99E+00	1.63E+00	8.57E+00	8.44E-05	4.85E-04	7.95E-04	9.40E-02	1.06E-06	3.73E-05	0.00E+00	7.62E-06
Cart	D	250	Military Tactical Suppor	6.62E+00	5.45E+00	3.65E+01	2.41E-04	8.53E-04	3.12E-03	4.04E-01	4.54E-06	8.95E-05	0.00E+00	2.17E-05
Communications	D	50	Military Tactical Suppor	2.65E+00	2.18E+00	3.02E+00	8.66E-05	2.71E-04	3.02E-04	3.28E-02	4.24E-07	2.39E-05	0.00E+00	7.81E-06
Communications	D	120	Military Tactical Suppor	3.97E+00	3.27E+00	8.99E+00	1.32E-04	6.11E-04	9.39E-04	9.83E-02	1.15E-06	7.05E-05	0.00E+00	1.19E-05

Compressor (Military)	D	50	Military Tactical Suppor	2.65E+00	2.18E+00	3.70E+00	1.06E-04	3.33E-04	3.70E-04	4.01E-02	5.19E-07	2.92E-05	0.00E+00	9.57E-06
Compressor (Military)	D	120	Military Tactical Suppor	9.99E+01	8.23E+01	2.01E+02	2.94E-03	1.37E-02	2.10E-02	2.20E+00	2.58E-05	1.57E-03	0.00E+00	2.66E-04
Compressor (Military)	D	175	Military Tactical Suppor	2.65E+00	2.18E+00	1.25E+01	1.23E-04	7.06E-04	1.16E-03	1.37E-01	1.54E-06	5.43E-05	0.00E+00	1.11E-05
Compressor (Military)	D	250	Military Tactical Suppor	5.29E+00	4.36E+00	3.31E+01	2.18E-04	7.72E-04	2.83E-03	3.65E-01	4.11E-06	8.10E-05	0.00E+00	1.97E-05
Compressor (Military)	D	500	Military Tactical Suppor	1.85E+01	1.53E+01	1.94E+02	1.15E-03	4.72E-03	1.50E-02	2.14E+00	2.10E-05	4.45E-04	0.00E+00	1.04E-04
Crane	D	120	Military Tactical Suppor	1.06E+01	8.72E+00	3.13E+01	1.99E-04	1.97E-03	2.28E-03	3.44E-01	4.04E-06	1.30E-04	0.00E+00	1.80E-05
Crane	D	175	Military Tactical Suppor	1.99E+00	1.63E+00	7.88E+00	3.68E-05	4.30E-04	4.76E-04	8.66E-02	9.75E-07	1.94E-05	0.00E+00	3.32E-06
Crane	D	250	Military Tactical Suppor	1.32E+00	1.09E+00	7.93E+00	2.77E-05	1.48E-04	4.25E-04	8.77E-02	9.86E-07	1.11E-05	0.00E+00	2.50E-06
Deicer	D	120	Military Tactical Suppor	2.65E+00	2.18E+00	8.24E+00	1.21E-04	5.60E-04	8.60E-04	9.01E-02	1.06E-06	6.46E-05	0.00E+00	1.09E-05
Generator (Military)	D	50	Military Tactical Suppor	1.79E+01	1.47E+01	1.94E+01	5.55E-04	1.74E-03	1.94E-03	2.10E-01	2.72E-06	1.53E-04	0.00E+00	5.01E-05
Generator (Military)	D	120	Military Tactical Suppor	4.45E+02	3.66E+02	1.04E+03	1.53E-02	7.10E-02	1.09E-01	1.14E+01	1.34E-04	8.19E-03	0.00E+00	1.38E-03
Generator (Military)	D	175	Military Tactical Suppor	3.58E+02	2.95E+02	1.48E+03	1.46E-02	8.40E-02	1.38E-01	1.63E+01	1.83E-04	6.47E-03	0.00E+00	1.32E-03
Generator (Military)	D	250	Military Tactical Suppor	9.46E+01	7.79E+01	5.92E+02	3.90E-03	1.38E-02	5.06E-02	6.53E+00	7.35E-05	1.45E-03	0.00E+00	3.52E-04
Generator (Military)	D	500	Military Tactical Suppor	3.84E+01	3.16E+01	3.74E+02	2.22E-03	9.13E-03	2.89E-02	4.13E+00	4.06E-05	8.60E-04	0.00E+00	2.00E-04
Generator (Military)	D	750	Military Tactical Suppor	1.32E+00	8.46E-01	1.54E+01	9.45E-05	3.76E-04	1.23E-03	1.70E-01	1.71E-06	3.60E-05	0.00E+00	8.53E-06
Hydraulic unit	D	120	Military Tactical Suppor	4.43E+01	3.65E+01	1.19E+02	1.75E-03	8.10E-03	1.24E-02	1.30E+00	1.53E-05	9.34E-04	0.00E+00	1.58E-04
Lift (Military)	D	120	Military Tactical Suppor	1.32E+00	1.09E+00	3.56E+00	5.22E-05	2.42E-04	3.72E-04	3.89E-02	4.57E-07	2.79E-05	0.00E+00	4.71E-06
Light	D	50	Military Tactical Suppor	3.31E+00	2.72E+00	4.72E+00	1.35E-04	4.24E-04	4.72E-04	5.12E-02	6.62E-07	3.73E-05	0.00E+00	1.22E-05
Pressure Washers	D	175	Military Tactical Suppor	1.99E+00	1.63E+00	8.51E+00	8.39E-05	4.82E-04	7.89E-04	9.34E-02	1.05E-06	3.71E-05	0.00E+00	7.57E-06
Pump (Military)	D	50	Military Tactical Suppor	3.84E+01	3.16E+01	4.27E+01	1.22E-03	3.84E-03	4.27E-03	4.63E-01	5.99E-06	3.37E-04	0.00E+00	1.10E-04
Pump (Military)	D	120	Military Tactical Suppor	2.98E+01	2.45E+01	8.43E+01	1.24E-03	5.73E-03	8.80E-03	9.22E-01	1.08E-05	6.61E-04	0.00E+00	1.11E-04
Start Cart	D	120	Military Tactical Suppor	6.62E-01	5.45E-01	1.87E+00	2.75E-05	1.27E-04	1.96E-04	2.05E-02	2.40E-07	1.47E-05	0.00E+00	2.48E-06
Start Cart	D	500	Military Tactical Suppor	6.62E-01	5.45E-01	5.25E+00	3.11E-05	1.28E-04	4.06E-04	5.80E-02	5.69E-07	1.21E-05	0.00E+00	2.81E-06
Test Stand	D	120	Military Tactical Suppor	2.18E+01	1.80E+01	5.69E+01	8.34E-04	3.87E-03	5.94E-03	6.22E-01	7.29E-06	4.46E-04	0.00E+00	7.52E-05
Test Stand	D	175	Military Tactical Suppor	1.32E+00	1.09E+00	5.30E+00	5.22E-05	3.00E-04	4.92E-04	5.82E-02	6.55E-07	2.31E-05	0.00E+00	4.71E-06
Test Stand	D	250	Military Tactical Suppor	2.05E+01	1.69E+01	1.13E+02	7.47E-04	2.64E-03	9.68E-03	1.25E+00	1.41E-05	2.77E-04	0.00E+00	6.74E-05
Test Stand	D	500	Military Tactical Suppor	7.94E+00	6.54E+00	7.64E+01	4.53E-04	1.86E-03	5.90E-03	8.43E-01	8.28E-06	1.75E-04	0.00E+00	4.09E-05
Welder	D	50	Military Tactical Suppor	1.39E+01	1.14E+01	1.39E+01	3.98E-04	1.25E-03	1.39E-03	1.51E-01	1.95E-06	1.10E-04	0.00E+00	3.59E-05
Welder	D	120	Military Tactical Suppor	3.84E+01	3.16E+01	6.73E+01	9.87E-04	4.58E-03	7.03E-03	7.37E-01	8.64E-06	5.28E-04	0.00E+00	8.91E-05
Other tactical support equipment	D	50	Military Tactical Suppor	6.62E-01	5.45E-01	9.44E-01	2.71E-05	8.48E-05	9.45E-05	1.02E-02	1.32E-07	7.45E-06	0.00E+00	2.44E-06
Other tactical support equipment	D	120	Military Tactical Suppor	1.06E+01	8.72E+00	2.37E+01	3.47E-04	1.61E-03	2.47E-03	2.59E-01	3.04E-06	1.86E-04	0.00E+00	3.13E-05
Other tactical support equipment	D	175	Military Tactical Suppor	1.06E+01	8.72E+00	4.42E+01	4.35E-04	2.50E-03	4.10E-03	4.85E-01	5.46E-06	1.93E-04	0.00E+00	3.93E-05
Other tactical support equipment	D	250	Military Tactical Suppor	3.97E+00	3.27E+00	2.43E+01	1.60E-04	5.66E-04	2.07E-03	2.68E-01	3.01E-06	5.94E-05	0.00E+00	1.44E-05
Other tactical support equipment	D	500	Military Tactical Suppor	1.32E+00	1.09E+00	1.00E+01	5.94E-05	2.44E-04	7.74E-04	1.11E-01	1.09E-06	2.30E-05	0.00E+00	5.36E-06
Other tactical support equipment	D	750	Military Tactical Suppor	6.62E-01	5.45E-01	1.16E+01	7.12E-05	2.83E-04	9.24E-04	1.28E-01	1.29E-06	2.71E-05	0.00E+00	6.43E-06
Compressor (Dredging)	D	50	Dredging	1.83E+00	4.70E+00	6.58E+00	2.81E-04	7.95E-04	7.02E-04	7.06E-02	9.13E-07	6.80E-05	0.00E+00	2.54E-05
Compressor (Dredging)	D	120	Dredging	1.37E+01	3.52E+01	9.22E+01	1.70E-03	6.93E-03	1.06E-02	1.01E+00	1.18E-05	9.43E-04	0.00E+00	1.54E-04
Compressor (Dredging)	D	175	Dredging	2.75E+00	4.77E+00	2.11E+01	2.68E-04	1.32E-03	2.14E-03	2.31E-01	2.60E-06	1.20E-04	0.00E+00	2.42E-05
Compressor (Dredging)	D	250	Dredging	2.75E+00	4.77E+00	2.67E+01	2.30E-04	6.87E-04	2.50E-03	2.94E-01	3.31E-06	8.06E-05	0.00E+00	2.07E-05
Compressor (Dredging)	D	500	Dredging	2.75E+00	4.77E+00	4.24E+01	3.35E-04	1.14E-03	3.52E-03	4.67E-01	4.59E-06	1.19E-04	0.00E+00	3.02E-05
Compressor (Dredging)	D	1000	Dredging	5.49E+00	9.54E+00	2.10E+02	1.97E-03	6.77E-03	2.39E-02	2.32E+00	2.33E-05	6.91E-04	0.00E+00	1.77E-04
Crane (Dredging)	D	750	Dredging	1.83E+00	4.65E+00	7.56E+01	3.64E-04	1.48E-03	3.90E-03	8.36E-01	8.20E-06	1.23E-04	0.00E+00	3.29E-05
Deck/door engine	D	250	Dredging	3.66E+00	1.64E+00	1.05E+01	6.13E-05	2.35E-04	8.65E-04	1.16E-01	1.31E-06	2.31E-05	0.00E+00	5.53E-06
Dredger	D	175	Dredging	7.32E+00	2.02E+01	8.27E+01	1.07E-03	5.20E-03	8.46E-03	9.05E-01	1.02E-05	4.77E-04	0.00E+00	9.64E-05
Dredger	D	250	Dredging	1.37E+01	3.80E+01	2.16E+02	1.89E-03	5.59E-03	2.04E-02	2.38E+00	2.67E-05	6.58E-04	0.00E+00	1.71E-04
Dredger	D	750	Dredging	5.49E+00	1.52E+01	2.41E+02	1.97E-03	6.49E-03	2.07E-02	2.66E+00	2.61E-05	6.94E-04	0.00E+00	1.77E-04
Dredger	D	9999	Dredging	5.49E+00	1.52E+01	5.27E+02	5.08E-03	1.70E-02	6.02E-02	5.81E+00	5.70E-05	1.75E-03	0.00E+00	4.59E-04
Hoist/swing/winch	D	50	Dredging	9.15E-01	2.53E+00	2.41E+00	1.05E-04	2.96E-04	2.59E-04	2.59E-02	3.34E-07	2.53E-05	0.00E+00	9.48E-06
Hoist/swing/winch	D	120	Dredging	8.24E+00	2.28E+01	6.94E+01	1.30E-03	5.25E-03	7.98E-03	7.57E-01	8.88E-06	7.20E-04	0.00E+00	1.17E-04
Hoist/swing/winch	D	175	Dredging	1.19E+01	3.29E+01	1.28E+02	1.65E-03	8.02E-03	1.31E-02	1.40E+00	1.57E-05	7.36E-04	0.00E+00	1.49E-04
Hoist/swing/winch	D	250	Dredging	2.29E+01	6.33E+01	3.90E+02	3.43E-03	1.01E-02	3.69E-02	4.30E+00	4.84E-05	1.19E-03	0.00E+00	3.09E-04
Hoist/swing/winch	D	500	Dredging	2.38E+01	6.58E+01	6.44E+02	5.20E-03	1.74E-02	5.37E-02	7.10E+00	6.97E-05	1.82E-03	0.00E+00	4.69E-04
Hoist/swing/winch	D	750	Dredging	1.01E+01	2.78E+01	5.43E+02	4.43E-03	1.46E-02	4.67E-02	5.99E+00	5.88E-05	1.57E-03	0.00E+00	4.00E-04
Hoist/swing/winch	D	9999	Dredging	4.58E+00	1.27E+01	4.65E+02	4.49E-03	1.50E-02	5.32E-02	5.12E+00	5.03E-05	1.55E-03	0.00E+00	4.05E-04
Pump (Dredging)	D	120	Dredging	3.66E+00	3.14E+00	1.35E+01	2.10E-04	9.38E-04	1.44E-03	1.47E-01	1.73E-06	1.13E-04	0.00E+00	1.89E-05
Pump (Dredging)	D	175	Dredging	9.15E-01	1.16E+00	7.36E+00	7.75E-05	4.27E-04	7.00E-04	8.08E-02	9.09E-07	3.45E-05	0.00E+00	7.00E-06
Pump (Dredging)	D	250	Dredging	8.24E+00	1.05E+01	1.10E+02	7.79E-04	2.64E-03	9.62E-03	1.21E+00	1.36E-05	2.87E-04	0.00E+00	7.03E-05

Pump (Dredging)	D	500	Dredging	1.37E+01	1.74E+01	2.82E+02	1.81E-03	7.17E-03	2.22E-02	3.12E+00	3.06E-05	6.88E-04	0.00E+00	1.63E-04
Pump (Dredging)	D	750	Dredging	7.32E+00	6.29E+00	1.49E+02	9.82E-04	3.79E-03	1.21E-02	1.65E+00	1.62E-05	3.70E-04	0.00E+00	8.86E-05
Pump (Dredging)	D	9999	Dredging	1.46E+01	1.86E+01	2.12E+03	1.79E-02	6.43E-02	2.29E-01	2.34E+01	2.29E-04	6.37E-03	0.00E+00	1.61E-03
Generator (Dredging)	D	50	Dredging	1.83E+00	5.83E+00	8.32E+00	3.73E-04	1.05E-03	9.00E-04	8.91E-02	1.15E-06	8.94E-05	0.00E+00	3.36E-05
Generator (Dredging)	D	120	Dredging	1.46E+01	4.66E+01	1.88E+02	3.62E-03	1.44E-02	2.18E-02	2.05E+00	2.41E-05	2.00E-03	0.00E+00	3.26E-04
Generator (Dredging)	D	175	Dredging	9.15E-01	2.91E+00	1.59E+01	2.11E-04	1.01E-03	1.64E-03	1.74E-01	1.96E-06	9.38E-05	0.00E+00	1.91E-05
Generator (Dredging)	D	250	Dredging	1.46E+01	4.66E+01	4.63E+02	4.20E-03	1.21E-02	4.40E-02	5.10E+00	5.74E-05	1.44E-03	0.00E+00	3.79E-04
Generator (Dredging)	D	500	Dredging	2.56E+01	8.16E+01	1.38E+03	1.15E-02	3.73E-02	1.15E-01	1.52E+01	1.49E-04	3.96E-03	0.00E+00	1.04E-03
Generator (Dredging)	D	750	Dredging	9.15E+00	2.91E+01	8.17E+02	6.92E-03	2.22E-02	7.06E-02	9.01E+00	8.84E-05	2.39E-03	0.00E+00	6.24E-04
Generator (Dredging)	D	9999	Dredging	1.46E+01	4.66E+01	2.86E+03	2.83E-02	9.31E-02	3.30E-01	3.15E+01	3.09E-04	9.69E-03	0.00E+00	2.55E-03
Other (Dredging)	D	120	Dredging	2.75E+00	7.59E+00	2.25E+01	4.21E-04	1.70E-03	2.58E-03	2.45E-01	2.87E-06	2.33E-04	0.00E+00	3.80E-05
Other (Dredging)	D	175	Dredging	9.15E-01	2.53E+00	1.29E+01	1.67E-04	8.12E-04	1.32E-03	1.41E-01	1.59E-06	7.45E-05	0.00E+00	1.51E-05
Other (Dredging)	D	250	Dredging	1.83E+00	5.06E+00	3.20E+01	2.81E-04	8.29E-04	3.02E-03	3.52E-01	3.97E-06	9.77E-05	0.00E+00	2.53E-05
Other (Dredging)	D	500	Dredging	3.66E+00	1.01E+01	1.13E+02	9.13E-04	3.05E-03	9.43E-03	1.25E+00	1.22E-05	3.20E-04	0.00E+00	8.24E-05
Misc Portable Equipment	D	120	Other Portable Equipme	1.78E+00	1.84E+00	5.78E+00	9.42E-05	4.10E-04	6.29E-04	6.32E-02	7.41E-07	5.12E-05	0.00E+00	8.50E-06
Misc Portable Equipment	D	175	Other Portable Equipme	4.38E-01	4.51E-01	1.95E+00	2.15E-05	1.15E-04	1.89E-04	2.14E-02	2.41E-07	9.60E-06	0.00E+00	1.94E-06
Misc Portable Equipment	D	250	Other Portable Equipme	9.39E-02	9.67E-02	6.95E-01	5.19E-06	1.70E-05	6.20E-05	7.67E-03	8.63E-08	1.90E-06	0.00E+00	4.68E-07
Misc Portable Equipment	D	500	Other Portable Equipme	3.44E-01	3.55E-01	4.76E+00	3.21E-05	1.23E-04	3.80E-04	5.25E-02	5.15E-07	1.21E-05	0.00E+00	2.90E-06
Misc Portable Equipment	D	750	Other Portable Equipme	1.57E-01	1.61E-01	3.07E+00	2.13E-05	7.96E-05	2.53E-04	3.39E-02	3.41E-07	7.93E-06	0.00E+00	1.92E-06
Misc Portable Equipment	D	1000	Other Portable Equipme	6.26E-02	6.45E-02	1.64E+00	1.40E-05	5.07E-05	1.79E-04	1.81E-02	1.82E-07	5.03E-06	0.00E+00	1.26E-06
Generator (Entertainment)	D	50	Entertainment Equipmer	3.17E-01	2.28E-01	4.59E-01	1.38E-05	4.25E-05	4.62E-05	4.97E-03	6.43E-08	3.72E-06	0.00E+00	1.24E-06
Generator (Entertainment)	D	120	Entertainment Equipmer	7.77E+00	5.59E+00	2.28E+01	3.41E-04	1.56E-03	2.40E-03	2.49E-01	2.92E-06	1.83E-04	0.00E+00	3.08E-05
Generator (Entertainment)	D	175	Entertainment Equipmer	6.42E+00	4.62E+00	3.14E+01	3.18E-04	1.80E-03	2.94E-03	3.45E-01	3.88E-06	1.41E-04	0.00E+00	2.87E-05
Generator (Entertainment)	D	250	Entertainment Equipmer	9.91E+00	7.13E+00	6.38E+01	4.32E-04	1.50E-03	5.50E-03	7.04E-01	7.92E-06	1.60E-04	0.00E+00	3.90E-05
Generator (Entertainment)	D	500	Entertainment Equipmer	1.54E+01	1.11E+01	1.38E+02	8.46E-04	3.43E-03	1.08E-02	1.53E+00	1.50E-05	3.25E-04	0.00E+00	7.63E-05
Generator (Entertainment)	D	750	Entertainment Equipmer	2.70E+00	1.94E+00	4.76E+01	3.00E-04	1.18E-03	3.82E-03	5.26E-01	5.29E-06	1.14E-04	0.00E+00	2.71E-05
Generator (Entertainment)	D	9999	Entertainment Equipmer	3.96E-01	2.85E-01	1.25E+01	1.03E-04	3.69E-04	1.33E-03	1.38E-01	1.38E-06	3.68E-05	0.00E+00	9.25E-06
Compressor (Entertainment)	D	120	Entertainment Equipmer	7.93E-02	1.38E-01	2.20E-01	4.06E-06	1.65E-05	2.52E-05	2.40E-03	2.81E-08	2.25E-06	0.00E+00	3.67E-07
Compressor (Railyard)	D	120	Railyard Operations	1.59E-01	2.75E-01	4.09E-01	7.57E-06	3.08E-05	4.69E-05	4.47E-03	5.24E-08	4.18E-06	0.00E+00	6.83E-07
Crane (Rail-CHE)	D	120	Railyard Operations	7.93E-02	1.38E-01	3.40E-01	6.28E-06	2.55E-05	3.89E-05	3.71E-03	4.35E-08	3.47E-06	0.00E+00	5.66E-07
Crane (Rail-CHE)	D	175	Railyard Operations	2.38E-01	1.71E-01	5.34E-01	5.39E-06	3.05E-05	4.99E-05	5.85E-03	6.59E-08	2.39E-06	0.00E+00	4.86E-07
Materials Handling (Rail-CHE)	D	120	Railyard Operations	7.93E-02	1.38E-01	3.73E-01	6.89E-06	2.80E-05	4.27E-05	4.07E-03	4.58E-08	3.81E-06	0.00E+00	6.22E-07
Generator (Railyard)	D	175	Railyard Operations	7.93E-02	5.70E-02	3.61E-01	3.65E-06	2.07E-05	3.38E-05	3.97E-03	4.46E-08	1.62E-06	0.00E+00	3.30E-07
Generator (Railyard)	D	9999	Railyard Operations	7.93E-02	5.70E-02	2.27E+00	1.87E-05	6.72E-05	2.42E-04	2.50E-02	2.52E-07	6.69E-06	0.00E+00	1.68E-06
Vessels w/Outboard Engines	G2	2	Pleasure Craft	3.36E+02	3.54E+01	2.47E+00	2.25E-03	2.86E-03	9.78E-06	1.07E-02	3.06E-07	1.77E-04	7.90E-06	1.40E-04
Vessels w/Outboard Engines	G2	15	Pleasure Craft	1.86E+04	1.96E+03	3.89E+02	3.18E-01	4.86E-01	1.04E-02	1.78E+00	5.08E-05	2.95E-02	2.17E-03	1.98E-02
Vessels w/Outboard Engines	G2	25	Pleasure Craft	5.06E+03	5.33E+02	3.05E+02	1.91E-01	3.86E-01	1.22E-02	1.61E+00	4.60E-05	2.67E-02	1.28E-03	1.18E-02
Vessels w/Outboard Engines	G2	50	Pleasure Craft	4.94E+03	5.20E+02	7.50E+02	2.98E-01	5.00E-01	3.34E-02	5.32E+00	8.31E-05	4.82E-02	2.14E-03	1.85E-02
Vessels w/Outboard Engines	G2	120	Pleasure Craft	4.34E+03	4.57E+02	1.38E+03	5.14E-01	9.66E-01	6.19E-02	9.87E+00	1.56E-04	9.05E-02	2.82E-03	3.19E-02
Vessels w/Outboard Engines	G2	175	Pleasure Craft	2.01E+03	2.11E+02	1.16E+03	4.26E-01	9.25E-01	4.89E-02	8.14E+00	1.32E-04	7.67E-02	1.70E-03	2.65E-02
Vessels w/Outboard Engines	G2	250	Pleasure Craft	5.76E+02	6.06E+01	4.28E+02	1.56E-01	2.98E-01	2.70E-02	3.07E+00	5.13E-05	2.98E-02	6.88E-04	9.72E-03
Vessels w/Outboard Engines	G2	500	Pleasure Craft	1.16E+02	1.22E+01	1.25E+02	5.09E-02	9.29E-02	8.60E-04	8.66E-01	1.45E-05	8.40E-03	5.29E-05	3.16E-03
Sailboat Auxiliary Outboard Engin	G2	15	Pleasure Craft	2.10E+02	4.61E+00	9.45E-01	7.30E-04	1.12E-03	2.82E-05	4.58E-03	1.31E-07	7.57E-05	5.50E-06	4.54E-05
Sailboat Auxiliary Outboard Engin	G2	25	Pleasure Craft	1.13E+02	2.48E+00	1.11E+00	6.51E-04	1.33E-03	4.60E-05	6.15E-03	1.75E-07	1.02E-04	5.33E-06	4.05E-05
Sailboat Auxiliary Outboard Engin	G2	50	Pleasure Craft	1.05E+02	2.30E+00	2.85E+00	1.04E-03	1.75E-03	1.36E-04	2.08E-02	3.25E-07	1.89E-04	9.08E-06	6.44E-05
Personal Water Craft	G2	9999	Pleasure Craft	2.93E+04	1.60E+03	6.13E+03	1.32E+00	2.32E+00	2.79E-01	5.05E+01	8.21E-04	4.63E-01	1.13E-02	8.21E-02
Vessels w/Inboard Engines	G4	250	Pleasure Craft	1.66E+04	3.39E+03	1.87E+04	7.10E-01	2.20E+01	9.05E-01	1.43E+02	1.65E-03	1.37E-02	2.95E-02	4.04E-02
Vessels w/Outboard Engines	G4	50	Pleasure Craft	3.02E+03	3.19E+02	4.26E+02	2.54E-02	6.71E-01	1.98E-02	2.96E+00	3.41E-05	2.83E-04	1.31E-03	1.44E-03
Vessels w/Sterndrive Engines	G4	250	Pleasure Craft	4.09E+04	6.55E+03	2.68E+04	1.01E+00	3.14E+01	1.27E+00	2.05E+02	2.37E-03	1.96E-02	4.81E-02	5.72E-02
Sailboat Auxiliary Inboard Engine	G4	15	Pleasure Craft	5.60E+02	1.23E+01	5.04E+00	3.02E-04	8.12E-03	2.35E-04	3.47E-02	5.80E-07	3.32E-06	2.70E-05	1.71E-05
Vessels w/Inboard Jet Engines	G4	500	Pleasure Craft	4.73E+03	7.57E+02	4.98E+03	1.90E-01	5.85E+00	2.42E-01	3.81E+01	4.39E-04	3.64E-03	7.28E-03	1.08E-02
Vessels w/Inboard Engines	D	250	Pleasure Craft	1.78E+03	3.63E+02	1.81E+03	1.07E-01	1.60E-01	3.65E-01	1.94E+01	2.18E-04	9.32E-03	0.00E+00	9.63E-03
Sailboat Auxiliary Inboard Engine	D	50	Pleasure Craft	1.14E+03	2.50E+01	1.38E+01	8.15E-04	1.22E-03	2.78E-03	1.48E-01	1.91E-06	7.00E-05	0.00E+00	7.35E-05

Table F.5-10 Offroad 2007-Emissions Factor Calculations (16 Pages)

Equipment Type	Fuel	HP vs. Equip Class	Equip Class hp-hrs/day	ROG Exhaust lbs/Hp-Hr	CO Exhaust lbs/Hp-Hr	NOX Exhaust lbs/Hp-Hr	CO2 Exhaust lbs/Hp-Hr	SO2 Exhaust lbs/Hp-Hr	PM Exhaust lbs/Hp-Hr	N2O Exhaust lbs/Hp-Hr	CH4 Exhaust lbs/Hp-Hr	Equip Class Fuel Use gal/hr
Off-Road Motorcycles Inactive	G2	15	4.44E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G2	25	6.36E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G2	50	1.04E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G2	120	1.19E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowmobiles Inactive	G2	25	1.48E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowmobiles Inactive	G2	50	1.40E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowmobiles Inactive	G2	120	6.11E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G2	15	5.86E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G2	25	6.36E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G2	50	1.67E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G4	15	8.65E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G4	25	2.33E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Inactive	G4	50	4.85E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G4	15	4.78E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G4	25	1.11E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All Terrain Vehicles (ATVs) Inactive	G4	50	1.00E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Off-Road Motorcycles Active	G2	15	1.11E+05	5.09E-03	7.95E-03	1.51E-06	1.69E-02	1.37E-05	6.17E-05	5.71E-06	3.16E-04	3.79E-02
Off-Road Motorcycles Active	G2	25	1.59E+05	3.05E-03	4.77E-03	9.06E-07	1.01E-02	1.53E-05	3.70E-05	3.42E-06	1.90E-04	3.79E-02
Off-Road Motorcycles Active	G2	50	2.59E+06	1.53E-03	2.39E-03	4.53E-07	5.07E-03	1.21E-05	1.85E-05	1.71E-06	9.49E-05	3.79E-02
Off-Road Motorcycles Active	G2	120	2.97E+06	6.36E-04	9.94E-04	1.89E-07	2.11E-03	7.45E-06	7.72E-06	7.13E-07	3.95E-05	3.79E-02
Snowmobiles Active	G2	25	4.27E+01	5.82E-02	1.70E-01	1.89E-03	2.58E-01	4.49E-06	1.78E-03	2.00E-04	3.62E-03	9.67E-01
Snowmobiles Active	G2	50	4.02E+02	5.53E-02	1.61E-01	1.80E-03	2.45E-01	4.26E-06	1.69E-03	1.41E-04	3.44E-03	1.84E+00
Snowmobiles Active	G2	120	1.76E+03	3.53E-02	1.06E-01	1.38E-03	1.74E-01	3.04E-06	1.16E-03	8.18E-05	2.19E-03	2.95E+00
All Terrain Vehicles (ATVs) Active	G2	15	1.93E+05	5.09E-03	7.95E-03	1.51E-06	1.69E-02	1.68E-05	6.17E-05	5.71E-06	3.16E-04	3.79E-02
All Terrain Vehicles (ATVs) Active	G2	25	2.09E+05	3.05E-03	4.77E-03	9.06E-07	1.01E-02	1.38E-05	3.70E-05	3.42E-06	1.90E-04	3.79E-02
All Terrain Vehicles (ATVs) Active	G2	50	5.51E+05	1.53E-03	2.39E-03	4.53E-07	5.07E-03	9.07E-06	1.85E-05	1.71E-06	9.49E-05	3.79E-02
Golf Carts	G2	15	0.00E+00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Specialty Vehicles Carts	G2	15	1.90E+04	1.77E-03	1.34E-01	1.31E-03	2.56E-01	1.06E-05	9.63E-05	2.11E-04	1.10E-04	3.68E-01
Tampers/Rammers	G2	15	2.82E+03	1.69E-03	7.26E-02	1.27E-03	1.39E-01	5.72E-06	1.16E-03	2.07E-04	1.05E-04	2.02E-01
Plate Compactors	G2	15	2.74E+02	1.69E-03	7.26E-02	1.27E-03	1.39E-01	5.72E-06	1.16E-03	2.07E-04	1.05E-04	2.02E-01
Other General Industrial Equipmen	G2	15	1.14E+02	2.36E-03	1.43E-01	1.73E-03	2.73E-01	1.12E-05	1.27E-04	2.44E-04	1.47E-04	3.93E-01
Lawn Mowers	G2	15	6.20E+04	1.71E-03	3.06E-02	4.42E-04	9.09E-02	3.74E-06	2.87E-04	1.18E-04	1.06E-04	1.13E-01
Lawn Mowers	G2	15	2.37E+04	4.01E-03	4.74E-02	4.92E-04	9.09E-02	3.74E-06	3.09E-04	1.19E-04	2.49E-04	1.40E-01
Chainsaws	G2	2	1.87E+04	4.99E-02	9.02E-02	7.63E-04	2.44E-01	1.00E-05	1.42E-04	4.04E-04	3.10E-03	5.96E-02
Chainsaws	G2	2	2.68E+03	2.80E-02	1.14E-01	8.06E-04	2.44E-01	1.00E-05	4.92E-04	4.13E-04	1.74E-03	5.49E-02
Chainsaws	G2	15	9.89E+04	1.61E-02	2.91E-02	2.46E-04	7.86E-02	3.24E-06	4.57E-05	8.63E-05	9.99E-04	1.44E-01
Chainsaws	G2	15	1.42E+04	8.21E-03	3.45E-02	2.56E-04	7.86E-02	3.24E-06	1.75E-04	8.72E-05	5.10E-04	1.28E-01
Chainsaws Preempt	G2	15	1.23E+05	1.61E-02	2.91E-02	2.46E-04	7.86E-02	3.24E-06	4.57E-05	8.63E-05	9.99E-04	1.44E-01
Chainsaws Preempt	G2	15	1.76E+04	1.10E-02	4.12E-02	2.12E-04	7.86E-02	3.24E-06	9.84E-05	7.92E-05	6.85E-04	1.44E-01
Trimmers/Edgers/Brush Cutters	G2	2	2.56E+04	2.39E-02	7.88E-02	6.67E-04	2.13E-01	8.77E-06	1.24E-04	3.76E-04	1.49E-03	4.44E-02
Trimmers/Edgers/Brush Cutters	G2	2	3.80E+04	1.91E-02	7.88E-02	6.82E-04	2.13E-01	8.77E-06	1.24E-04	3.80E-04	1.19E-03	4.25E-02
Leaf Blowers/Vacuums	G2	2	6.19E+04	3.68E-02	8.76E-02	7.41E-04	2.37E-01	9.75E-06	1.38E-04	3.98E-04	2.29E-03	5.33E-02
Leaf Blowers/Vacuums	G2	2	2.93E+03	2.71E-02	1.11E-01	7.82E-04	2.37E-01	9.75E-06	4.78E-04	4.06E-04	1.69E-03	5.33E-02
Shredders	G2	15	1.62E+03	3.29E-03	1.58E-01	2.48E-03	3.03E-01	1.25E-05	2.54E-03	2.96E-04	2.04E-04	4.39E-01
Shredders	G2	15	2.88E+02	1.38E-02	1.77E-01	1.93E-03	3.03E-01	1.25E-05	2.54E-03	2.54E-04	8.59E-04	4.93E-01

Commercial Turf Equipment	G2	15	5.07E+03	2.48E-03	1.49E-01	1.82E-03	2.84E-01	1.17E-05	1.32E-04	2.51E-04	1.54E-04	4.10E-01
Commercial Turf Equipment	G2	25	4.17E+03	3.13E-03	2.00E-01	2.33E-03	3.60E-01	1.48E-05	1.68E-04	2.25E-04	1.95E-04	8.88E-01
Other Lawn & Garden Equipment	G2	2	2.45E+01	2.74E-02	1.02E-01	8.59E-04	2.75E-01	1.13E-05	1.60E-04	4.31E-04	1.70E-03	5.58E-02
Other Lawn & Garden Equipment	G2	2	3.53E+01	3.10E-02	1.28E-01	9.07E-04	2.75E-01	1.13E-05	5.54E-04	4.40E-04	1.93E-03	6.16E-02
Other Lawn & Garden Equipment	G2	15	7.99E+01	1.83E-02	6.77E-02	5.73E-04	1.83E-01	7.54E-06	1.07E-04	1.35E-04	1.14E-03	2.79E-01
Other Lawn & Garden Equipment	G2	15	1.15E+02	1.88E-02	8.04E-02	5.95E-04	1.83E-01	7.54E-06	4.07E-04	1.37E-04	1.17E-03	2.96E-01
Generator Sets	G2	2	1.11E+02	1.42E-02	1.31E-01	2.37E-03	3.22E-01	1.33E-05	1.24E-03	7.27E-04	8.81E-04	6.02E-02
Generator Sets	G2	2	5.84E+01	1.85E-02	1.50E-01	2.35E-03	3.22E-01	1.33E-05	1.32E-03	7.20E-04	1.15E-03	6.52E-02
Generator Sets	G2	15	8.36E+00	4.37E-03	2.07E-01	2.85E-03	3.86E-01	1.59E-05	1.81E-04	3.17E-04	2.72E-04	5.65E-01
Generator Sets	G2	15	4.28E+00	1.14E-02	2.22E-01	2.75E-03	3.86E-01	1.59E-05	4.37E-04	3.08E-04	7.06E-04	6.05E-01
Pumps	G2	2	8.44E+02	7.68E-03	9.86E-02	2.28E-03	3.27E-01	1.35E-05	1.15E-03	7.16E-04	4.77E-04	5.29E-02
Pumps	G2	2	4.46E+02	1.23E-02	1.22E-01	2.41E-03	3.27E-01	1.35E-05	1.22E-03	7.35E-04	7.63E-04	5.86E-02
Pumps	G2	15	1.71E+03	4.41E-03	1.83E-01	3.25E-03	3.48E-01	1.43E-05	2.92E-03	3.42E-04	2.74E-04	5.08E-01
Pumps	G2	15	9.01E+02	5.84E-03	1.88E-01	3.15E-03	3.48E-01	1.43E-05	2.92E-03	3.35E-04	3.63E-04	5.18E-01
Pumps	G2	25	3.44E+01	5.83E-03	2.47E-01	3.84E-03	4.44E-01	1.83E-05	3.72E-03	2.94E-04	3.62E-04	1.11E+00
Pumps	G2	25	1.80E+01	5.93E-03	2.49E-01	3.76E-03	4.44E-01	1.83E-05	3.72E-03	2.91E-04	3.69E-04	1.11E+00
Off-Road Motorcycles Active	G4	15	2.16E+05	1.79E-04	4.09E-03	7.80E-05	1.69E-02	1.37E-05	8.82E-06	4.54E-05	1.01E-05	1.87E-02
Off-Road Motorcycles Active	G4	25	5.81E+05	1.07E-04	2.45E-03	4.68E-05	1.01E-02	1.53E-05	5.29E-06	2.73E-05	6.03E-06	1.87E-02
Off-Road Motorcycles Active	G4	50	1.21E+06	5.37E-05	1.23E-03	2.34E-05	5.07E-03	1.21E-05	2.65E-06	1.36E-05	3.02E-06	1.87E-02
All Terrain Vehicles (ATVs) Active	G4	15	1.57E+05	1.88E-04	4.19E-03	1.02E-04	1.69E-02	1.68E-05	8.82E-06	5.24E-05	1.06E-05	1.88E-02
All Terrain Vehicles (ATVs) Active	G4	25	3.65E+06	1.13E-04	2.52E-03	6.11E-05	1.01E-02	1.38E-05	5.29E-06	3.14E-05	6.33E-06	1.88E-02
All Terrain Vehicles (ATVs) Active	G4	50	3.30E+05	5.63E-05	1.26E-03	3.06E-05	5.07E-03	9.07E-06	2.65E-06	1.57E-05	3.17E-06	1.88E-02
Minibikes	G4	5	2.93E+03	5.82E-02	3.74E-01	1.42E-03	5.07E-02	1.62E-05	1.56E-03	3.58E-04	3.31E-03	2.23E-01
Golf Carts	G4	15	0.00E+00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Specialty Vehicles Carts	G4	5	1.96E+02	7.93E-03	2.80E-01	1.91E-03	5.49E-01	1.90E-05	1.30E-03	4.18E-04	4.51E-04	2.64E-01
Specialty Vehicles Carts	G4	15	7.97E+03	1.93E-03	1.51E-01	1.37E-03	2.56E-01	7.31E-06	9.63E-05	2.11E-04	1.10E-04	3.89E-01
Specialty Vehicles Carts	G4	25	7.30E+03	3.23E-03	2.60E-01	2.15E-03	4.17E-01	1.06E-05	1.57E-04	2.10E-04	1.83E-04	1.09E+00
Asphalt Pavers	G4	15	1.34E+02	5.82E-03	2.21E-01	4.19E-03	3.75E-01	1.07E-05	3.14E-03	3.82E-04	3.30E-04	5.78E-01
Asphalt Pavers	G4	25	3.81E+02	9.01E-03	3.44E-01	5.69E-03	5.50E-01	1.39E-05	4.61E-03	3.54E-04	5.11E-04	1.46E+00
Asphalt Pavers	G4	50	3.88E+02	3.14E-03	9.83E-02	4.44E-03	7.29E-01	8.87E-06	5.59E-05	2.09E-04	1.78E-04	2.32E+00
Asphalt Pavers	G4	120	5.12E+02	1.59E-03	3.00E-02	4.57E-03	5.73E-01	5.53E-06	4.44E-05	1.32E-04	9.02E-05	3.89E+00
Tampers/Rammers	G4	15	1.30E+02	4.90E-03	1.85E-01	3.43E-03	3.12E-01	8.91E-06	2.62E-03	3.43E-04	2.79E-04	4.83E-01
Plate Compactors	G4	5	1.57E+03	1.02E-02	1.55E-01	4.46E-03	4.17E-01	1.44E-05	1.36E-04	6.58E-04	5.79E-04	1.81E-01
Plate Compactors	G4	15	5.73E+03	4.28E-03	1.63E-01	3.07E-03	2.78E-01	7.92E-06	2.33E-03	3.23E-04	2.43E-04	4.28E-01
Rollers	G4	5	8.09E+01	1.29E-02	2.58E-01	5.65E-03	5.87E-01	2.03E-05	1.91E-04	7.46E-04	7.34E-04	2.70E-01
Rollers	G4	15	1.47E+03	5.41E-03	2.07E-01	3.90E-03	3.52E-01	1.00E-05	2.95E-03	3.67E-04	3.07E-04	5.43E-01
Rollers	G4	25	1.65E+03	7.23E-03	2.78E-01	4.56E-03	4.46E-01	1.13E-05	3.74E-03	3.15E-04	4.11E-04	1.18E+00
Rollers	G4	50	4.33E+02	4.80E-03	1.41E-01	5.79E-03	7.92E-01	9.63E-06	6.07E-05	2.45E-04	2.72E-04	2.67E+00
Rollers	G4	120	1.95E+03	2.64E-03	4.72E-02	6.33E-03	6.62E-01	6.39E-06	5.13E-05	1.63E-04	1.50E-04	4.64E+00
Paving Equipment	G4	5	2.08E+03	1.09E-02	1.69E-01	4.75E-03	4.47E-01	1.54E-05	1.46E-04	6.81E-04	6.17E-04	1.95E-01
Paving Equipment	G4	15	1.24E+04	5.72E-03	2.19E-01	4.11E-03	3.72E-01	1.06E-05	3.12E-03	3.77E-04	3.25E-04	5.74E-01
Paving Equipment	G4	25	4.60E+02	7.97E-03	3.07E-01	5.01E-03	4.92E-01	1.25E-05	4.12E-03	3.30E-04	4.53E-04	1.30E+00
Paving Equipment	G4	50	4.73E+02	1.71E-03	6.90E-02	2.82E-03	7.54E-01	9.17E-06	5.78E-05	1.61E-04	9.70E-05	2.25E+00
Paving Equipment	G4	120	2.93E+02	7.15E-04	1.67E-02	2.43E-03	5.54E-01	5.35E-06	4.29E-05	8.89E-05	4.06E-05	3.63E+00
Surfacing Equipment	G4	5	4.49E+02	1.15E-02	1.68E-01	5.04E-03	4.64E-01	1.60E-05	1.51E-04	7.03E-04	6.55E-04	2.00E-01
Surfacing Equipment	G4	15	1.01E+04	3.99E-03	1.46E-01	2.88E-03	2.47E-01	7.05E-06	2.07E-03	3.12E-04	2.26E-04	3.82E-01
Surfacing Equipment	G4	25	2.30E+02	6.01E-03	2.21E-01	3.79E-03	3.53E-01	8.94E-06	2.96E-03	2.85E-04	3.41E-04	9.36E-01
Signal Boards	G4	5	3.61E+00	1.65E-02	2.97E-01	7.23E-03	7.20E-01	2.48E-05	2.35E-04	8.51E-04	9.40E-04	3.24E-01

Signal Boards	G4	15	1.68E+02	5.85E-03	2.26E-01	4.22E-03	3.84E-01	1.09E-05	3.22E-03	3.83E-04	3.33E-04	5.91E-01
Trenchers	G4	15	2.38E+03	6.56E-03	2.45E-01	4.73E-03	4.17E-01	1.19E-05	3.49E-03	4.07E-04	3.72E-04	6.43E-01
Trenchers	G4	25	3.07E+03	8.73E-03	3.28E-01	5.51E-03	5.25E-01	1.33E-05	4.40E-03	3.48E-04	4.95E-04	1.39E+00
Trenchers	G4	50	2.55E+03	3.41E-03	1.00E-01	4.71E-03	6.84E-01	8.31E-06	5.24E-05	2.18E-04	1.94E-04	2.21E+00
Trenchers	G4	120	2.03E+03	2.03E-03	3.66E-02	5.73E-03	6.20E-01	5.99E-06	4.80E-05	1.53E-04	1.15E-04	4.26E+00
Bore/Drill Rigs	G4	15	1.94E+01	7.58E-03	2.95E-01	5.29E-03	4.99E-01	1.42E-05	4.18E-03	4.31E-04	4.30E-04	7.70E-01
Bore/Drill Rigs	G4	25	1.61E+02	8.57E-03	3.37E-01	5.28E-03	5.39E-01	1.36E-05	4.51E-03	3.39E-04	4.87E-04	1.43E+00
Bore/Drill Rigs	G4	50	3.28E+01	3.11E-03	9.10E-02	5.53E-03	8.73E-01	1.06E-05	6.69E-05	2.34E-04	1.77E-04	2.66E+00
Bore/Drill Rigs	G4	120	3.62E+02	2.30E-03	4.21E-02	8.71E-03	9.89E-01	9.56E-06	7.66E-05	1.88E-04	1.31E-04	6.62E+00
Bore/Drill Rigs	G4	175	1.31E+02	1.27E-03	3.02E-02	9.42E-03	9.45E-01	9.38E-06	7.52E-05	1.65E-04	7.20E-05	9.04E+00
Concrete/Industrial Saws	G4	5	1.25E+02	1.36E-02	2.44E-01	5.94E-03	5.91E-01	2.04E-05	1.93E-04	7.66E-04	7.72E-04	2.66E-01
Concrete/Industrial Saws	G4	15	4.01E+03	6.80E-03	2.60E-01	4.90E-03	4.43E-01	1.26E-05	3.71E-03	4.15E-04	3.86E-04	6.83E-01
Concrete/Industrial Saws	G4	25	2.09E+03	8.14E-03	3.13E-01	5.14E-03	5.02E-01	1.27E-05	4.21E-03	3.35E-04	4.63E-04	1.33E+00
Concrete/Industrial Saws	G4	50	6.98E+02	1.16E-03	7.80E-02	1.65E-03	9.43E-01	1.15E-05	7.22E-05	1.32E-04	6.55E-05	2.77E+00
Concrete/Industrial Saws	G4	120	9.60E+02	3.46E-04	1.55E-02	7.69E-04	7.33E-01	7.08E-06	5.67E-05	5.84E-05	1.96E-05	4.71E+00
Cement and Mortar Mixers	G4	5	1.60E+03	1.26E-02	2.37E-01	5.52E-03	5.59E-01	1.93E-05	1.82E-04	7.36E-04	7.17E-04	2.54E-01
Cement and Mortar Mixers	G4	15	8.13E+03	6.21E-03	1.94E-01	2.89E-03	2.98E-01	8.49E-06	2.45E-03	3.12E-04	3.53E-04	4.87E-01
Cement and Mortar Mixers	G4	25	5.71E+01	1.12E-02	3.73E-01	4.91E-03	5.59E-01	1.42E-05	4.59E-03	3.25E-04	6.35E-04	1.54E+00
Cranes	G4	50	1.45E+02	3.03E-03	8.90E-02	4.15E-03	6.01E-01	7.30E-06	4.60E-05	2.04E-04	1.72E-04	1.95E+00
Cranes	G4	120	6.94E+02	1.65E-03	2.96E-02	4.58E-03	4.95E-01	4.78E-06	3.83E-05	1.36E-04	9.33E-05	3.40E+00
Cranes	G4	175	4.05E+01	9.01E-04	1.99E-02	5.97E-03	5.57E-01	5.54E-06	4.44E-05	1.31E-04	5.11E-05	5.37E+00
Crushing/Proc. Equipment	G4	15	4.10E+01	7.37E-03	2.84E-01	5.32E-03	4.83E-01	1.38E-05	4.05E-03	4.33E-04	4.19E-04	7.44E-01
Crushing/Proc. Equipment	G4	25	4.48E+01	8.31E-03	3.21E-01	5.24E-03	5.15E-01	1.31E-05	4.32E-03	3.39E-04	4.72E-04	1.36E+00
Crushing/Proc. Equipment	G4	120	2.34E+02	3.20E-03	5.80E-02	1.05E-02	1.16E+00	1.12E-05	8.99E-05	2.09E-04	1.82E-04	7.86E+00
Rough Terrain Forklifts	G4	50	5.76E+01	5.16E-03	1.51E-01	7.07E-03	1.02E+00	1.24E-05	7.83E-05	2.71E-04	2.93E-04	3.32E+00
Rough Terrain Forklifts	G4	120	1.96E+03	2.53E-03	4.54E-02	7.05E-03	7.62E-01	7.36E-06	5.90E-05	1.71E-04	1.43E-04	5.24E+00
Rough Terrain Forklifts	G4	175	1.01E+02	1.37E-03	3.03E-02	9.08E-03	8.49E-01	8.43E-06	6.76E-05	1.64E-04	7.77E-05	8.18E+00
Rubber Tired Loaders	G4	50	1.78E+02	3.88E-03	1.17E-01	5.05E-03	7.46E-01	9.07E-06	5.71E-05	2.26E-04	2.20E-04	2.45E+00
Rubber Tired Loaders	G4	120	2.84E+03	1.88E-03	3.44E-02	4.91E-03	5.53E-01	5.34E-06	4.29E-05	1.40E-04	1.07E-04	3.82E+00
Tractors/Loaders/Backhoes	G4	120	2.56E+03	8.03E-04	2.49E-02	1.85E-03	4.30E-01	4.16E-06	3.33E-05	8.20E-05	4.53E-05	2.94E+00
Skid Steer Loaders	G4	15	8.90E+01	7.98E-03	3.01E-01	5.75E-03	5.13E-01	1.46E-05	4.30E-03	4.52E-04	4.53E-04	7.90E-01
Skid Steer Loaders	G4	25	9.92E+03	6.86E-03	2.60E-01	4.33E-03	4.17E-01	1.06E-05	3.50E-03	3.06E-04	3.90E-04	1.10E+00
Skid Steer Loaders	G4	50	2.95E+03	9.58E-04	5.96E-02	1.44E-03	6.41E-01	7.79E-06	4.91E-05	1.19E-04	5.44E-05	1.91E+00
Skid Steer Loaders	G4	120	4.23E+03	4.35E-04	1.67E-02	1.18E-03	6.60E-01	6.38E-06	5.11E-05	6.64E-05	2.47E-05	4.28E+00
Dumpers/Tenders	G4	5	1.32E+02	7.69E-03	1.13E-01	3.36E-03	3.11E-01	1.07E-05	1.01E-04	5.66E-04	4.37E-04	1.34E-01
Dumpers/Tenders	G4	15	8.46E+02	4.65E-03	1.49E-01	2.39E-03	2.33E-01	6.64E-06	1.93E-03	2.81E-04	2.64E-04	3.76E-01
Dumpers/Tenders	G4	25	2.61E+02	5.76E-03	1.94E-01	2.75E-03	2.95E-01	7.48E-06	2.44E-03	2.39E-04	3.27E-04	8.06E-01
Dumpers/Tenders	G4	120	7.65E+01	9.21E-04	1.68E-02	3.40E-03	3.85E-01	3.72E-06	2.98E-05	1.14E-04	5.23E-05	2.58E+00
Other Construction Equipment	G4	175	1.27E+03	2.56E-04	1.89E-02	8.99E-04	5.74E-01	5.70E-06	4.57E-05	5.07E-05	1.45E-05	5.48E+00
Aerial Lifts	G4	15	2.20E+01	5.81E-03	2.22E-01	4.19E-03	3.77E-01	1.08E-05	3.16E-03	3.81E-04	3.30E-04	5.82E-01
Aerial Lifts	G4	25	1.56E+03	5.50E-03	2.07E-01	3.47E-03	3.31E-01	8.39E-06	2.77E-03	2.72E-04	3.12E-04	8.77E-01
Aerial Lifts	G4	50	3.67E+03	9.23E-04	5.45E-02	1.40E-03	5.24E-01	6.37E-06	4.02E-05	1.15E-04	5.24E-05	1.59E+00
Aerial Lifts	G4	120	8.82E+03	3.69E-04	1.30E-02	1.05E-03	4.39E-01	4.24E-06	3.40E-05	6.06E-05	2.09E-05	2.86E+00
Forklifts	G4	25	8.79E+01	2.93E-03	1.65E-01	2.19E-03	2.61E-01	6.62E-06	1.46E-04	2.12E-04	1.65E-04	6.88E-01
Forklifts	G4	50	6.11E+04	1.26E-03	1.21E-01	2.52E-03	4.25E-01	5.16E-06	3.25E-05	1.60E-04	7.02E-05	1.61E+00
Forklifts	G4	120	5.15E+05	3.70E-04	2.45E-02	1.39E-03	2.99E-01	2.89E-06	2.31E-05	7.76E-05	2.05E-05	2.11E+00
Forklifts	G4	175	2.74E+04	3.53E-04	1.75E-02	1.74E-03	4.16E-01	4.13E-06	3.31E-05	7.34E-05	1.96E-05	4.03E+00
Sweepers/Scrubbers	G4	15	4.59E+02	3.72E-03	2.11E-01	2.59E-03	3.59E-01	1.02E-05	1.82E-04	2.95E-04	2.11E-04	5.47E-01

Sweepers/Scrubbers	G4	25	7.46E+02	5.08E-03	3.02E-01	3.74E-03	4.84E-01	1.23E-05	2.54E-04	2.83E-04	2.88E-04	1.27E+00
Sweepers/Scrubbers	G4	50	4.88E+03	1.24E-03	9.52E-02	2.43E-03	8.58E-01	1.04E-05	6.57E-05	1.61E-04	7.03E-05	2.62E+00
Sweepers/Scrubbers	G4	120	9.79E+03	3.76E-04	2.05E-02	2.04E-03	6.87E-01	6.64E-06	5.32E-05	9.80E-05	2.13E-05	4.48E+00
Sweepers/Scrubbers	G4	175	8.30E+01	3.57E-04	3.17E-02	2.91E-03	9.43E-01	9.37E-06	7.51E-05	9.93E-05	2.02E-05	9.02E+00
Other General Industrial Equipmen	G4	15	1.26E+03	2.97E-03	1.60E-01	2.06E-03	2.73E-01	7.77E-06	1.45E-04	2.62E-04	1.69E-04	4.17E-01
Other General Industrial Equipmen	G4	25	7.90E+02	4.03E-03	2.30E-01	3.00E-03	3.68E-01	9.33E-06	2.02E-04	2.52E-04	2.29E-04	9.65E-01
Other General Industrial Equipmen	G4	50	2.32E+03	1.01E-03	8.10E-02	1.98E-03	5.60E-01	6.80E-06	4.29E-05	1.43E-04	5.71E-05	1.79E+00
Other General Industrial Equipmen	G4	120	1.83E+03	4.48E-04	2.44E-02	2.09E-03	6.07E-01	5.86E-06	4.70E-05	9.80E-05	2.53E-05	4.02E+00
Other General Industrial Equipmen	G4	175	2.58E+02	4.43E-04	3.13E-02	3.08E-03	8.92E-01	8.86E-06	7.10E-05	1.01E-04	2.50E-05	8.55E+00
Other Material Handling Equipment	G4	50	1.77E+01	2.98E-03	1.11E-01	4.56E-03	7.51E-01	9.12E-06	5.75E-05	2.16E-04	1.69E-04	2.42E+00
Other Material Handling Equipment	G4	120	1.88E+03	1.02E-03	2.17E-02	3.19E-03	4.07E-01	3.93E-06	3.15E-05	1.16E-04	5.77E-05	2.77E+00
Lawn Mowers	G4	5	1.22E+05	5.59E-03	1.03E-01	1.39E-03	2.73E-01	9.42E-06	8.60E-04	3.53E-04	3.18E-04	1.18E-01
Lawn Mowers	G4	5	9.87E+04	5.40E-03	1.49E-01	1.50E-03	2.73E-01	9.42E-06	6.52E-04	3.54E-04	3.08E-04	1.37E-01
Tillers	G4	5	3.10E+03	5.01E-03	1.41E-01	1.23E-03	3.03E-01	1.05E-05	7.99E-04	3.29E-04	2.85E-04	1.41E-01
Tillers	G4	5	2.92E+03	6.52E-03	1.65E-01	1.71E-03	3.03E-01	1.05E-05	7.55E-04	3.81E-04	3.71E-04	1.52E-01
Trimmers/Edgers/Brush Cutters	G4	5	1.33E+04	1.58E-03	2.77E-02	6.93E-04	6.82E-02	2.35E-06	2.22E-05	2.44E-04	9.00E-05	3.05E-02
Trimmers/Edgers/Brush Cutters	G4	5	7.35E+03	2.01E-03	3.81E-02	5.89E-04	6.82E-02	2.35E-06	9.69E-05	2.23E-04	1.14E-04	3.51E-02
Leaf Blowers/Vacuums	G4	5	1.55E+03	1.94E-03	7.00E-02	4.68E-04	1.36E-01	4.71E-06	3.20E-04	1.97E-04	1.10E-04	6.57E-02
Leaf Blowers/Vacuums	G4	5	7.71E+01	2.79E-03	9.12E-02	6.54E-04	1.36E-01	4.71E-06	2.71E-04	2.30E-04	1.59E-04	7.52E-02
Rear Engine Riding Mowers	G4	15	2.39E+05	2.04E-03	1.27E-01	1.43E-03	2.16E-01	6.15E-06	1.00E-04	2.15E-04	1.16E-04	3.29E-01
Rear Engine Riding Mowers	G4	15	1.63E+04	2.22E-03	1.29E-01	1.45E-03	2.16E-01	6.15E-06	8.60E-05	2.14E-04	1.26E-04	3.32E-01
Rear Engine Riding Mowers	G4	25	1.82E+03	2.29E-03	1.53E-01	1.64E-03	2.45E-01	6.20E-06	1.14E-04	1.82E-04	1.30E-04	6.39E-01
Rear Engine Riding Mowers	G4	25	1.22E+02	2.56E-03	1.54E-01	1.53E-03	2.45E-01	6.20E-06	9.75E-05	1.74E-04	1.45E-04	6.43E-01
Front Mowers	G4	15	1.09E+04	3.25E-03	2.03E-01	2.28E-03	3.45E-01	9.83E-06	1.60E-04	2.76E-04	1.85E-04	5.25E-01
Front Mowers	G4	15	2.76E+04	3.54E-03	2.06E-01	2.31E-03	3.45E-01	9.83E-06	1.37E-04	2.75E-04	2.01E-04	5.29E-01
Front Mowers	G4	25	1.43E+04	2.54E-03	1.69E-01	1.81E-03	2.70E-01	6.85E-06	1.25E-04	1.92E-04	1.44E-04	7.06E-01
Front Mowers	G4	25	3.60E+04	2.83E-03	1.70E-01	1.69E-03	2.70E-01	6.85E-06	1.08E-04	1.84E-04	1.61E-04	7.11E-01
Shredders	G4	5	1.43E+03	1.41E-02	2.46E-01	6.16E-03	6.06E-01	2.09E-05	1.98E-04	7.81E-04	8.00E-04	2.71E-01
Shredders	G4	5	2.65E+02	1.26E-02	4.20E-01	3.94E-03	6.06E-01	2.09E-05	1.22E-03	6.16E-04	7.14E-04	3.41E-01
Lawn & Garden Tractors	G4	15	2.07E+04	3.29E-03	2.45E-01	2.33E-03	4.17E-01	1.19E-05	1.63E-04	2.79E-04	1.87E-04	6.33E-01
Lawn & Garden Tractors	G4	15	1.15E+04	3.79E-03	2.48E-01	2.57E-03	4.17E-01	1.19E-05	1.51E-04	2.92E-04	2.15E-04	6.38E-01
Lawn & Garden Tractors	G4	25	1.36E+04	3.11E-03	2.41E-01	2.10E-03	3.86E-01	9.79E-06	1.52E-04	2.08E-04	1.77E-04	1.01E+00
Lawn & Garden Tractors	G4	25	7.54E+03	3.62E-03	2.43E-01	2.21E-03	3.86E-01	9.79E-06	1.40E-04	2.12E-04	2.06E-04	1.01E+00
Lawn & Garden Tractors	G4	50	2.24E+02	1.18E-03	4.71E-02	2.26E-03	5.18E-01	6.30E-06	3.97E-05	1.46E-04	6.71E-05	1.55E+00
Wood Splitters	G4	5	2.32E+03	1.23E-02	2.71E-01	3.03E-03	6.53E-01	2.26E-05	1.92E-03	5.34E-04	6.99E-04	2.92E-01
Wood Splitters	G4	5	3.72E+02	1.11E-02	4.46E-01	2.91E-03	6.53E-01	2.26E-05	1.17E-03	5.09E-04	6.30E-04	3.62E-01
Chippers/Stump Grinders	G4	15	9.63E+02	8.88E-03	3.26E-01	6.36E-03	5.42E-01	1.54E-05	4.54E-03	4.74E-04	4.95E-04	8.45E-01
Chippers/Stump Grinders	G4	15	1.69E+01	8.69E-03	3.55E-01	4.29E-03	5.42E-01	1.54E-05	4.17E-03	3.86E-04	4.94E-04	8.80E-01
Chippers/Stump Grinders	G4	25	9.11E+03	9.20E-03	3.40E-01	5.77E-03	5.32E-01	1.35E-05	4.46E-03	3.54E-04	5.14E-04	1.43E+00
Chippers/Stump Grinders	G4	25	1.59E+02	8.26E-03	3.60E-01	3.82E-03	5.32E-01	1.35E-05	4.09E-03	2.86E-04	4.69E-04	1.46E+00
Commercial Turf Equipment	G4	15	4.56E+04	4.05E-03	2.06E-01	2.81E-03	3.47E-01	9.90E-06	1.94E-04	3.07E-04	2.28E-04	5.34E-01
Commercial Turf Equipment	G4	25	3.75E+04	4.09E-03	2.27E-01	3.04E-03	3.60E-01	9.12E-06	2.01E-04	2.52E-04	2.30E-04	9.48E-01
Commercial Turf Equipment	G4	50	1.95E+04	1.85E-03	9.56E-02	2.82E-03	4.84E-01	5.88E-06	3.70E-05	1.69E-04	1.05E-04	1.66E+00
Commercial Turf Equipment	G4	120	3.09E+02	1.82E-04	9.86E-03	1.06E-03	3.77E-01	3.64E-06	2.92E-05	6.93E-05	1.03E-05	2.44E+00
Other Lawn & Garden Equipment	G4	5	1.15E+03	7.23E-03	2.05E-01	1.76E-03	4.39E-01	1.52E-05	1.15E-03	3.99E-04	4.11E-04	2.04E-01
Other Lawn & Garden Equipment	G4	5	1.65E+03	8.78E-03	2.95E-01	2.09E-03	4.39E-01	1.52E-05	8.61E-04	4.26E-04	4.99E-04	2.42E-01
Other Lawn & Garden Equipment	G4	15	1.53E+03	2.34E-03	1.72E-01	1.66E-03	2.93E-01	8.35E-06	1.16E-04	2.33E-04	1.33E-04	4.45E-01
Other Lawn & Garden Equipment	G4	15	2.20E+03	3.10E-03	1.85E-01	1.88E-03	2.93E-01	8.35E-06	1.01E-04	2.47E-04	1.76E-04	4.62E-01

Other Lawn & Garden Equipment	G4	25	5.37E+01	3.03E-03	2.33E-01	2.06E-03	3.73E-01	9.46E-06	1.48E-04	2.06E-04	1.72E-04	9.73E-01
Other Lawn & Garden Equipment	G4	25	7.80E+01	3.97E-03	2.46E-01	2.16E-03	3.73E-01	9.46E-06	1.29E-04	2.10E-04	2.25E-04	1.00E+00
Other Lawn & Garden Equipment	G4	50	4.88E+00	1.78E-03	6.32E-02	3.49E-03	7.21E-01	8.77E-06	5.52E-05	1.83E-04	1.01E-04	2.14E+00
Other Lawn & Garden Equipment	G4	120	2.81E+01	1.27E-03	2.78E-02	5.66E-03	8.42E-01	8.13E-06	6.52E-05	1.56E-04	7.20E-05	5.54E+00
2-Wheel Tractors	G4	5	9.93E+01	1.13E-02	1.80E-01	4.95E-03	4.70E-01	1.62E-05	1.53E-04	6.96E-04	6.43E-04	2.06E-01
2-Wheel Tractors	G4	15	7.19E+02	4.83E-03	1.84E-01	3.48E-03	3.13E-01	8.93E-06	2.62E-03	3.46E-04	2.75E-04	4.82E-01
2-Wheel Tractors	G4	25	3.22E+01	6.13E-03	2.34E-01	3.87E-03	3.76E-01	9.52E-06	3.15E-03	2.88E-04	3.48E-04	9.94E-01
Agricultural Tractors	G4	120	3.20E+03	2.72E-03	4.87E-02	6.84E-03	7.23E-01	6.99E-06	5.60E-05	1.69E-04	1.54E-04	5.04E+00
Agricultural Tractors	G4	175	6.39E+02	1.28E-03	2.76E-02	8.11E-03	7.35E-01	7.31E-06	5.86E-05	1.55E-04	7.23E-05	7.10E+00
Combines	G4	120	1.82E+02	8.74E-04	2.46E-02	2.95E-03	1.08E+00	1.05E-05	8.40E-05	1.00E-04	4.97E-05	7.00E+00
Combines	G4	175	1.48E+02	5.97E-04	3.67E-02	3.54E-03	1.15E+00	1.14E-05	9.17E-05	9.26E-05	3.39E-05	1.10E+01
Combines	G4	250	3.89E+01	4.21E-04	3.04E-02	3.72E-03	9.27E-01	9.47E-06	7.60E-05	9.17E-05	2.39E-05	1.26E+01
Balers	G4	50	6.02E+02	2.24E-03	6.56E-02	4.16E-03	6.65E-01	8.08E-06	5.09E-05	2.00E-04	1.27E-04	2.01E+00
Balers	G4	120	7.38E+02	1.10E-03	2.02E-02	4.38E-03	5.01E-01	4.84E-06	3.88E-05	1.30E-04	6.26E-05	3.34E+00
Agricultural Mowers	G4	15	3.48E+02	3.94E-03	1.45E-01	2.65E-03	2.42E-01	6.91E-06	2.03E-03	2.98E-04	2.24E-04	3.77E-01
Agricultural Mowers	G4	25	4.74E+02	5.52E-03	2.06E-01	3.30E-03	3.27E-01	8.29E-06	2.74E-03	2.64E-04	3.14E-04	8.71E-01
Sprayers	G4	5	2.40E+02	9.01E-03	1.48E-01	3.94E-03	3.79E-01	1.31E-05	1.23E-04	6.15E-04	5.12E-04	1.67E-01
Sprayers	G4	15	2.24E+02	5.07E-03	1.49E-01	2.12E-03	2.21E-01	6.30E-06	1.78E-03	2.64E-04	2.88E-04	3.68E-01
Sprayers	G4	25	9.65E+02	6.96E-03	2.20E-01	2.78E-03	3.22E-01	8.16E-06	2.60E-03	2.40E-04	3.95E-04	8.99E-01
Sprayers	G4	50	1.33E+02	1.96E-03	5.72E-02	3.58E-03	5.70E-01	6.93E-06	4.37E-05	1.85E-04	1.11E-04	1.73E+00
Sprayers	G4	120	5.39E+02	1.08E-03	1.98E-02	4.24E-03	4.84E-01	4.67E-06	3.75E-05	1.28E-04	6.16E-05	3.23E+00
Sprayers	G4	175	1.77E+02	8.76E-04	2.10E-02	6.59E-03	6.64E-01	6.60E-06	5.29E-05	1.36E-04	4.98E-05	6.35E+00
Tillers	G4	15	1.77E+04	5.73E-03	2.02E-01	2.68E-03	3.14E-01	8.94E-06	1.60E-04	2.97E-04	3.26E-04	5.07E-01
Swathers	G4	120	2.07E+03	1.49E-03	2.72E-02	5.73E-03	6.51E-01	6.29E-06	5.04E-05	1.50E-04	8.46E-05	4.35E+00
Swathers	G4	175	2.31E+03	8.48E-04	2.02E-02	6.33E-03	6.37E-01	6.32E-06	5.07E-05	1.33E-04	4.82E-05	6.09E+00
Hydro Power Units	G4	5	2.58E+01	1.29E-02	1.99E-01	5.65E-03	5.30E-01	1.83E-05	1.73E-04	7.47E-04	7.34E-04	2.31E-01
Hydro Power Units	G4	15	4.09E+02	4.50E-03	1.67E-01	3.24E-03	2.83E-01	8.06E-06	2.37E-03	3.33E-04	2.55E-04	4.37E-01
Hydro Power Units	G4	25	2.60E+02	6.06E-03	2.26E-01	3.82E-03	3.61E-01	9.14E-06	3.02E-03	2.86E-04	3.44E-04	9.56E-01
Hydro Power Units	G4	50	3.74E+01	9.83E-04	7.09E-02	1.40E-03	7.35E-01	8.94E-06	5.63E-05	1.21E-04	5.58E-05	2.20E+00
Hydro Power Units	G4	120	1.12E+01	2.47E-04	1.10E-02	5.50E-04	5.26E-01	5.08E-06	4.07E-05	4.89E-05	1.40E-05	3.38E+00
Other Agricultural Equipment	G4	5	1.49E+01	9.87E-03	1.64E-01	4.32E-03	4.17E-01	1.44E-05	1.36E-04	6.46E-04	5.61E-04	1.84E-01
Other Agricultural Equipment	G4	15	3.91E+01	5.81E-03	2.10E-01	3.72E-03	3.47E-01	9.90E-06	2.91E-03	3.57E-04	3.30E-04	5.43E-01
Other Agricultural Equipment	G4	25	1.66E+01	8.94E-03	3.30E-01	5.13E-03	5.21E-01	1.32E-05	4.36E-03	3.34E-04	5.08E-04	1.39E+00
Other Agricultural Equipment	G4	50	3.41E+01	1.63E-03	5.28E-02	2.84E-03	5.51E-01	6.70E-06	4.22E-05	1.61E-04	9.27E-05	1.66E+00
Other Agricultural Equipment	G4	120	4.74E+02	9.73E-04	1.90E-02	3.57E-03	5.24E-01	5.07E-06	4.06E-05	1.12E-04	5.53E-05	3.47E+00
Other Agricultural Equipment	G4	175	7.88E+01	7.68E-04	2.27E-02	5.47E-03	7.10E-01	7.05E-06	5.65E-05	1.17E-04	4.36E-05	6.79E+00
Other Agricultural Equipment	G4	250	4.18E+01	7.80E-04	2.88E-02	6.03E-03	8.73E-01	8.93E-06	7.16E-05	1.15E-04	4.43E-05	1.19E+01
Generator Sets	G4	5	3.63E+03	1.75E-02	2.30E-01	4.01E-03	5.15E-01	1.78E-05	1.78E-03	6.14E-04	9.95E-04	2.45E-01
Generator Sets	G4	5	1.92E+03	1.97E-02	2.62E-01	4.00E-03	5.15E-01	1.78E-05	1.75E-03	6.12E-04	1.12E-03	2.59E-01
Generator Sets	G4	15	2.99E+04	5.55E-03	2.33E-01	3.40E-03	3.86E-01	1.10E-05	2.04E-04	3.39E-04	3.15E-04	6.02E-01
Generator Sets	G4	15	1.58E+04	7.49E-03	2.52E-01	3.30E-03	3.86E-01	1.10E-05	2.02E-04	3.33E-04	4.25E-04	6.30E-01
Generator Sets	G4	25	2.68E+04	6.95E-03	3.11E-01	4.16E-03	4.89E-01	1.24E-05	2.59E-04	2.98E-04	3.95E-04	1.30E+00
Generator Sets	G4	25	1.41E+04	8.92E-03	3.26E-01	3.90E-03	4.89E-01	1.24E-05	2.56E-04	2.86E-04	5.07E-04	1.34E+00
Generator Sets	G4	50	1.52E+04	2.15E-03	7.53E-02	4.01E-03	7.52E-01	9.14E-06	5.76E-05	1.99E-04	1.22E-04	2.27E+00
Generator Sets	G4	120	7.07E+03	1.43E-03	3.07E-02	5.90E-03	8.03E-01	7.76E-06	6.22E-05	1.60E-04	8.14E-05	5.33E+00
Generator Sets	G4	175	9.74E+02	9.81E-04	2.98E-02	7.66E-03	9.42E-01	9.36E-06	7.50E-05	1.54E-04	5.57E-05	9.00E+00
Pumps	G4	5	2.47E+03	1.10E-02	1.33E-01	4.47E-03	3.92E-01	1.35E-05	2.61E-04	6.59E-04	6.25E-04	1.67E-01
Pumps	G4	5	1.31E+03	1.38E-02	1.70E-01	4.21E-03	3.92E-01	1.35E-05	6.15E-04	6.36E-04	7.83E-04	1.84E-01

Pumps	G4	15	8.03E+03	5.59E-03	2.06E-01	3.92E-03	3.48E-01	9.93E-06	2.92E-03	3.68E-04	3.18E-04	5.39E-01
Pumps	G4	15	4.24E+03	6.11E-03	2.13E-01	3.77E-03	3.48E-01	9.93E-06	2.90E-03	3.60E-04	3.47E-04	5.48E-01
Pumps	G4	25	3.43E+03	7.28E-03	2.77E-01	4.60E-03	4.44E-01	1.13E-05	3.72E-03	3.16E-04	4.14E-04	1.18E+00
Pumps	G4	25	1.81E+03	7.48E-03	2.80E-01	4.47E-03	4.44E-01	1.13E-05	3.72E-03	3.11E-04	4.25E-04	1.18E+00
Pumps	G4	50	2.34E+03	2.17E-03	7.69E-02	3.47E-03	7.39E-01	8.98E-06	5.66E-05	1.80E-04	1.23E-04	2.25E+00
Pumps	G4	120	7.12E+03	1.63E-03	3.41E-02	5.40E-03	9.13E-01	8.82E-06	7.07E-05	1.39E-04	9.29E-05	6.05E+00
Pumps	G4	175	3.13E+02	9.55E-04	3.08E-02	6.35E-03	9.43E-01	9.37E-06	7.51E-05	1.27E-04	5.42E-05	9.02E+00
Air Compressors	G4	5	1.96E+03	1.41E-02	1.67E-01	6.17E-03	5.30E-01	1.83E-05	1.73E-04	7.83E-04	8.02E-04	2.19E-01
Air Compressors	G4	5	1.03E+03	1.41E-02	1.67E-01	6.17E-03	5.30E-01	1.83E-05	1.73E-04	7.83E-04	8.02E-04	2.19E-01
Air Compressors	G4	15	2.97E+03	3.99E-03	1.46E-01	2.87E-03	2.47E-01	7.05E-06	2.07E-03	3.12E-04	2.26E-04	3.82E-01
Air Compressors	G4	15	1.57E+03	3.90E-03	1.45E-01	2.81E-03	2.47E-01	7.05E-06	2.07E-03	3.08E-04	2.21E-04	3.81E-01
Air Compressors	G4	25	6.67E+02	6.14E-03	2.25E-01	3.87E-03	3.61E-01	9.14E-06	3.02E-03	2.88E-04	3.48E-04	9.56E-01
Air Compressors	G4	25	3.53E+02	6.02E-03	2.25E-01	3.80E-03	3.61E-01	9.14E-06	3.02E-03	2.85E-04	3.42E-04	9.55E-01
Air Compressors	G4	50	1.95E+03	3.26E-03	9.99E-02	4.24E-03	6.77E-01	8.23E-06	5.19E-05	2.04E-04	1.85E-04	2.19E+00
Air Compressors	G4	120	1.52E+04	1.74E-03	3.21E-02	4.55E-03	5.58E-01	5.39E-06	4.32E-05	1.33E-04	9.89E-05	3.82E+00
Air Compressors	G4	175	1.49E+03	1.06E-03	2.54E-02	6.74E-03	7.12E-01	7.07E-06	5.67E-05	1.37E-04	6.03E-05	6.86E+00
Welders	G4	15	4.22E+03	6.52E-03	2.19E-01	3.83E-03	3.54E-01	1.01E-05	2.92E-03	3.63E-04	3.70E-04	5.62E-01
Welders	G4	25	2.54E+04	5.72E-03	2.08E-01	3.32E-03	3.28E-01	8.32E-06	2.75E-03	2.65E-04	3.25E-04	8.77E-01
Welders	G4	50	4.38E+03	2.88E-03	8.79E-02	4.61E-03	7.93E-01	9.64E-06	6.07E-05	2.11E-04	1.64E-04	2.44E+00
Welders	G4	120	1.07E+04	1.19E-03	2.21E-02	3.96E-03	5.08E-01	4.91E-06	3.94E-05	1.21E-04	6.75E-05	3.40E+00
Welders	G4	175	1.08E+03	7.98E-04	2.05E-02	5.59E-03	6.29E-01	6.25E-06	5.01E-05	1.22E-04	4.53E-05	6.02E+00
Pressure Washers	G4	5	9.74E+02	2.11E-02	2.94E-01	5.96E-03	8.05E-01	2.78E-05	2.76E-03	7.56E-04	1.20E-03	3.49E-01
Pressure Washers	G4	5	5.15E+02	2.89E-02	3.90E-01	6.21E-03	8.05E-01	2.78E-05	2.73E-03	7.73E-04	1.64E-03	3.96E-01
Pressure Washers	G4	15	2.61E+03	5.39E-03	2.27E-01	3.31E-03	3.76E-01	1.07E-05	1.98E-04	3.34E-04	3.06E-04	5.85E-01
Pressure Washers	G4	15	1.38E+03	7.28E-03	2.45E-01	3.21E-03	3.76E-01	1.07E-05	1.96E-04	3.28E-04	4.14E-04	6.12E-01
Pressure Washers	G4	25	8.16E+02	7.76E-03	3.66E-01	4.88E-03	5.79E-01	1.47E-05	3.03E-04	3.24E-04	4.41E-04	1.53E+00
Pressure Washers	G4	25	4.31E+02	9.99E-03	3.82E-01	4.64E-03	5.79E-01	1.47E-05	3.01E-04	3.15E-04	5.68E-04	1.58E+00
Pressure Washers	G4	50	1.36E+02	2.21E-03	7.69E-02	3.86E-03	8.51E-01	1.04E-05	6.52E-05	1.89E-04	1.26E-04	2.54E+00
Cargo Tractor	G4	120	2.65E+04	1.66E-03	6.25E-02	4.52E-03	7.30E-01	6.03E-06	5.65E-05	1.42E-04	9.34E-05	5.19E+00
A/C Tug Narrow Body	G4	175	1.99E+03	1.31E-03	3.76E-02	8.29E-03	9.87E-01	9.80E-06	7.86E-05	1.61E-04	7.41E-05	9.53E+00
A/C Tug Wide Body	G4	500	1.32E+03	5.65E-04	4.50E-02	4.38E-03	1.29E+00	1.32E-05	1.06E-04	7.50E-05	3.21E-05	3.53E+01
Air Conditioner	G4	175	1.90E+00	7.85E-04	2.84E-02	6.46E-03	9.25E-01	9.19E-06	7.37E-05	1.40E-04	4.46E-05	8.82E+00
Air Start Unit	G4	175	1.50E+02	9.81E-04	3.47E-02	7.85E-03	1.11E+00	1.10E-05	8.84E-05	1.56E-04	5.57E-05	1.06E+01
Baggage Tug	G4	120	2.21E+04	5.13E-04	3.21E-02	2.56E-03	7.83E-01	7.56E-06	6.06E-05	1.10E-04	2.90E-05	5.19E+00
Belt Loader	G4	120	9.66E+03	3.25E-04	1.84E-02	1.50E-03	4.27E-01	4.12E-06	3.31E-05	8.20E-05	1.84E-05	2.84E+00
Bobtail	G4	120	3.55E+03	5.13E-04	3.21E-02	2.56E-03	7.83E-01	7.56E-06	6.06E-05	1.10E-04	2.90E-05	5.19E+00
Cargo Loader	G4	120	2.29E+03	4.48E-04	2.16E-02	1.89E-03	4.98E-01	4.81E-06	3.86E-05	9.17E-05	2.54E-05	3.32E+00
Cart	G4	15	2.03E+01	4.01E-03	2.23E-01	2.81E-03	3.79E-01	1.08E-05	1.91E-04	3.07E-04	2.28E-04	5.78E-01
Deicer	G4	120	3.39E+01	1.70E-03	3.81E-02	8.07E-03	1.26E+00	1.21E-05	9.74E-05	1.88E-04	9.66E-05	8.23E+00
Forklift	G4	50	9.09E+02	8.31E-04	6.85E-02	1.65E-03	5.18E-01	6.30E-06	3.97E-05	1.31E-04	4.71E-05	1.63E+00
Fuel Truck	G4	175	5.96E+01	2.70E-04	9.44E-03	2.23E-03	3.08E-01	3.06E-06	2.46E-05	7.93E-05	1.53E-05	2.94E+00
Ground Power Unit	G4	175	2.74E+03	4.21E-04	3.68E-02	3.27E-03	1.07E+00	1.06E-05	8.50E-05	1.06E-04	2.38E-05	1.02E+01
Lav Cart	G4	15	1.76E+00	4.01E-03	2.23E-01	2.81E-03	3.79E-01	1.08E-05	1.91E-04	3.07E-04	2.28E-04	5.78E-01
Lav Truck	G4	175	5.11E+03	2.79E-04	1.22E-02	1.49E-03	3.08E-01	3.06E-06	2.46E-05	6.66E-05	1.57E-05	2.98E+00
Lift	G4	120	1.98E+03	1.56E-03	3.51E-02	5.07E-03	7.11E-01	6.87E-06	5.51E-05	1.48E-04	8.86E-05	4.80E+00
Maint. Truck	G4	175	2.42E+03	5.57E-04	2.15E-02	3.80E-03	6.17E-01	6.13E-06	4.91E-05	1.07E-04	3.16E-05	5.92E+00
Other GSE	G4	50	4.17E+02	2.47E-03	9.30E-02	4.38E-03	8.63E-01	1.05E-05	6.61E-05	2.09E-04	1.41E-04	2.64E+00
Passenger Stand	G4	175	6.90E+02	6.84E-04	2.27E-02	5.23E-03	7.00E-01	6.20E-06	5.58E-05	1.25E-04	3.89E-05	6.70E+00

Sweeper	G4	120	8.79E+01	8.33E-04	1.88E-02	2.74E-03	3.87E-01	3.19E-06	3.00E-05	1.07E-04	4.73E-05	2.61E+00
Generator	G4	120	1.37E+02	4.06E-03	9.28E-02	9.59E-03	1.19E+00	9.80E-06	9.20E-05	2.10E-04	2.29E-04	8.39E+00
Service Truck	G4	250	1.87E+04	3.35E-04	9.41E-03	2.05E-03	2.32E-01	2.38E-06	1.90E-05	6.48E-05	1.89E-05	3.22E+00
Catering Truck	G4	250	4.55E+03	1.07E-03	2.91E-02	6.24E-03	6.84E-01	5.98E-06	5.61E-05	1.17E-04	6.02E-05	9.51E+00
Water Truck	G4	175	4.24E+02	3.00E-04	9.57E-03	2.18E-03	2.85E-01	2.83E-06	2.27E-05	7.88E-05	1.71E-05	2.73E+00
Hydrant truck	G4	175	4.01E+03	1.50E-03	3.80E-02	7.87E-03	8.07E-01	6.85E-06	6.43E-05	1.57E-04	8.40E-05	7.91E+00
Transport Refrigeration Units	G4	15	1.29E+04	4.36E-03	2.24E-01	3.02E-03	3.79E-01	1.08E-05	2.12E-04	3.20E-04	2.47E-04	5.80E-01
Aerial Lifts	C4	15	2.46E+01	2.48E-04	9.58E-02	2.62E-03	5.93E-01	0.00E+00	2.72E-04	0.00E+00	2.08E-03	8.01E-01
Aerial Lifts	C4	25	1.76E+03	3.35E-04	8.85E-02	2.44E-03	5.20E-01	0.00E+00	2.68E-04	0.00E+00	2.81E-03	1.19E+00
Forklifts	C4	25	5.74E+01	4.98E-04	7.88E-02	2.20E-03	4.11E-01	0.00E+00	2.70E-04	0.00E+00	4.18E-03	9.81E-01
Forklifts	C4	50	1.12E+05	4.22E-05	5.89E-03	1.81E-03	3.66E-01	0.00E+00	3.25E-05	0.00E+00	3.54E-04	1.34E+00
Forklifts	C4	120	9.44E+05	3.01E-05	1.18E-02	1.35E-03	2.60E-01	0.00E+00	2.31E-05	0.00E+00	2.52E-04	2.38E+00
Forklifts	C4	175	5.04E+04	2.76E-05	1.29E-02	1.35E-03	3.72E-01	0.00E+00	3.31E-05	0.00E+00	2.32E-04	4.89E+00
Generator Sets	C4	120	5.26E+02	7.66E-05	2.20E-02	5.06E-03	7.00E-01	0.00E+00	6.22E-05	0.00E+00	6.42E-04	6.27E+00
Generator Sets	C4	175	6.36E+02	7.27E-05	2.18E-02	6.03E-03	8.44E-01	0.00E+00	7.50E-05	0.00E+00	6.10E-04	1.09E+01
Gas Compressors	C4	50	3.24E+03	7.79E-05	1.38E-02	2.83E-03	9.39E-01	0.00E+00	7.20E-05	0.00E+00	6.53E-04	3.42E+00
Gas Compressors	C4	120	1.61E+04	8.56E-05	4.45E-02	3.37E-03	1.06E+00	0.00E+00	8.25E-05	0.00E+00	7.17E-04	9.68E+00
Gas Compressors	C4	175	3.78E+03	1.01E-04	3.85E-02	3.84E-03	1.18E+00	0.00E+00	9.38E-05	0.00E+00	8.51E-04	1.54E+01
Gas Compressors	C4	250	4.32E+03	6.83E-05	3.87E-02	3.25E-03	1.06E+00	0.00E+00	9.44E-05	0.00E+00	5.73E-04	2.00E+01
Gas Compressors	C4	500	7.56E+03	5.50E-05	3.12E-02	2.61E-03	8.55E-01	0.00E+00	7.60E-05	0.00E+00	4.61E-04	3.21E+01
Cargo Tractor	C4	175	4.83E+02	5.71E-05	1.87E-02	4.69E-03	7.14E-01	0.00E+00	6.35E-05	0.00E+00	4.78E-04	9.26E+00
Air Conditioner	C4	175	1.14E+01	5.99E-05	2.04E-02	5.27E-03	8.29E-01	0.00E+00	7.37E-05	0.00E+00	5.02E-04	1.07E+01
Baggage Tug	C4	120	4.17E+03	1.48E-04	3.00E-02	5.57E-03	6.82E-01	0.00E+00	6.06E-05	0.00E+00	1.24E-03	6.25E+00
Belt Loader	C4	120	7.37E+02	6.36E-05	1.45E-02	2.81E-03	3.72E-01	0.00E+00	3.31E-05	0.00E+00	5.33E-04	3.38E+00
Bobtail	C4	120	1.01E+02	3.88E-05	2.45E-02	2.35E-03	6.82E-01	0.00E+00	6.06E-05	0.00E+00	3.25E-04	6.14E+00
Cargo Loader	C4	120	5.57E+02	1.09E-04	2.06E-02	3.74E-03	4.34E-01	0.00E+00	3.86E-05	0.00E+00	9.13E-04	4.00E+00
Forklift	C4	50	2.13E+03	2.20E-05	5.52E-03	1.57E-03	4.46E-01	0.00E+00	3.97E-05	0.00E+00	1.85E-04	1.62E+00
Fuel Truck	C4	175	1.94E+02	3.07E-05	9.18E-03	2.14E-03	2.97E-01	0.00E+00	2.65E-05	0.00E+00	2.57E-04	3.89E+00
Lav Truck	C4	175	1.19E+02	2.57E-05	7.96E-03	1.91E-03	2.76E-01	0.00E+00	2.46E-05	0.00E+00	2.15E-04	3.60E+00
Lift	C4	120	6.74E+01	8.43E-05	2.19E-02	4.39E-03	6.20E-01	0.00E+00	5.51E-05	0.00E+00	7.06E-04	5.59E+00
Other	C4	50	4.38E+02	1.71E-04	1.25E-02	7.23E-03	7.44E-01	0.00E+00	6.61E-05	0.00E+00	1.43E-03	2.73E+00
Passenger Stand	C4	175	1.60E+00	5.93E-05	2.03E-02	5.25E-03	8.27E-01	0.00E+00	7.36E-05	0.00E+00	4.97E-04	1.07E+01
Sweeper	C4	50	1.06E+01	6.60E-05	8.18E-03	4.86E-03	6.83E-01	0.00E+00	6.07E-05	0.00E+00	5.54E-04	2.48E+00
Service Truck	C4	250	2.83E+03	2.22E-05	7.55E-03	1.15E-03	2.14E-01	0.00E+00	1.90E-05	0.00E+00	1.86E-04	4.02E+00
Catering Truck	C4	250	3.76E+02	6.14E-05	1.88E-02	4.45E-03	6.34E-01	0.00E+00	5.64E-05	0.00E+00	5.14E-04	1.18E+01
Pavers	D	25	1.08E+02	9.85E-04	3.19E-03	6.00E-03	7.46E-01	9.46E-06	3.00E-04	0.00E+00	8.89E-05	8.50E-01
Pavers	D	50	1.28E+04	2.73E-03	7.18E-03	5.89E-03	5.59E-01	7.23E-06	6.17E-04	0.00E+00	2.47E-04	1.31E+00
Pavers	D	120	3.61E+04	1.16E-03	4.21E-03	6.96E-03	5.76E-01	6.76E-06	6.08E-04	0.00E+00	1.04E-04	3.17E+00
Pavers	D	175	3.27E+04	1.02E-03	4.44E-03	7.87E-03	7.32E-01	8.24E-06	4.40E-04	0.00E+00	9.17E-05	5.86E+00
Pavers	D	250	5.63E+03	8.28E-04	2.43E-03	7.79E-03	7.77E-01	8.74E-06	3.02E-04	0.00E+00	7.47E-05	8.83E+00
Pavers	D	500	1.16E+04	4.54E-04	1.85E-03	4.21E-03	4.66E-01	4.57E-06	1.63E-04	0.00E+00	4.10E-05	1.06E+01
Plate Compactors	D	15	1.02E+03	3.34E-04	1.75E-03	2.09E-03	2.87E-01	4.47E-06	8.20E-05	0.00E+00	3.02E-05	1.97E-01
Rollers	D	15	2.22E+03	4.90E-04	2.57E-03	3.07E-03	4.21E-01	6.55E-06	1.19E-04	0.00E+00	4.42E-05	2.88E-01
Rollers	D	25	1.54E+03	6.45E-04	2.20E-03	4.09E-03	5.33E-01	6.77E-06	1.64E-04	0.00E+00	5.82E-05	6.07E-01
Rollers	D	50	9.70E+03	2.05E-03	5.82E-03	5.16E-03	5.19E-01	6.71E-06	4.90E-04	0.00E+00	1.85E-04	1.21E+00
Rollers	D	120	1.25E+05	8.23E-04	3.38E-03	5.21E-03	4.91E-01	5.76E-06	4.45E-04	0.00E+00	7.42E-05	2.70E+00
Rollers	D	175	7.33E+04	7.14E-04	3.54E-03	5.78E-03	6.17E-01	6.95E-06	3.15E-04	0.00E+00	6.44E-05	4.93E+00
Rollers	D	250	1.48E+04	5.05E-04	1.55E-03	5.25E-03	6.12E-01	6.88E-06	1.80E-04	0.00E+00	4.55E-05	6.94E+00

Rollers	D	500	2.08E+04	3.30E-04	1.26E-03	3.36E-03	4.38E-01	4.30E-06	1.18E-04	0.00E+00	2.98E-05	9.93E+00
Scrapers	D	120	1.83E+03	1.57E-03	5.78E-03	9.28E-03	7.82E-01	9.17E-06	8.20E-04	0.00E+00	1.41E-04	4.31E+00
Scrapers	D	175	2.44E+04	1.18E-03	5.20E-03	8.90E-03	8.45E-01	9.51E-06	5.06E-04	0.00E+00	1.07E-04	6.76E+00
Scrapers	D	250	3.40E+04	9.00E-04	2.56E-03	8.19E-03	8.37E-01	9.42E-06	3.16E-04	0.00E+00	8.12E-05	9.51E+00
Scrapers	D	500	1.87E+05	6.36E-04	2.42E-03	5.65E-03	6.42E-01	6.30E-06	2.19E-04	0.00E+00	5.74E-05	1.46E+01
Scrapers	D	750	1.12E+04	7.36E-04	2.78E-03	6.65E-03	7.40E-01	7.44E-06	2.55E-04	0.00E+00	6.64E-05	2.52E+01
Paving Equipment	D	25	1.89E+02	6.10E-04	2.08E-03	3.87E-03	5.05E-01	6.40E-06	1.55E-04	0.00E+00	5.51E-05	5.75E-01
Paving Equipment	D	50	3.23E+02	2.33E-03	6.10E-03	5.02E-03	4.78E-01	6.18E-06	5.26E-04	0.00E+00	2.11E-04	1.12E+00
Paving Equipment	D	120	1.12E+04	9.07E-04	3.30E-03	5.47E-03	4.54E-01	5.32E-06	4.79E-04	0.00E+00	8.18E-05	2.50E+00
Paving Equipment	D	175	7.66E+03	7.94E-04	3.47E-03	6.18E-03	5.77E-01	6.49E-06	3.44E-04	0.00E+00	7.16E-05	4.61E+00
Paving Equipment	D	250	3.08E+03	5.10E-04	1.50E-03	4.88E-03	4.89E-01	5.50E-06	1.87E-04	0.00E+00	4.61E-05	5.55E+00
Surfacing Equipment	D	50	1.59E+02	9.54E-04	2.81E-03	2.72E-03	2.82E-01	3.64E-06	2.37E-04	0.00E+00	8.61E-05	6.54E-01
Surfacing Equipment	D	120	7.63E+01	8.09E-04	3.51E-03	5.44E-03	5.31E-01	6.23E-06	4.31E-04	0.00E+00	7.30E-05	2.92E+00
Surfacing Equipment	D	175	8.35E+01	5.12E-04	2.70E-03	4.43E-03	4.90E-01	5.51E-06	2.24E-04	0.00E+00	4.62E-05	3.91E+00
Surfacing Equipment	D	250	2.38E+02	4.10E-04	1.35E-03	4.47E-03	5.39E-01	6.06E-06	1.50E-04	0.00E+00	3.70E-05	6.11E+00
Surfacing Equipment	D	500	3.97E+03	3.06E-04	1.28E-03	3.32E-03	4.42E-01	4.34E-06	1.13E-04	0.00E+00	2.76E-05	1.00E+01
Surfacing Equipment	D	750	8.73E+02	3.25E-04	1.34E-03	3.55E-03	4.62E-01	4.65E-06	1.20E-04	0.00E+00	2.94E-05	1.57E+01
Signal Boards	D	15	1.11E+04	4.78E-04	2.51E-03	3.00E-03	4.11E-01	6.39E-06	1.17E-04	0.00E+00	4.32E-05	2.82E-01
Signal Boards	D	50	1.32E+02	2.31E-03	6.91E-03	6.83E-03	7.23E-01	9.35E-06	5.93E-04	0.00E+00	2.08E-04	1.67E+00
Signal Boards	D	120	5.16E+03	9.81E-04	4.34E-03	6.51E-03	6.68E-01	7.83E-06	5.38E-04	0.00E+00	8.85E-05	3.67E+00
Signal Boards	D	175	4.67E+03	8.79E-04	4.76E-03	7.62E-03	8.82E-01	9.93E-06	3.92E-04	0.00E+00	7.93E-05	7.04E+00
Signal Boards	D	250	1.41E+03	6.53E-04	2.14E-03	7.99E-03	1.02E+00	1.15E-05	2.32E-04	0.00E+00	5.89E-05	1.16E+01
Trenchers	D	15	2.44E+02	6.56E-04	3.44E-03	4.11E-03	5.64E-01	8.77E-06	1.60E-04	0.00E+00	5.92E-05	3.86E-01
Trenchers	D	25	4.29E+02	1.59E-03	5.42E-03	1.00E-02	1.32E+00	1.67E-05	3.89E-04	0.00E+00	1.43E-04	1.50E+00
Trenchers	D	50	3.33E+04	3.13E-03	8.16E-03	6.86E-03	6.58E-01	8.50E-06	7.07E-04	0.00E+00	2.83E-04	1.54E+00
Trenchers	D	120	1.08E+05	1.07E-03	3.90E-03	6.55E-03	5.40E-01	6.34E-06	5.58E-04	0.00E+00	9.64E-05	2.98E+00
Trenchers	D	175	1.73E+04	1.12E-03	4.93E-03	8.87E-03	8.22E-01	9.24E-06	4.86E-04	0.00E+00	1.01E-04	6.57E+00
Trenchers	D	250	2.22E+03	9.40E-04	2.83E-03	8.99E-03	8.91E-01	1.00E-05	3.51E-04	0.00E+00	8.48E-05	1.01E+01
Trenchers	D	500	5.65E+03	5.96E-04	2.59E-03	5.69E-03	6.22E-01	6.11E-06	2.20E-04	0.00E+00	5.38E-05	1.42E+01
Trenchers	D	750	2.44E+02	7.55E-04	3.26E-03	7.28E-03	7.82E-01	7.86E-06	2.80E-04	0.00E+00	6.81E-05	2.67E+01
Bore/Drill Rigs	D	15	4.27E+01	8.02E-04	4.21E-03	5.02E-03	6.89E-01	1.07E-05	1.95E-04	0.00E+00	7.24E-05	4.72E-01
Bore/Drill Rigs	D	25	2.14E+02	7.73E-04	2.63E-03	4.90E-03	6.39E-01	8.11E-06	1.96E-04	0.00E+00	6.97E-05	7.28E-01
Bore/Drill Rigs	D	50	1.94E+03	5.77E-04	4.56E-03	5.13E-03	6.20E-01	8.02E-06	2.39E-04	0.00E+00	5.21E-05	1.42E+00
Bore/Drill Rigs	D	120	1.43E+04	3.72E-04	3.91E-03	3.81E-03	6.42E-01	7.53E-06	2.14E-04	0.00E+00	3.35E-05	3.51E+00
Bore/Drill Rigs	D	175	4.82E+03	4.02E-04	4.30E-03	3.96E-03	8.05E-01	9.06E-06	1.72E-04	0.00E+00	3.62E-05	6.41E+00
Bore/Drill Rigs	D	250	5.92E+03	3.17E-04	1.37E-03	3.05E-03	7.52E-01	8.46E-06	8.81E-05	0.00E+00	2.86E-05	8.50E+00
Bore/Drill Rigs	D	500	2.63E+04	2.59E-04	1.10E-03	2.34E-03	6.22E-01	6.11E-06	7.20E-05	0.00E+00	2.33E-05	1.41E+01
Bore/Drill Rigs	D	750	5.04E+03	3.42E-04	1.45E-03	3.12E-03	8.19E-01	8.24E-06	9.53E-05	0.00E+00	3.08E-05	2.78E+01
Bore/Drill Rigs	D	1000	7.63E+03	4.16E-04	1.67E-03	5.95E-03	9.27E-01	9.33E-06	1.54E-04	0.00E+00	3.75E-05	4.20E+01
Excavators	D	25	4.53E+02	7.93E-04	2.71E-03	5.01E-03	6.57E-01	8.34E-06	1.88E-04	0.00E+00	7.15E-05	7.48E-01
Excavators	D	50	3.48E+04	1.64E-03	5.68E-03	4.91E-03	5.00E-01	6.46E-06	4.25E-04	0.00E+00	1.48E-04	1.16E+00
Excavators	D	120	2.27E+05	9.07E-04	4.31E-03	5.66E-03	6.13E-01	7.19E-06	4.90E-04	0.00E+00	8.18E-05	3.37E+00
Excavators	D	175	6.38E+05	6.91E-04	3.81E-03	5.11E-03	6.41E-01	7.21E-06	2.93E-04	0.00E+00	6.24E-05	5.12E+00
Excavators	D	250	3.71E+05	4.97E-04	1.42E-03	4.55E-03	6.34E-01	7.14E-06	1.49E-04	0.00E+00	4.48E-05	7.19E+00
Excavators	D	500	5.35E+05	3.47E-04	1.05E-03	2.95E-03	4.67E-01	4.58E-06	1.03E-04	0.00E+00	3.13E-05	1.06E+01
Excavators	D	750	4.30E+03	3.86E-04	1.16E-03	3.36E-03	5.16E-01	5.19E-06	1.16E-04	0.00E+00	3.48E-05	1.75E+01
Concrete/Industrial Saws	D	25	2.08E+01	7.95E-04	2.71E-03	5.02E-03	6.59E-01	8.36E-06	1.95E-04	0.00E+00	7.17E-05	7.50E-01
Concrete/Industrial Saws	D	50	3.56E+02	1.91E-03	5.84E-03	5.71E-03	6.04E-01	7.80E-06	4.94E-04	0.00E+00	1.73E-04	1.40E+00

Concrete/Industrial Saws	D	120	1.49E+03	8.89E-04	4.03E-03	5.96E-03	6.17E-01	7.24E-06	4.92E-04	0.00E+00	8.02E-05	3.39E+00
Concrete/Industrial Saws	D	175	7.13E+01	8.98E-04	4.97E-03	7.78E-03	9.15E-01	1.03E-05	4.04E-04	0.00E+00	8.10E-05	7.30E+00
Cement and Mortar Mixers	D	15	8.08E+02	4.96E-04	2.57E-03	3.13E-03	4.21E-01	6.55E-06	1.42E-04	0.00E+00	4.47E-05	2.88E-01
Cement and Mortar Mixers	D	25	1.21E+02	1.08E-03	3.25E-03	6.04E-03	7.02E-01	8.90E-06	3.32E-04	0.00E+00	9.75E-05	8.01E-01
Cranes	D	50	7.65E+02	2.03E-03	5.78E-03	4.79E-03	4.63E-01	5.99E-06	4.79E-04	0.00E+00	1.83E-04	1.08E+00
Cranes	D	120	2.01E+04	7.67E-04	3.01E-03	4.59E-03	4.18E-01	4.90E-06	4.11E-04	0.00E+00	6.92E-05	2.30E+00
Cranes	D	175	2.94E+04	5.90E-04	2.75E-03	4.44E-03	4.59E-01	5.16E-06	2.55E-04	0.00E+00	5.32E-05	3.67E+00
Cranes	D	250	8.13E+04	4.16E-04	1.18E-03	3.98E-03	4.48E-01	5.04E-06	1.40E-04	0.00E+00	3.75E-05	5.09E+00
Cranes	D	500	5.96E+04	3.10E-04	1.06E-03	2.84E-03	3.60E-01	3.53E-06	1.04E-04	0.00E+00	2.80E-05	8.17E+00
Cranes	D	750	1.61E+04	3.50E-04	1.18E-03	3.28E-03	4.04E-01	4.06E-06	1.18E-04	0.00E+00	3.15E-05	1.37E+01
Cranes	D	9999	1.82E+05	9.49E-05	3.33E-04	1.04E-03	9.70E-02	9.75E-07	3.19E-05	0.00E+00	8.56E-06	4.41E+01
Graders	D	50	2.34E+02	2.16E-03	6.53E-03	5.54E-03	5.50E-01	7.11E-06	5.25E-04	0.00E+00	1.95E-04	1.28E+00
Graders	D	120	3.74E+04	1.05E-03	4.42E-03	6.44E-03	6.24E-01	7.32E-06	5.64E-04	0.00E+00	9.44E-05	3.43E+00
Graders	D	175	1.86E+05	8.40E-04	4.19E-03	6.40E-03	7.07E-01	7.96E-06	3.62E-04	0.00E+00	7.58E-05	5.65E+00
Graders	D	250	1.65E+05	5.97E-04	1.73E-03	5.68E-03	6.88E-01	7.74E-06	1.97E-04	0.00E+00	5.38E-05	7.80E+00
Graders	D	500	9.35E+03	3.71E-04	1.26E-03	3.37E-03	4.59E-01	4.50E-06	1.21E-04	0.00E+00	3.35E-05	1.04E+01
Graders	D	750	1.83E+02	5.26E-04	1.77E-03	4.88E-03	6.47E-01	6.51E-06	1.74E-04	0.00E+00	4.75E-05	2.20E+01
Off-Highway Trucks	D	175	7.94E+03	8.25E-04	4.33E-03	5.89E-03	7.14E-01	8.04E-06	3.45E-04	0.00E+00	7.44E-05	5.71E+00
Off-Highway Trucks	D	250	8.38E+04	5.60E-04	1.53E-03	4.95E-03	6.66E-01	7.49E-06	1.65E-04	0.00E+00	5.05E-05	7.55E+00
Off-Highway Trucks	D	500	2.36E+05	4.34E-04	1.27E-03	3.57E-03	5.44E-01	5.34E-06	1.27E-04	0.00E+00	3.91E-05	1.23E+01
Off-Highway Trucks	D	750	8.04E+04	4.72E-04	1.37E-03	3.98E-03	5.88E-01	5.92E-06	1.39E-04	0.00E+00	4.26E-05	2.00E+01
Off-Highway Trucks	D	1000	3.40E+04	5.48E-04	1.67E-03	5.97E-03	6.24E-01	6.28E-06	1.79E-04	0.00E+00	4.94E-05	2.83E+01
Crushing/Proc. Equipment	D	50	2.68E+03	3.49E-03	1.00E-02	8.71E-03	8.80E-01	1.14E-05	8.46E-04	0.00E+00	3.15E-04	2.05E+00
Crushing/Proc. Equipment	D	120	1.82E+04	1.17E-03	4.80E-03	7.13E-03	6.92E-01	8.12E-06	6.51E-04	0.00E+00	1.06E-04	3.81E+00
Crushing/Proc. Equipment	D	175	1.12E+04	1.11E-03	5.49E-03	8.71E-03	9.55E-01	1.07E-05	4.95E-04	0.00E+00	1.00E-04	7.63E+00
Crushing/Proc. Equipment	D	250	1.59E+03	7.39E-04	2.17E-03	8.09E-03	9.77E-01	1.10E-05	2.48E-04	0.00E+00	6.67E-05	1.11E+01
Crushing/Proc. Equipment	D	500	1.79E+04	5.22E-04	1.69E-03	5.42E-03	7.47E-01	7.33E-06	1.77E-04	0.00E+00	4.71E-05	1.69E+01
Crushing/Proc. Equipment	D	750	3.07E+02	5.52E-04	1.76E-03	5.92E-03	7.84E-01	7.89E-06	1.89E-04	0.00E+00	4.98E-05	2.67E+01
Crushing/Proc. Equipment	D	9999	4.09E+03	1.13E-04	3.67E-04	1.33E-03	1.31E-01	1.31E-06	3.88E-05	0.00E+00	1.02E-05	5.93E+01
Rough Terrain Forklifts	D	50	2.21E+03	2.37E-03	7.56E-03	6.63E-03	6.77E-01	8.75E-06	6.01E-04	0.00E+00	2.14E-04	1.57E+00
Rough Terrain Forklifts	D	120	2.54E+05	7.97E-04	3.60E-03	5.00E-03	5.20E-01	6.10E-06	4.42E-04	0.00E+00	7.20E-05	2.86E+00
Rough Terrain Forklifts	D	175	4.74E+04	7.74E-04	4.14E-03	5.98E-03	7.13E-01	8.02E-06	3.39E-04	0.00E+00	6.98E-05	5.70E+00
Rough Terrain Forklifts	D	250	3.78E+03	5.18E-04	1.52E-03	5.19E-03	6.83E-01	7.68E-06	1.66E-04	0.00E+00	4.67E-05	7.73E+00
Rough Terrain Forklifts	D	500	4.97E+03	3.65E-04	1.14E-03	3.42E-03	5.13E-01	5.03E-06	1.17E-04	0.00E+00	3.29E-05	1.16E+01
Rubber Tired Loaders	D	25	1.18E+02	8.16E-04	2.79E-03	5.16E-03	6.77E-01	8.58E-06	2.00E-04	0.00E+00	7.37E-05	7.70E-01
Rubber Tired Loaders	D	50	4.66E+03	2.40E-03	7.28E-03	6.23E-03	6.22E-01	8.05E-06	5.85E-04	0.00E+00	2.17E-04	1.45E+00
Rubber Tired Loaders	D	120	3.04E+05	8.10E-04	3.46E-03	5.01E-03	4.91E-01	5.75E-06	4.38E-04	0.00E+00	7.31E-05	2.70E+00
Rubber Tired Loaders	D	175	2.50E+05	7.08E-04	3.58E-03	5.43E-03	6.07E-01	6.83E-06	3.06E-04	0.00E+00	6.39E-05	4.85E+00
Rubber Tired Loaders	D	250	3.55E+05	5.03E-04	1.47E-03	4.85E-03	5.95E-01	6.70E-06	1.67E-04	0.00E+00	4.54E-05	6.75E+00
Rubber Tired Loaders	D	500	2.95E+05	3.73E-04	1.28E-03	3.43E-03	4.74E-01	4.65E-06	1.23E-04	0.00E+00	3.37E-05	1.07E+01
Rubber Tired Loaders	D	750	7.59E+03	5.13E-04	1.74E-03	4.81E-03	6.47E-01	6.50E-06	1.70E-04	0.00E+00	4.63E-05	2.20E+01
Rubber Tired Loaders	D	1000	7.36E+02	5.18E-04	1.84E-03	5.96E-03	5.93E-01	5.97E-06	1.79E-04	0.00E+00	4.68E-05	2.69E+01
Rubber Tired Dozers	D	175	1.00E+03	1.21E-03	4.83E-03	8.89E-03	7.39E-01	8.32E-06	5.10E-04	0.00E+00	1.09E-04	5.92E+00
Rubber Tired Dozers	D	250	3.50E+04	9.72E-04	2.73E-03	8.32E-03	7.33E-01	8.25E-06	3.51E-04	0.00E+00	8.77E-05	8.35E+00
Rubber Tired Dozers	D	500	1.08E+05	6.41E-04	2.84E-03	5.45E-03	5.29E-01	5.19E-06	2.26E-04	0.00E+00	5.78E-05	1.21E+01
Rubber Tired Dozers	D	750	1.39E+04	6.46E-04	2.85E-03	5.57E-03	5.31E-01	5.34E-06	2.29E-04	0.00E+00	5.82E-05	1.82E+01
Rubber Tired Dozers	D	1000	8.51E+02	7.49E-04	3.44E-03	7.44E-03	5.91E-01	5.95E-06	2.59E-04	0.00E+00	6.76E-05	2.70E+01
Tractors/Loaders/Backhoes	D	25	2.33E+03	7.80E-04	2.62E-03	4.94E-03	6.34E-01	8.04E-06	2.26E-04	0.00E+00	7.04E-05	7.22E-01

Tractors/Loaders/Backhoes	D	50	2.86E+04	1.79E-03	6.40E-03	5.78E-03	6.06E-01	7.84E-06	4.77E-04	0.00E+00	1.62E-04	1.40E+00
Tractors/Loaders/Backhoes	D	120	9.18E+05	5.80E-04	2.94E-03	3.81E-03	4.31E-01	5.05E-06	3.20E-04	0.00E+00	5.23E-05	2.36E+00
Tractors/Loaders/Backhoes	D	175	9.99E+04	5.66E-04	3.35E-03	4.40E-03	5.79E-01	6.51E-06	2.45E-04	0.00E+00	5.10E-05	4.62E+00
Tractors/Loaders/Backhoes	D	250	4.62E+04	4.82E-04	1.46E-03	4.67E-03	6.86E-01	7.72E-06	1.48E-04	0.00E+00	4.35E-05	7.77E+00
Tractors/Loaders/Backhoes	D	500	1.49E+05	4.58E-04	1.49E-03	4.13E-03	6.89E-01	7.75E-06	1.40E-04	0.00E+00	4.13E-05	1.56E+01
Tractors/Loaders/Backhoes	D	750	3.76E+04	4.61E-04	1.49E-03	4.26E-03	6.89E-01	7.75E-06	1.43E-04	0.00E+00	4.16E-05	2.34E+01
Crawler Tractors	D	50	2.57E+02	2.35E-03	6.49E-03	5.25E-03	4.97E-01	6.43E-06	5.41E-04	0.00E+00	2.12E-04	1.16E+00
Crawler Tractors	D	120	3.51E+05	1.08E-03	4.05E-03	6.40E-03	5.48E-01	6.43E-06	5.65E-04	0.00E+00	9.74E-05	3.02E+00
Crawler Tractors	D	175	1.73E+05	9.58E-04	4.25E-03	7.16E-03	6.92E-01	7.78E-06	4.08E-04	0.00E+00	8.64E-05	5.54E+00
Crawler Tractors	D	250	2.12E+05	7.05E-04	2.00E-03	6.38E-03	6.64E-01	7.47E-06	2.45E-04	0.00E+00	6.36E-05	7.54E+00
Crawler Tractors	D	500	2.91E+05	5.08E-04	1.90E-03	4.47E-03	5.18E-01	5.08E-06	1.73E-04	0.00E+00	4.58E-05	1.18E+01
Crawler Tractors	D	750	5.39E+03	6.09E-04	2.27E-03	5.46E-03	6.19E-01	6.22E-06	2.10E-04	0.00E+00	5.50E-05	2.11E+01
Crawler Tractors	D	1000	4.86E+03	6.90E-04	2.70E-03	7.37E-03	6.58E-01	6.61E-06	2.36E-04	0.00E+00	6.22E-05	2.99E+01
Skid Steer Loaders	D	25	1.41E+04	8.06E-04	2.48E-03	4.66E-03	5.51E-01	6.99E-06	2.51E-04	0.00E+00	7.27E-05	6.29E-01
Skid Steer Loaders	D	50	2.59E+05	1.04E-03	4.53E-03	4.55E-03	5.10E-01	6.59E-06	3.14E-04	0.00E+00	9.35E-05	1.17E+00
Skid Steer Loaders	D	120	3.26E+05	3.58E-04	2.29E-03	2.72E-03	3.56E-01	4.18E-06	2.04E-04	0.00E+00	3.23E-05	1.95E+00
Off-Highway Tractors	D	120	4.71E+01	1.76E-03	5.99E-03	1.03E-02	7.80E-01	9.16E-06	8.99E-04	0.00E+00	1.59E-04	4.31E+00
Off-Highway Tractors	D	175	8.39E+04	1.17E-03	4.76E-03	8.76E-03	7.45E-01	8.38E-06	4.98E-04	0.00E+00	1.06E-04	5.96E+00
Off-Highway Tractors	D	250	1.13E+05	6.55E-04	1.87E-03	5.78E-03	5.21E-01	5.86E-06	2.40E-04	0.00E+00	5.91E-05	5.93E+00
Off-Highway Tractors	D	750	3.61E+04	8.71E-04	3.84E-03	7.74E-03	7.57E-01	7.61E-06	3.14E-04	0.00E+00	7.86E-05	2.59E+01
Off-Highway Tractors	D	1000	3.44E+03	9.82E-04	4.50E-03	1.00E-02	8.14E-01	8.18E-06	3.43E-04	0.00E+00	8.86E-05	3.71E+01
Dumpers/Tenders	D	25	1.39E+02	3.86E-04	1.28E-03	2.40E-03	3.05E-01	3.87E-06	1.16E-04	0.00E+00	3.48E-05	3.47E-01
Other Construction Equipment	D	15	1.20E+03	7.84E-04	4.11E-03	4.91E-03	6.73E-01	1.05E-05	1.90E-04	0.00E+00	7.07E-05	4.61E-01
Other Construction Equipment	D	25	3.39E+02	6.39E-04	2.17E-03	4.05E-03	5.28E-01	6.70E-06	1.62E-04	0.00E+00	5.76E-05	6.01E-01
Other Construction Equipment	D	50	1.06E+03	1.51E-03	5.31E-03	5.17E-03	5.59E-01	7.23E-06	4.10E-04	0.00E+00	1.36E-04	1.29E+00
Other Construction Equipment	D	120	4.20E+03	8.40E-04	4.40E-03	5.86E-03	6.73E-01	7.90E-06	4.74E-04	0.00E+00	7.58E-05	3.69E+00
Other Construction Equipment	D	175	8.46E+03	5.36E-04	3.35E-03	4.58E-03	6.08E-01	6.84E-06	2.40E-04	0.00E+00	4.83E-05	4.85E+00
Other Construction Equipment	D	500	5.61E+04	2.90E-04	1.05E-03	3.04E-03	5.08E-01	4.99E-06	9.82E-05	0.00E+00	2.62E-05	1.15E+01
Aerial Lifts	D	15	5.75E+02	6.75E-04	3.52E-03	4.24E-03	5.76E-01	8.97E-06	1.79E-04	0.00E+00	6.09E-05	3.95E-01
Aerial Lifts	D	25	1.56E+03	6.55E-04	1.99E-03	3.73E-03	4.38E-01	5.56E-06	2.03E-04	0.00E+00	5.91E-05	5.00E-01
Aerial Lifts	D	50	1.10E+04	1.14E-03	3.46E-03	3.66E-03	3.92E-01	5.07E-06	3.05E-04	0.00E+00	1.03E-04	9.05E-01
Aerial Lifts	D	120	2.34E+04	4.53E-04	2.01E-03	3.09E-03	3.17E-01	3.72E-06	2.44E-04	0.00E+00	4.09E-05	1.74E+00
Aerial Lifts	D	500	1.25E+04	2.32E-04	9.17E-04	3.00E-03	4.25E-01	4.17E-06	8.79E-05	0.00E+00	2.09E-05	9.63E+00
Aerial Lifts	D	750	1.51E+03	2.89E-04	1.11E-03	3.73E-03	5.13E-01	5.15E-06	1.08E-04	0.00E+00	2.61E-05	1.74E+01
Forklifts	D	50	1.56E+04	8.80E-04	3.23E-03	2.86E-03	2.93E-01	3.79E-06	2.41E-04	0.00E+00	7.94E-05	6.80E-01
Forklifts	D	120	5.88E+04	3.62E-04	1.81E-03	2.31E-03	2.60E-01	3.05E-06	2.00E-04	0.00E+00	3.27E-05	1.43E+00
Forklifts	D	175	8.62E+04	3.25E-04	1.89E-03	2.42E-03	3.20E-01	3.60E-06	1.39E-04	0.00E+00	2.93E-05	2.56E+00
Forklifts	D	250	1.22E+05	2.27E-04	6.43E-04	2.10E-03	3.08E-01	3.47E-06	6.67E-05	0.00E+00	2.05E-05	3.49E+00
Forklifts	D	500	1.05E+05	1.56E-04	4.40E-04	1.31E-03	2.22E-01	2.18E-06	4.54E-05	0.00E+00	1.41E-05	5.02E+00
Sweepers/Scrubbers	D	15	1.24E+02	8.25E-04	4.86E-03	5.80E-03	7.95E-01	1.24E-05	2.26E-04	0.00E+00	7.44E-05	5.45E-01
Sweepers/Scrubbers	D	25	2.07E+02	9.46E-04	3.23E-03	5.98E-03	7.84E-01	9.95E-06	2.32E-04	0.00E+00	8.54E-05	8.92E-01
Sweepers/Scrubbers	D	50	1.51E+04	2.07E-03	6.82E-03	6.10E-03	6.30E-01	8.15E-06	5.39E-04	0.00E+00	1.87E-04	1.46E+00
Sweepers/Scrubbers	D	120	6.01E+04	9.15E-04	4.28E-03	5.80E-03	6.25E-01	7.33E-06	5.15E-04	0.00E+00	8.26E-05	3.43E+00
Sweepers/Scrubbers	D	175	4.04E+04	8.15E-04	4.57E-03	6.36E-03	7.94E-01	8.93E-06	3.61E-04	0.00E+00	7.36E-05	6.34E+00
Sweepers/Scrubbers	D	250	9.23E+03	4.56E-04	1.35E-03	4.69E-03	6.47E-01	7.29E-06	1.44E-04	0.00E+00	4.12E-05	7.33E+00
Other General Industrial Equipmen	D	15	7.15E+02	4.42E-04	2.60E-03	3.11E-03	4.26E-01	6.63E-06	1.21E-04	0.00E+00	3.99E-05	2.92E-01
Other General Industrial Equipmen	D	25	1.60E+03	7.40E-04	2.53E-03	4.68E-03	6.13E-01	7.78E-06	1.75E-04	0.00E+00	6.68E-05	6.98E-01
Other General Industrial Equipmen	D	50	3.96E+03	1.91E-03	5.42E-03	4.46E-03	4.35E-01	5.62E-06	4.57E-04	0.00E+00	1.72E-04	1.02E+00

Other General Industrial Equipmen	D	120	3.80E+04	9.62E-04	3.73E-03	5.58E-03	5.17E-01	6.06E-06	5.28E-04	0.00E+00	8.68E-05	2.84E+00
Other General Industrial Equipmen	D	175	5.56E+04	7.07E-04	3.27E-03	5.24E-03	5.48E-01	6.16E-06	3.08E-04	0.00E+00	6.38E-05	4.38E+00
Other General Industrial Equipmen	D	250	7.90E+04	4.63E-04	1.26E-03	4.73E-03	5.42E-01	6.10E-06	1.50E-04	0.00E+00	4.18E-05	6.14E+00
Other General Industrial Equipmen	D	500	1.58E+05	4.22E-04	1.26E-03	4.05E-03	5.30E-01	5.21E-06	1.36E-04	0.00E+00	3.81E-05	1.20E+01
Other General Industrial Equipmen	D	750	5.91E+04	4.67E-04	1.38E-03	4.60E-03	5.83E-01	5.86E-06	1.53E-04	0.00E+00	4.21E-05	1.98E+01
Other General Industrial Equipmen	D	1000	3.25E+04	5.15E-04	1.63E-03	5.95E-03	5.59E-01	5.62E-06	1.78E-04	0.00E+00	4.65E-05	2.54E+01
Other Material Handling Equipment	D	50	1.05E+02	2.65E-03	7.49E-03	6.20E-03	6.06E-01	7.84E-06	6.35E-04	0.00E+00	2.39E-04	1.42E+00
Other Material Handling Equipment	D	120	1.51E+03	9.35E-04	3.63E-03	5.45E-03	5.05E-01	5.93E-06	5.14E-04	0.00E+00	8.43E-05	2.78E+00
Other Material Handling Equipment	D	175	2.36E+03	8.91E-04	4.14E-03	6.66E-03	6.97E-01	7.84E-06	3.90E-04	0.00E+00	8.04E-05	5.57E+00
Other Material Handling Equipment	D	250	8.02E+03	4.89E-04	1.34E-03	5.05E-03	5.80E-01	6.52E-06	1.59E-04	0.00E+00	4.41E-05	6.57E+00
Other Material Handling Equipment	D	500	3.00E+03	3.00E-04	9.03E-04	2.92E-03	3.83E-01	3.76E-06	9.79E-05	0.00E+00	2.71E-05	8.68E+00
Other Material Handling Equipment	D	9999	1.80E+04	6.90E-05	2.15E-04	7.86E-04	7.41E-02	7.27E-07	2.34E-05	0.00E+00	6.22E-06	3.36E+01
Leaf Blowers/Vacuums	D	15	4.60E+00	2.10E-04	1.22E-03	1.47E-03	2.00E-01	3.12E-06	6.22E-05	0.00E+00	1.89E-05	1.37E-01
Leaf Blowers/Vacuums	D	120	3.22E+01	4.50E-04	2.39E-03	3.56E-03	4.05E-01	4.75E-06	2.40E-04	0.00E+00	4.06E-05	2.22E+00
Leaf Blowers/Vacuums	D	250	1.92E+01	1.92E-04	7.73E-04	2.83E-03	4.01E-01	4.51E-06	7.32E-05	0.00E+00	1.73E-05	4.54E+00
Lawn & Garden Tractors	D	15	5.04E+04	6.54E-04	3.78E-03	4.60E-03	6.19E-01	9.63E-06	2.10E-04	0.00E+00	5.90E-05	4.24E-01
Lawn & Garden Tractors	D	25	6.57E+04	6.93E-04	2.35E-03	4.41E-03	5.71E-01	7.25E-06	1.90E-04	0.00E+00	6.26E-05	6.51E-01
Chippers/Stump Grinders	D	25	3.35E+01	9.71E-04	3.31E-03	6.14E-03	8.05E-01	1.02E-05	2.38E-04	0.00E+00	8.76E-05	9.16E-01
Chippers/Stump Grinders	D	120	4.42E+03	8.70E-04	4.04E-03	6.01E-03	6.33E-01	7.42E-06	4.77E-04	0.00E+00	7.85E-05	3.47E+00
Chippers/Stump Grinders	D	175	4.42E+02	7.01E-04	4.00E-03	6.31E-03	7.53E-01	8.47E-06	3.15E-04	0.00E+00	6.32E-05	6.00E+00
Chippers/Stump Grinders	D	250	1.49E+02	5.52E-04	1.88E-03	6.80E-03	8.89E-01	1.00E-05	2.01E-04	0.00E+00	4.98E-05	1.01E+01
Chippers/Stump Grinders	D	500	2.75E+03	2.77E-04	1.08E-03	3.37E-03	4.94E-01	4.85E-06	1.04E-04	0.00E+00	2.50E-05	1.12E+01
Chippers/Stump Grinders	D	750	4.68E+03	4.57E-04	1.73E-03	5.58E-03	7.93E-01	7.97E-06	1.71E-04	0.00E+00	4.12E-05	2.69E+01
Chippers/Stump Grinders	D	1000	9.38E+03	6.21E-04	2.22E-03	8.16E-03	8.46E-01	8.51E-06	2.25E-04	0.00E+00	5.61E-05	3.84E+01
Commercial Turf Equipment	D	15	2.49E+03	6.67E-04	3.93E-03	4.69E-03	6.43E-01	1.00E-05	1.84E-04	0.00E+00	6.02E-05	4.40E-01
Commercial Turf Equipment	D	25	7.80E+04	6.98E-04	2.38E-03	4.41E-03	5.79E-01	7.34E-06	1.65E-04	0.00E+00	6.30E-05	6.59E-01
Other Lawn & Garden Equipment	D	15	1.45E+01	8.46E-04	4.97E-03	5.94E-03	8.14E-01	1.27E-05	2.41E-04	0.00E+00	7.63E-05	5.58E-01
Other Lawn & Garden Equipment	D	25	3.46E+00	7.86E-04	2.68E-03	4.97E-03	6.52E-01	8.27E-06	1.93E-04	0.00E+00	7.09E-05	7.42E-01
Agricultural Tractors	D	15	1.04E+04	8.17E-04	4.28E-03	5.11E-03	7.02E-01	1.09E-05	1.98E-04	0.00E+00	7.37E-05	4.81E-01
Agricultural Tractors	D	25	2.14E+04	9.77E-04	3.32E-03	6.20E-03	8.07E-01	1.02E-05	2.50E-04	0.00E+00	8.81E-05	9.19E-01
Agricultural Tractors	D	50	8.91E+04	2.40E-03	6.78E-03	6.60E-03	6.84E-01	8.84E-06	5.95E-04	0.00E+00	2.16E-04	1.59E+00
Agricultural Tractors	D	120	2.47E+05	9.59E-04	3.98E-03	6.29E-03	6.07E-01	7.12E-06	5.12E-04	0.00E+00	8.65E-05	3.33E+00
Agricultural Tractors	D	175	2.03E+05	7.61E-04	3.85E-03	6.55E-03	7.12E-01	8.01E-06	3.33E-04	0.00E+00	6.86E-05	5.68E+00
Agricultural Tractors	D	250	1.87E+05	4.99E-04	1.60E-03	5.96E-03	7.12E-01	8.01E-06	1.81E-04	0.00E+00	4.50E-05	8.07E+00
Agricultural Tractors	D	500	7.44E+04	3.70E-04	1.40E-03	4.39E-03	5.82E-01	5.72E-06	1.37E-04	0.00E+00	3.34E-05	1.32E+01
Combines	D	120	1.65E+03	1.02E-03	4.76E-03	7.54E-03	7.89E-01	9.26E-06	5.23E-04	0.00E+00	9.20E-05	4.33E+00
Combines	D	175	3.57E+03	6.12E-04	3.55E-03	6.03E-03	7.12E-01	8.01E-06	2.61E-04	0.00E+00	5.53E-05	5.67E+00
Combines	D	250	5.45E+03	3.88E-04	1.43E-03	5.39E-03	7.02E-01	7.89E-06	1.42E-04	0.00E+00	3.50E-05	7.94E+00
Combines	D	500	4.35E+02	2.42E-04	1.01E-03	3.41E-03	4.82E-01	4.73E-06	9.34E-05	0.00E+00	2.18E-05	1.09E+01
Balers	D	50	8.23E-01	1.55E-03	5.12E-03	6.54E-03	7.27E-01	9.39E-06	4.65E-04	0.00E+00	1.40E-04	1.67E+00
Balers	D	120	1.39E+03	5.65E-04	2.70E-03	4.27E-03	4.54E-01	5.33E-06	2.87E-04	0.00E+00	5.09E-05	2.49E+00
Agricultural Mowers	D	120	2.49E+02	4.33E-04	1.86E-03	2.95E-03	2.92E-01	3.42E-06	2.28E-04	0.00E+00	3.91E-05	1.60E+00
Sprayers	D	25	7.38E+01	9.27E-04	2.54E-03	4.35E-03	4.76E-01	6.04E-06	2.76E-04	0.00E+00	8.37E-05	5.45E-01
Sprayers	D	50	2.73E+01	9.54E-04	3.16E-03	4.06E-03	4.51E-01	5.83E-06	2.88E-04	0.00E+00	8.61E-05	1.04E+00
Sprayers	D	120	6.27E+02	5.88E-04	2.82E-03	4.46E-03	4.75E-01	5.57E-06	2.98E-04	0.00E+00	5.31E-05	2.60E+00
Sprayers	D	175	3.85E+02	4.44E-04	2.65E-03	4.50E-03	5.41E-01	6.08E-06	1.88E-04	0.00E+00	4.01E-05	4.31E+00
Sprayers	D	250	3.43E+02	3.26E-04	1.25E-03	4.69E-03	6.21E-01	6.99E-06	1.20E-04	0.00E+00	2.94E-05	7.03E+00
Sprayers	D	500	1.17E+02	1.61E-04	6.92E-04	2.37E-03	3.40E-01	3.33E-06	6.30E-05	0.00E+00	1.46E-05	7.68E+00

Tillers	D	15	2.39E+00	4.78E-04	2.78E-03	3.36E-03	4.56E-01	7.10E-06	1.43E-04	0.00E+00	4.31E-05	3.12E-01
Tillers	D	250	3.72E+00	5.39E-04	1.97E-03	7.40E-03	9.58E-01	1.08E-05	1.98E-04	0.00E+00	4.86E-05	1.08E+01
Tillers	D	500	2.23E+01	4.35E-04	1.81E-03	6.07E-03	8.54E-01	8.38E-06	1.68E-04	0.00E+00	3.93E-05	1.93E+01
Swathers	D	120	8.70E+03	5.63E-04	2.67E-03	4.23E-03	4.48E-01	5.25E-06	2.86E-04	0.00E+00	5.08E-05	2.46E+00
Swathers	D	175	1.13E+02	4.93E-04	2.92E-03	4.95E-03	5.91E-01	6.65E-06	2.09E-04	0.00E+00	4.45E-05	4.71E+00
Hydro Power Units	D	15	6.13E+01	4.67E-04	2.45E-03	2.92E-03	4.01E-01	6.24E-06	1.13E-04	0.00E+00	4.21E-05	2.75E-01
Hydro Power Units	D	25	3.08E+02	5.53E-04	1.88E-03	3.51E-03	4.57E-01	5.80E-06	1.42E-04	0.00E+00	4.99E-05	5.20E-01
Hydro Power Units	D	50	6.71E+02	1.81E-03	4.90E-03	4.24E-03	4.21E-01	5.44E-06	4.25E-04	0.00E+00	1.63E-04	9.82E-01
Hydro Power Units	D	120	1.48E+02	6.27E-04	2.44E-03	3.83E-03	3.51E-01	4.12E-06	3.42E-04	0.00E+00	5.66E-05	1.93E+00
Other Agricultural Equipment	D	15	1.23E+02	5.96E-04	3.12E-03	3.73E-03	5.11E-01	7.95E-06	1.53E-04	0.00E+00	5.37E-05	3.50E-01
Other Agricultural Equipment	D	25	5.70E+02	8.05E-04	2.51E-03	4.68E-03	5.62E-01	7.13E-06	2.49E-04	0.00E+00	7.26E-05	6.41E-01
Other Agricultural Equipment	D	50	8.51E+02	1.62E-03	4.71E-03	4.85E-03	5.11E-01	6.61E-06	4.17E-04	0.00E+00	1.46E-04	1.18E+00
Other Agricultural Equipment	D	120	6.90E+03	6.39E-04	2.73E-03	4.32E-03	4.26E-01	5.00E-06	3.38E-04	0.00E+00	5.76E-05	2.34E+00
Other Agricultural Equipment	D	175	8.37E+02	5.35E-04	2.80E-03	4.76E-03	5.29E-01	5.96E-06	2.32E-04	0.00E+00	4.83E-05	4.22E+00
Other Agricultural Equipment	D	250	1.20E+03	3.54E-04	1.18E-03	4.39E-03	5.37E-01	6.04E-06	1.29E-04	0.00E+00	3.19E-05	6.08E+00
Other Agricultural Equipment	D	500	5.78E+02	2.30E-04	9.03E-04	2.86E-03	3.86E-01	3.79E-06	8.65E-05	0.00E+00	2.08E-05	8.74E+00
Generator Sets	D	15	5.04E+03	9.80E-04	4.53E-03	6.69E-03	6.80E-01	1.06E-05	3.80E-04	0.00E+00	8.84E-05	4.67E-01
Generator Sets	D	25	6.15E+03	1.05E-03	3.58E-03	6.33E-03	7.05E-01	8.94E-06	3.58E-04	0.00E+00	9.48E-05	8.04E-01
Generator Sets	D	50	1.50E+04	1.69E-03	5.21E-03	5.66E-03	6.12E-01	7.91E-06	4.60E-04	0.00E+00	1.53E-04	1.41E+00
Generator Sets	D	120	5.48E+04	9.02E-04	4.07E-03	6.25E-03	6.49E-01	7.61E-06	4.83E-04	0.00E+00	8.14E-05	3.56E+00
Generator Sets	D	175	4.72E+03	7.52E-04	4.21E-03	6.93E-03	8.11E-01	9.12E-06	3.32E-04	0.00E+00	6.78E-05	6.46E+00
Generator Sets	D	250	3.77E+03	5.00E-04	1.73E-03	6.61E-03	8.49E-01	9.56E-06	1.82E-04	0.00E+00	4.51E-05	9.61E+00
Generator Sets	D	500	1.68E+04	3.55E-04	1.42E-03	4.71E-03	6.73E-01	6.61E-06	1.36E-04	0.00E+00	3.20E-05	1.52E+01
Generator Sets	D	750	1.56E+04	3.96E-04	1.53E-03	5.23E-03	7.24E-01	7.28E-06	1.49E-04	0.00E+00	3.57E-05	2.46E+01
Generator Sets	D	9999	5.42E+04	7.78E-05	2.74E-04	1.01E-03	1.05E-01	1.05E-06	2.79E-05	0.00E+00	7.02E-06	4.75E+01
Pumps	D	15	4.52E+03	8.18E-04	3.29E-03	4.95E-03	4.94E-01	7.69E-06	3.23E-04	0.00E+00	7.38E-05	3.40E-01
Pumps	D	25	2.25E+03	1.40E-03	3.96E-03	7.00E-03	7.79E-01	9.88E-06	4.28E-04	0.00E+00	1.27E-04	8.90E-01
Pumps	D	50	7.84E+03	2.04E-03	6.15E-03	6.42E-03	6.86E-01	8.87E-06	5.41E-04	0.00E+00	1.84E-04	1.59E+00
Pumps	D	120	3.69E+04	9.37E-04	4.14E-03	6.34E-03	6.49E-01	7.61E-06	5.05E-04	0.00E+00	8.45E-05	3.56E+00
Pumps	D	175	5.82E+03	7.73E-04	4.22E-03	6.95E-03	8.00E-01	9.00E-06	3.43E-04	0.00E+00	6.98E-05	6.38E+00
Pumps	D	250	5.99E+03	4.96E-04	1.66E-03	6.37E-03	8.05E-01	9.05E-06	1.80E-04	0.00E+00	4.47E-05	9.11E+00
Pumps	D	500	2.36E+02	3.82E-04	1.49E-03	4.88E-03	6.90E-01	6.77E-06	1.44E-04	0.00E+00	3.44E-05	1.56E+01
Pumps	D	750	5.91E+01	4.34E-04	1.65E-03	5.56E-03	7.60E-01	7.64E-06	1.62E-04	0.00E+00	3.92E-05	2.58E+01
Pumps	D	9999	1.73E+04	1.03E-04	3.62E-04	1.33E-03	1.35E-01	1.36E-06	3.67E-05	0.00E+00	9.30E-06	6.14E+01
Air Compressors	D	15	1.24E+02	7.96E-04	3.20E-03	4.81E-03	4.81E-01	7.49E-06	3.14E-04	0.00E+00	7.18E-05	3.31E-01
Air Compressors	D	25	4.10E+02	1.04E-03	2.93E-03	5.19E-03	5.77E-01	7.33E-06	3.17E-04	0.00E+00	9.38E-05	6.60E-01
Air Compressors	D	50	7.46E+03	1.79E-03	5.02E-03	4.42E-03	4.45E-01	5.75E-06	4.33E-04	0.00E+00	1.62E-04	1.04E+00
Air Compressors	D	120	1.19E+05	6.73E-04	2.70E-03	4.11E-03	3.91E-01	4.59E-06	3.73E-04	0.00E+00	6.07E-05	2.15E+00
Air Compressors	D	175	6.58E+03	5.92E-04	2.88E-03	4.72E-03	5.05E-01	5.68E-06	2.65E-04	0.00E+00	5.35E-05	4.04E+00
Air Compressors	D	250	1.32E+04	3.96E-04	1.17E-03	4.46E-03	5.24E-01	5.90E-06	1.36E-04	0.00E+00	3.57E-05	5.94E+00
Air Compressors	D	500	3.45E+04	3.20E-04	1.06E-03	3.46E-03	4.63E-01	4.55E-06	1.12E-04	0.00E+00	2.89E-05	1.05E+01
Air Compressors	D	750	1.94E+04	3.34E-04	1.09E-03	3.69E-03	4.77E-01	4.80E-06	1.18E-04	0.00E+00	3.01E-05	1.62E+01
Air Compressors	D	1000	6.38E+02	4.11E-04	1.38E-03	5.03E-03	4.86E-01	4.89E-06	1.45E-04	0.00E+00	3.71E-05	2.21E+01
Welders	D	15	3.26E+03	6.84E-04	2.75E-03	4.14E-03	4.13E-01	6.43E-06	2.70E-04	0.00E+00	6.17E-05	2.84E-01
Welders	D	25	4.78E+03	8.12E-04	2.29E-03	4.05E-03	4.51E-01	5.72E-06	2.48E-04	0.00E+00	7.33E-05	5.16E-01
Welders	D	50	2.94E+04	1.90E-03	5.43E-03	5.04E-03	5.19E-01	6.71E-06	4.71E-04	0.00E+00	1.72E-04	1.20E+00
Welders	D	120	5.48E+04	5.33E-04	2.21E-03	3.37E-03	3.29E-01	3.86E-06	2.93E-04	0.00E+00	4.81E-05	1.81E+00
Welders	D	175	3.96E+02	6.15E-04	3.11E-03	5.11E-03	5.61E-01	6.31E-06	2.75E-04	0.00E+00	5.55E-05	4.48E+00

Welders	D	250	1.26E+02	3.35E-04	1.03E-03	3.95E-03	4.76E-01	5.35E-06	1.18E-04	0.00E+00	3.03E-05	5.39E+00
Welders	D	500	6.29E+02	2.14E-04	7.55E-04	2.46E-03	3.35E-01	3.29E-06	7.74E-05	0.00E+00	1.93E-05	7.59E+00
Pressure Washers	D	15	1.00E+02	4.69E-04	2.17E-03	3.20E-03	3.26E-01	5.07E-06	1.82E-04	0.00E+00	4.23E-05	2.24E-01
Pressure Washers	D	25	3.90E+01	4.26E-04	1.45E-03	2.57E-03	2.86E-01	3.62E-06	1.45E-04	0.00E+00	3.84E-05	3.26E-01
Pressure Washers	D	50	1.55E+02	6.13E-04	2.05E-03	2.55E-03	2.86E-01	3.69E-06	1.84E-04	0.00E+00	5.53E-05	6.56E-01
Pressure Washers	D	120	1.53E+02	2.47E-04	1.20E-03	1.84E-03	2.00E-01	2.35E-06	1.29E-04	0.00E+00	2.23E-05	1.10E+00
Cargo Tractor	D	120	2.05E+03	8.78E-04	3.53E-03	5.26E-03	4.96E-01	5.58E-06	4.81E-04	0.00E+00	7.93E-05	2.73E+00
A/C Tug Narrow Body	D	250	1.10E+04	8.96E-04	2.65E-03	8.41E-03	7.14E-01	8.03E-06	3.48E-04	0.00E+00	8.09E-05	8.13E+00
A/C Tug Wide Body	D	500	6.64E+03	7.71E-04	3.65E-03	7.20E-03	6.65E-01	6.53E-06	2.93E-04	0.00E+00	6.95E-05	1.52E+01
Air Conditioner	D	175	1.59E+03	4.63E-04	4.40E-03	4.69E-03	8.30E-01	9.33E-06	2.19E-04	0.00E+00	4.18E-05	6.61E+00
Air Conditioner	D	250	1.80E+02	3.61E-04	1.50E-03	4.12E-03	8.30E-01	9.33E-06	1.19E-04	0.00E+00	3.26E-05	9.38E+00
Air Conditioner	D	500	2.40E+02	3.47E-04	1.46E-03	3.66E-03	8.30E-01	9.33E-06	1.16E-04	0.00E+00	3.14E-05	1.88E+01
Air Start Unit	D	175	1.73E+01	7.27E-04	4.46E-03	6.94E-03	8.66E-01	8.50E-06	3.26E-04	0.00E+00	6.56E-05	6.90E+00
Air Start Unit	D	250	7.41E+01	4.79E-04	1.74E-03	6.32E-03	8.66E-01	8.50E-06	1.77E-04	0.00E+00	4.32E-05	9.80E+00
Air Start Unit	D	500	5.83E+03	4.30E-04	1.78E-03	5.67E-03	8.66E-01	8.50E-06	1.66E-04	0.00E+00	3.88E-05	1.96E+01
Air Start Unit	D	750	1.26E+03	4.45E-04	1.78E-03	5.85E-03	8.66E-01	8.50E-06	1.70E-04	0.00E+00	4.01E-05	2.94E+01
Baggage Tug	D	120	2.37E+04	9.29E-04	3.09E-03	5.34E-03	4.07E-01	4.78E-06	4.84E-04	0.00E+00	8.38E-05	2.25E+00
Belt Loader	D	120	8.01E+03	5.89E-04	2.07E-03	3.47E-03	2.83E-01	3.33E-06	3.14E-04	0.00E+00	5.31E-05	1.56E+00
Bobtail	D	120	4.13E+02	1.27E-03	4.58E-03	7.75E-03	6.47E-01	7.59E-06	6.72E-04	0.00E+00	1.15E-04	3.56E+00
Cargo Loader	D	120	9.09E+03	9.31E-04	3.68E-03	5.69E-03	5.26E-01	6.17E-06	5.10E-04	0.00E+00	8.40E-05	2.89E+00
Forklift	D	175	1.50E+03	3.48E-04	1.86E-03	2.89E-03	3.34E-01	3.76E-06	1.57E-04	0.00E+00	3.14E-05	2.67E+00
Fuel Truck	D	250	9.73E+02	1.56E-04	5.06E-04	1.83E-03	2.36E-01	2.66E-06	5.57E-05	0.00E+00	1.41E-05	2.68E+00
Ground Power Unit	D	175	1.57E+04	9.25E-04	4.98E-03	7.42E-03	8.76E-01	9.85E-06	4.15E-04	0.00E+00	8.35E-05	6.99E+00
Lav Truck	D	175	3.39E+02	3.53E-04	1.76E-03	2.68E-03	3.00E-01	3.37E-06	1.55E-04	0.00E+00	3.19E-05	2.40E+00
Lift	D	120	1.46E+03	9.27E-04	4.05E-03	5.93E-03	6.01E-01	7.05E-06	5.18E-04	0.00E+00	8.36E-05	3.30E+00
Other GSE	D	175	4.45E+03	7.08E-04	3.00E-03	5.48E-03	5.03E-01	6.50E-06	3.08E-04	0.00E+00	6.39E-05	4.02E+00
Passenger Stand	D	120	1.99E+01	6.49E-04	3.59E-03	5.29E-03	6.18E-01	7.25E-06	3.46E-04	0.00E+00	5.86E-05	3.38E+00
Sweeper	D	120	2.37E+02	2.41E-04	1.61E-03	2.12E-03	2.73E-01	3.07E-06	1.40E-04	0.00E+00	2.17E-05	1.49E+00
Generator	D	120	8.70E+02	1.17E-03	4.89E-03	6.99E-03	6.84E-01	7.70E-06	6.43E-04	0.00E+00	1.06E-04	3.76E+00
Generator	D	175	6.94E+03	1.07E-03	5.27E-03	7.93E-03	8.84E-01	9.95E-06	4.64E-04	0.00E+00	9.68E-05	7.07E+00
Generator	D	250	1.03E+04	7.54E-04	2.07E-03	7.32E-03	8.95E-01	1.01E-05	2.39E-04	0.00E+00	6.80E-05	1.01E+01
Generator	D	500	2.17E+03	5.60E-04	1.63E-03	5.08E-03	7.09E-01	7.98E-06	1.76E-04	0.00E+00	5.05E-05	1.61E+01
Generator	D	750	4.35E+03	6.07E-04	1.76E-03	5.65E-03	7.64E-01	8.59E-06	1.94E-04	0.00E+00	5.47E-05	2.60E+01
Service Truck	D	175	8.65E+02	2.32E-04	1.33E-03	2.07E-03	2.49E-01	2.80E-06	1.04E-04	0.00E+00	2.09E-05	1.98E+00
Catering Truck	D	250	2.19E+02	2.66E-04	1.13E-03	3.76E-03	6.25E-01	7.04E-06	1.00E-04	0.00E+00	2.40E-05	7.07E+00
Hydrant Truck	D	175	5.17E+02	9.25E-04	4.84E-03	7.81E-03	8.77E-01	9.87E-06	4.14E-04	0.00E+00	8.35E-05	7.00E+00
Compressor (GSE)	D	120	1.13E+02	7.40E-04	3.22E-03	4.71E-03	4.76E-01	5.58E-06	4.13E-04	0.00E+00	6.67E-05	2.62E+00
Compressor (GSE)	D	250	4.69E+01	3.34E-04	1.03E-03	3.71E-03	4.67E-01	5.25E-06	1.15E-04	0.00E+00	3.01E-05	5.29E+00
Compressor (GSE)	D	500	3.75E+02	3.16E-04	1.07E-03	3.36E-03	4.81E-01	4.72E-06	1.11E-04	0.00E+00	2.85E-05	1.09E+01
Compressor (GSE)	D	750	1.83E+03	3.16E-04	1.05E-03	3.42E-03	4.74E-01	4.76E-06	1.11E-04	0.00E+00	2.85E-05	1.61E+01
Transport Refrigeration Units	D	15	2.47E+04	5.71E-04	3.26E-03	4.02E-03	5.35E-01	6.78E-06	1.89E-04	0.00E+00	5.15E-05	3.66E-01
Transport Refrigeration Units	D	25	1.43E+04	6.65E-04	2.25E-03	4.25E-03	5.45E-01	6.92E-06	1.89E-04	0.00E+00	6.00E-05	6.21E-01
Transport Refrigeration Units	D	50	8.68E+05	6.49E-04	4.29E-03	4.48E-03	5.18E-01	6.70E-06	2.42E-04	0.00E+00	5.86E-05	1.19E+00
A/C unit	D	120	6.74E+03	8.48E-04	3.93E-03	6.04E-03	6.33E-01	7.42E-06	4.53E-04	0.00E+00	7.65E-05	3.47E+00
A/C unit	D	250	5.86E+03	3.73E-04	1.32E-03	4.84E-03	6.25E-01	7.04E-06	1.39E-04	0.00E+00	3.37E-05	7.08E+00
A/C unit	D	500	4.63E+03	2.54E-04	1.05E-03	3.31E-03	4.74E-01	4.65E-06	9.86E-05	0.00E+00	2.30E-05	1.07E+01
Aircraft Support	D	120	1.83E+03	5.71E-04	2.65E-03	4.07E-03	4.26E-01	5.00E-06	3.05E-04	0.00E+00	5.15E-05	2.34E+00
Aircraft Support	D	175	3.81E+03	5.40E-04	3.10E-03	5.08E-03	6.01E-01	6.77E-06	2.39E-04	0.00E+00	4.87E-05	4.79E+00

Cart	D	120	7.85E+02	6.80E-04	3.15E-03	4.84E-03	5.07E-01	5.95E-06	3.64E-04	0.00E+00	6.14E-05	2.78E+00
Cart	D	175	2.86E+02	5.90E-04	3.39E-03	5.55E-03	6.57E-01	7.39E-06	2.61E-04	0.00E+00	5.32E-05	5.24E+00
Cart	D	250	1.36E+03	3.54E-04	1.25E-03	4.58E-03	5.92E-01	6.67E-06	1.31E-04	0.00E+00	3.19E-05	6.71E+00
Communications	D	50	1.09E+02	1.59E-03	4.98E-03	5.55E-03	6.01E-01	7.77E-06	4.38E-04	0.00E+00	1.43E-04	1.39E+00
Communications	D	120	3.92E+02	6.72E-04	3.12E-03	4.78E-03	5.01E-01	5.88E-06	3.59E-04	0.00E+00	6.06E-05	2.75E+00
Compressor (Military)	D	50	1.09E+02	1.95E-03	6.10E-03	6.80E-03	7.37E-01	9.52E-06	5.36E-04	0.00E+00	1.76E-04	1.70E+00
Compressor (Military)	D	120	9.87E+03	5.96E-04	2.76E-03	4.25E-03	4.45E-01	5.22E-06	3.19E-04	0.00E+00	5.38E-05	2.44E+00
Compressor (Military)	D	175	3.81E+02	6.44E-04	3.70E-03	6.06E-03	7.17E-01	8.07E-06	2.85E-04	0.00E+00	5.81E-05	5.72E+00
Compressor (Military)	D	250	1.09E+03	4.00E-04	1.42E-03	5.19E-03	6.71E-01	7.54E-06	1.49E-04	0.00E+00	3.61E-05	7.59E+00
Compressor (Military)	D	500	7.63E+03	3.01E-04	1.24E-03	3.92E-03	5.61E-01	5.50E-06	1.17E-04	0.00E+00	2.72E-05	1.27E+01
Crane	D	120	1.05E+03	3.81E-04	3.77E-03	4.36E-03	6.58E-01	7.72E-06	2.49E-04	0.00E+00	3.44E-05	3.59E+00
Crane	D	175	2.86E+02	2.58E-04	3.01E-03	3.33E-03	6.06E-01	6.81E-06	1.35E-04	0.00E+00	2.32E-05	4.82E+00
Crane	D	250	2.72E+02	2.03E-04	1.09E-03	3.12E-03	6.43E-01	7.24E-06	8.17E-05	0.00E+00	1.84E-05	7.27E+00
Deicer	D	120	2.62E+02	9.24E-04	4.28E-03	6.58E-03	6.89E-01	8.08E-06	4.94E-04	0.00E+00	8.33E-05	3.78E+00
Generator (Military)	D	50	7.36E+02	1.51E-03	4.73E-03	5.27E-03	5.71E-01	7.39E-06	4.16E-04	0.00E+00	1.36E-04	1.32E+00
Generator (Military)	D	120	4.39E+04	6.97E-04	3.23E-03	4.96E-03	5.20E-01	6.10E-06	3.73E-04	0.00E+00	6.29E-05	2.85E+00
Generator (Military)	D	175	5.16E+04	5.67E-04	3.26E-03	5.34E-03	6.31E-01	7.10E-06	2.51E-04	0.00E+00	5.12E-05	5.03E+00
Generator (Military)	D	250	1.95E+04	4.00E-04	1.42E-03	5.19E-03	6.71E-01	7.54E-06	1.49E-04	0.00E+00	3.61E-05	7.59E+00
Generator (Military)	D	500	1.58E+04	2.81E-04	1.15E-03	3.66E-03	5.23E-01	5.14E-06	1.09E-04	0.00E+00	2.54E-05	1.18E+01
Generator (Military)	D	750	6.35E+02	2.98E-04	1.18E-03	3.86E-03	5.36E-01	5.39E-06	1.13E-04	0.00E+00	2.69E-05	1.82E+01
Hydraulic unit	D	120	4.38E+03	7.98E-04	3.70E-03	5.68E-03	5.95E-01	6.98E-06	4.27E-04	0.00E+00	7.20E-05	3.26E+00
Lift (Military)	D	120	1.31E+02	7.98E-04	3.70E-03	5.68E-03	5.95E-01	6.98E-06	4.27E-04	0.00E+00	7.20E-05	3.26E+00
Light	D	50	1.36E+02	1.99E-03	6.23E-03	6.93E-03	7.52E-01	9.72E-06	5.47E-04	0.00E+00	1.79E-04	1.73E+00
Pressure Washers	D	175	2.86E+02	5.86E-04	3.37E-03	5.52E-03	6.53E-01	7.35E-06	2.59E-04	0.00E+00	5.29E-05	5.21E+00
Pump (Military)	D	50	1.58E+03	1.55E-03	4.86E-03	5.41E-03	5.86E-01	7.58E-06	4.27E-04	0.00E+00	1.40E-04	1.35E+00
Pump (Military)	D	120	2.94E+03	8.40E-04	3.89E-03	5.98E-03	6.26E-01	7.35E-06	4.49E-04	0.00E+00	7.58E-05	3.44E+00
Start Cart	D	120	6.54E+01	8.40E-04	3.89E-03	5.98E-03	6.26E-01	7.35E-06	4.49E-04	0.00E+00	7.58E-05	3.44E+00
Start Cart	D	500	2.72E+02	2.29E-04	9.39E-04	2.98E-03	4.25E-01	4.18E-06	8.85E-05	0.00E+00	2.06E-05	9.63E+00
Test Stand	D	120	2.16E+03	7.73E-04	3.58E-03	5.50E-03	5.76E-01	6.76E-06	4.13E-04	0.00E+00	6.97E-05	3.16E+00
Test Stand	D	175	1.91E+02	5.48E-04	3.15E-03	5.16E-03	6.10E-01	6.86E-06	2.42E-04	0.00E+00	4.94E-05	4.86E+00
Test Stand	D	250	4.22E+03	3.54E-04	1.25E-03	4.58E-03	5.92E-01	6.67E-06	1.31E-04	0.00E+00	3.19E-05	6.71E+00
Test Stand	D	500	3.27E+03	2.77E-04	1.14E-03	3.61E-03	5.16E-01	5.06E-06	1.07E-04	0.00E+00	2.50E-05	1.17E+01
Welder	D	50	5.72E+02	1.39E-03	4.36E-03	4.85E-03	5.26E-01	6.80E-06	3.83E-04	0.00E+00	1.25E-04	1.21E+00
Welder	D	120	3.79E+03	5.21E-04	2.41E-03	3.71E-03	3.88E-01	4.56E-06	2.78E-04	0.00E+00	4.70E-05	2.13E+00
Other tactical support equipment	D	50	2.72E+01	1.99E-03	6.23E-03	6.93E-03	7.52E-01	9.72E-06	5.47E-04	0.00E+00	1.79E-04	1.73E+00
Other tactical support equipment	D	120	1.05E+03	6.63E-04	3.08E-03	4.72E-03	4.95E-01	5.81E-06	3.55E-04	0.00E+00	5.99E-05	2.71E+00
Other tactical support equipment	D	175	1.53E+03	5.71E-04	3.28E-03	5.37E-03	6.36E-01	7.15E-06	2.52E-04	0.00E+00	5.15E-05	5.07E+00
Other tactical support equipment	D	250	8.17E+02	3.91E-04	1.39E-03	5.07E-03	6.56E-01	7.38E-06	1.45E-04	0.00E+00	3.53E-05	7.42E+00
Other tactical support equipment	D	500	5.45E+02	2.18E-04	8.96E-04	2.84E-03	4.06E-01	3.98E-06	8.45E-05	0.00E+00	1.97E-05	9.19E+00
Other tactical support equipment	D	750	4.09E+02	3.49E-04	1.39E-03	4.52E-03	6.27E-01	6.31E-06	1.33E-04	0.00E+00	3.15E-05	2.13E+01
Compressor (Dredging)	D	50	2.35E+02	2.39E-03	6.77E-03	5.98E-03	6.01E-01	7.77E-06	5.79E-04	0.00E+00	2.16E-04	1.40E+00
Compressor (Dredging)	D	120	4.23E+03	8.07E-04	3.28E-03	4.99E-03	4.76E-01	5.58E-06	4.46E-04	0.00E+00	7.28E-05	2.62E+00
Compressor (Dredging)	D	175	8.35E+02	6.42E-04	3.15E-03	5.14E-03	5.53E-01	6.23E-06	2.87E-04	0.00E+00	5.79E-05	4.42E+00
Compressor (Dredging)	D	250	1.19E+03	3.85E-04	1.15E-03	4.20E-03	4.93E-01	5.55E-06	1.35E-04	0.00E+00	3.48E-05	5.59E+00
Compressor (Dredging)	D	500	2.38E+03	2.81E-04	9.54E-04	2.95E-03	3.92E-01	3.85E-06	9.95E-05	0.00E+00	2.53E-05	8.89E+00
Compressor (Dredging)	D	1000	9.54E+03	4.12E-04	1.42E-03	5.02E-03	4.86E-01	4.89E-06	1.45E-04	0.00E+00	3.72E-05	2.21E+01
Crane (Dredging)	D	750	3.48E+03	2.09E-04	8.47E-04	2.24E-03	4.80E-01	4.71E-06	7.05E-05	0.00E+00	1.89E-05	1.63E+01
Deck/door engine	D	250	4.09E+02	2.99E-04	1.15E-03	4.23E-03	5.69E-01	6.41E-06	1.13E-04	0.00E+00	2.70E-05	6.44E+00

Dredger	D	175	3.54E+03	6.03E-04	2.93E-03	4.78E-03	5.11E-01	5.75E-06	2.69E-04	0.00E+00	5.44E-05	4.08E+00
Dredger	D	250	9.49E+03	3.99E-04	1.18E-03	4.29E-03	5.01E-01	5.64E-06	1.39E-04	0.00E+00	3.60E-05	5.68E+00
Dredger	D	750	1.14E+04	3.45E-04	1.14E-03	3.64E-03	4.67E-01	4.58E-06	1.22E-04	0.00E+00	3.12E-05	1.59E+01
Dredger	D	9999	1.52E+05	6.70E-05	2.24E-04	7.94E-04	7.65E-02	7.51E-07	2.31E-05	0.00E+00	6.04E-06	3.47E+01
Hoist/swing/winch	D	50	1.27E+02	1.66E-03	4.69E-03	4.09E-03	4.09E-01	5.29E-06	4.00E-04	0.00E+00	1.50E-04	9.53E-01
Hoist/swing/winch	D	120	2.73E+03	9.52E-04	3.84E-03	5.84E-03	5.54E-01	6.50E-06	5.27E-04	0.00E+00	8.59E-05	3.05E+00
Hoist/swing/winch	D	175	5.76E+03	5.73E-04	2.79E-03	4.54E-03	4.86E-01	5.46E-06	2.56E-04	0.00E+00	5.17E-05	3.88E+00
Hoist/swing/winch	D	250	1.58E+04	4.34E-04	1.28E-03	4.66E-03	5.44E-01	6.13E-06	1.51E-04	0.00E+00	3.91E-05	6.17E+00
Hoist/swing/winch	D	500	3.29E+04	3.16E-04	1.06E-03	3.26E-03	4.32E-01	4.24E-06	1.11E-04	0.00E+00	2.85E-05	9.79E+00
Hoist/swing/winch	D	750	2.09E+04	4.25E-04	1.40E-03	4.48E-03	5.74E-01	5.64E-06	1.50E-04	0.00E+00	3.83E-05	1.95E+01
Hoist/swing/winch	D	9999	1.26E+05	7.09E-05	2.38E-04	8.41E-04	8.10E-02	7.95E-07	2.44E-05	0.00E+00	6.40E-06	3.68E+01
Pump (Dredging)	D	120	3.77E+02	1.11E-03	4.97E-03	7.64E-03	7.80E-01	9.15E-06	6.01E-04	0.00E+00	1.00E-04	4.28E+00
Pump (Dredging)	D	175	2.03E+02	7.63E-04	4.20E-03	6.89E-03	7.95E-01	8.94E-06	3.39E-04	0.00E+00	6.89E-05	6.34E+00
Pump (Dredging)	D	250	2.61E+03	5.96E-04	2.02E-03	7.36E-03	9.27E-01	1.04E-05	2.20E-04	0.00E+00	5.38E-05	1.05E+01
Pump (Dredging)	D	500	8.71E+03	4.15E-04	1.65E-03	5.11E-03	7.16E-01	7.03E-06	1.58E-04	0.00E+00	3.74E-05	1.62E+01
Pump (Dredging)	D	750	4.72E+03	4.16E-04	1.61E-03	5.13E-03	6.98E-01	6.86E-06	1.57E-04	0.00E+00	3.76E-05	2.37E+01
Pump (Dredging)	D	9999	1.86E+05	1.92E-04	6.92E-04	2.46E-03	2.52E-01	2.47E-06	6.85E-05	0.00E+00	1.74E-05	1.14E+02
Generator (Dredging)	D	50	2.91E+02	2.56E-03	7.23E-03	6.18E-03	6.12E-01	7.91E-06	6.14E-04	0.00E+00	2.31E-04	1.43E+00
Generator (Dredging)	D	120	5.59E+03	1.29E-03	5.16E-03	7.81E-03	7.34E-01	8.61E-06	7.15E-04	0.00E+00	1.17E-04	4.04E+00
Generator (Dredging)	D	175	5.10E+02	8.29E-04	3.98E-03	6.44E-03	6.83E-01	7.69E-06	3.68E-04	0.00E+00	7.48E-05	5.46E+00
Generator (Dredging)	D	250	1.17E+04	7.21E-04	2.08E-03	7.56E-03	8.75E-01	9.85E-06	2.47E-04	0.00E+00	6.51E-05	9.92E+00
Generator (Dredging)	D	500	4.08E+04	5.66E-04	1.83E-03	5.65E-03	7.44E-01	7.30E-06	1.94E-04	0.00E+00	5.11E-05	1.69E+01
Generator (Dredging)	D	750	2.18E+04	6.33E-04	2.03E-03	6.47E-03	8.25E-01	8.09E-06	2.19E-04	0.00E+00	5.71E-05	2.80E+01
Generator (Dredging)	D	9999	4.66E+05	1.21E-04	3.99E-04	1.41E-03	1.35E-01	1.33E-06	4.16E-05	0.00E+00	1.09E-05	6.14E+01
Other (Dredging)	D	120	9.11E+02	9.25E-04	3.73E-03	5.67E-03	5.38E-01	6.31E-06	5.12E-04	0.00E+00	8.35E-05	2.96E+00
Other (Dredging)	D	175	4.43E+02	7.54E-04	3.67E-03	5.97E-03	6.39E-01	7.19E-06	3.36E-04	0.00E+00	6.80E-05	5.10E+00
Other (Dredging)	D	250	1.27E+03	4.44E-04	1.31E-03	4.77E-03	5.57E-01	6.27E-06	1.54E-04	0.00E+00	4.00E-05	6.32E+00
Other (Dredging)	D	500	5.06E+03	3.61E-04	1.21E-03	3.73E-03	4.93E-01	4.84E-06	1.27E-04	0.00E+00	3.26E-05	1.12E+01
Misc Portable Equipment	D	120	2.21E+02	8.54E-04	3.72E-03	5.71E-03	5.73E-01	6.72E-06	4.64E-04	0.00E+00	7.71E-05	3.15E+00
Misc Portable Equipment	D	175	7.90E+01	5.45E-04	2.91E-03	4.78E-03	5.41E-01	6.09E-06	2.43E-04	0.00E+00	4.92E-05	4.32E+00
Misc Portable Equipment	D	250	2.42E+01	4.29E-04	1.41E-03	5.13E-03	6.34E-01	7.14E-06	1.57E-04	0.00E+00	3.87E-05	7.18E+00
Misc Portable Equipment	D	500	1.77E+02	3.62E-04	1.39E-03	4.29E-03	5.92E-01	5.81E-06	1.36E-04	0.00E+00	3.27E-05	1.34E+01
Misc Portable Equipment	D	750	1.21E+02	3.52E-04	1.32E-03	4.18E-03	5.61E-01	5.64E-06	1.31E-04	0.00E+00	3.17E-05	1.91E+01
Misc Portable Equipment	D	1000	6.45E+01	4.34E-04	1.57E-03	5.56E-03	5.61E-01	5.64E-06	1.56E-04	0.00E+00	3.92E-05	2.55E+01
Generator (Entertainment)	D	50	1.14E+01	2.41E-03	7.45E-03	8.09E-03	8.72E-01	1.13E-05	6.53E-04	0.00E+00	2.18E-04	2.01E+00
Generator (Entertainment)	D	120	6.71E+02	1.02E-03	4.65E-03	7.15E-03	7.42E-01	8.70E-06	5.46E-04	0.00E+00	9.18E-05	4.07E+00
Generator (Entertainment)	D	175	8.09E+02	7.85E-04	4.44E-03	7.28E-03	8.53E-01	9.60E-06	3.48E-04	0.00E+00	7.09E-05	6.80E+00
Generator (Entertainment)	D	250	1.78E+03	4.85E-04	1.69E-03	6.17E-03	7.90E-01	8.89E-06	1.80E-04	0.00E+00	4.38E-05	8.94E+00
Generator (Entertainment)	D	500	5.53E+03	3.06E-04	1.24E-03	3.90E-03	5.53E-01	5.42E-06	1.18E-04	0.00E+00	2.76E-05	1.25E+01
Generator (Entertainment)	D	750	1.45E+03	4.13E-04	1.62E-03	5.25E-03	7.23E-01	7.27E-06	1.56E-04	0.00E+00	3.72E-05	2.46E+01
Generator (Entertainment)	D	9999	2.85E+03	7.19E-05	2.59E-04	9.32E-04	9.64E-02	9.70E-07	2.58E-05	0.00E+00	6.49E-06	4.37E+01
Compressor (Entertainment)	D	120	1.65E+01	4.92E-04	2.00E-03	3.05E-03	2.91E-01	3.41E-06	2.72E-04	0.00E+00	4.44E-05	1.60E+00
Compressor (Railyard)	D	120	3.30E+01	4.59E-04	1.86E-03	2.84E-03	2.71E-01	3.17E-06	2.54E-04	0.00E+00	4.14E-05	1.49E+00
Crane (Rail-CHE)	D	120	1.65E+01	7.61E-04	3.09E-03	4.71E-03	4.49E-01	5.27E-06	4.21E-04	0.00E+00	6.86E-05	2.47E+00
Crane (Rail-CHE)	D	175	2.99E+01	3.60E-04	2.04E-03	3.34E-03	3.91E-01	4.40E-06	1.59E-04	0.00E+00	3.25E-05	3.12E+00
Materials Handling (Rail-CHE)	D	120	1.65E+01	8.35E-04	3.39E-03	5.17E-03	4.93E-01	5.54E-06	4.62E-04	0.00E+00	7.53E-05	2.71E+00
Generator (Railyard)	D	175	9.98E+00	7.32E-04	4.14E-03	6.78E-03	7.95E-01	8.94E-06	3.24E-04	0.00E+00	6.60E-05	6.34E+00
Generator (Railyard)	D	9999	5.70E+02	6.55E-05	2.35E-04	8.48E-04	8.78E-02	8.83E-07	2.35E-05	0.00E+00	5.91E-06	3.98E+01

Vessels w/Outboard Engines	G2	2	7.09E+01	6.36E-02	8.07E-02	2.76E-04	3.03E-01	8.64E-06	5.01E-03	2.23E-04	3.95E-03	6.96E-02
Vessels w/Outboard Engines	G2	15	2.94E+04	2.16E-02	3.30E-02	7.10E-04	1.21E-01	3.46E-06	2.00E-03	1.48E-04	1.34E-03	1.99E-01
Vessels w/Outboard Engines	G2	25	1.33E+04	2.86E-02	5.79E-02	1.83E-03	2.42E-01	6.91E-06	4.01E-03	1.92E-04	1.78E-03	5.73E-01
Vessels w/Outboard Engines	G2	50	2.60E+04	2.29E-02	3.84E-02	2.56E-03	4.09E-01	6.39E-06	3.71E-03	1.64E-04	1.42E-03	1.44E+00
Vessels w/Outboard Engines	G2	120	5.49E+04	1.87E-02	3.52E-02	2.25E-03	3.60E-01	5.69E-06	3.30E-03	1.03E-04	1.16E-03	3.02E+00
Vessels w/Outboard Engines	G2	175	3.70E+04	2.30E-02	5.01E-02	2.65E-03	4.40E-01	7.16E-06	4.15E-03	9.21E-05	1.43E-03	5.50E+00
Vessels w/Outboard Engines	G2	250	1.52E+04	2.06E-02	3.93E-02	3.57E-03	4.05E-01	6.77E-06	3.93E-03	9.07E-05	1.28E-03	7.06E+00
Vessels w/Outboard Engines	G2	500	6.12E+03	1.66E-02	3.04E-02	2.81E-04	2.83E-01	4.73E-06	2.74E-03	1.73E-05	1.03E-03	1.02E+01
Sailboat Auxiliary Outboard Engin	G2	15	6.91E+01	2.11E-02	3.25E-02	8.17E-04	1.33E-01	3.78E-06	2.19E-03	1.59E-04	1.31E-03	2.05E-01
Sailboat Auxiliary Outboard Engin	G2	25	6.19E+01	2.10E-02	4.29E-02	1.49E-03	1.99E-01	5.67E-06	3.29E-03	1.72E-04	1.31E-03	4.49E-01
Sailboat Auxiliary Outboard Engin	G2	50	1.15E+02	1.80E-02	3.05E-02	2.37E-03	3.63E-01	5.67E-06	3.29E-03	1.58E-04	1.12E-03	1.24E+00
Personal Water Craft	G2	9999	1.60E+07	1.65E-04	2.90E-04	3.49E-05	6.31E-03	1.03E-07	5.78E-05	1.42E-06	1.03E-05	3.83E+00
Vessels w/Inboard Engines	G4	250	8.46E+05	1.68E-03	5.19E-02	2.14E-03	3.39E-01	3.91E-06	3.24E-05	6.98E-05	9.54E-05	5.53E+00
Vessels w/Outboard Engines	G4	50	1.59E+04	3.19E-03	8.42E-02	2.49E-03	3.72E-01	4.28E-06	3.56E-05	1.65E-04	1.81E-04	1.34E+00
Vessels w/Sterndrive Engines	G4	250	1.64E+06	1.23E-03	3.84E-02	1.55E-03	2.51E-01	2.89E-06	2.40E-05	5.87E-05	6.99E-05	4.09E+00
Sailboat Auxiliary Inboard Engine	G4	15	1.84E+02	3.27E-03	8.81E-02	2.55E-03	3.77E-01	6.30E-06	3.60E-05	2.93E-04	1.86E-04	4.10E-01
Vessels w/Inboard Jet Engines	G4	500	3.78E+05	1.00E-03	3.09E-02	1.28E-03	2.01E-01	2.32E-06	1.93E-05	3.85E-05	5.71E-05	6.57E+00
Vessels w/Inboard Engines	D	250	9.07E+04	2.36E-03	3.54E-03	8.06E-03	4.28E-01	4.82E-06	2.06E-04	0.00E+00	2.12E-04	4.99E+00
Sailboat Auxiliary Inboard Engine	D	50	1.25E+03	1.30E-03	1.96E-03	4.45E-03	2.37E-01	3.06E-06	1.12E-04	0.00E+00	1.18E-04	5.52E-01

Table F.5-11 Construction Impact Summary

Modeling Inputs/Results for QBPP Construction Impacts (Combustion Sources as Point Sources) - FASTALL/20m+50m+Prop.Bdy Recs

Short Term Impacts (24 hrs and less)						Long Term Impacts (annual)					
	NOx	CO	SOx	PM10	PM2.5		NOx	CO	SOx	PM10	PM2.5
Combustion (lbs/day)	174.4	127.9	0.201	9.43	9.34	Combustion (tons/year)	23.59	19.95	0.030	1.64	1.62
						Combustion (days/year)**	312	312	312	312	312
Combustion (hrs/day)	10	10	10	10	10	Combustion (hrs/day)	10	10	10	10	10
Combustion (lbs/hr)	17.44	12.79	0.02	0.94	0.93	Combustion (lbs/hr)**	12.93	10.93	0.02	0.90	0.89
Combustion (g/sec)	2.20E+00	1.61E+00	2.53E-03	1.19E-01	1.18E-01	Combustion (g/sec)	1.63E+00	1.38E+00	2.07E-03	1.13E-01	1.12E-01
Construction Dust (lbs/day)	Worst-case Short-term Conditions:			12.55	1.90	Construction Dust (tons/year)	Worst-case 12-month Conditions:			0.767	0.139
	NOx/SO2/PM10/2.5=Grading Phase					Construction Dust (days/year)	NOx/CO/SO2: 12 months Building Ph			312	312
Construction Dust (hrs/day)	CO=Building Phase			10	10	Construction Dust (hrs/day)	PM10/2.5: 2m Grading + 10m Building			10	10
Construction Dust (lbs/hr)				1.26	0.19	Construction Dust (lbs/hr)**			(Based on lbs/month)	0.420	0.076
Construction Dust (g/sec)	3.00 acres			1.58E-01	2.39E-02	Construction Dust (g/sec)	16.01 acres			5.30E-02	9.60E-03
AERMOD Inputs	**12,150 m^2**		**32 Pt.Srcs**				**64,803 m^2**		**43 Pt.Srcs**		
Combustion (g/s/src)	6.867E-02	5.036E-02	7.914E-05	3.713E-03	3.678E-03	Combustion (g/s/src)	3.788E-02	3.203E-02	4.817E-05	2.633E-03	2.601E-03
Construction Dust (g/s/m^2)				1.301E-05	1.970E-06	Construction Dust (g/s/m^2)				8.172E-07	1.481E-07
AERMOD Results (ug/m^3)											
Combustion Only						Combustion Only					
1-hour Max	615.728*	451.557	0.710	33.29309							
3-hour Max			0.286	13.40857							
8-hour Max		77.071		5.68237							
24-hour Max			0.060	2.83608	2.80901	Annual	8.708		0.011	0.60542	0.59804
All Particulate Sources						All Particulate Sources					
24-hour Max				65.89531	10.05596	Annual				2.38999	0.76422
3-yr Avg 8th High Daily 1-hr NO2 Max	212.256*	w/ Seasonal/Hourly NO2 Background for NAAQS				Annual NO2 w/ ARM	6.531	based on ARM Ratio of:		75%	
Max 1-hr NO2 Max	282.671*	w/ Concurrent Hourly NO2 Background for CAAQS									
Background (ug/m^3)						Background (ug/m^3)					
1-hour Max	N/A	5290	49.8								
3-hour Max			36.4								
8-hour Max		3600									
24-hour Max			18.4	50	23.7	Annual	26.4		7.9	25	12
Total + Background (ug/m^3)						Total + Background (ug/m^3)					
1-hour Max	N/A	5742	50.5								
3-hour Max			36.69								
8-hour Max		3677									
24-hour Max			18.46	115.9	33.8	Annual	32.9		7.9	27.4	12.8

*Based on AERMOD Ozone Limiting Method (OLM) keyword with all sources combined in one source group, including background in AERMOD analyses.

**Even for construction projects taking less than 12-months or 7 days/wk, the hourly emissions for modeling are still based on total tons (projects<12 months) or tons/year (projects>12months) divided by 365 days since all days in the met dataset (i.e., all 12 months and all 365 days - i.e., 7 days/week) are modeled.

Table F.5-12
Construction Personnel Craft by Month Estimates (months after Notice to Proceed)

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
Carpenter	0	0	8	8	15	15	22	22	18	18	8	8	0	0	0	0	0	0	**142**
Cement Mason	0	6	12	20	20	24	26	26	26	12	12	12	6	6	2	0	0	0	**210**
Electricians	0	0	0	0	0	0	0	0	16	42	58	56	42	40	12	3	2	2	**273**
Iron Worker	0	0	0	8	14	20	22	14	14	14	14	12	12	8	2	0	0	0	**154**
labor	9	15	10	24	46	56	50	44	44	34	46	46	36	18	9	0	0	0	**487**
Millwright	0	0	0	0	0	6	16	32	36	36	36	36	26	4	4	2	2	2	**238**
Operator	18	20	15	15	15	15	15	15	6	6	12	12	12	6	2	2	0	0	**186**
Pipe fitter	0	0	0	0	0	6	6	12	38	42	52	52	38	8	6	2	2	2	**266**
Teamster	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	**30**
Insulation Worker	0	0	0	0	0	0	0	0	6	6	12	12	12	12	8	2	0	0	**70**
Painter	0	0	0	0	0	0	0	0	0	0	0	6	6	8	8	2	2	2	**34**
Sheet Metal	0	0	0	0	0	0	0	0	6	10	16	10	10	0	0	2	0	0	**54**
Total Craft	**29**	**43**	**47**	**77**	**112**	**144**	**159**	**167**	**212**	**222**	**268**	**264**	**202**	**112**	**55**	**15**	**8**	**8**	**2144**

Above chart based on the construction of Plains End Facility with adjustments for Quail Brush site specifics :
134 average workforce over 16 months
252 peak workforce at month 11

APPENDIX F.6

BACT ANALYSIS FOR CRITERIA AND GHG POLLUTANTS

APPENDIX F.6

Evaluation of Best Available Control Technology

Objectives of the QBPP Project

QBPP will be a nominal 100-megawatt (MW) facility using 11 natural gas-fired reciprocating engines (hereinafter referred to as the "Power Cycle Engines".) QBPP is contracted under a 20-year power purchase agreement (PPA) with the investor-owned utility San Diego Gas & Electric (SDG&E) in response to the utility's 2009 Request for Offers (RFO). The RFO sought several types of energy products to support reliability within SDG&E's service territory, supply energy to bundled customers, meet Resource Adequacy requirements and provide other portfolio needs. The requested energy products in the RFO included peaking facilities (such as QBPP), demand-side management, and renewable resource generation. In particular, the RFO sought projects that would be online no later than October 1, 2014, have an annual capacity of at least 30% and an availability of at least 98%. The RFO also specified that SDG&E was seeking flexible resources that would be capable of providing regulation during the morning and evening ramps and/or units that can be started and shutdown as needed. It also emphasized the importance of quick start operations and black start capability.

QBPP is designed to specifically satisfy these needs and will provide SDG&E and the San Diego area for more peaking and load-shaping generation for both the short and long term. By necessity, peaking plants must be able to start quickly and adjust load levels easily. In particular, SDG&E needs peaking facilities to support renewable energy generation, including generation from wind, hydroelectric, and solar facilities, that have variable outputs. When the output of the renewable resources decreases, QBPP can be dispatched quickly. Conversely, when the output of renewable resources increases, QBPP can be ramped down quickly and still operate efficiently with the lower load. The design of the project as consisting of multiple Power Cycle Engines, as opposed to one or two combustion turbines, provides unique flexibility, while still achieving higher efficiencies across the entire load range. QBPP can thus support further integration of renewable resources into SDG&E's generation portfolio, and assist statewide goals calling for increased reliance on renewable energy.

Additionally, the design of QBPP will allow it provide several ancillary services necessary for reliability of the grid operated by the California Independent System Operator (CAISO) within SDG&E's service territory. These services include: (1) regulation service (regulation up and regulation down) to allow the CAISO balancing authority area to meet reliability standards set by the North American Electric Reliability Corporation (NERC) and the Western Electricity Coordinating Council (WECC); (2) spinning and non-spinning reserves to help maintain contingency capacity and energy on the grid; and (3) voltage support to help maintain required voltage levels and reactive margins on the grid within NERC and WECC reliability standards. Provision of such services requires QBPP to be under the direct

control of CAISO's Automatic Generation Control system. The ability of QBPP to start quickly, operate efficiently across the entire load range, and provide such ancillary services will help improve system-wide reliability within SDG&E's service territory. These features are all key elements to the Project's overall business objectives.

When considering the project design and building into the RFO, the Applicant gave consideration to multiple other types of generation. However, all were ultimately rejected because they did not meet the RFO objectives of providing peaking and load-shaping generation to SDG&E and ancillary services to the grid within SDG&E's service territory and therefore would not meet the Project's goals. A discussion of the rationale for eliminating these alternative generation technologies is provided at Section 3.0 of the Application for Certification (AFC).

Meaning of Best Available Control Technology (BACT)

BACT Definition Per the San Diego APCD Rules and Regulations (Rule 20.1)

"Best Available Control Technology (BACT)" means and is applied as follows:

(i) The lowest emitting of any of the following:

(A) the most stringent emission limitation, or the most effective emission control device or control technique, which has been proven in field application and which is cost-effective for such class or category of emission unit, unless the applicant demonstrates to the satisfaction of the Air Pollution Control Officer that such limitation, device or control technique is not technologically feasible, or

(B) any emission control device, emission limitation or control technique which has been demonstrated but not necessarily proven in field application and which is cost-effective for such class or category of emission unit, as determined by the Air Pollution Control Officer, unless the applicant demonstrates to the satisfaction of the Air Pollution Control Officer that such limitation, device or control technique is not technologically feasible, or

(C) any control equipment, process modifications, changes in raw material including alternate fuels, and substitution of equipment or processes with any equipment or processes, or any combination of these, determined by the Air Pollution Control Officer on a case-by-case basis to be technologically feasible and cost-effective, including transfers of technology from another category of source, or

(D) the most stringent emission limitation, or the most effective emission control device or control technique, contained in any State Implementation Plan (SIP) approved by the federal EPA for such emission unit category, unless the applicant demonstrates to the satisfaction of the Air Pollution Control Officer that such limitation or technique has not been proven in field application, that it is not technologically feasible or that it is not cost-effective for such class or category of emission unit.

BACT is applied to new sources per Rule 20.2(d)(1)(i), as follows: Any new or modified emission unit which has any increase in its potential to emit particulate matter (PM10), oxides of nitrogen (NOx), volatile organic compounds (VOC) or oxides of sulfur (SOx) and which unit has a post-project potential to emit of 10 pounds per day or more of PM10, NOx, VOC, or SOx

shall be equipped with Best Available Control Technology (BACT) for each such air contaminant.

BACT Definition per the PSD Regulations (40 CFR 52.21)

Best available control technology means an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act (CAA or Act) which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results.

BACT Analysis for Criteria Pollutants

BACT for Power Cycle Engines - Normal Operations

To evaluate BACT for the proposed Wartsila natural gas-fired lean burn, spark-ignited reciprocating internal combustion engines (RICEs), the applicant applied the U.S. Environmental Protection Agency's (EPA) "top-down" method, which requires, as "Step 1", identification, for the proposed source and each pollutant subject to analysis, all available control technologies. This may include inherently lower-emitting processes, practices or designs; add-on controls; and combinations of inherently lower-emitting processes with add-on controls. "Step 2" of the top-down method involves elimination of technically infeasible options. A control option will generally be considered technically feasible for the proposed source if it either has been demonstrated and operated successfully on the same type of source or is both available and applicable to the source under review. "Step 3" involves ranking of all technically feasible control technologies that were not eliminated at Step 2. At "Step 4", the applicant considers the relative economic, energy and environmental impacts of the available control technologies, either to affirm selection of the top control technology identified at Step 3 or to justify selection of a lower-ranked control technology. Finally, at "Step 5" of the analysis, the most effective control option not eliminated at Step 4 is selected as BACT for each particular pollutant and unit under consideration. This selection of BACT must then be translated into an enforceable emissions limitation by the permitting agency.

As a starting point for consideration of BACT for criteria pollutants emitted by the proposed QBPP, the applicant reviewed several general references to identify guidelines for appropriate emissions limitations for this source category. The SDAPCD's "Best Available Control Technology (BACT) Guidelines" were then evaluated. For the purposes of

comparison to the District's guideline, select other permitting agencies' summaries of BACT determinations were reviewed.

Step 1 - Identify BACT Technologies

The primary reference was the SDAPCD's BACT guidelines, while other references included other California Districts' guidelines for this source category. Table F.6-1 presents a summary of this initial review.

Table F.6-1 BACT Guidelines for Specified California Air Districts

District	Units	NOx	CO	VOC	SOx	PM10
SDAPCD[2]	g/hp-hr	.07-.15	none	.6-1.0	LSF	.1 PCV
BAAQMD[1]	g/hp-hr	.07-.15	.1-.6	.15	LSF	LSF
SCAQMD[3]	g/hp-hr	.15	.6	.15	LSF	LSF
SJVUAPCD[3]	g/hp-hr	.15	.6	.15	LSF	LSF
Proposed 20V34SG-C2 Engines*	**g/hp-hr**	**.046**	**.055**	**.056**	**.009**	**.049**

*based on engine at full load rating (12874 HP) and Wartsila data per Table F.1-2 (Appendix F.1), firing nat gas.

[1] BACT is specific for natural gas-fired, spark-ignited, lean burn internal combustion engines.
[2] BACT is specific for natural gas-fired, spark-ignited, lean burn internal combustion engines greater than 2,000 hp.
[3] BACT is general for natural gas-fired, spark-ignited internal combustion engines, i.e., it is applicable to both lean-burn and rich burn engines.
LSF = low sulfur fuel (natural gas, propane, LNG, low sulfur fuel oil, etc.)

The agencies referenced in Table F.6-1, which have BACT determinations specific for lean-burn engines, have identified the following methods for reducing the criteria pollutant emissions include the following:

Table F.6-2 Identified BACT Technologies

Pollutant	Technology
NOx	Lean burn, lean burn w/3-way catalyst, lean burn with SCR
CO	Lean burn, lean burn w/3-way catalyst, lean burn with oxidation catalyst
VOC	Lean burn, lean burn w/3-way catalyst, lean burn with oxidation catalyst
SOx	Clean fuel (natural gas, propane, LS fuel oil, etc)
PM10/PM2.5	Lean burn, Clean fuel (natural gas, propane, LNG, LS fuel oil, etc), PCV filter

As a preliminary matter, the Applicant also considered inherently lower polluting processes that might be available for the general source category of electric power generation. This consisted of evaluation of several alternative generating technologies, none of which could meet the project objectives. See Section 3.0 of the AFC for a more detailed discussion of this consideration of alternative technologies. The Applicant

considered both renewable energy technologies (hydroelectric processes, geothermal power processes, ocean wave energy processes, energy from biomass, solar energy, wind energy), and other fossil-fuel energy technologies (conventional boiler and steam turbine, conventional simple-cycle combustion turbine, conventional combined-cycle power plant, Kalina combined-cycle power plant, and advanced combustion turbine designs). In each case, however, these alternative generating technologies failed to meet fundamental project objectives and/or were not technically feasible and were therefore eliminated from consideration for the reasons described below. Indeed, EPA guidance provides that BACT will not ordinarily be applied to require an applicant to redefine its proposed source.

Alternative Fuels

Other fuels such as propane, LNG, and LS fuel oils were eliminated from consideration because SDG&E's RFO specifically called for projects that would operate pursuant to a tolling agreement, i.e., projects that would utilize PUC-quality natural gas provided by SDG&E to generate electricity. Accordingly, use of any other fuel would defeat a project objective. Moreover, PUC-grade natural gas is the best (cleanest) fuel choice with respect to all criteria pollutants under consideration. Thus, even if alternative fuel sources were available, they would be ranked lower than the proposed use of PUC-grade natural gas. In addition, these other fuel sources would all be eliminated due to technical infeasibility for the Project. On-site propane storage would be impractical from the standpoint of tank number or tank sizes, safety and the constant need for deliveries, etc. LNG is not commercially available in the project region at this time. LS fuel oil does not match the design of the proposed engines; nor would use of LS fuel oil constitute a clean fuel choice.

Alternative Generating Technologies - Renewable Energy

The Applicant considered renewable generating sources as an alternative to the proposed Project. The Applicant notes that both the California Energy Commission and SDG&E have aggressive goals and targets for increasing renewable generating capacity within San Diego County and the SDG&E service area. The Applicant believes that, due to their intermittent availability, there are no renewable energy projects that would meet the need for new peaking capacity and ancillary services in the San Diego region in the near term. Indeed, a fundamental objective of QBPP is to provide dispatchable peaking and load-shaping power that will help facilitate integration of intermittent renewable generating sources, in particular, wind and solar resources, to the grid. The proposed QBPP, which will have a 10-minute start-time from cold start, will be under the direct control of the CAISO's Automatic Generator Control system and can be flexibly dispatched to increase or decrease load, as load from intermittent renewable sources varies throughout the day. Thus, QBPP will provide critical grid support within SDG&E's service territory and assure system reliability as significant additional renewable generating sources are connected to the grid. The following summarizes select renewable generating technologies that were eliminated as alternatives for the Project.

Hydroelectric Processes

A new hydroelectric project would require a flowing river or a series of reservoirs that could store water for a pumped storage project, requiring a large quantity of water. No rivers are located in the vicinity of the Project, and the use of pumped storage would require a much larger site area and result in a significantly larger environmental footprint than the Project. It is highly unlikely that this technology could be implemented within 3 to 5 years from the date of the RFO and online by 2014. Therefore, the hydroelectric option is not feasible and was eliminated from consideration.

Geothermal Power Processes

Geothermal power plants use steam turbine facilities, for which the heat is generated by the high temperature and pressure geothermal fluids that are pumped from deep underground. Geothermal development is not viable at the Project location because suitable thermal vents and strata are not present. Therefore, geothermal power processes are not feasible. Moreover, geothermal power plants typically provide baseload power and do not have the fast-ramping flexibly that could provide peaking and load-shaping power to the grid, to help integrate intermittent renewables. Thus, geothermal generation would not meet the Project's objectives and was eliminated.

Ocean Wave Energy Processes

Wave energy is generated by the influence of wind on the ocean surface. At the present time very few of these devices have been tested at full-scale and even fewer devices are ready for early adoption in commercial development projects. Therefore, this technology is not commercially available and cannot be considered technically feasible at this time. Additionally, the Project site is not located near enough the ocean to make ocean wave energy processes feasible.

Energy from Biomass

Energy production from a biomass power plant may come from the direct combustion of the biomass materials or from the conversion of the biomass into another fuel (such as alcohol or methane) and subsequent combustion of that fuel. The combustion process is used to heat steam boilers to generate steam for a steam turbine. Large quantities of the biomass "fuel" are not generated in the vicinity of the Project site and would need to be trucked to the site. The storage and handling of the biomass would require additional space, and the power plant footprint would be larger than that for the proposed Project. Additionally, although classified as renewable, the emissions of criteria pollutants from a biomass power plant are, in many cases, significantly greater than the emissions from the proposed Power Cycle Engines burning PUC-grade natural gas. Moreover, as previously noted, the Project objectives include utilization of natural gas provided to the Project by SDG&E pursuant to a tolling agreement. Thus, construction of a biomass power plant instead of the proposed gas-fired reciprocating engines would defeat a Project objective. For all these reasons, although this technology is considered to be commercially available, it is not a feasible technology for the proposed Project and was eliminated from consideration.

Solar Energy

Most of these technologies collect solar radiation, heat water to create steam, and use the steam to power a steam turbine/generator. Photovoltaic technologies convert the sunlight directly into electricity. In both cases, power is only available while the sun shines so the units do not supply power that can be cycled up or down to follow demand as a peaking power plant is designed to operate. Thus, solar energy fails to meet project needs for peaking, load-shaping generation, which, by definition, is intended to balance integration of intermittent renewable sources such as solar to the grid. Additionally, the acreage required per MW generated is high, and not enough land is available at the Project site to deliver sufficient energy to meet project needs. Because a solar project would be inconsistent with the fundamental objective of providing firming and shaping power intended to balance variable renewable generating sources (such as solar), solar generation technology is not an alternative to the Project and was eliminated from consideration.

Wind Energy

Based on current technology, the production of 100 MW of electrical power would potentially require between 25 and 30 wind turbines, spaced out along available ridge lines. The project site is not suitable for wind energy development and therefore such technology is not feasible. Additionally, wind power does not meet the peaking power plant operational needs and is fundamentally inconsistent with the project objective of providing peaking, load-shaping generation that can be flexibly and efficiently dispatched to assure reliability and grid stability as intermittent renewable sources such as wind are increasingly integrated to the grid. Thus, a wind project fails to meet a fundamental project objective and cannot be considered a feasible alternative for the project.

Nuclear Power Technology

Nuclear power alternatives are not considered as a feasible alternative for the QBPP project and are not discussed further in this evaluation. The Applicant is unaware of any application of nuclear generating technology to meet peak and load-shaping demand. Additionally, given the permitting and regulatory constraints and barriers that would likely be faced by construction of a new nuclear generating facility in California (or elsewhere, for that matter), it is entirely unreasonable to anticipate that a new nuclear power plant could be constructed to meet demand within SDG&E's service area by October 2014. Thus, the technology would fail to meet fundamental project objectives and was rejected from consideration.

Alternative Fossil-Fuel Generating Technologies

The Applicant also evaluated several alternative fossil-fueled generating technologies that have been used to produce both peaking and base-load power in and out of California, i.e., boilers, simple cycle combustion turbines, and combined-cycle turbines. These alternative generating technologies were rejected for failing to achieve fundamental project objectives. In general, these technologies are commercially available. However, because of their relatively low efficiency at low load, low turn-down ratios and difficulty achieving fast-start times, these traditional systems would fail to meet critical Project objectives.

Conventional Boiler and Steam Turbine

Conventional boiler and steam turbine technology generates high pressure steam by burning natural gas in the furnace of a conventional boiler. This technology is well established and has been used in countless power plants worldwide. Typical thermal efficiencies of up to approximately 36 percent can be achieved by Boiler/Steam Turbine plants when utilizing natural gas. However, this technology is best suited for continuously operating power plants, due to the need to maintain the steam pressure in the boiler.

The conventional boiler and steam turbine technology does not meet project needs because of its inability to quickly ramp up to meet demand as needed to meet SDG&E's dispatch pattern, and its resulting lower overall efficiency due to the need to maintain high readiness for peaker operation (i.e., with frequent start-stop cycles). QBPP is designed to have a 10-minute cold-start to full capacity and as many as four start-up events per day. Thus, a conventional boiler/steam turbine design would be poorly suited to the Project. Additionally, this technology, although proven reliable and commercially available, would involve considerably greater water consumption and waste generation and would also require significantly greater space. For these reasons, use of a conventional boiler and steam turbine is inappropriate and was rejected from consideration for the Project.

Simple-Cycle Combustion Turbine

Simple-cycle combustion turbines are able to achieve thermal efficiencies up to approximately 38 percent. These systems are capable of rapidly reaching their operating peak, which makes them suitable for use in peaking power production. However, gas turbines are designed and built in fixed sizes (capacities) and are most efficient when they are operated at or near their design load capacity, i.e., the efficiency of the system decreases as a turbine is operated at reduced load. For a 100-MW project, either one (LMS100) or two (LM6000) turbines would be needed. Because simple-cycle gas turbines typically have a limited turn-down ratio, use of only one or two gas turbines would not provide the same flexibility that will be afforded by use of multiple reciprocating engines, as proposed for QBPP. Nor would use of simple-cycle turbine afford the same degree of efficiency in generation across the entire load range, as will the proposed QBPP. In addition, simple-cycle turbines generally operate at a higher heat rate than the proposed reciprocating engines and could therefore result in increased emissions of both GHGs and criteria pollutants per MWh-generated. A simple cycle turbine-generator could also result in increased water usage for water injection for emissions control and increased land requirements. For these reasons, simple-cycle combustion turbine technology was rejected as an alternative to the proposed QBPP.

Combined-Cycle Power Plant

A combined-cycle power plant integrates combustion turbines (equivalent to the simple-cycle combustion turbine-generator) and steam turbines to improve the overall power plant efficiency, relative to a simple-cycle plant, by capturing and utilizing waste heat from the combustion turbines to generate additional power in the steam turbine. The combustion turbine's hot exhaust is passed through a heat recovery steam generator (HRSG) to create high pressure steam which is then used to drive a steam turbine-generator. This technology is able to achieve high thermal efficiencies, typically in the 50 to 60 percent under a steady-state operation. The high efficiency resulting from the additional heat recovery and power

generation systems is achieved when these systems are at their normal operating temperatures and pressures. Thus, a combined-cycle power plant is more appropriate for intermediate to baseload power plants and is not an appropriate choice for a peaking plant. EPA guidance and case law confirms that the intended function of an electric generating unit as a baseload or peaking plant may be considered as part of the fundamental business purpose of a proposed source, i.e., permitting agencies should not require an applicant to build a combined-cycle power plant when they have proposed a simple-cycle facility instead.

While turbine vendors have developed fast-start technology, such technology is currently only available for larger "frame" turbines, which are much larger than the proposed QBPP. Operation of a larger capacity turbine at only a fraction of its capacity to meet the demand of a 100-MW plant would likely reduce the overall efficiency of the combined-cycle plant, such that it would be inferior to, or no better than, that of the proposed reciprocating engines. Further, although once-through steam generators (OTSG) could be used in place of conventional HSRG technology, affording faster start-up times than a conventional combined-cycle plant, the steam cycle would still need to be warmed to generate any efficiency gain, relative to a simple-cycle operation. For a plant such as QBPP that is intended for peaking/firming and shaping power with multiple daily startups, use of an OTSG would therefore likely provide little to no efficiency gain. Further, to assure that the facility's capacity was available to quickly be brought online, the facility would need to maintain the steam cycle in some standby- or partial load-mode when not dispatched, which would be neither practical nor economical for a project intended to operate no more than 4,000 hours per year. Additionally, combined-cycle power plants require the use of very high quality water and involve much greater water consumption if cooling towers are used for cooling; if air cooled, the project would require considerably greater space for an air cooled condenser, which would also consume significant auxiliary load, reducing the plant's overall efficiency and therefore erasing some of the gains attributable to the steam cycle. For these reasons, a combined-cycle power plant is not an appropriate choice for a project intended to provide peaking and load-shaping power to the grid. Accordingly, combined-cycle technology was eliminated as a feasible alternative for the Project.

<u>Step 2 - Eliminate Technologically Infeasible Options</u>

Alternative Control Technologies

SCONOX, a new catalytic reduction technology, was not listed by any agency as a viable control technology for LB-RICEs, and was eliminated as BACT technology for the proposed power cycle engines simply based on the fact that no applications of the technology could be found or confirmed for any internal combustion engine, regardless of size or duty category.

The Applicant could not identify a manufacturer of Standard 3-Way Catalysts (NSCR) which could provide NSCR for engines with the exhaust flow of the Wartsila engines. Thus, this technology, while commercially available, is not applicable to the Project and was eliminated from consideration. Additionally, the Applicant concluded that, even if NSCR were both an available and applicable technology, it would be less effective than the proposed BACT technologies of SCR for NOx and an oxidation catalyst for CO. This was based upon a technical analysis that indicated that NSCR is not an effective or recommended control for the facility "lean-burn" power cycle engines. Attachment F.6-1 presents a summary discussion of this analysis, supporting the conclusion that 3-way

catalysts (NSCR) are not an effective control technology for large lean-burn engines firing natural gas, due in part to thermal, chemical and/or mechanical deactivation of the catalysts.

Step 3 - Rank Remaining BACT Technologies

Table F.6-3 ranks the remaining BACT technologies in order of control efficiency.

Table F.6-3 BACT Technology Ranking in Order of Control Efficiency

Pollutant	Technology
NOx	(1) Lean burn with SCR (2) Lean burn
CO	(1) Lean burn with oxidation catalyst (2) Lean burn
VOC	(1) Lean burn with oxidation catalyst (2) Lean burn
SOx	(1) Clean Fuel – natural gas
PM10/PM2.5	(1) Clean Fuel – natural gas
All Pollutants	(1) Good combustion practices (GCP)

Step 4 – Evaluate the Most Effective Controls

For each pollutant, QBPP has selected the highest rank control technology listed in Table F.6-3 as the appropriate controls for the proposed Wartsila 20V34SG engines. The Applicant is not aware of any other identified control technologies that could be applied to the proposed engines. Nor is the Applicant aware of any energy, environmental, or economic impacts associated with use of the selected technologies that would warrant their elimination from the BACT analysis. In light of this and because the Applicant has selected the most stringent control technology available for each pollutant, a more detailed assessment of the economic, energy and environmental impacts is not included here. Screening level control cost-effectiveness estimates for NOx and CO are presented in Attachment F.6-2.

Step 5 - Select BACT for Power Cycle Engines

As suggested above, BACT is determined to be the most effective control technology that is not eliminated from consideration due to infeasibility (at Step 2) or unacceptable energy, environmental, or cost impacts (at Step 4).

Table F.6-4 presents the Applicant's proposed BACT technologies and numeric emissions limits based upon the chosen BACT technologies for the power cycle engines.

Table F.6-4 Proposed BACT Numeric Emissions Limits (Steady-state Operations, 100% Load, per Engine)

Pollutant	BACT Technology	BACT Emissions Limit
NOx	Lean burn with SCR and GCP	1.317 lbs/hour
CO	Lean burn with oxidation catalyst and GCP	1.564 lbs/hour

VOC	Lean burn with oxidation catalyst and GCP	1.584 lbs/hour
SOx	Clean Fuel – natural gas and GCP	0.256 lbs/hour (Fuel S <= 0.25 gr S/100scf)
PM10/PM2.5	Clean Fuel – natural gas, PCV filter and GCP	1.379 lbs/hour (Fuel S <= 0.25 gr S/100scf)
Opacity	All of the above.	<=10% / 0.5 Ringelmann
Ammonia Slip*	Use of Urea*	1.08 lbs/hr (10 ppmvd @ 15%O2)*
BACT limits in units of lbs/hour apply over all engine operational load ranges. GCP = good combustion practices SOx BACT limit in lbs/hr includes the contribution from lube oil consumption. *Ammonia is not a BACT pollutant under either federal PSD or SDAPCD regulations, but is included here to assure no unacceptable environmental impacts associated with selection of SCR as BACT for NOx.		

The Applicant is proposing the following BACT technologies for the power cycle engines as follows:

- NOx – Lean burn engine technology with SCR
- CO - Lean burn engine technology with Oxidation Catalyst
- VOC - Lean burn engine technology with Oxidation Catalyst
- SOx – Clean fuel, use of natural gas with sulfur content less than or equal to 0.25 gr S/100scf.
- PM10/PM2.5 - Lean burn engine technology with use of natural gas with sulfur content less than or equal to 0.25 gr S/100scf.
- Opacity – less than or equal to 10% or 0.5 Ringelmann
- Good combustion practices (GCP)

Based on the Applicant's BACT review of available technologies and data, the combination of the above technologies also represents T-BACT for the Wartsila engines.

Summary of Other BACT Data

Tables F.6-5 and F.6-7 present a summary of a recent review of other BACT-related decisions. Table F.6-5 presents information from the South Coast Air Quality Management District (SCAQMD) and includes the broader category of gas-fired, spark-ignited engines, i.e., both rich-burn and lean-burn.

Table F.6-5 SCAQMD Recent BACT Decisions (Achieved in Practice) for Spark-Ignited Gas Fired IC

Engine HP/Controls	NOx	CO	VOC	PM10/SOx
750 w/3 way catalyst + AFRC	0.15 g/bhp-hr	0.6 g/bhp-hr	0.15 g/bhp-hr	Natural gas
1334 w/3 way catalyst +AFRC	1.5 g/bhp-hr	2.0 g/bhp-hr	1.5 g/bhp-hr	Natural gas
93 w/3 way catalyst +AFRC	0.15 g/bhp-hr	0.6 g/bhp-hr	0.15 g/bhp-hr	Natural gas

Table F.6-5 SCAQMD Recent BACT Decisions (Achieved in Practice) for Spark-Ignited Gas Fired IC				
171 w/3 way catalyst +AFRC	0.15 g/bhp-hr	0.6 g/bhp-hr	0.15 g/bhp-hr	Natural gas
1408 lean burn + AFRC2	0.6 g/bhp-hr	2.5g/bhp-hr	0.8 g/bhp-hr	No BACT limits
1850 no control3	0.6 g/bhp-hr	2.5 g/bhp-hr	0.8 g/bhp-hr	No BACT limits
4321 no controls4	0.53 g-bhp-hr	-	0.216 g/bhp-hr	Natural gas
3870 lean burn SCR5	9 ppmv	56 ppmv	25 ppmv	PM10: 0.02 g/bhp-hr

1 This compilation presents both rich and lean burn BACT determinations. AFRC is defined as air-to-fuel ratio controller. SCR is defined as selective catalytic reduction.
[2]Source is fired with digester gas and natural gas as an alternative fuel.
[3]Source is fired with landfill gas fuel, turbocharged with AFRC.
[4]Source is a facility located in Santa Barbara. PM10 BACT at 0.66 g/bhp-hr
[5]Source is a facility (NEO Landfill) located in Red Bluff, CA, Tehama County APCD.

The US EPA RACT-BACT-LAER Clearinghouse (RBLC) was also consulted to review recent US EPA BACT decisions for large gas fired IC engines with size ratings at least 1,000 bhp (or approximately 745 kW) or greater. These recent BACT decisions are summarized in Table F.6-6. Emission levels are presented in g/bhp-hr units, unless otherwise noted. See Table F.6-13 for a comprehensive listing of search results. In all cases, the proposed BACT limits for QBPP (see Table F.6-1) are more stringent, confirming the appropriateness of these BACT limits for the Project.

Table F.6-6 Large Gas Fired IC Engines RBLC BACT Determinations (Natural Gas) 2001 -2011

RBLC ID	Unit Size BHP	Control Type	NOx, g/bhp-hr	CO, g/bhp -hr	VOC, g/bhp-hr
AL 0189	4000	Lean Burn	2.2	2.68	1.52
AZ 0047	6MW (7895 BHP)	Not specified	1.5	2.3	-
CA1068	3870	Lean Burn	9 ppmv	56 ppmv	25 ppmv
CO 0058[1]	1775	Lean Burn	0.8	0.21	0.3
GA 0104	4730	Lean Burn	0.7	0.18	0.3
IA 0077	4735	Catalytic Oxidizer	1.0	0.18	0.68
IL 0083	4000	Clean Burn	2	2.2	0.43
LA 0141	1478	Not specified	-	3.0	0.50
MS 0056	4730	Lean Burn	0.7	-	-
OK 0109	2200	Lean Burn	2	-	-
PA 0201	800	Clean Burn	3	-	-
PA 0209[1]	1088	Lean Burn	1.5	-	-
PA 0230	1665	Not specified	0.7	-	0.9

Table F.6-6 Large Gas Fired IC Engines RBLC BACT Determinations (Natural Gas) 2001 -2011					
TX 0364	2400	Not specified	-	1.2	1.2[2]
TX0364	3105	Not specified	3.2/2/0[3]	4.8[2]	1.6[2]
TX 0408	800	Not specified	2.0	3.0	1.2
WA 0289	1448	Not specified	10	-	-
WV 0019 +0020	4640	Lean Burn	2	2.1	0.7[2]
WY 0060	1252	NSCR and AFRC	1.1	1.6	-

[1] Draft status as presented in the RBLC.
[2] Other permit limit; limit is not specified as BACT as presented in the RBLC.
[3] Hourly/annual limit as presented for this source in the RBLC.

Enforceability of BACT

Pursuant to the NSR/PSD Workbook (10/90, Chapter B, Section V) the following guidance is provided regarding the establishment and enforceability of BACT emissions limits.

> "The emissions limits must be included in the proposed permit submitted for public comment, as well as the final permit. BACT emission limits or conditions must be met on a continual basis at all levels of operation (e.g., limits written in pounds/MMBtu or percent reduction achieved), demonstrate protection of short term ambient standards (limits written in pounds/hour) and be enforceable as a practical manner (contain appropriate averaging times, compliance verification procedures and record keeping requirements). Consequently, the permit must:
>
> - "Be able to show compliance or noncompliance (i.e., through monitoring times of operation, fuel input, or other indices of operating conditions and practices), and,
> - "Specify a reasonable compliance averaging time consistent with established reference methods, contain reference methods for compliance, and provide for adequate reporting and record keeping so that the permitting agency can determine the compliance status of the source."

Furthermore, in Sections B.IV.C and B.IV.C.1 which discuss the ranking of technical feasibility to establish a control hierarchy and the choice of units of emissions performance to compare levels amongst control options, the use of appropriate units such as lbs/gallon, lbs/hr, lbs/ton, lbs/MMBtu, lbs/kWh, etc., are presented as examples of BACT units for such analyses.

The Applicant has chosen to set the appropriate BACT limits in terms of lbs/hour, which will assure compliance with BACT across the entire range of operational loads for the proposed Wartsila engines. The applicant also notes that these limits are readily enforceable through the use of periodic source testing, and CEMs/PEMs to monitor, calculate, report, and record the necessary data to show compliance with the established BACT limits. In addition, the applicant notes that BACT emissions rate "units" vary widely as presented in the EPA RBLC

Clearinghouse listings, as well as in numerous California air district BACT guidance and listing documents. (See Table F.6-13, RBLC Search Results.)

Compliance monitoring and reporting is proposed as follows (for each stack):

- For NOx, the use of a certified CEM system per 40 CFR 60 coupled with a DAHS capable of analyzing and presenting the data in terms of lbs/hr. NOx CEMS will also be required at the inlet to the SCR to satisfy the ammonia slip compliance verification as noted below.
- For CO, the use of a certified CEM system per 40 CFR 60 coupled with a DAHS capable of analyzing and presenting the data in terms of lbs/hr.
- For O2, the use of a certified CEM system per 40 CFR 60 capable of analyzing stack gas O2 data and transfer of the data to the CEMs DAHS for compliance reporting.
- For SOx, periodic analysis of natural gas samples, monitoring of fuel use via certified fuel meters, and a DAHS capable of calculating and reporting SOx emissions in units of lbs/hr.
- For PM10 and PM2.5, periodic (annual) source testing of the engine stacks. This testing may be accomplished on all the engines or a subset of the engines at the discretion of SDAPCD.
- For ammonia, periodic (annual) source testing of the engine stacks. This testing may be accomplished on all the engines or a subset of the engines at the discretion of SDAPCD. Monitoring of urea injection rates, coupled with parametric monitoring of specific process variables will be used to establish an enforceable relationship to track and report ammonia "slip" emissions.. Ammonia is not subject to BACT under either federal PSD or SDAPCD regulations. Nevertheless, an appropriate limit on ammonia slip is included here to assure no unacceptable environmental impacts associated with selection of SCR as the BACT selection for NOx.

BACT for Power Cycle Engines - Startup and Shutdown Periods

The emissions controls for the project – SCR and an oxidation catalyst – cannot be operated or only provide limited control during periods of start-up and shutdown. In the case of SCR, the Applicant will not be able to commence urea injection until the catalyst has reached adequate temperature. This top-down BACT analysis will consider the following technologies for startup and shutdown.

Best Operating Practices

The Applicant is proposing best operating practices to minimize the duration of startup and shutdown events and thereby reduce the resulting emissions. These best operating practices include the following:

- During a startup, bring the engines to the minimum load needed to achieve compliance with the applicable NOx and CO limits as quickly as possible, consistent with the equipment manufacturers' recommendations and safe operating practices;
- During a startup, initiate urea injection to the SCR as soon as the SCR catalyst temperature has reached its minimum operating temperature;

- During shutdown, once the engines reach a load that is lower than the minimum load necessary to maintain compliance with the NOx and CO emissions limits, reduce the engine load to zero as quickly as possible, consistent with the equipment manufacturers' recommendations and safe operating practices; and
- During shutdown, maintain urea injection to the SCR as long as the SCR catalyst temperature remains above its minimum operating temperature.

Quick-Start Design of Power Cycle Engines

As discussed previously, a critical Project objective is assuring fast start-up times. The proposed Power Cycle Engines were specifically chosen because they will provide the fastest start-capability available. QBPP is designed for fast start-up and shutdown; the engines are guaranteed to ramp from cold start to maximum capacity in only 10 minutes. They are also guaranteed to ramp-down from maximum capacity to shutdown within 10 minutes.

The Applicant is unaware of any additional technologies that could be used to further shorten the duration of startup or shutdown. Thus, for purposes of the BACT analysis, the two technologies identified as both available and applicable to the Project are best operating practices and the proposed Power Cycle Engines.

Both of these technologies – best operating practices and the 10-minute start-up guaranteed for the Power Cycle Engines – are being proposed for the Project. Because the Applicant is selecting all available control technologies identified, no further analysis of the technologies' relative energy, environmental or economic impacts is provided here. Moreover, the Applicant is unaware of any such impacts. Accordingly, both technologies are retained at Step 4 of the BACT analysis and will be selected as BACT at Step 5.

The Applicant is proposing the numerical mass emissions limits and event time limits as stated in AFC Section 4.7, Table 4.7-8 as appropriate BACT limits, to assure the enforceability of this BACT determination. These mass emissions limits and time limits were provided by the equipment vendor and will be achieved through use of best operational practices.

BACT for Emergency Diesel Compression Ignition Engine

The proposed diesel engine (fire pump) will comply with the EPA Tier III standards (at a minimum) as applicable based upon engine size and year of manufacture. This engine will be fired on California certified low sulfur diesel fuel. Due to the low use rates of this device no other controls were considered for application as BACT on these engines. Pursuant to SDAPCD Rule 20.2 (d)(1)(i), the fire pump is exempt from the district BACT determination process due to emissions (potential and actual) of the affected BACT pollutants being below 10 lbs/day. The fire pump engine will nevertheless be subject to BACT pursuant to the federal PSD permit, which does not afford any *de minimis* exemption for major stationary sources. Use of Tier III fire pump engine will meet BACT for all criteria pollutants.

BACT for Cooling Towers

There are no proposals for cooling towers at the QBPP site. The cooling system employed will be a closed loop fan-cooled "radiator" type system, with no emissions.

BACT for Fuel Gas and Warm Start Heaters

The proposed fuel gas and warm start heaters (rated at 4 MMBtu/hr each) will be equipped with low NOx burners, will fire only PUC grade natural gas, and will utilize good combustion practices. This is considered BACT for these small heaters. Pursuant to SDAPCD Rule 20.2

(d)(1)(i), the fuel gas and warm start heaters are exempt from the district BACT determination process due to emissions (potential and actual) of the affected BACT pollutants being below 10 lbs/day. Although these units are also exempt from the APCD permitting requirements, they will be subject to BACT pursuant to the federal PSD permitting program, which does not provide for any *de minimis* exemption. As noted, utilization of good combustion practices and PUC-grade natural gas will meet BACT for all PSD pollutants for the fuel gas and warm start heaters.

BACT Analysis for Greenhouse Gases

This section presents the BACT analysis for GHGs for the Wartsila power cycle engines, the emergency fire pump engine, fuel gas and warm start heaters, and electrical breakers.

Introduction

In November of 2010, EPA issued guidance to assist permit writers and permit applicants in addressing the prevention of significant deterioration (PSD) and Title V permitting requirements for greenhouse gases (GHGs) that began to apply on January 2, 2011. The guidance document: (1) describes, in general terms and through examples, the requirements of the PSD and Title V permit regulations; (2) reiterates and emphasizes relevant past EPA guidance on the PSD and Title V review processes for other regulated air pollutants; and (3) provides additional recommendations and suggested methods for meeting the permitting requirements for GHGs, which are illustrated in many cases by examples. EPA believed this guidance was necessary to respond to inquiries from permitting authorities and other stakeholders regarding how these permitting programs will apply to GHG emissions. The guidance was finalized in March of 2011.[1]

New major stationary sources and major modifications at existing major stationary sources are required by the Clean Air Act (CAA or Act) to, among other things, obtain an air pollution permit before commencing construction. This permitting process for major stationary sources is called new source review (NSR) and is required whether the major source or major modification is planned for an area where the national ambient air quality standards (NAAQS) are exceeded (nonattainment areas) or an area where the NAAQS have not been exceeded (attainment and unclassifiable areas). In general, permits for sources in attainment or unclassifiable areas are referred to as prevention of significant deterioration (PSD) permits, while permits for major sources emitting nonattainment pollutants in major amounts and located in nonattainment areas are referred to as nonattainment NSR (NNSR) permits. The entire preconstruction permitting program, including both the PSD and NNSR permitting programs, is referred to as the NSR program. Because EPA has not established a NAAQS for GHGs, the nonattainment component of the NSR program does not apply. Thus, the NSR portions of the EPA guidance focus on the PSD requirements that apply once GHGs become a regulated NSR pollutant.

Over the past several years, EPA has taken several actions regarding GHGs under the CAA. The result of these EPA actions, explained in more detail below, is that certain PSD permits and certain Title V permits issued on or after January 2, 2011, must address emissions of GHGs. These actions included new rules that established a common sense approach to phase in

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[1] *See* PSD and Title V Permitting Guidance for Greenhouse Gases, U.S. EPA, Office of Air Quality Planning and Standards, March 2011.

permitting requirements for greenhouse gas (GHG) emissions from stationary sources, beginning with large industrial sources that are already subject to PSD and Title V permitting requirements. On December 15, 2009, EPA found that elevated atmospheric concentrations of six well mixed GHGs, taken in combination, endanger both public health and welfare, i.e., "the endangerment finding".

For stationary sources, on March 29, 2010, EPA made a final decision to continue applying (with one refinement) the Agency's existing interpretation regarding when a pollutant becomes "subject to regulation" under the Act, and thus covered under the PSD and Title V permitting programs applicable to such sources. EPA published notice of this decision on April 2, 2010. Under EPA's final interpretation, a pollutant becomes "subject to regulation" on the date that a requirement in the CAA or a rule adopted by EPA under the Act to actually control emissions of that pollutant "takes effect" or becomes applicable to the regulated activity (rather than upon promulgation or the legal effective date of the rule containing such a requirement). Thus, under EPA's interpretation of the Act and applicable rules, construction permits issued under the PSD program on or after January 2, 2011, must contain conditions addressing GHG emissions.

On June 3, 2010, EPA issued a final rule that "tailors" the applicability provisions of the PSD and Title V programs to enable EPA and states to phase in permitting requirements for GHGs in a common sense manner ("Tailoring Rule"). The Tailoring Rule focuses on first applying the CAA permitting requirements for GHG emissions to the largest sources with the most CAA permitting experience. Under the Tailoring Rule, facilities responsible for nearly 70 percent of the national GHG emissions from stationary sources are subject to permitting requirements beginning in 2011, including the nation's largest GHG emitters. i.e., power plants, refineries, and cement production facilities. Emissions from small farms, churches, restaurants, and small commercial facilities are examples of source types that are not likely to be covered by these programs under the Tailoring Rule. The rule then expands to cover the largest sources of GHGs that may not have been previously covered by the CAA for other pollutants.

As discussed below, under the Tailoring Rule, application of PSD to GHGs will be implemented in multiple steps, which we refer to in this document as "Tailoring Rule Steps" to avoid confusion with the five steps for implementing the "top down" best available control technology (BACT) analysis and the two steps of the applicability procedures for modifications.

The first Tailoring Rule step begins on January 2, 2011, and ends on June 30, 2011, and this step covers what EPA has called "anyway sources" and "anyway modifications" that would be subject to PSD "anyway" based on emissions of pollutants other than GHGs. The second step begins on July 1, 2011, and continues thereafter to cover both anyway sources and certain other large emitters of GHGs. EPA has committed to completing another rulemaking no later than July 1, 2012, to solicit comments on whether to take a third step of the implementation process to apply the PSD permitting programs to additional sources. EPA has also committed to undertaking another rulemaking after 2012. Sources subject to the permitting programs under the first two steps will remain subject to these programs through any future steps. Future steps are not discussed in the March 2011 guidance document, given that the outcomes of those rulemaking efforts are not yet known. Under the Tailoring Rule, in no event are sources with a potential to emit (PTE) less than 50,000 TPY of CO2 equivalent (CO2e) subject to PSD or Title V permitting for GHG emissions before 2016.

EPA Regional Offices have been advised that they should apply the policies and practices reflected in the guidance document when issuing permits under the federal PSD and Title V permitting programs, unless the facts and the record in an individual case demonstrate grounds to approach the subjects discussed in a different manner. State, local and tribal permitting authorities that issue permits under a delegation of federal authority from EPA Regional Offices are also advised to follow the guidance document. EPA has also recommended that permitting authorities with approved PSD or Title V permit programs apply the guidance reflected in the document, but these permitting authorities have the discretion to apply alternative approaches that comply with state and/or local laws and the requirements of the CAA and approved state, local or tribal programs. As is always the case, permitting authorities have the discretion to establish requirements in their permits that are more stringent than those suggested in the guidance or prescribed by EPA regulations.[1]

The QBPP is being proposed in response to a power delivery solicitation from San Diego Gas and Electric Company (SDG&E). The solicitation for power development proposals, is in response to the predicted power needs of the San Diego region in the both the short and long term (see Appendix F.10). As discussed previously, the QBPP is designed to provide peaking, load-shaping power to the SDG&E service area, along with certain ancillary services to support grid stability and reliability as intermittent renewable generating sources are integrated to the grid in coming years. In addition, QBPP will have a relatively low heat rate and will be capable of sustaining high-efficiency operations across its entire load range. As a consequence, dispatch of QBPP is expected to displace power generation by less efficient and more polluting technologies, in both the short and long term. The Applicant believes that QBPP will meet BACT for GHGs through use of high-efficiency natural gas-fired generating equipment, as well as by incorporating high-efficiency auxiliary load-consuming equipment into the overall plant design.

Summary of Proposed GHG BACT

The QBPP facility is proposing the following as GHG BACT:

1. Power Cycle Engines:
    a. Use of lean-burn, 4 stroke, internal combustion engine generating technology to generate the greatest amount of peaking and load-shaping power from each unit of fuel combusted
    b. Use of natural gas as the only fuel in the engine power systems
    c. Maintain the efficiency of the internal combustion engine power systems by employing proper maintenance practices and procedures, and using good combustion practices
2. Fuel Gas and Warm Start Heaters
    a. Use of natural gas as the only fuel in the heaters
    b. Record operational hours and total fuel use (annual basis)
    c. Maintain heaters according to manufacturers specifications
    d. Tune heaters every two (2) years according to manufacturers specifications

3. Auxiliary Load-Consuming Equipment
    a. Specification of high-efficiency load-consuming equipment (fans and pumps) as part of the overall plant design
4. Diesel Fire Pump Engine
    a. Use California certified low sulfur diesel fuel
    b. Use of the appropriate Tier rated engine based upon date of manufacture, size, duty, etc.
    c. Record operational hours and total fuel use (annual basis)
    d. Maintain engine tuning and maintenance according to the manufacturers specifications
5. SF_6 Equipment (electrical breakers)
    a. Purchase breakers which have manufacturers specified leak rates at less than or equal to 1%
    b. Maintain breakers to insure an annual leak rate of less than or equal to 1%
    c. Maintain purchase, disposal, and use records for all SF_6 transactions and report emissions per CARB requirements

GHG BACT for Power Cycle Engines/Generating Equipment

Step 1 - Identify All Possible Control Technologies, and Step 2 - Eliminate Technologically Infeasible Options

Steps 1 and 2 of the EPA top-down method are presented together in this analysis. The table summarizes the potentially available control technologies for GHGs and those that have been eliminated and/or included for consideration as BACT for the project.

TABLE F.6-7 GHG Technologies Identified

GHG Technology	Evaluation Status
Inherently lower-emitting GHG processes, practices, or designs	Considered/Eliminated
Add-on GHG controls	Considered/Eliminated
Combinations of Inherently lower-emitting GHG processes, practices, or designs, and add-on GHG controls	Considered/Eliminated
Renewable energy technology (solar or wind)	Considered/Eliminated
Alternative generating technologies	Considered/Eliminated
Alternative fuels	Considered/Eliminated
Energy efficiency	Considered/Applied
Carbon capture and storage	Considered/Eliminated

EPA defines BACT as an emissions limitation based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant.

EPA also states, in the NSR Workshop Manual, that, (1) a control technology that is demonstrated for a given type or class of sources is assumed to be technically feasible unless source-specific factors exist and are demonstrated to justify technical infeasibility, (2) technical feasibility of technology transfer control options is generally assessed based on an evaluation of the pollutant-bearing gas stream characteristics for the proposed source and other source types to which the control has been previously applied, (3) innovative controls that have not been demonstrated on any source type similar to the proposed source need not be considered in the BACT analysis, and (4) the applicant is responsible for providing the basis for assessing technical feasibility or infeasibility and the reviewing authority is responsible for the decision on what is and is not technically feasible.

EPA notes in its March 2011 GHG Guidance document, that the requirement to consider inherently lower-emitting processes, practices, or designs does not require a fundamental redesign of the device, process, or source. As such, lower-emitting process/practices/designs that do not achieve the objectives, goals, or overall purposes of the project may be considered technologically infeasible as BACT for a specific project system or process.

Unlike other regulated air pollutants, which are often emitted as by-products of imperfect combustion and can be reduced by controlling the combustion process or through addition of add-on controls, at this time, there is no corresponding way to reduce the amount of CO2 generated during combustion, as CO2 is an essential product of the chemical reaction between the fuel and oxygen in which it burns. As such, the only way to reduce the amount of CO2 generated by a fuel-burning power plant is to generate as much electric power as possible from combustion through the use of efficient generating technologies. The Applicant notes that natural gas produces about half as much CO2 as coal and substantially less emissions of both criteria and toxic air pollutants as well. Based on the analysis presented herein, the Applicant believes that the proposed reciprocating engine technology (firing natural gas) constitutes the most efficient electrical generating technology available for the Project.

Renewable Energy Technologies

As explained above, the Applicant considered several alternative generation technologies, including renewable energy technologies. The Applicant again notes that, in conducting BACT analyses for power plants, permitting authorities have not typically considered whether renewable alternatives would achieve lower emissions and should therefore be required as BACT. Moreover, because of the intermittent availability of renewable energy generation technologies, they would fail to achieve a basic objective of the proposed project: to provide peaking and load-shaping power to meet the growing demand of reliable peaking power in the San Diego region. For a discussion of the specific renewable generating sources the Applicant considered and the reasons why each was eliminated from consideration, see Section 3.0 of the AFC and pages ___ above in this BACT evaluation.

Alternative Fossil-Fuel Generating Technologies

As explained above, the Applicant identified several alternative generating technologies that have been used to produce both peaking and base-load power in and out of California, i.e., boilers, and simple cycle combustion turbines, and combined-cycle turbines. These alternative generating technologies either fail to meet fundamental project objectives and/or would operate at lower efficiency and thereby increased emissions of GHG per MWh generated. For these reasons, they were eliminated from consideration as part of this BACT analysis.

Conventional Boiler and Steam Turbine

As explained above, conventional boiler and steam turbine technology does not meet Project needs because of its inability to quickly ramp up to meet demand as needed to meet SDG&E's dispatch pattern, and its resulting lower overall efficiency due to the need to maintain high readiness for peaker operation (i.e., with frequent start-stop cycles).

QBPP is designed to have a 10-minutes cold start to full capacity and as many as four start-up events per day. Thus, a conventional boiler/steam turbine design would be poorly suited to the project. Additionally, this technology, although proven reliable and commercially available, would involve considerably greater water consumption and waste generation and would also require significantly greater space. For these reasons, use of a conventional boiler and steam turbine is inappropriate and was rejected from consideration for the project.

Simple-Cycle Combustion Turbine

As explained above, simple-cycle combustion turbines, which can achieve thermal efficiencies of up to approximately 38 percent, are capable of rapidly reaching their operating peak, making them suitable for use in peaking power production. However, gas turbines are designed and built in fixed sizes (capacities) and are most efficient when they are operated at or near their design load capacity, i.e., the efficiency of the system decreases as a turbine is operated at reduced load. Moreover, simple-cycle gas turbines typically have a limited turn-down ratio and operate at a higher heat rate than the proposed QBPP. This combination of reduced capacity range and decrease in efficiency, at both full and partial load, would therefore fail to meet the project objectives of providing fast-ramping peaking power and ancillary services, while operating efficiently across the entire load range.

In addition, even if simple-cycle turbine technology was not eliminated from consideration because requiring use of a turbine would redefine the proposed source, it would be ranked lower than the proposed reciprocating engines at Step 3 because simple-cycle turbines generally operate at a higher heat rate, i.e., are less efficient, and would therefore generate more emissions per MWh-generated. This confirms that, even if a simple-cycle turbine were not eliminated as a feasible alternative for the Project, it would not constitute BACT for GHGs.

Combined-Cycle Power Plant

As explained above, conventional combined-cycle plants are able to achieve high thermal efficiencies, when these systems are at their normal operating temperatures and pressures. The peaking dispatch requirement to rapidly bring the power plant online would necessitate that these systems be maintained in some standby or partial load mode when not dispatched, which is not economical or practical. Rather, combined-cycle technology is appropriate for intermediate to baseload duty cycles and would not be an appropriate technology for a power

plant intended to have as many as four start-up events per day and to be operated less than 4,000 hours per year. For this reason, combined-cycle technology was rejected as inconsistent with the Project objectives of providing peaking and firming power to the grid.

While turbine vendors have developed fast-start technology, such technology is currently only available for larger "frame" turbines, which are significantly larger than the proposed QBPP. Operation of a larger capacity turbine at only a fraction of its capacity to provide only a 100-MW to the grid would likely reduce the overall efficiency of the combined-cycle plant, such that it would be inferior to, or no better than, that of the proposed reciprocating engines. Further, although once-through steam generators (OTSG) could be used in place of conventional HSRG technology, the steam cycle would still need to be warmed to generate any efficiency gain, relative to a simple-cycle operation. For a plant such as QBPP that is intended for peaking/firming with multiple daily startups, use of an OTSG would therefore likely provide no efficiency gain. As EPA's March 2011 guidance notes, "the permitting authority can consider the intended function of an electric generating facility as a baseload or peaking unit in assessing the fundamental business purpose of a permit applicant." March 2011 Guidance, 27. Because combined-cycle technology is inconsistent with the Project's intended purpose of providing peaking power, it was not considered as part of this BACT analysis.

Alternative Fuels

Emissions of carbon dioxide (CO_2) during fossil fueled combustion are strongly correlated to the amount of carbon in the fuel stream. As noted previously, a fundamental objective of the Project is to utilize PUC-quality natural gas provided by SDG&E pursuant to a tolling agreement. Thus, specification of any other fuel would frustrate a fundamental project objective. Nevertheless, because the definition of BACT includes, among other things, "fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques for control of each … pollutant", the Applicant would note that, in comparison to all other potential fuels, natural gas will achieve the lowest emissions of CO_2 and other greenhouse gases. A comparison of emissions rate factors for the various fuels as presented in Table F.6-8 shows that natural gas, when used as a fuel in stationary sources, typically produces less CO_2 than other fuels.

Table F.6-8 CO2 Emissions Factors for Various Fuels

Fuel	Stationary Source Factors	
	CCAR, lb/gal	CCAR, lb/MMBtu
Nat Gas	15.12	116.98
LNG	9.63	-
LPG	13.11	139.24
Diesel #2	22.38	161.27
Gasoline	19.55	-
Residual Oil	25.99	173.72
Propane	12.57	139.04
Biodiesel	20.99	-

Table F.6-8 CO2 Emissions Factors for Various Fuels		
Fuel	**Stationary Source Factors**	
	CCAR, lb/gal	**CCAR, lb/MMBtu**
Wood-Biomass	-	200.49
Kerosene	21.54	159.41
Coal	-	206.04
California Climate Action Registry (CCAR), General Protocol, V3.1, 1/2009, and Power Sector Protocol, V1.1, May 2009.		

Another fuel choice might include combustion of biomass, such as wood ships or agricultural waste. Biomass is considered a renewable fuel choice and EPA has recently agreed to a three-year deferral from PSD permitting requirements for biomass fuel combustion. However, the Applicant has not been able to identify a biomass fuel source in large enough quantities in the vicinity to make such a plant viable. The Energy Commission has noted that biomass plants are typically sized to generate less than 10 MW, which is substantially less than the capacity of the QBPP project (~102.3 Mw). In addition, biomass fired power plants are usually designed and operated as base-loaded facilities, not peakers. For this reason, combustion of biomass does not appear at this time to provide a feasible alternative to the proposed Project. Moreover, as previously noted, use of any other fuel than natural gas would frustrate the project objective of using only PUC-quality natural gas provided by SDG&E pursuant to a tolling agreement.

Carbon Capture and Storage (CCS)

Background on CCS. Carbon capture (or compression), transport, and storage (CCS) is the term used to describe a set of technologies aimed at capturing carbon dioxide emitted from industrial and energy-related sources before it enters the atmosphere, compressing it, and injecting it deep underground in secure geological formations, and ensuring it remains stored there indefinitely. EPA states, in the guidance noted above, that CCS is not in widespread use at this time, but that EPA generally considers CCS to be an "available" add-on pollution control for large CO2-emitting facilities with high-purity CO2 streams. EPA further states while CCS is a promising technology, EPA does not believe that at this time CCS will be a technically feasible BACT option in certain cases. In particular, EPA notes that there are significant logistical hurdles that may preclude its application to a particular project or site, warranting its elimination from the BACT analysis at Step 2. The applicant agrees with EPA and concludes, for the reasons explained below, CCS is technologically infeasible for the proposed Project and, even if it were available at this time, would likely be cost prohibitive.

The key driving force behind undertaking CCS is the need to find cost-effective solutions to tackle the global issue of climate change by reducing CO_2 emissions in a world where there is a continued and rising demand for energy. CCS has an important role to play as a bridge to a low-carbon energy future. However, CCS faces a number of challenges; the biggest of which is how to best demonstrate that CCS is safe, effective and can be done now at industrial scale at a competitive cost. Large scale pilot and demonstration projects will play an important role in showing that the integrated process can work, from capture through to storage. These demonstrations and accompanying research and technology development require substantial investment but will ultimately drive down costs while helping identify the most appropriate

technologies, equipment and skills needed to use them. Additionally, a regulatory framework is needed for CCS to clarify, both at national and international levels, the long-term rights, liabilities and technical requirements as to how CCS will be undertaken.

Over 90% of the CO_2 produced by fossil fuels at large fixed installations can be captured and prevented from reaching the atmosphere. Three main technology types; pre-combustion, post-combustion and oxy-firing, are available, allowing CO_2 to be captured from industrial processes such as power generation, oil refining and cement manufacture.

Pre-combustion capture involves partial combustion of CO_2 to produce hydrogen and CO_2. Hydrogen combustion produces no CO_2 emissions, with water vapor being the main by-product. The component parts of pre-combustion technology exist today at commercial scale; the challenge now is to integrate these in a power application.

In post-combustion capture, the CO_2 is removed after combustion of the fossil fuel. CO_2 is captured from exhaust gases and other large point sources. Post-combustion can be installed on both new and existing power plants, which is important given that the average power plant operates for 40 years. The challenge around post-combustion is scale-up of the technology to commercial scale in a power application, as well as integration.

Today, CO_2 is transported by truck, ship or pipeline. However, to transport the large amounts of CO_2 from power plant emissions, pipelines are the only practical solution. The pipeline transportation process is well understood as CO_2 pipelines have been used since the 1970s, transporting large volumes of CO_2 to oil fields for enhanced oil recovery (EOR). For example, US pipeline infrastructure has the capacity to safely and reliably carry 50 million tons of CO_2 a year.

The oil and gas industry has years of experience injecting CO_2 underground into geological formations for EOR. Oil and gas have remained underground for millions of years. The same natural conditions allow injected CO_2 to be stored securely. Once CO_2 is injected deep underground (typically more than 800 meters) it is absorbed and then trapped in minute pores or spaces in the rock structure. Impermeable cap-rock acts as a final seal to ensure safe storage for millions of years.

Structural trapping - at the storage site the CO_2 is injected under pressure deep down into the ground until it reaches the geological storage formation. The rocks of the storage formation are like a rigid sponge; they are both porous and permeable. Fluid CO_2 tends to rise towards the top of the formation until it reaches an impermeable layer of rock overlying the storage site. This layer, known as the cap-rock, securely traps the CO_2 in the storage formation. Structural trapping is the same mechanism that has kept oil and gas securely stored under the ground for millions of years.

Residual trapping - another natural process further traps the CO_2. As the injected CO_2 moves up through the geological storage site towards the cap-rock some is left behind, trapped in the microscopic pore spaces of the rock. This process is similar to air becoming trapped in a sponge.

Dissolution and mineral trapping – two additional mechanisms also trap CO_2. Over time the CO_2 stored in a geological formation will begin to dissolve in the surrounding salty water. The salty water combined with the CO_2 becomes heavier and sinks towards the bottom of the formation over time. This is known as dissolution storage. Mineral storage occurs when the CO_2 held

within the storage site binds chemically and permanently with the surrounding rock. Depleted hydrocarbon reservoirs, such as oil and gas fields, are highly suited to such geological storage of CO_2. Other potential storage sites are saline formations (permeable rock formations, which contain salty waters in their pore spaces), and unminable coal beds. According to the Intergovernmental Panel on Climate Change (IPCC), such geological formations could provide storage space for at least 2,000Gt (billion metric tonnes) of CO_2.

Feasibility of CCS for the Proposed Project. The Applicant is unaware of instances where CCS has successfully been applied to a similarly sized peaking or gas-fired power plant. CCS therefore cannot be considered to constitute a demonstrated technology for the proposed source at this time. While EPA's March 2011 Guidance indicates that EPA would generally consider CCS to be an available technology, according to this guidance, the determination of whether CCS is technically feasible for any individual project involves consideration of all three main components of the process: CO_2 capture and/or compression, transport and storage. If these three components cannot be integrated into the base facility, then CCS may be eliminated from consideration as infeasible. The Applicant is unaware of the availability of adequate sequestration basins within the vicinity of the Project site. The time required to study the availability of such sequestration basins and confirm their adequacy for long-term capture would likely preclude development of the project in time to meet one the Project's objective of providing power to SDG&E's service area no later than October 2014. Further, there currently exists no adequate infrastructure for the transport of any captured carbon to sequestration basins elsewhere. Thus, for logistical reasons, implementation of CCS at the Project site would be infeasible, even if the technology for CO_2 capture from natural-gas fired emissions streams were commercially available at this time. Moreover, all available information surveyed by the Applicant indicates that most CCS technologies are not yet commercial and are not expected to become commercially available for 10 to 20+ years. Additionally, the regulatory regime governing CO_2 injection and future liability is nascent, posing additional regulatory hurdles to the feasibility of CO_2 for the Project site.

In addition to these logistical hurdles, which render CCS an infeasible option for the Project at this time, another major impediment to implementation CCS would be the significant cost associated with capturing the flue gas, which can amount to up to 75% of the total cost of CCS. Recent studies conducted by MIT researchers *(The Cost of Carbon Capture, J. David and H. Herzog, MIT, Cambridge, MA)*, indicated that the range of CCS costs ($/metric ton) for technologies such as IGCC, PC, and NGCC plants was approximately $18 to $41. Assuming a $40/metric ton cost and based on an estimated CO2 emissions rate from the plant combustion related processes of approximately 191,590 metric tons/year, the cost for implementation of CCS could be approximately $7.66 million per year in equipment and operational costs.

As acknowledged by EPA in its March 2011 Guidance, "EPA recognizes that at present CCS is an expensive technology, largely because of the costs associated with CO2 capture and compression, and these costs will generally make the price of electricity from power plants with CCS uncompetitive compared to electricity from plants with other GHG controls." March 2011 Guidance, 42. Thus, EPA anticipates that CCS will often be eliminated as too costly at Step 4 of the analysis, even in cases where feasible. *See id.*, 42-43. The Applicant is unaware of any circumstances that would make CCS a less costly or more viable option for the project, *e.g.*, proximity to enhanced oil recovery fields, developed sequestration basins or existing pipeline

infrastructure. Accordingly, the Applicant believes that, even if CCS were feasible for the Project at this time, it would likely be eliminated from consideration due to excessive cost.

Step 3 - Rank Remaining Control Technologies

As suggested previously, the amount of CO_2 and other GHGs emitted during combustion of fossil fuels is directly correlative to the amount of fuel consumed. Thus, the only available means of reducing emissions of CO_2 from the generation of power is to reduce the amount of fuel consumed per unit of energy generated. Accordingly, a comparison of various generating technologies' relative efficiency – or "heat rate" – provides an appropriate basis for comparing and ranking the control efficiency of such technologies. For QBPP, the only fuel to be used in the power generation cycle will be natural gas. QBPP is therefore proposing to minimize GHG emissions in its generation of peaking power by using highly efficient reciprocating engine technology with a low heat rate and high efficiency across the entire load range.

Table F.6-9 presents a generalized ranking of the identified generation technologies based on their known ranges of heat rates[7], as considered in the BACT analysis for this project.

TABLE F.6-9 Ranking of Potential Generating Technologies by Heat Rate[7]

Technology	Heat Rate Range (HHV basis)	Technologically Feasible for This Project?
Renewable energy sources	n/a	No
Nuclear power	n/a	No
Biomass and other biofuels	n/a	No
CCS	n/a	No
Combined cycle turbines	~7000-8000 btu/Kw-hr	No
Reciprocating IC engines	~7500-8600 btu/Kw-hr	Yes
Simple cycle turbines	~8500-10000 btu/Kw-hr	No
Boilers	>10000 btu/Kw-hr	No

Notably, simple-cycle combustion turbine technology generally has a higher heat rate than reciprocating engine technology. Table F.6-10 presents a comparison of various power plant facility heat rates and GHG performance as prepared by CEC staff dated March 2011. This data is primarily for combined cycle turbines and boilers. The applicant has added data for QBPP and for the Eastshore Energy Project (which proposed to use similar engines to QBPP), as well as data on simple-cycle turbine applications.

Table F.6-10 Power Plant Heat Rates and GHG Performance

Facility	Heat Rate, Btu/kWh	Est. Energy Output, GWh	GHG Performance, MTCO2/MWh
QBPP (Rice)	8600	~412.5	~0.464
Eastshore (Rice)	8898	~462	~0.463
Mariposa Energy (SC)	9450	800	0.541
EME Walnut (SC)	8595	2000	0.481

Table F.6-10 Power Plant Heat Rates and GHG Performance			
Facility	**Heat Rate, Btu/kWh**	**Est. Energy Output, GWh**	**GHG Performance, MTCO2/MWh**
Gateway GS (CC)	7123	2490.2	0.378
Los Medanos EC (CC)	7184	3394.7	0.381
Delta EC (CC)	7308	5013.5	0.387
CCPP #6 (Blr)	13499	21.1	0.716
CCPP #7 (Blr)	11182	176.9	0.593
PPP #5 (Blr)	11461	103.3	0.608
PPP #6 (Blr)	11918	84.4	0.632
PPP #7 (Blr)	14629	29.3	0.776
RICE-reciprocating internal combustion engine(s) *Dependent upon PPA and actual facility dispatch.			

At the present time, combined cycle plants utilizing efficient turbines, HRSGs, and clean fuels certainly represent the highest efficiencies with respect to fuel burned versus power produced. But, a combined cycle plant does not always "fit the bill" when peaking power is what is needed. As previously discussed, fast-start capabilities are currently only available for much larger turbines than would be needed to meet the Project's proposed capacity of 100 MW (the 300 MW Siemens SCC6-500F and GE 7FA Response System). Operation of a larger turbine at only a fraction of its capacity would result in significant losses in efficiency, such that the efficiency of the combined-cycle plant would likely be even less than a smaller simple-cycle plant. Further, although once-through steam generators (OTSG) might be used in lieu of conventional HSRG technology, the addition of a steam cycle to a plant only intended for peaking generation likely would provide only marginal to no efficiency gains, in comparison to a simple-cycle operation. Thus, for peaking and load-shaping plants that will undergo multiple daily startups, the steam cycle would likely provide no to marginal benefit.

For peaking power production, simple cycle turbines and reciprocating internal combustion engines typically represent the systems of choice due to the flexibility in overall operations, i.e., fast startup times, fast power ramp-up times, ability of air pollution control systems to reach optimum performance levels within short periods of time, and ability to vary loads versus demand. This last attribute – the ability to change load swiftly in response to demand – is more characteristic of reciprocating engines than simple-cycle turbines. Thus, one clear advantage to the proposed QBPP design in using several reciprocating engines, as opposed to one or two combustion turbines, is the wide range of dispatch scenarios that QBPP can achieve. Table F.6-12 shows the flexibility of the system for a set of typical operational loads.

Table F.6-11 Power Supply Scenarios					
	Load vs MW				**# of Engines Operating**
Engine #	**50%**	**75%**	**90%**	**100%**	
Engine 1	4.65	6.98	8.37	9.3	
MWs	***4.65***	***6.98***	***8.37***	***9.3***	***1***
Engine 2	4.65	6.98	8.37	9.3	

Table F.6-11 Power Supply Scenarios					
	Load vs MW				# of Engines Operating
Engine #	50%	75%	90%	100%	
MWs	***13.95***	***16.28***	***17.67***	***18.6***	***2***
Engine 3	4.65	6.98	8.37	9.3	
MWs	***23.25***	***25.58***	***26.97***	***27.9***	***3***
Engine 4	4.65	6.98	8.37	9.3	
MWs	***32.55***	***34.88***	***36.27***	***37.2***	***4***
Engine 5	4.65	6.98	8.37	9.3	
MWs	***41.85***	***44.18***	***45.57***	***46.5***	***5***
Engine 6	4.65	6.98	8.37	9.3	
MWs	***51.15***	***53.48***	***54.87***	***55.8***	***6***
Engine 7	4.65	6.98	8.37	9.3	
MWs	***60.45***	***62.78***	***64.17***	***65.1***	***7***
Engine 8	4.65	6.98	8.37	9.3	
MWs	***69.75***	***72.08***	***73.47***	***74.4***	***8***
Engine 9	4.65	6.98	8.37	9.3	
MWs	***79.05***	***81.38***	***82.77***	***83.7***	***9***
Engine 10	4.65	6.98	8.37	9.3	
MWs	***88.35***	***90.68***	***92.07***	***93***	***10***
Engine 11	4.65	6.98	8.37	9.3	
MWs	***97.65***	***99.98***	***101.37***	***102.3***	***11***
The flexibility of the proposed engines to produce a wide range of power output is evident from the above basic load vs. MW table. The lowest typical load is 50% for any single engine. Each engine can be run at numerous load levels above 50%. The engines will be dispatched per the PPA which may differ in load scenarios from the above noted values in the table.					

In comparison, use of simple-cycle gas turbines to meet the proposed Project's demand, such as a single 100-MW LMS-100 or two 50-MW LM-6000s would not afford the same degree of flexibility as the multiple dispatch scenarios noted above for the reciprocating engines by Table F.6-11. Moreover, as indicated above by Tables F.6-9 and F.6-10, reciprocating engines generally have a lower heat rate that simple-cycle combustion turbines. While the LMS-100 represents a significant advancement in the heat rate for smaller combustion turbines, due to its size, its overall efficiency would be substantially reduced if operated at only a fraction of its capacity to meet the varying load levels expected for a plant intended to provide firming and shaping power to support renewables integration. Thus, even if combustion turbines were deemed a feasible alternative for the proposed Project, they would be ranked lower than the proposed reciprocating engines in terms of efficiency. To illustrate this, a single LMS-100 simple cycle turbine (~100 MW) operating for 4000 hrs/yr would produce approximately 192,547 mtons of CO2e per year, while two (2) LM-6000 PG simple cycle turbines (~50 MW each) operating 4000 hrs/yr each would produce approximately 220,060 mtons of CO2e per year. This assumes that the combustion turbines were operating at their optimal efficiency, which is typically constrained to a fairly narrow capacity range near maximum capacity. In contrast, the

proposed 11 reciprocating IC engines, based on 4032 hrs/yr of operation each (including startups and shutdowns) would produce approximately 189,600 mtons of CO2e per year.

As suggested by the foregoing discussion, a critical component of GHG BACT for the Project includes the use of clean fuels. The QBPP proposes to use PUC -grade natural gas as the only fuel in the power generation cycle, and as such the use of clean fuels, i.e., fuels which inherently have lower CO2e emissions, becomes an integral part of the overall GHG BACT applied to the project.

Beyond consideration of the power cycle, another critical component of the GHG BACT analysis is the efficiency of load-consuming elements of the overall plant design. The more efficiently the plant consumes energy, the more energy that can be provided to the grid, resulting in lower emissions of GHGs per MWh of energy provided to the grid. As a consequence, the Applicant will also consider the efficiency of other major components of plant design, including fans and pumps used for the engine cooling system, to assure that these are designed to achieve maximum efficiency. However, the Applicant has not yet completed the design of the Project, and does not yet know what equipment will make up the remainder of the auxiliary load. When information on the overall plant design is available, the Applicant will provide a supplement to this GHG BACT analysis to demonstrate that the design of the load-consuming elements of the plant will meet BACT for GHGs.

Table F.6-12 presents the ranking of the GHG technologies deemed feasible for the proposed project. While these three technologies are "ranked" in order of their presentation, they are more appropriately considered as a suite of measures that will be implemented to assure that the proposed Project generates and consume power in the most efficient manner and thereby achieves BACT for GHGs.

TABLE F.6-12 GHG Technology Ranking for QBPP per the Executed Agreement and PPA

Technology	Ranking	Applied to Project
Reciprocating Engines	1	Yes
Clean Fuels	2	Yes
Energy Efficiency	3	Yes

Based on the foregoing, the Applicant believes that reciprocating engine power generation systems utilizing efficient engine designs and firing natural gas, represent the most efficient system in terms of GHG emissions for the proposed Project.

Step 4 – Evaluate the Most Effective Control Technologies Considering Environmental, Energy, and Cost Impacts

Because the Applicant is proposing to utilize all three of the feasible technologies for reducing GHGs from the generation of power, no detailed analysis is provided to compare the available control technologies' relative environmental, energy and economic impacts.

Step 5 – Select BACT

As indicated above, the Applicant is proposing the use of reciprocating engines, clean fuels and efficient design of load-consuming equipment as BACT for the proposed Project. The Applicant

will also maintain the efficiency of the internal combustion engine power systems by employing proper maintenance practices and procedures, and using good combustion practices.

The technology selected as BACT at Step 5 must be translated into an enforceable emissions limitation by the permitting agency. In its March 2011 Guidance, EPA encouraged permitting authorities to consider establishing output-based limits or a combination of both output- and input-based limits. March 2011 Guidance, 46. EPA noted that, because the environmental concern related to GHG emissions is their cumulative impacts, the focus in establishing limits should be on longer-term averages, e.g., 30- or 365-day rolling average, rather than short-term averages. *Id*. The Applicant will work with agency personnel to establish appropriate BACT limits for the Power Cycle Equipment and auxiliary load-consuming elements that affect efficiency.

GHG BACT for Diesel Engine (Fire Pump System)

The Project includes an emergency diesel engine (fire pump) for use in the case of an emergency to provide water to fight fires. Such a diesel-fired engine is required by fire safety standards, which require redundant sources of power for the fire suppression system. The Project will be equipped with one electric fire pump and another diesel fire pump to meet this redundancy requirement. The Air Resources Board's Airborne Toxic Control Measure (ATCM) for Stationary Compression-Ignition Engines limits operations of diesel-fired fire pump engines to emergencies and no more than 50 hours per year for inspection, maintenance and testing, which is typically done to meet the requirements of National Fire Protection Association (NFPA) standards. The design of these diesel engines is dictated by the manufacturer, not by the end-user. As such, the Applicant is limited to commercially available options, which include those engines meeting EPA Tier 3 requirements.

Consistent with its rationale for the BACT determination for greenhouse gas emissions from the RICE power plant, the Applicant believes that BACT for this source involves selection of the most efficient stationary fire pump engine that can meet the facility's needs. The Applicant has provided information on the emissions from the specified diesel engine in the AFC and District permitting documents. The Applicant has estimated total greenhouse gas emissions from the diesel engine at 5.11 metric tons CO_2E per year.

The Applicant is unaware of any more fuel efficient alternative to a Tier 3-certified engine for these purposes. Further, because emissions of greenhouse gases are directly correlative to operation of the unit, the Applicant believes that BACT requires that the engine shall only be operated for readiness testing and during emergencies and other periods authorized by the ATCM, or permitting authority permit.

Because operation of this source will be limited by permit conditions for reliability-related activities and the Applicant will be required to keep records of the operation of this source and its fuel usage, the Applicant believes no additional conditions are required to enforce this BACT determination.

GHG BACT for Fuel Gas Heater and Warm Start Heaters

The fuel gas heater and the engine warm start heaters as proposed, would be fired exclusively on natural gas, and are used to pre-heat fuel and engine water to facilitate rapid starts. The units are rated at approximately 4.0 MMBtu/hr each, and are expected to be fired for a total of

4232 and 4928 hours per year (each respectively). GHG emissions from these units are estimated to be on the order of 1953.4 metric tons CO2e/yr. The basic GHG BACT reasoning presented for the reciprocating engines essentially applies to these heaters as well. The Applicant proposes that GHG BACT for these units will be the following:

- Use of clean fuels (exclusive use of natural gas)
- Requiring the Applicant to maintain the units according to the manufacturer's specifications, and to operate the units in the most efficient manner possible, i.e. good combustion practices.
- Tune the units every two (2) years according to the manufacturer's specifications.
- Record the annual hours of operation and annual fuel use, and report the GHG emissions annually. The GHG emissions from this unit will be included in the facility-wide annual GHG limit.

It should be noted that there will be three (3) units, one fuel gas heater, and two warm start heaters. But, one of the warm start heater units will be used strictly as a backup unit, therefore emissions are only calculated for the fuel heater and a single warm start heater at full operational mode.

Emissions of Sulfur Hexafluoride (SF_6) from Circuit Breakers

In addition to emissions of greenhouse gases from the IC engine based power plant, fuel and water heaters, and the emergency diesel engine, QBPP will also utilize high-voltage circuit breakers which use sulfur hexafluoride (SF_6) as a gaseous dielectric. The Applicant's facility will include a switchyard with a single circuit breaker, containing SF_6 in a sealed-pressure system. Total system capacity of SF6 is expected to be less than 290 lbs.

SF_6 is the most highly potent greenhouse gas, with a "global warming potential" over a 100-year period 23,900 times greater than carbon dioxide (CO_2) and an estimated persistence in the atmosphere for several thousand years. Because of SF_6's high global warming potential, the California Air Resources Board (CARB) has promulgated a regulation limiting emissions of SF6 from gas insulated switchgear. *See* Cal. Code Reg., tit. 17 §§ 95350 *et seq*. This regulation requires owners of gas insulated switchgear to reduce emissions from such equipment to no more than 1% per year (by weight) by 2020. *See id*. § 95352. This limitation is enforced through recordkeeping and reporting requirements based upon the amount of SF6 replacement gas that is added to the switchgear.

To evaluate the "best available control technology" for emissions of SF_6 from the facility, the Applicant followed U.S. EPA's "top-down" methodology.

<u>Step 1 - Identify Control Technologies for SF_6</u>

1. *Use of Other Gases/Substances for Insulation and Arc Quenching*

The best way to control emissions of SF_6 would be to eliminate its use in the circuit breakers and substitute in its place a non-hazardous substance that does not have comparable emissions of greenhouse gases. However, due to the superior performance and arc-quenching capability afforded by SF_6 breakers, use of a dielectric oil or an compressed air ("air blast") circuit breaker does not represent a feasible option for the Project. Research and development efforts have

focused on finding substitutes for SF_6 that have comparable insulating and arc quenching properties in high-voltage applications. While some progress has reportedly been made using mixtures of SF_6 and other inert gases (e.g., nitrogen or helium) in medium- or low-voltage applications, most studies have concluded that there is no replacement gas immediately available to use as an SF_6 substitute for high-voltage applications.

2. *Modern Closed-Pressure SF_6 Breakers with Leak Detection*

In comparison to older SF_6 circuit breakers, modern breakers use substantially less SF_6 and are designed as a totally enclosed-pressure system. According to information provided by the Applicant, the facility will consist of a single state-of-the-art circuit breaker, containing a total of approximately 290 pounds of SF_6 at a pressure rating determined by the manufacturer. New circuit breakers are typically guaranteed by the equipment vendor with leakage of no more than 1% per year (by weight). Leakage is only expected to occur as a result of circuit interruption and at extremely low temperatures which are not anticipated in the San Diego region.

Step 2 - Eliminate Technically Infeasible Options

As indicated above, SF_6 has become the predominant insulator and arc quenching substance in circuit breakers because of its superior capabilities, in comparison to other alternatives. Thus, alternatives to SF_6 breakers were eliminated from consideration for the proposed Project. As noted above, modern breakers with a guaranteed leakage rate of less than 1% per year (by weight) represent an available and applicable control technology for the Project.

Step 3 - Rank Control Technologies

In the absence of feasible alternatives to use of SF_6, the next best control would be use of a new circuit breaker that has guaranteed leak rate of 1% or less per year. Assuming a total inventory of 290 lbs for the proposed QBPP and leakage rate of 1%, this would amount to potential emissions of SF_6 of 2.9 lbs/year, which due to SF_6's high global warming potential would equal approximately 31.5 metric tons CO_2E per year.

Step 4 - Evaluate Most Effective Controls and Economic Impacts and Document Results

Because the Applicant is selecting the highest ranked control technology as BACT, no consideration is given to ancillary energy, environmental or economic impacts. However, the Applicant would not that, if oil-filled breakers were not eliminated as infeasible for the Project, they would have potential environmental and safety impacts in the case of leakage that would possibly warrant their elimination from consideration at Step 4 of the BACT analysis.

Step 5 - Select BACT

The Applicant has concluded that using totally enclosed circuit breakers of the number and size proposed by the Applicant, coupled with a leak rate of less than or equal to 1%, constitutes BACT for this source. In addition, the proposed Project's product purchase and use records will provide a relatively accurate process for inventorying emissions of SF_6. Based upon the Applicant's review, purchase record reconciliation is the standard method for measuring and reporting SF_6 emissions from circuit breakers, as required by CARB's regulation and Mandatory Reporting Rule. Thus, the Applicant believes that an appropriate emissions limit would be based upon the anticipated leakage rate of less than or equal to 1%.

References

1. PSD and Title V Permitting Guidance for GHGs, EPA-OAQPS, November 2010.

2. Avenal Energy Project, Final Staff Assessment, California Energy Commission, June 2009.

3. Change in Carbon Emissions from the Base Case When Avenal Energy Power Plant is Added, Black and Veatch, 164901, May 2009

4. Additional Statement of Basis, Draft Federal PSD Permit, Russell City Energy Center, BAAQMD, Application #15487, August 2009.

5. Bay Area Air Quality Management District Revised GHG BACT Analysis for the Russell City Energy Center (RCEC), BAAQMD, 2010.

6. USEPA, OAQPS, New Source Review Manual, PSD and Nonattainment Area Permitting, October 1990.

7. Sierra Research, Pio-Pico GHG BACT Assessment, Appendix G, 2/2011.

8. CEC, Final Staff Assessment, CEC-700-2011-001-FSA, 09-AFC-4, Air Quality Section 4.1, March 2011.

Attachment F.6-1
3-Way Catalyst (NSCR) Data Summary

Non-Selective Catalytic Reduction (NSCR or 3-Way Catalyst) BACT Discussion

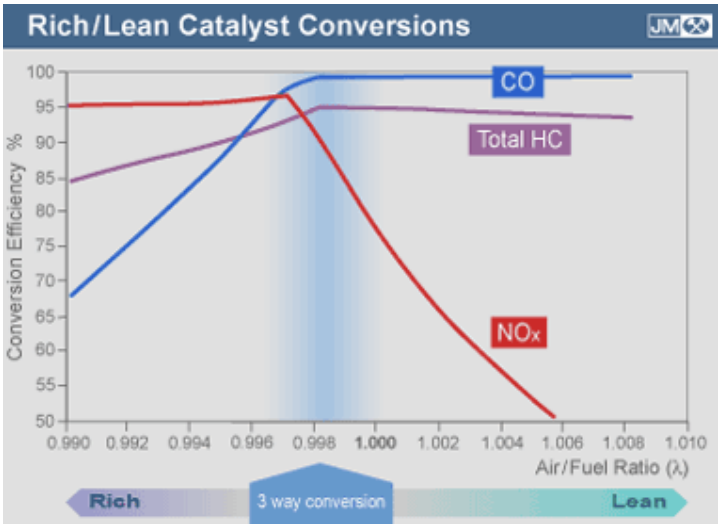
Application of 3-way catalyst systems (NSCR) on lean burn engines operating in excess of 4% O2 are not as ideal as similar applications to rich burn engines firing natural gas. 3-way catalysts can reduce carbon monoxide (CO), hydrocarbons (HC), and oxides of nitrogen (NOx). The following data is presented to support the Applicant's rationale for eliminating NSCR from consideration for use on the large Wartsila lean-burn power cycle engines.

Applicability of the Technology

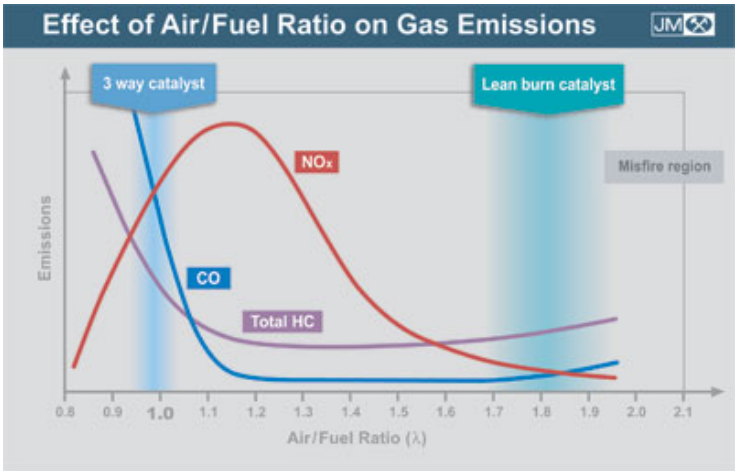
Review of the references listed below indicates the following:

1. For lean burn engines (both 2 and 4 stroke), the control technology recommended is SCR coupled with a CO catalyst.
2. The NESHAPs summary prepared by ILTA, indicates that EPA does not recommend NSCR (TWCs) for lean burn engines in either the major source or area source categories.
3. The CDPHE reasonable progress review for NOx emissions from RICEs clearly indicates that NSCR is not the preferred control technology for lean burn engines, and they state that NSCR is only applicable to rich burn engines. Their technology #5 option, for large lean burn engines, is to control NOx via the use of SCR.
4. The control technology and cost analysis prepared for OAQPS by ECR, Inc., indicates that for 2SLB and 4SLB engines for CO control, an oxidation catalyst is the preferred option. They state that NSCR is applicable to rich burn engines (no cost or technology application data is presented for NSCR applied to lean burn engines).
5. Draft cost effectiveness data from OAQPS (3-21-06) only addresses NSCR for rich burn engines.
6. Data compiled by MECA (1997) indicates that the preferred NOx control for large lean burn engines is SCR, and for CO is the use of an oxidation catalyst.
7. In the STAPPA-ALAPCO RICE summary, they indicate that NSCR is not applicable to lean burn engines, and that SCR is the recommended technology for such engines.
8. The Applicant concludes that NSCR is not applicable to, or available for use on the large Wartsila lean burn engines, and as such, no cost data is presented for this technology.
9. Several of the primary TWC manufacturers (such as Miratech) do not recommend TWC systems for large lean burn 4-stroke engines, but rather they recommend SCR in conjunction with a CO Catalyst. For example, Miratech makes TWCs for rich burn engines up to 10,000 bhp. The Wartsila engines are rated at 12,874 bhp, and are lean burn design.
10. The Applicant could not find a manufacturer that builds a TWC that could handle the exhaust flows from the Wartisla engines, i.e., in excess of 61,000 acfm at fuel rated load.
11. Data provided by JM Catalysts shows the following for lean burn engine TWC applications:

Graph 1:



Graph 2:



12. Data from these two graphs, which is typical of those presented in most of the TWC (NSCR) manufacturers websites and technical brochures indicates that a TWC system is most likely not the best control system for the proposed Wartsila lean-burn engines. Data presented in the Wartsila brochure in Appendix F.1 indicates that the engines operate in the air-fuel ratio range of slightly above 2.0 but less than 2.3. In addition, Caterpillar clearly indicates on its website for TWCs that they cannot operate efficiently on lean-burn engines.
13. In addition, the following technical data is presented as further evidence that NSCR is not BACT for the proposed Wartsila lean burn engines.

Three-Way Catalysts: Aging, Causes of Failure and Deactivation

Three-Way Catalytic Converters ("Three-Way Catalysts", "TWC") are generally effective at achieving significant reductions of Carbon Monoxide, Hydrocarbons and Nitrogen Oxides. Unfortunately, the operating conditions to which Three-Way Converters are subjected often cause their catalysts to become thermally, chemically and/or mechanically deactivated. These causes of deactivation may occur separately or in combination, but their net effect is always the removal of active sites from the converter's catalytic surface. Catalytic deactivation is broadly defined as a phenomenon in which the structure and state of the catalyst changes, leading to the loss of active sites on the catalyst's surface, thereby causing a decrease in the catalyst's performance. High temperatures and high temperature gradients, the presence of poisons and other impurities, as well as the fluctuation of gas phase composition and flow rates all increase the possibility of catalytic de-activation .

Thermal Deactivation by Thermal Degradation and Sintering

Thermal degradation of a Three-Way Catalyst begins at temperatures between 800° - 900° C, or in some cases, at lower temperatures depending upon the catalytic material. Thermal degradation is a physical process which leads to catalytic deactivation at high temperatures. Deactivation of this type is caused by a loss of catalytic surface area due to crystalline growth of the catalytic phase, the loss of washcoat area due to the collapse of the pore structure, and/or chemical transformations of catalytic phases to non-catalytic phases. The first two processes are typically referred to as sintering and the third process as Solid-solid Phase Transition at high temperatures.

Sintering: There are two models used to explain how sintering occurs: 1) the atomic migration model, and 2) the crystallite migration model.

1. The Atomic Migration Model: during atomic migration, .sintering occurs due to metal atoms migrating from one crystallite to another via the catalyst surface or gas phase by diminishing the size of small crystallites and increasing the size of larger ones.

2. The Crystallite Migration Model: during crystallite migration, sintering occurs when crystallites migrate along the catalyst's surface. During crystallite migration, crystallites collide and coalesce to form larger crystallites.

In any case, the formulation and growth of crystals on the catalyst's surface reduce the amount active sites which affect the oxidation of pollutant emissions. It should be mentioned that the rate of sintering increases exponentially with temperature and becomes increasingly pronounced above temperatures of 600°C. Temperatures in the range of 800° - 900° C are not expected to occur in the Wartsila engine exhaust stream.

Solid-solid Phase Transitions: are extreme forms of sintering that occur at very high temperatures and lead to the transformation of one crystalline phase into another. Phase transformations typically occur in the bulk washcoat and they dramatically decrease the surface area of the catalyst.

Active precious metals are commonly used as catalysts for the purification of exhaust gasses. Of

all of the precious metals employed in TWCs—platinum, palladium and rhodium—rhodium has the greatest propensity to sinter at high temperatures. This leads to poor activity in the reduction of NOx, as rhodium is the most commonly used precious metal in a TWC's reduction catalysts.

Re-dispersion: re-dispersion is a process that is the opposite of sintering. During re-dispersion, complex phenomena occur. Among them, particle sizes decrease and the surface area increases. In particular, the interaction between oxygen and precious metals may lead to the formation of species that are mobile on the catalyst's surface and reverse the process of agglomeration.

Chemical Deactivation, Poisoning and Inhibition

Accumulation of fuels and lubricants on catalytic surfaces reduces a catalyst's effectiveness. Poisoning is defined as a loss of catalytic activity due to the chemisorptions of impurities on the catalyst's the active sites. Normally, a distinction is made between poisons and inhibitors. Poisons are substances that interact very strongly and irreversibly with the catalyst's active sites, whereas the adsorption of inhibitors on the catalytic surface is weak and most-often reversible.

Catalytic converters are poisoned and/or inhibited by impurities contained in fuel and lubrication oils, or by metal shavings from the exhaust pipe. Even low levels of impurities are enough to completely cover a catalyst's active sites. Of all poisons and inhibitors, lead, sulfur, phosphorus, zinc, calcium and magnesium are the most common.

Fuel-based Poisons and Inhibitors:

Lead (Pb): Pb is arguably the most damaging catalytic poison. Catalytic converters are known to completely lose their catalytic capacity with persistent use of fuel containing lead, and the effects of lead on the catalyst are irreversible. This will not be the case for the proposed engines firing natural gas.

Sulfur (S): The presence of sulfur as oxide or sulfide invariably and often immediately decreases catalytic performance. Sulfur competes with other exhaust pollutants for space on the catalytic surface. During the combustion process, fuel sulfur oxidizes to SO2 and SO3. These compounds absorb onto the catalytic surface at low temperatures and react with alumina to form aluminum sulfates. These sulfates reduce the active surface of the wash coat and deactivate the catalyst. Deactivation of this type has the duel effect of reducing the converter's overall performance as well as its oxygen storage capacity. The impact of sulfur on aged catalysts is typically irreversible under temperatures of 650°C. It should also be noted that even though catalytic purification efficiency is partially recoverable at higher temperatures, oxygen storage capacity is not. Fuel based poisons and/or inhibitors are not expected to be present in the natural gas proposed for use at the facility (but see the discussion below for SOx and LOC).

Lube Oil Poisons and Inhibitors

Lube oils can enter into the exhaust system by leaking through worn out piston rings, faulty valve seals, failed gaskets and/or warped engine components. Fouling occurs when lube oil emissions coat the catalyst with carbon soot. Carbon deposits prevent the catalytic converter

from reducing harmful emissions, and they also reduce air flow. Reduced air flow increases engine backpressure and can force heat and exhaust gasses back into the engine compartment. In some cases, the engine may actually draw back exhaust gasses into the combustion chamber. Re-entrance of exhaust gases into the combustion chamber reduces subsequent combustion cycle efficiency. Reduced cycle efficiencies result in a loss of power, increased emissions, and overheating of engine components.

The process of a catalyst being coated with carbon soot is technically referred to as "coke formation". In technical terms, coke formation is a phenomenon during which carbonaceous residues cover the catalyst's active sites and decrease the catalyst's active surface area. A primary cause of "pore blockage" is caused when coke formations are so large that carbon blocks the internal pores of the catalyst, thereby prohibiting airflow.

Phosphorus, zinc, calcium and magnesium are the most common impurities found in lubrication oils. Like sulfur, these substances accumulate on the catalyst's surface and compete with other exhaust pollutants for surface area (26). These substances are generally regarded as catalyst inhibitors, rather than catalyst poisons. All of them however, decrease catalytic efficiency and can potentially cause harm to the engine.

Lube oil consumption, and combustion (LOC), has been addressed by the facility in its calculation of potential SOx emissions. Wartsila has provided information which indicates that up to 0.2 lbs/hr of SO2 can emitted from each engine due to LOC. Therefore, lube oil constituent poisoning is a potential problem for the use of TWCs at the proposed facility.

Mechanical Deactivation

Mechanical deactivation is caused by mechanical malfunction, improper operation of key components or physical damage being inflicted upon the TWC converter. Based upon the design of the proposed system, mechanical deactivation is not anticipated to be a viable circumstance at the proposed facility.

Meltdown: Converters can literally melt down when conditions become so rich that raw fuel is discharged from the combustion chamber into the exhaust flow. Fuel in the exhaust flow can be ignited by a catalyst's high temperatures. Burning fuel within the converter creates so much additional heat that the ceramic catalyst is unable to withstand the high temperatures and begins to melt. Melting causes the ceramic monolith to collapse and the converter to be destroyed. A melted ceramic converter may significantly block exhaust flow and cause irreparable damage to the engine. This situation is not anticipated to occur with the engines chosen due to the lean burn design and the controls on each engine with respect to air-fuel ratios.

Converter meltdown can also be caused by other malfunctions including: faulty oxygen sensors, incorrect fuel mixtures, worn spark plugs or plug wires, faulty check valves, incorrect ignition timing, faulty fuel injectors and other ignition malfunctions.

Deteriorated Spark Plugs or Spark Plug Wires: spark plugs that don't fire, or misfire, can cause

unburned fuel to be discharged into the exhaust system.

Improperly Operating Oxygen Sensor: an oxygen sensor failure can lead to incorrect readings of exhaust gasses. A faulty sensor can cause air / fuel ratios to be either too rich or too lean. A rich mixture can cause fuel to be discharged into the exhaust system. Lean mixtures produce conditions which diminish the rate at which hydrocarbons are oxidized.

Catalyst Fracture: fracture to the catalyst can be caused by the catalyst becoming loose or cracked. Once breakage occurs, pieces of the converter may dislodge and begin obstruct air flow. Airflow obstruction creates backpressure and increases heat in the exhaust system, which can ultimately lead to overheating.

For the above noted reasons, the use of NSCR (TWCs) on the Wartsila engines was rejected in favor of a more technically proven SCR/CO Catalyst control system.

References:

1. www.sabertec.com
2. Universal Emissions Technologies, Full Line Catalog, 3-way Catalysts
3. Miratech Emissions Solutions, www.miratechcorp.com , MIR 3 Way 04-04 Rev 1.
4. Miratech RICE NESHAPs Summary, www.miratechcorp.com
5. CleanAir Systems, A Caterpillar Company, CleanAir Assure TWC FAQ Sheet, www.clenairsys.com.
6. Johnson Matthey Catalysts, http://ect.jmcatalysts.com, 3-Way NSCR Catalysts.
7. RICE-Controlling NOx Under the CAA:A Menu of Options, STAPPA-ALAPCO (no date).
8. Control Costs for Existing Stationary SI RICE, ECR Inc., June 2010, Memorandum to Melanie King-EPA,OAPQS/SPPD/ESG.
9. Draft Estimates of Cost Effectiveness for NSCR for Rich-burn IC Engines, Jaime Pagan-EPA/OAQPS, 3-21-06.
10. Emissions Control Technology for Stationary ICEs, Status Report, MECA, Washington, D.C., July 1997.
11. RICE, NOx Emission Factor Analysis for Reasonable Progress, CDPHE-APCD, 2007.
12. NOx Control for Stationary Gas Engines, MARAMA Workshop, JM Catalysts, May 2011.
13. RICE NESHAPs Rule Summary, International Liquid Terminals Assoc., June 2010.
14. Alternative Control Techniques Document: Stationary Diesel Engines, ECR Inc., USEPA/OAQPS, March 2010.
15. Control of Compressor Engine Emissions-Related Costs and Considerations, Thomas Mark, 10/2003.
16. Engine Classification Matrix: Control Options and Costs, Argonne Nationla Laboratory, 3/2007.
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18. NOx Emissions Control Costs for Stationary RICEs in NOx SIP Call States, E.H. Pechan and Associates, Inc., Revised Final Report, USEPA/OAQPS, 8/2000.
19. Air Emissions Regulations Affecting Natural Gas Transmission, 2011 CORE Symposium, J. McCarthy, 5/2011.
20. SOTA Manual for RICEs, NJDEP/DAQ, Section 3.13, 2003.

21. Catalyst Control Cost Information, ICCR Coordinating Committee, Sept 1998.
22. Control Costs for Existing Stationary CI RICE, ECR Inc., Memo to Melanie King-USEPA/OAQPS, Jan 2010.

Attachment F.6-2
SCR and CO Catalyst Cost-Effectiveness
Screening Level Values

SCR and CO Catalyst Cost-Effectiveness Screening Level Values

The Applicant's SCR and CO catalyst systems are being designed and purchased as integral system to the Wartsila engines. As such, a breakout of individual system costs is difficult. The following table presents data extracted from the various sources noted in the NSCR discussion above and references below which the Applicant believes clearly shows that the chosen control technologies for NOx and CO are very cost effective.

Large Lean-burn SI Natural Gas-fired RICEs		
Cost Effectiveness Values, $/ton Reduced		
HP	NOx (SCR)	CO (Oxidation Catalyst)
250	$4280-$4810	-
1000	$1320-$1490	-
4000	$580-$660	-
100 to >500	$430-$4900	<$5000
1000	$2400-$3200	-
300-500*	$8800	-
500-100*	$10,300	-
Applicant's estimated data for the Wartsila engines.	*~$7500*	*~$2700*
*SCR as an incremental control to LEC.		

Preliminary screening level cost analyses for the proposed engine control systems are presented in the following tables.

References:

1. JM Catalysts, MARAMA Workshop, NOx Control For Stationary Gas Engines, W. Chu, May 2011.
2. Wartsila Air Emissions Solutions, Marketing and Application Development Presentation, R. Wettstein, Wartsila, June 2011.
3. Wartsila Low NOx Solutions, Scope and Experience, SFT-Oslo, H-P Nesse, Wartsila, May 2008.
4. Baltic NECA-Economic Impacts, Center for Maritime Studies, J. Kalli et al., Oct 2010.
5. SCR Presentation, J. Boij, Wartsila, March 2007.
6. See other references in the NSCR discussion above.

Attachment F.6-2 Table 1

QBPP

SCR Catalyst Control System (per engine)

Pollutant Controlled: Nox (steady state only)

CAPITAL COST SUMMARY

DIRECT CAPITAL COSTS		Explanation of Cost Estimates (2011 $)
1. Purchased Equipment:		**Base Controlled Case**
A) Purchased Equipment Costs	$344,100	Ref 3, best estimate from Applicant
B) Other Required Systems (urea system)	$0	per Applicant
C) Instrumentation & Controls	$34,410	EPA OAQPS 10% of A
D) Freight	$17,205	EPA OAQPS 5% of A
E) Taxes	$27,700	7.0% Tax Rate (NC avg)
Total Purchased Equip. Costs (TEC):	$423,415	
2. Installation Costs:		
A) Foundation & Supports	$33,900	EPA OAQPS 8% of TEC
B) Erection and Handling	$148,200	EPA OAQPS 35% of TEC
C) Electrical	$25,400	EPA OAQPS 6% of TEC
D) Piping	$63,500	EPA OAQPS 15% of TEC
E) Insulation	$8,500	EPA OAQPS 2% of TEC
F) Painting	$16,900	EPA OAQPS 4% of TEC
G) Site Preparation	$41,800	estimated by Project engineer
Total Installation Costs (TINC):	$338,200	
Total Direct Capital Costs (TDCC):	$761,615	Sum TEC,TINC
INDIRECT CAPITAL COSTS		
1. Engineering & Supervision	$63,500	EPA OAQPS 15% of TEC
2. Construction and Field Exp.	$42,300	EPA OAQPS 10% of TEC
3. Contractor Fees	$21,200	EPA OAQPS 5% of TEC
4. Start-up	$4,200	EPA OAQPS 1% of TEC
5. Performance Testing	$4,200	EPA OAQPS 1% of TEC
Total Indirect Capital Costs (TICC):	$135,400	
Total Direct & Indirect Capital Costs (TDICC):	$897,015	Sum TDCC,TICC
Contingency (@ 3%):	$26,900	3% TDICC (EPA OAQPS)
TOTAL CAPITAL COSTS (TCC):	$923,915	Sum TDICC,Contingency

ANNUAL OPERATING COST SUMMARY

DIRECT OPERATING COSTS		Explanation of Cost Estimates
1. Operating Labor	$0	1 hr/day, @41.50 hr, 200 days/yr
2. Supervisory Labor	$0	EPA OAQPS 15% Operating Labor
3. Maintenance Labor	$0	1 hr/day, @41.50 hr, 200 days/yr
4. Maintenance Materials	$0	100% of maintenance labor costs
4. Utility Expenses (gas and electricity, plus fuel penalty cost)	$0	see Cost Est tab
5. Media replacement and disposal (catalyst, every 3 yrs)	$0	see Cost Est tab
6. Process chemicals costs (urea)	$0	see Cost Est tab
7. Annual Media Cost	$0	Item 5 divided by media life (yrs), x CRF (7%, 3 yrs, = 0.381)
8. Other Penalties (specify)	$0	Loss power sales $, added SCR maint., see Cost Est tab
Total Direct Operating Costs (TDOC):	$275,000	Ref 3, best estimate from Applicant
INDIRECT OPERATING COSTS		
1. Overhead	$0	60% Total Labor, EPA OAQPS
Total Indirect Operating Costs (TIOC):	$0	
CAPITAL CHARGES & COSTS		
1. Property Tax	$9,200	EPA OAQPS 1% TCC
2. Insurance	$9,200	EPA OAQPS 1% TCC
3. General Administrative	$18,500	EPA OAQPS 2% TCC
4. Capital Recovery Cost	$74,500	7% per OMB, 30 yr plant life, CRF=.0806
Total Capital Charges Costs (TCCC):	$111,400	Sum 1,2,3,4
TOTAL ANNUALIZED OPERATING COSTS:	$386,400	Sum TDOC,TIOC,TCCC

COST EFFECTIVENESS EVALUATION

Uncontrolled Case Emissions		
Base Concentration-Uncontrolled	1.000	g/bhp-hr, see Note 5
Annual Emission Rate	54.2	tpy (steady state emissions only)
Incremental Controlled Emissions Case		
NOx Concentration	0.046	g/bhp-hr, lean burn with SCR
Annual Emission Rate:	2.50	tpy
NOx Reduction from Uncontrolled Case:	51.7	tpy
Control Cost Effectiveness:	**$7,500**	per ton NOx

References:

1. OAQPS - OAQPS Cost Control Manual, 6th ED., January 2002, EPA

2. EPA1998 - Cost Effectiveness fo Oxidation Catalyst Control of HAP Emissions from Stationary Combustion Turbines, EPA, 1998.

3. data supplied by Applicant, Wartsila Air Solutions Paper, June 2011, R. Wettstein.

4. JM Catalysts, MARAMA Workshop Paper, May 2011, at $42 kw equipment cost, adjusted to $37 kw by applicant.

5. Assumes low emissions combustion design, 40 CFR 60 Subpart JJJJ Nox floor. for SI NG engines over 500 hp for 7/2010 compliance.

Attachment F.6-2, Table 2

QBPP

CO Oxidation Catalyst Control System (per engine)

Pollutant Controlled: CO (and VOC, VOC HAPs)

CAPITAL COST SUMMARY

DIRECT CAPITAL COSTS		Explanation of Cost Estimates (2011 $)
1. Purchased Equipment:		**Base Cost - 90% Control**
A) Purchased Equipment Costs	$165,000	Ref 4, $12.80 per BHP
B) Other Required Systems	$0	from Applicant
C) Instrumentation & Controls	$16,500	EPA OAQPS 10% of A
D) Freight	$8,250	EPA OAQPS 5% of A
E) Taxes	$13,283	7% Tax Rate (NC avg)
Total Purchased Equip. Costs (TEC):	$203,033	
2. Installation Costs:		
A) Foundation & Supports	$16,200	EPA OAQPS 8% of TEC
B) Erection and Handling	$71,100	EPA OAQPS 35% of TEC
C) Electrical	$12,200	EPA OAQPS 6% of TEC
D) Piping	$10,200	EPA OAQPS 5% of TEC
E) Insulation	$4,100	EPA OAQPS 2% of TEC
F) Painting	$4,100	EPA OAQPS 2% of TEC
G) Site Preparation	$0	estimated by Project engineer
Total Installation Costs (TINC):	$117,900	
Total Direct Capital Costs (TDCC):	$320,933	Sum TEC,TINC
INDIRECT CAPITAL COSTS		
1. Engineering & Supervision	$30,500	EPA OAQPS 15% of TEC
2. Construction and Field Exp.	$20,300	EPA OAQPS 10% of TEC
3. Contractor Fees	$10,200	EPA OAQPS 5% of TEC
4. Start-up	$4,100	EPA OAQPS 2% of TEC
5. Performance Testing	$2,000	EPA OAQPS 1% of TEC
Total Indirect Capital Costs (TICC):	$67,100	
Total Direct & Indirect Capital Costs (TDICC):	$388,033	Sum TDCC,TICC
Contingency (@ 3%):	$11,600	3% TDICC (EPA OAQPS)
TOTAL CAPITAL COSTS (TCC):	$399,633	Sum TDICC,Contingency

ANNUAL OPERATING COST SUMMARY

DIRECT OPERATING COSTS		Explanation of Cost Estimates
1. Operating Labor	$0	0.5 hr/day, @41.50 hr, 200 days/yr
2. Supervisory Labor	$0	EPA OAQPS 15% Operating Labor
3. Maintenance Labor	$0	0.5 hr/day, @41.50 hr, 200 days/yr
4. Maintenance Materials	$0	100% of labor costs
4. Utility Expenses (gas and electricity, plus fuel penalty cost)	$0	see Cost Est tab
5. Media replacement and disposal (catalyst, every 5 yrs)	$0	see Cost Est tab
6. Process chemicals costs	$0	see Cost Est tab
7. Annual Media Cost	$0	Item 5 divided by media life (yrs), x CRF (7%, 5 yrs, = 0.244)
8. Other Penalties (specify)	$0	Loss power sales $, see Cost Est tab
Total Direct Operating Costs (TDOC):	$23,300	Ref 4, $1.81 per BHP
INDIRECT OPERATING COSTS		
1. Overhead	$0	60% Total Labor, EPA OAQPS
Total Indirect Operating Costs (TIOC):	$0	
CAPITAL CHARGES & COSTS		
1. Property Tax	$4,000	EPA OAQPS 1% TCC
2. Insurance	$4,000	EPA OAQPS 1% TCC
3. General Administrative	$8,000	EPA OAQPS 2% TCC
4. Capital Recovery Cost	$32,200	7% per OMB, 30 yr plant life, CRF=.0806
Total Capital Charges Costs (TCCC):	$48,200	Sum 1,2,3,4
TOTAL ANNUALIZED OPERATING COSTS:	$71,500	Sum TDOC,TIOC,TCCC

COST EFFECTIVENESS EVALUATION

Uncontrolled Case Emissions		
Base Concentration-Uncontrolled	0.550	g/bhp-hr, uncontrolled
Annual Emission Rate	29.7	tpy (steady state emissions only)
Controlled Emissions Case		
CO Concentration	0.055	g/bhp-hr, lean burn with CO Catalyst
Annual Emission Rate:	2.97	tpy
CO Reduction from Uncontrolled Case:	26.7	tpy
Control Cost Effectiveness:	**$2,700**	per ton CO

References:

1. OAQPS - OAQPS Cost Control Manual, 6th ED., January 2002, EPA

2. EPA1998 - Cost Effectiveness fo Oxidation Catalyst Control of HAP Emissions from Stationary Combustion Turbines, EPA, 1998.

3, data supplied by Applicant

4. ECR Memo to OAQPS (Melanie King), June 2010. CO catalyst cost regression analysis.

APPENDIX F.7

MITIGATION OF IMPACTS

APPENDIX F.7

Mitigation of Impacts

Table F.7-1 (on the following page) presents the most recent listing of ERCs currently held in the SDAPCD bank as of August 11, 2010.

The Project, pursuant to the APCD NSR rule is **not** required to purchase or acquire sufficient emission reduction credits to offset the proposed project emissions due to its status as a non-major source. As a result of the AQIA for PM10 as required in Rule 20.2(d)(2)(i) and 20.2(d)(2)(v), PM10 offsets are also not required to mitigate PM10 impacts on State AAQS. NSR rule required amounts of ERCs are delineated in Table F.7-2.

TABLE F.7-2 SDAPCD EMISSION BANK CREDITS REQUIRED BY MMC
Emission Reduction Credits - TPY

	PM_{10}	VOC	NO_x	SO_2	CO
SDAPCD Offset Trigger Thresholds	100	50	50	100	100
Facility PTE*	33.1	46.5	44.8	5.74	56.5
Total Emission Credits Required to Mitigate Project Emissions Per District NSR Rules 20.1, 20.2, 20.3.	0	0	0	0	0
PM10 offsets per Rule 20.2(d)(2)(v) PM10 AQIA	0	-	-	-	-

*Values derived from Section 4.7.

The Project currently holds no ERC certificates or other forms of mitigation.

TABLE F.7-3 SDAPCD EMISSION BANK CREDITS HELD BY THE PROJECT AS OF AFC SUBMITTAL DATE
Emission Reduction Credits - TPY

	PM_{10}	VOC	NO_x	SO_2	CO
Total Emission Credits Held/Owned by QBPP at time of AFC/AQMD Application Submittal	0	0	0	0	0

Imposed mitigations pursuant to CEQA, per the CEC authority, will be negotiated, acquired, and implemented per CEC guidance. These mitigations may be one or a combination of the following strategies:

- Acquisition of existing ERCs from the District Bank.
- Development of emissions reductions meeting the requirements of Rules 26.0 through 26.10.

- Funding of the Carl Moyer program as negotiated with the CEC and APCD.
- Funding of other APCD clean air programs as negotiated with the CEC and APCD.

Table F.7-1

San Diego APCD ERC Banking Registry Summary

last update: August 11, 2010
"Subject to Verification"

CLASS A - ACTIVE ERC'S (TPY)				Cumulative Totals	
Company Name	**Certificate No.**	**NOx**	**VOC**	**NOx**	**VOC**
Cabrillo Enterprises, LLC	080527-01		1.25	0.00	1.25
Cabrillo Power II, LLC	978938-05	35.30		35.30	1.25
	981518-01	2.30		37.60	
Childrens Hospital	984240-02	0.54		38.14	1.25
City of San Diego, Metropolitan Wastewater Dept.	950766-06		0.38	38.14	1.63
	970821-02		22.76	38.14	24.39
Element Markets	070823-01	1.10		39.24	24.39
	070823-02		5.30	39.24	29.69
	070823-03		0.20	39.24	29.89
General Dynamics Properties, Inc.	970809-02	1.26		40.50	29.89
	970809-05		0.23	40.50	30.12
Gillis, Johm	070619-02		2.10	40.50	32.22
Grey K. Environmental Fund, LP	983809-01		25.10	40.50	57.32
	060328-01	1.90		42.40	57.32
	060328-02	2.20		44.60	57.32
	060328-03		2.90	44.60	60.22
	060328-04		0.54	44.60	60.76
	060328-05		0.10	44.60	60.86
	060328-06		0.30	44.60	61.16
	060803-02		36.70	44.60	97.86
	070731-01		20.70	44.60	118.56

CLASS A - ACTIVE ERC'S (TPY)				Cumulative Totals	
Company Name	**Certificate No.**	**NOx**	**VOC**	**NOx**	**VOC**
Hanson Aggregates, Pacific SW Region	980772-01	0.93		45.53	118.56
	980772-03		0.26	45.53	118.82
Hughes-Aircraft Co., Electro-Opti Cal Systems	940261-01		1.06	45.53	119.88
	940261-02		0.22	45.53	120.10
IG&E GP, LLC	090819-01		18.70	45.53	138.80
	090819-02		18.70	45.53	157.50
Muht-Hei, Inc.	981002-01		0.18	45.53	157.68
	981002-02		0.18	45.53	157.86
	981002-03		0.18	45.53	158.04
	981002-04		0.18	45.53	158.22
	981002-05		0.57	45.53	158.79
	981002-06		0.19	45.53	158.98
	981002-07		2.23	45.53	161.21
	981002-08		1.28	45.53	162.49
	981002-09		0.18	45.53	162.67
	981002-10		2.07	45.53	164.74
	981002-11		1.28	45.53	166.02
	981002-12		0.57	45.53	166.59
National Steel & Shipbuilding	40995-02	0.18		45.71	166.59
	40995-03		0.60	45.71	167.19
	40996-02	0.04		45.75	167.19
	40997-02	0.32		46.07	167.19
	40997-03		0.02	46.07	167.21
Naval Air Station, North Island	991014-01	8.00		54.07	167.21
	991015-01	3.30		57.37	167.21
	991016-01	18.70		76.07	167.21
Naval Station, San Diego	950949-01	4.83		80.90	167.21

CLASS A - ACTIVE ERC'S (TPY)				Cumulative Totals	
Company Name	**Certificate No.**	**NOx**	**VOC**	**NOx**	**VOC**
	940206-01	0.67		81.57	167.21
	940206-03		0.05	81.57	167.26
Navy Region Southwest	990223-01	12.02		93.59	167.26
Northrop-Grumman Ryan Aeronautical Center	975000-01		1.20	93.59	168.46
Olduvai Gorge LLC	070430-01	2.00		95.59	168.46
	070502-01	14.72		110.31	168.46
	070822-01	1.20		111.51	168.46
	070822-02		0.10	111.51	168.56
	070822-04		11.05	111.51	179.61
	071004-01		10.80	111.51	190.41
	071004-02	12.00		123.51	190.41
	080527-01		16.90	123.51	207.31
	080722-01		21.18	123.51	228.49
Otay Mesa Generating Co., LLC	000427-05	0.78		124.28	228.49
	000224-01	4.40		127.91	228.49
Performance Contracting Inc.	071217-01		1.00	127.91	229.49
SDG&E	983811-01	4.00		131.91	229.49
	060324-01		0.40	131.91	229.89
	060324-02	19.90		151.81	229.89
Sherwin Williams	987553-01		7.46	151.81	237.35
Shipyard Supplies, Inc.	06-0824-02		1.00	151.81	238.35
Solar Turbines	970123-04	10.00		161.81	238.35
	950562-01		0.60	161.81	238.95
Southern California Edison Company	950171-01	0.51		162.32	238.95
	950171-03		0.02	162.32	238.97
Surface Technologies	990325-01		1.48	162.32	240.45
United States Marine Corps	030507-01	3.00		165.32	240.45
US Foam	974375-03		0.10	165.32	240.55

CLASS A - ACTIVE ERC'S (TPY)				Cumulative Totals	
Company Name	**Certificate No.**	**NOx**	**VOC**	**NOx**	**VOC**
SW Division, Naval Facilities Engineering Cmd.	954185-01		2.00	165.32	242.55
	960709-01		9.00	165.32	251.55
	970311-01		13.00	165.32	264.55
	980511-03		3.15	165.32	267.70
	980521-02		13.25	165.32	280.95
	980529-02		7.40	165.32	288.35
Unisys Corporation	901238-01		3.66	165.32	292.01
	921410-01		1.25	165.32	293.26
	940577-01		2.95	165.32	296.21
USN Communications Station	940560-01	2.40		167.72	296.21
	940560-04		0.05	167.72	296.26
	940561-01	0.12		167.84	296.26
	940561-03		0.00	167.84	296.26
	940562-01	0.12		167.96	296.26
	940562-03		0.00	167.96	296.26
Veterans Administration Hospital	979555-01	1.90		169.86	296.26
Witte, Fred	070619-03		2.10	169.86	298.36
	TOTALS (tons/year) =			169.86	298.36

San Diego APCD ERC Banking Registry Summary

last update: August 11, 2010
"Subject to Verification"

CLASS A - ACTIVE ERC's (TPY)					Cumulative Totals		
Company Name	**Certificate No.**	**PM10**	**CO**	**SOx**	**PM10**	**CO**	**SOx**
Cabrillo Power II, LLC	978938-02		15.2		0.00	15.20	0.00
	978938-03	2.8			2.80	15.20	0.00
	978938-04			8.1	2.80	15.20	8.10
	981518-02		0.9		2.80	16.10	8.10
	981518-03	0.1			2.90	16.10	8.10
	981518-04			0.7	2.90	16.10	8.80
City of San Diego, Metropolitan Wastewater Dept.	950766-02		1.88		2.90	17.98	8.80
	950766-04	0.63			3.53	17.98	8.80
Element Markets	070823-04			0.30	3.53	17.98	9.10
	070823-05	0.30			3.83	17.98	9.10
	070823-06		1.30		3.83	19.28	9.10
General Dynamics, Convair	951022-01		64.80		3.83	84.08	9.10
	951022-04			0.10	3.83	84.08	9.20
	951022-07	1.50			5.33	84.08	9.20
General Dynamics Properties, Inc.	970809-01		1.17		5.33	85.25	9.20
	970809-03	0.46			5.79	85.25	9.20
	970809-04			0.02	5.79	85.25	9.22
Grey K Environmental Fund, LP	060328-10		0.70		5.79	85.95	9.22
	060328-08	0.20			5.99	85.95	9.22
	060328-09		2.00		5.99	87.95	9.22
	060328-07	0.40			6.39	87.95	9.22
Hanson Aggregates, Pacific SW Region	980772-02		2.20		6.39	90.15	9.22
	980772-04	0.09			6.48	90.15	9.22

CLASS A - ACTIVE ERC's (TPY)					Cumulative Totals		
Company Name	Certificate No.	PM10	CO	SOx	PM10	CO	SOx
H. G. Fenton Material Co.	41106-03	129.10			135.58	90.15	9.22
	930902-02		3.85		135.58	94.00	9.22
	930902-04	1.06			136.64	94.00	9.22
	930902-05			1.00	136.64	94.00	10.22
	975070-01		1.10		136.64	95.10	10.22
	975070-03	0.10			136.74	95.10	10.22
	975070-04			0.10	136.74	95.10	10.32
	975733-01		1.60		136.74	96.70	10.32
	975733-03	0.20			136.94	96.70	10.32
Jack Brunton	973039-02		24.20		136.94	120.90	10.32
National Steel & Shipbuilding	40994-01	0.10			137.04	120.90	10.32
	40995-01	0.09			137.13	120.90	10.32
	40995-05			0.27	137.13	120.90	10.59
	40995-06		3.40		137.13	124.30	10.59
	40996-01	0.01			137.14	124.30	10.59
	40996-03		0.02		137.14	124.32	10.59
	40996-04			0.35	137.14	124.32	10.94
	40997-01	0.45			137.59	124.32	10.94
	40997-04		0.06		137.59	124.38	10.94
	40997-05			0.04	137.59	124.38	10.98
0.03 tpy of Lead (Pb)	40997-06				137.59	124.38	10.98
Naval Station, San Diego	950949-02		0.75		137.59	125.13	10.98
	950949-03	1.09			138.68	125.13	10.98
	940206-02	0.04			138.72	125.13	10.98
	940206-04		0.12		138.72	125.25	10.98
	940206-05			0.04	138.72	125.25	11.02
NAVERUS, Inc.	040203-01		0.60		138.72	125.85	11.02

CLASS A - ACTIVE ERC's (TPY)					Cumulative Totals		
Company Name	Certificate No.	PM10	CO	SOx	PM10	CO	SOx
	040203-02	0.10			138.82	125.85	11.02
	978227-01		0.90		138.82	126.75	11.02
	978227-03	0.10			138.92	126.75	11.02
	981024-02	0.17			139.09	126.75	11.02
	981024-04		0.37		139.09	127.12	11.02
	981024-05			0.09	139.09	127.12	11.11
	981954-01		4.52		139.09	131.64	11.11
	981954-03			0.28	139.09	131.64	11.39
	981954-04	0.61			139.70	131.64	11.39
Olduvai Gorge LLC	071004-03		50.30		139.70	181.94	11.39
	071004-04	0.85			140.55	181.94	11.39
	071004-05			0.10	140.55	181.94	11.49
Ralston Purina	50055-01	0.50			141.05	181.94	11.49
	50055-02			4.60	141.05	181.94	16.09
	50055-05		3.40		141.05	185.34	16.09
SDG&E	921291-03		55.30		141.05	240.64	16.09
	921291-04	2.90			143.95	240.64	16.09
	979298-02		13.83		143.95	254.47	16.09
South Coast Materials Company	940101-01	10.80			154.75	254.47	16.09
Southern California Edison Company	950171-02		0.11		154.75	254.58	16.09
	950171-04	0.01			154.76	254.58	16.09
	950171-05			0.10	154.76	254.58	16.19
STMicroelectronics, Inc.	978887-01		1.50		154.76	256.08	16.19
	978887-04	0.10			154.86	256.08	16.19
SW Division, Naval Facilities Engineering Cmd.	970312-01	2.00			156.86	256.08	16.19
US Foam	974375-02		1.10		156.86	257.18	16.19
	974375-05	0.10			156.96	257.18	16.19

CLASS A - ACTIVE ERC's (TPY)					Cumulative Totals		
Company Name	**Certificate No.**	**PM10**	**CO**	**SOx**	**PM10**	**CO**	**SOx**
USN Communications Station	940560-02			0.49	156.96	257.18	16.68
	940560-03	0.34			157.30	257.18	16.68
	940560-05		1.05		157.30	258.23	16.68
	940561-02		0.03		157.30	258.26	16.68
	940561-04			0.01	157.30	258.26	16.69
	940561-05	0.00			157.30	258.26	16.69
	940562-02		0.03		157.30	258.29	16.69
	940562-04			0.01	157.30	258.29	16.71
	940562-05	0.00			157.31	258.29	16.71
					PM10	**CO**	**Sox**
	TOTALS (tons/year)=				**157.31**	**258.29**	**16.71**

San Diego APCD MERC Banking Registry Summary

last update: August 11, 2010
"Subject to Verification"

CLASS A - ACTIVE MERC'S (TPY)				Cumulative Totals	
Company Name	Certificate No.	NOx	VOC	NOx	VOC
COMCABWEST USMC	977891-01	4.30		4.30	0.00
Otay Mesa Generating Co. LLC	980626-01	2.53		6.83	0.00
	TOTALS (tons/year) =			6.83	0.00

APPENDIX F.8

CUMULATIVE IMPACTS PROTOCOL AND SUPPORT DATA

APPENDIX F.8

Cumulative Impacts Analysis Protocol

Potential cumulative air quality impacts are not expected to occur or result from the Cogentrix QBPP Project due to the following; (1) emissions from the project are below the SDAPCD major source thresholds, (2) the low predicted impacts as delineated in Section 4.7, and (3) the scarcity of significant major sources within an 8 mile radius of the site. Notwithstanding the foregoing, a request has been made to the SDAPCD for the necessary source records (source locations, stack data, and emissions data) for any identified major stationary sources within the designated 8 mile radius. These records were not received prior to the AFC filing, and as such the cumulative analysis is being prepared for presentation at a later date.

Regional Impacts

Regional air quality impacts are possible for pollutants such as ozone, which involve photochemical processes that can take hours to occur. The Project is not required, per the San Diego Air Pollution Control District (SDAPCD) NSR Rule to supply emissions mitigation (see Appendix B.7), although mitigation for some pollutants may be required by the CEC.

Although the relative importance of VOC and NO_x emissions in ozone formation differs from region to region, and from day to day, most air pollution control plans in California require roughly equivalent controls (on a ton per year basis) for these two pollutants. The change in emissions of the sum of these pollutants, equally weighted, will be used to provide a reasonable estimate of the impact of the Project on ozone levels. The net change in emissions of ozone precursors from the Project will be compared with emissions from all sources within the SDAPCD (Table F.8-1).

Table F.8-1 Estimated SDAPCD Emissions Inventory for 2008 (tons/day)

Source Category	**TOG**	**ROG**	**CO**	**NOx**	**SOx**	**PM10**	**PM2.5**
Total Stationary Sources	357.7	32.3	22.2	9.1	0.5	8.6	6.1
Total Area Sources	58.3	35.8	28.1	2.7	0.2	94.5	16.1
Total Mobile Sources	96.5	88.1	771.9	157	1.3	10.8	8.8
Total Natural Sources	87	67.1	137.6	4.2	1.3	13.9	11.8
Air Basin Total (tons/day)	599.5	223.3	959.8	173	3.3	127.8	42.8
Air Basin Total (tons/yr)[1]	**218,818**	**81,505**	**350,327**	**63,145**	**1,205**	**46,647**	**15,622**

Source: CARB, 3/2011.
[1] based on 365 days/year.

Air quality impacts of fine particulate, PM_{10} and/or $PM_{2.5}$, have the potential to be either regional or localized in nature. On a regional basis, an analysis similar to that proposed above for ozone will be performed, looking at the three pollutants that can form PM_{10} in the atmosphere, i.e., VOC, SO_x, and NO_x, as well as directly emitted particulate matter. SDAPCD regulations do not require offsets to be provided for $PM_{10,}$ NOx, SOx, and VOC emissions from the project, i.e., the net increases are well below the SDAPCD offset trigger thresholds.

As in the case of ozone precursors, emissions of $PM_{10/2.5}$ precursors are expected to have approximately equivalent ambient impacts in forming $PM_{10/2.5}$, per ton of emissions on a regional basis. Table F.8-2 provides the comparison of emissions of the criteria pollutants from the Project with emissions from all sources within the SDAPCD as a whole.

Table F.8-2 Comparison of the Project Emissions to Estimated Inventory for 2008

Category	TOG	ROG[1]	CO	NOx	SOx	PM10	PM2.5
Project Emissions (tons/yr)	0	46.5	56.5	44.8	5.74	33.1	33.1
SDAPCD Total (tons/yr)	218,818	81,505	350,327	63,145	1,205	46,647	15,622
Project % of Air Basin Total (basis Tons/yr)	**0**	**0.057**	**0.016**	**0.071**	**0.48**	**0.071**	**0.212**

[1] Project VOC emissions compared to inventory ROG emissions.

Localized Impacts

Localized impacts from the Project could result from emissions of carbon monoxide, oxides of nitrogen, sulfur oxides, and directly emitted PM_{10}. A dispersion modeling analysis of potential cumulative air quality impacts will be performed for all four of these pollutants.

In evaluating the potential cumulative localized impacts of the Project in conjunction with the impacts of existing facilities and facilities not yet in operation but that are reasonably foreseeable, a potential impact area in which cumulative localized impacts could occur was identified as an area with a radius of 8 miles around the plant site. Based on the results of the proposed air quality modeling analyses described above, "significant" air quality impacts, as that term is defined in federal air quality modeling guidelines, will be determined. If the project's impacts do not exceed the significance levels, no cumulative impacts will be expected to occur, and no further analysis will be required. Otherwise, in order to ensure that other projects that might have significant cumulative impacts in conjunction with the Project are identified, a search area with a radius of 8 miles beyond the project's impact area will be used for the cumulative impacts analysis. Within this search area, three categories of projects with emissions sources will be used as criteria for identification:

- Projects which have recently commenced operations whose emissions may not be reflected in the ambient monitoring background data, i.e., commenced operations after January 2010.

- Projects which have filed for air pollution permits to construct which have not been issued, but that are reasonably anticipated to be issued, and subsequently constructed and operated.
- Foreseeable (reasonably known) projects that have not, to date, filed any applications for development.

The applicable inclusion dates for each of the above source categories will be discussed and approved by the SDAPCD staff. The requested source listings will incorporate these dates. Projects that are existing, and that have been in operation such that their emissions are reflected in the ambient air quality data that has been used to represent background concentrations require no further analysis. The cumulative impacts analysis adds the modeled impacts of selected facilities to the maximum measured background air quality levels, thus ensuring that these existing projects are taken into account.

Projects for which air pollution permits to construct have been issued but that were not operational will be identified through a request of permit records from the SDAPCD. The search will be requested to be performed at two levels. For permits that are considered "major modifications" (i.e., emissions increases greater than 40 tons/year of NO_x or SO_2, 25 tons/year of total suspended particulate, 15 tons/year of PM_{10}), a region within 8 miles of the proposed project site will be evaluated. For projects that had smaller emissions changes, but still greater than 15 tons/year, a region within 8 miles of the proposed project site will also evaluated. Projects that satisfy either of these criteria and that had a permit to construct issued after the applicable inclusion date, will be included in the cumulative air quality impacts analysis. The inclusion date, as noted above, will be selected based on the typical length of time a permit to construct is valid and typical project construction times, to ensure that projects that are not reflected in the current ambient air quality data are included in the analysis. Projects for which the emissions change was smaller than 15 tons/year will be assumed to be *de minimus*, and will not be included in the dispersion modeling analysis.

A list of projects within the project region meeting the above noted criteria has been requested from the SDAPCD staff.

Given the potentially wide geographic area over which the dispersion modeling analysis is to be performed, the Aermod model will be used to evaluate cumulative localized air quality impacts. The detailed modeling procedures, Aermod options, and meteorological data used in the cumulative impacts dispersion analysis were the same as those described in Section 4.7. The receptor grid will be spaced at 100 meters and cover the area in which the detailed modeling analysis (described above) indicates that the project will have impacts that may exceed any significance levels.

Cumulative Impacts Dispersion Modeling

The dispersion modeling analysis of cumulative localized air quality impacts for the proposed project will be evaluated in combination with other reasonably foreseeable projects and air quality levels attributable to existing emission sources, and the impacts were compared to state or federal air quality standards for significant impact. As discussed above, the highest second-highest modeled concentrations will be used to demonstrate compliance with standards based on short-term averaging periods (24 hours or less).

Supporting information to be used in the analysis includes the following:

- 2008 estimated emissions inventory for the SDAPCD (Table F.8-1);
- List of projects resulting from the screening analysis of permit files by the SDAPCD;
- Table delineating location data of sources included in the cumulative air quality impacts dispersion modeling analysis;
- Stack parameters for sources included in the cumulative air quality impacts dispersion modeling analysis; and
- Output files for the dispersion modeling analysis.

APPENDIX F.9

SAN DIEGO APCD PERMIT APPLICATION FORMS

APPENDIX F.9

District Permitting Forms

Pursuant to the SDAPCD Rule 14, the following District permit application forms are included herein:

Form APCD 116 (1)

Form 34AJ (12)

Form Certificate of Exemption (1)

These forms reference data contained in the AFC which is of higher detail than can be input on the actual form. This data is contained in the following specific sections of the AFC:

Section 2.0	Project Description
Section 4.7	Air Quality
Section 4.8	Public Health
Appendices	F.1 through F.10

APPENDIX F.10

Miscellaneous Support Data

This appendix contains miscellaneous support data (text, tables, or figures) that were deemed not consistent for inclusion in Appendices F.1 through F.9.

CALIFORNIA
ENERGY
COMMISSION

CALIFORNIA ENERGY DEMAND 2008-2018 STAFF REVISED FORECAST

Chapter 4 (only)

STAFF FINAL REPORT

NOVEMBER 2007
CEC-200-2007-015-SF2

Arnold Schwarzenegger, *Governor*

CHAPTER 4: SAN DIEGO GAS & ELECTRIC PLANNING AREA

The San Diego Gas & Electric (SDG&E) planning area includes (1) SDG&E bundled retail customers, (2) customers served by non-utility energy service providers (ESPs) using the SDG&E distribution system, and (3) customers served by the city of Escondido.

This chapter first presents forecasts of total and per capita consumption and peak loads for the planning area. It then compares the revised 2008-2018 forecast values to both the draft 2008-2018 and *CED 2006* forecasts. It also discusses the forecasted load factor, jointly determined by the consumption and peak load estimates. The chapter then presents sector consumption and peak load forecasts and compares them at the sector level to both previous forecasts. Finally, the chapter presents estimates of conservation savings embedded in the revised forecast.

Forecast Results

Tables 21 and **22** present comparisons of the planning area electricity consumption and peak demand forecasts for selected years. The revised electricity consumption forecast, presented in Table 21, is less than 1 percent higher than the draft forecast. This is caused by a revision to historical self-generation estimates that increased historical consumption values. The long-term growth rate of the revised forecast is virtually identical to the draft forecast.

Table 21: SDG&E Planning Area
Electricity Consumption Forecast Comparison

Consumption (GWH)					
	CED 2006	Staff Draft	Staff Revised	Percent Difference Staff Revised/CED 2006	Percent Difference Staff Revised/Staff Draft
1990	14,926	14,926	14,926	0.00%	0.00%
2000	19,295	19,295	19,294	0.00%	0.00%
2005	19,988	19,595	19,910	-0.39%	1.61%
2008	21,051	21,130	21,304	1.20%	0.82%
2013	22,614	22,812	23,002	1.71%	0.83%
2016	23,490	23,742	23,960	2.00%	0.92%
Average Annual Growth Rates					
1990-2000	2.60%	2.60%	2.60%		
2000-2005	0.71%	0.31%	0.63%		
2005-2008	1.74%	2.55%	2.28%		
2008-2016	1.38%	1.47%	1.48%		
Historic values are shaded					

Source: California Energy Commission, 2007

Table 22 similarly compares peak forecasts. Differences between the revised peak forecast and the draft forecast are similar to those seen in the electricity consumption comparison.

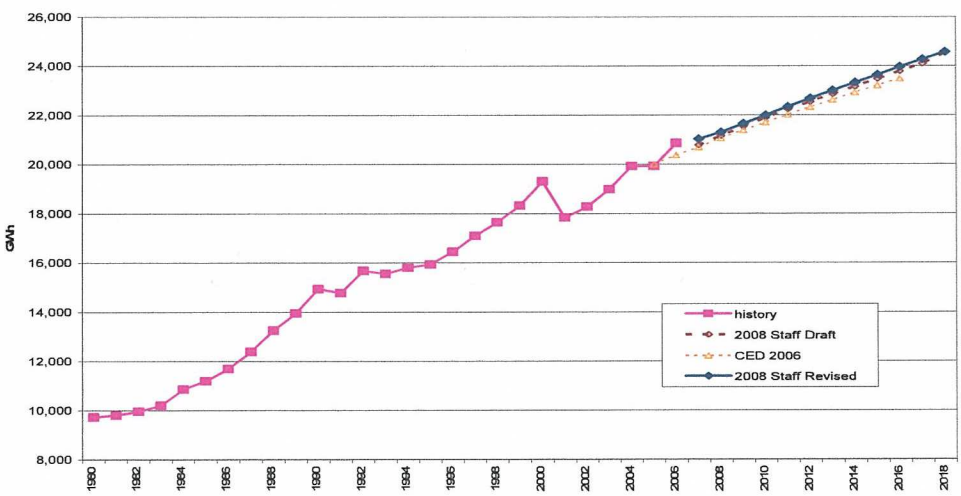
Table 22: SDG&E Planning Area Peak Forecast Comparison

Peak (MW)					
	CED 2006	Staff Draft	Staff Revised	Percent Difference Staff Revised/CED 2006	Percent Difference Staff Revised/Staff Draft
1990	2,961	2,949	2,956	-0.17%	0.23%
2000	3,472	3,471	3,476	0.11%	0.13%
2005	4,231	4,052	4,003	-5.40%	-1.22%
2008	4,451	4,578	4,568	2.63%	-0.21%
2013	4,784	4,899	4,925	2.95%	0.52%
2016	4,970	5,084	5,131	3.23%	0.92%
Average Annual Growth Rates					
1990-2000	1.60%	1.64%	1.63%		
2000-2005	4.03%	3.14%	2.86%		
2005-2008	1.70%	4.15%	4.51%		
2008-2016	1.39%	1.32%	1.46%		
Historic values are shaded					

Source: California Energy Commission, 2007.

As shown in **Figure 75**, the revised forecast is only slightly higher than the draft consumption forecast. Projected growth rates of the forecasts are essentially the same.

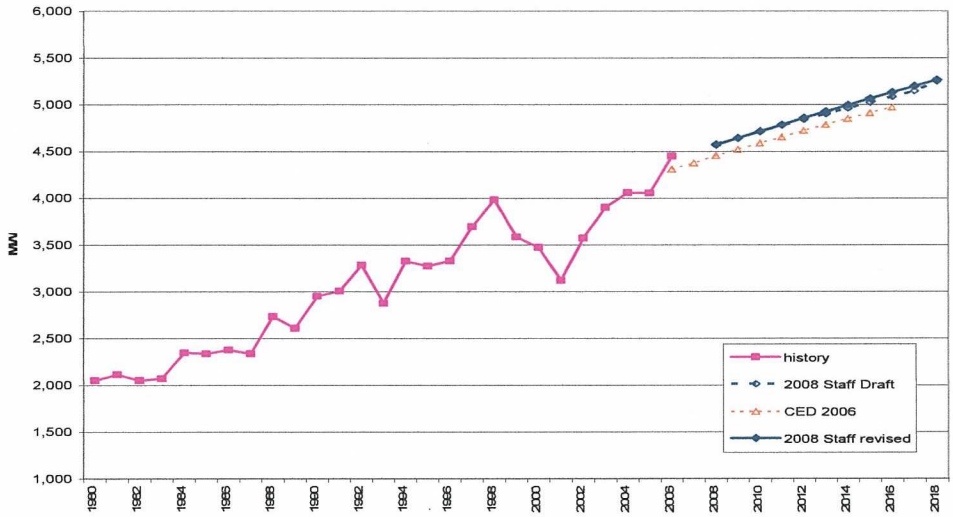
Figure 75: SDG&E Planning Area Electricity Forecast



Source: California Energy Commission, 2007.

Figure 76 compares the various peak forecasts. The revised peak demand forecast has a similar growth rate as the draft forecast. The starting point of the revised forecast is consistent with the updated 2008 peak forecast adopted in June 2007.

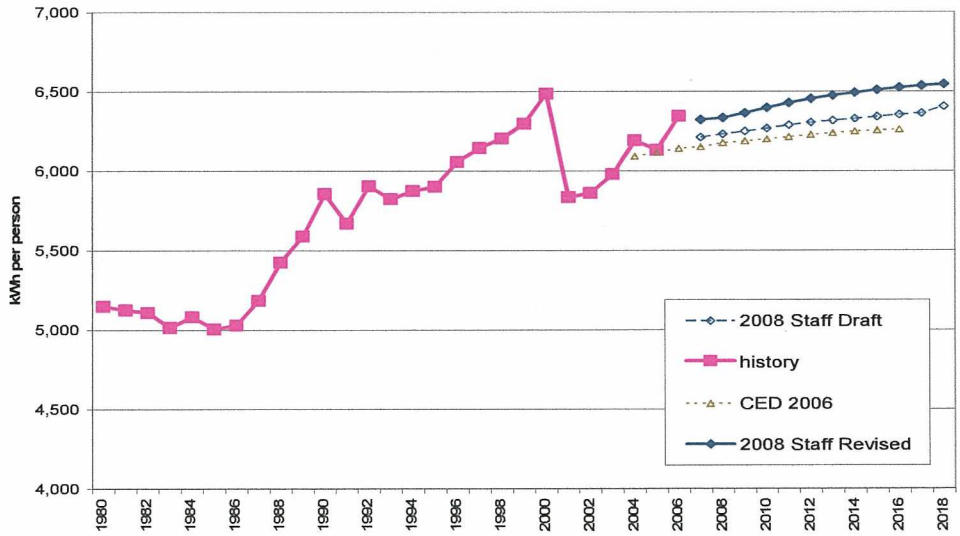
Figure 76: SDG&E Planning Area Peak



Source: California Energy Commission, 2007.

Figure 77 compares forecasted per capita residential electricity consumption. Per capita consumption in the revised forecast is higher than in the draft forecast because of upward revisions to historical consumption estimates and higher projected growth in per capita income.

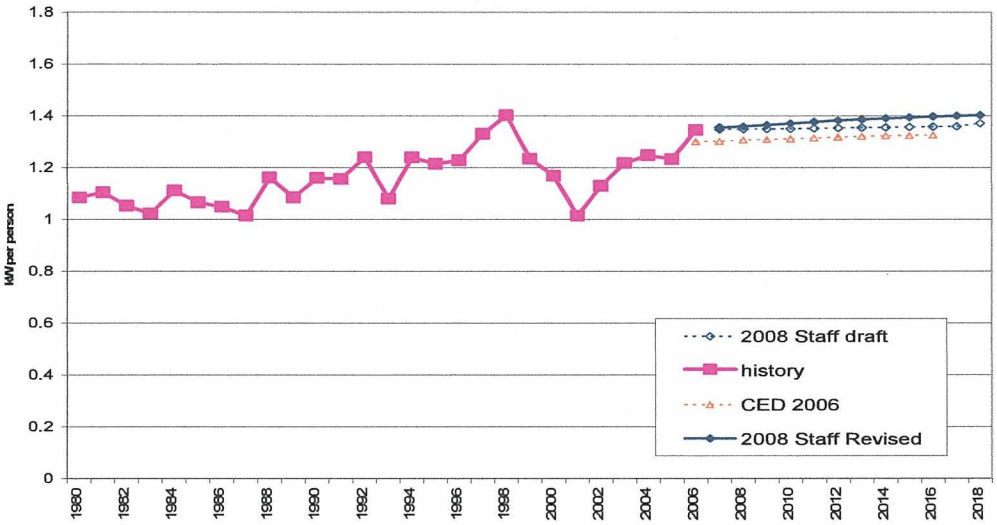
Figure 77: SDG&E Planning Area per Capita Electricity Consumption



Source: California Energy Commission, 2007.

Revised per capita peak demand, shown in **Figure 78**, grows at a slightly greater rate than in the draft forecast. This is caused by both a change in the mix of nonresidential sector consumption projections and an increase in the growth of per capita income over the forecast period. The projections of per capita peak demand still remain below pre-electricity crisis levels until the end of the forecast period.

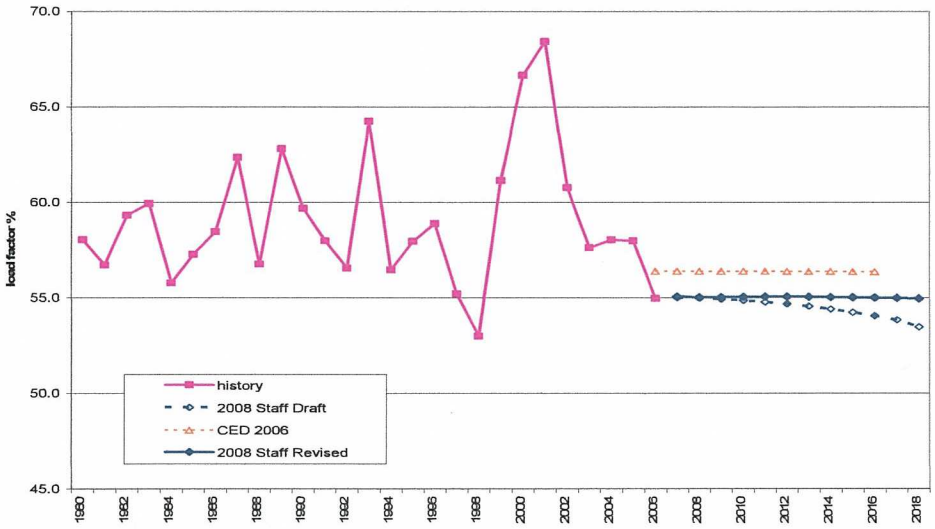
Figure 78: SDG&E Planning Area per Capita Peak Demand



Source: California Energy Commission, 2007.

Figure 79 provides a comparison of the respective forecast load factors. High load factors observed from 1998 to 2005 are a product of lower-than-average temperatures reducing peaks compared with what would have been expected, and a reaction to the energy crisis when consumers voluntarily reduced their air conditioning usage. The projected load factor, based on higher, 1-in-2 peak temperatures and a return to normal air conditioning use patterns, should be lower than these recent values. The forecasted load factor is relatively constant at the lower end of the historical spectrum, reflecting an increase in air conditioning use in the SDG&E territory.

Figure 79: SDG&E Planning Area Peak Load Factor



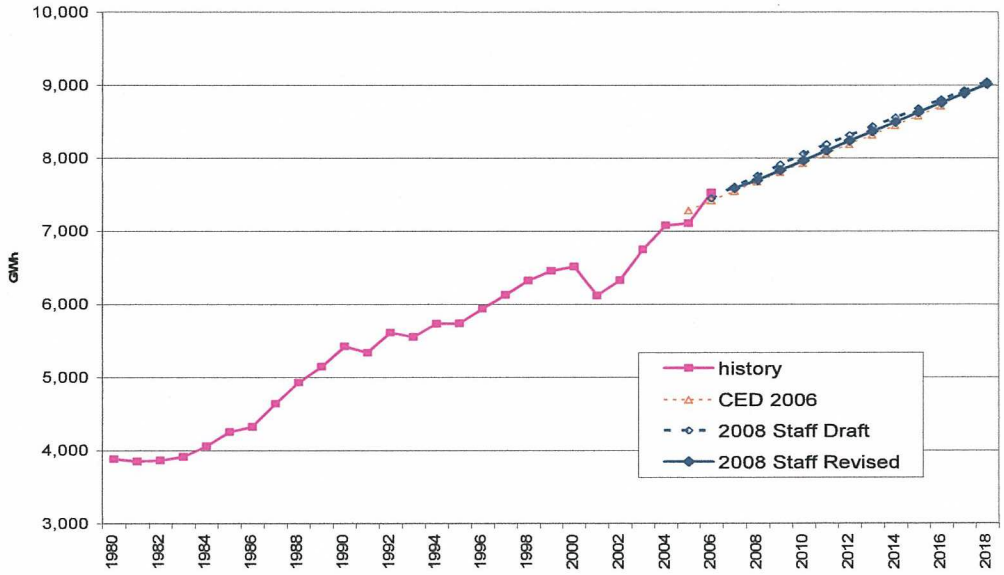
Source: California Energy Commission, 2007.

Sector Level Results and Input Assumptions

Residential

Figure 80 provides comparisons of the residential electricity forecasts. The revised forecast is slightly lower than the draft forecast and slightly higher than the *CED 2006* forecast. These differences are caused by incorporation of the new DOF long-term population forecast for the SDG&E planning area. The new population forecast is slightly lower than the one used in both previous forecasts. However, the lower population forecast is partially offset by faster growth in the revised household income forecast. The draft forecast used December 2006 economic projections from Economy.com; the revised forecast uses their May 2007 projections.

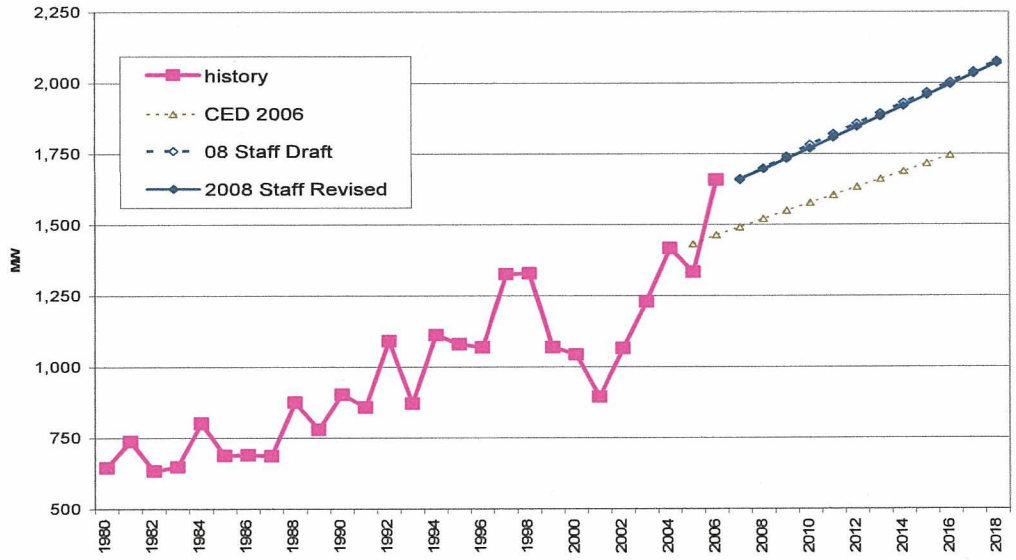
Figure 80: SDG&E Planning Area Residential Consumption



Source: California Energy Commission, 2007

Figure 81 compares the revised 2008-2018 residential peak demand forecasts with both the draft 2008-2018 and *CED 2006* forecasts. The differences in the respective electricity forecasts drive differences between the revised and draft forecasts.

Figure 81: SDG&E Planning Area Residential Peak

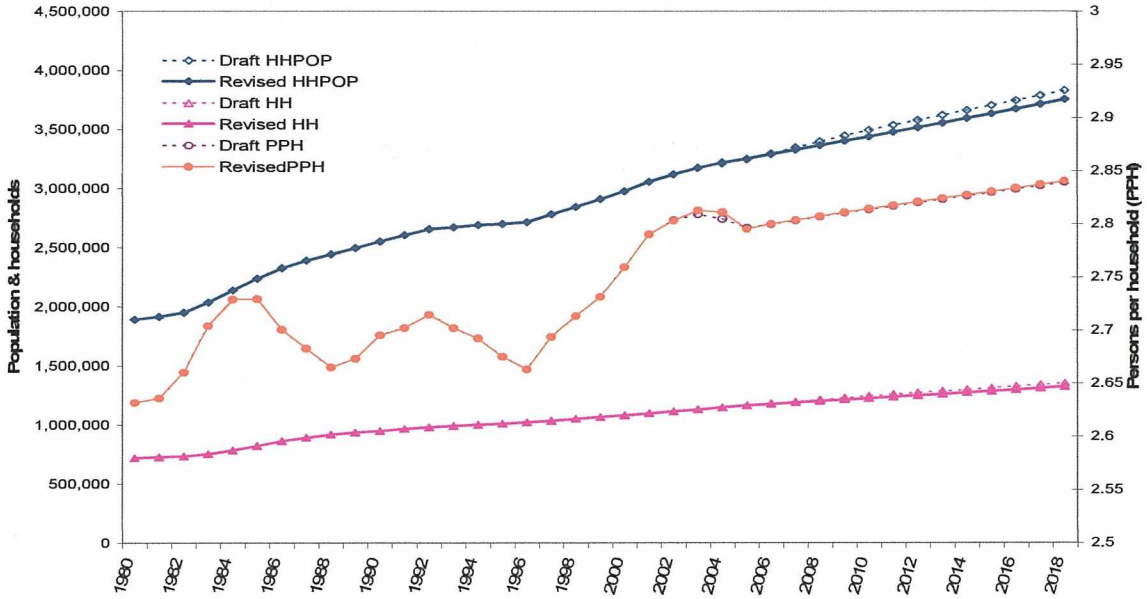


Source: California Energy Commission, 2007

Figures 82 and **83** provide comparisons of the residential drivers used in the revised forecast with those used in the draft forecast. Figure 82 provides comparisons of total population, total households, and persons per household projections. The

revised 2008 forecast of total population is slightly lower than the draft 2008 forecast. This produces a slightly lower revised household forecast.

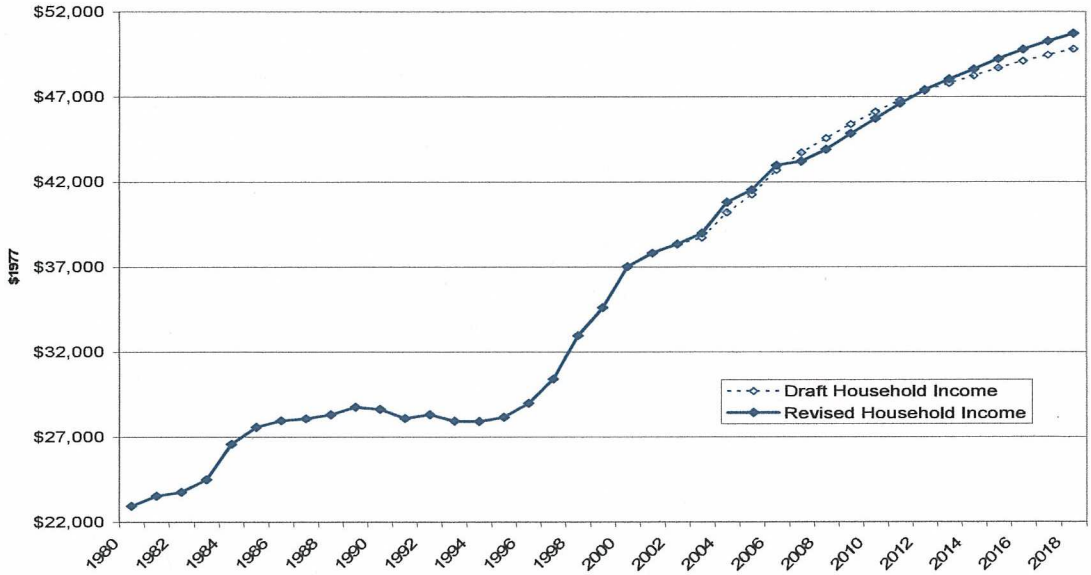
Figure 82: SDG&E Planning Area Residential Demographic Projections



Source: California Energy Commission, 2007

Figure 83 provides a comparison of household income projections used in the revised forecast with those used in the draft forecast. The revised projection, using the May 2007 Economy.com forecast, is lower in the short term but grows at a faster rate over the forecast period than the December 2006 projection that was used in the draft forecast.

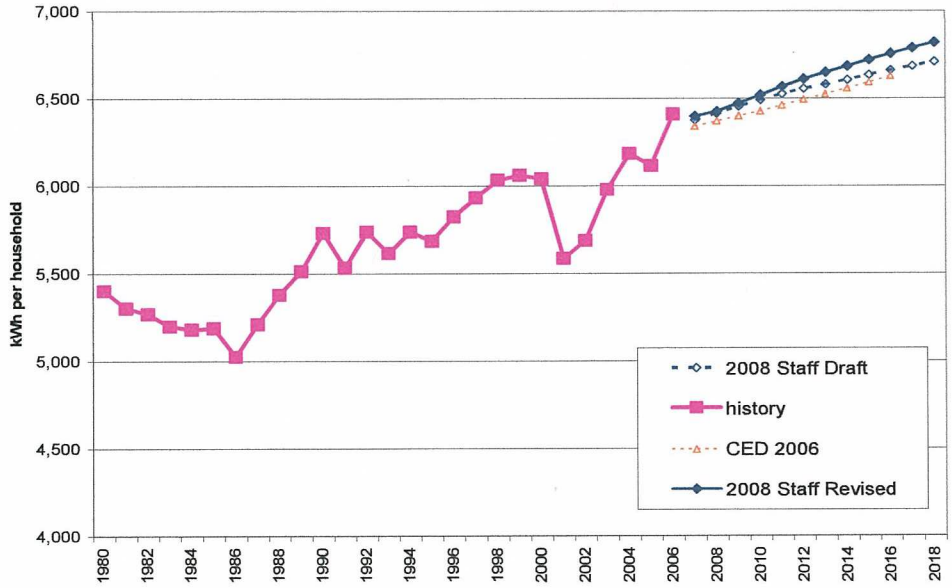
Figure 83: SDG&E Planning Area Household Income Projections



Source: California Energy Commission, 2007.

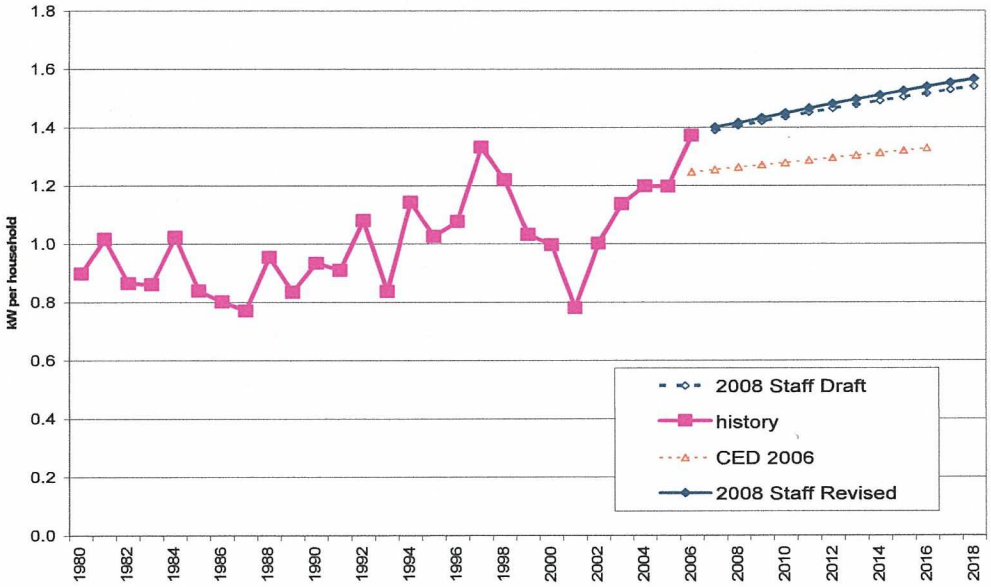
Figures 84 and **85** present comparisons of use per household between the forecasts. Figure 84 is a comparison of annual electricity use per household, and Figure 85 is a comparison of peak demand per household. Both the electricity and peak revised forecasts of use per household are slightly higher than the draft projections, primarily because of higher household income growth projections.

Figure 84: SDG&E Planning Area Use per Household



Source: California Energy Commission, 2007

Figure 85: SDG&E Planning Area Peak Use per Household

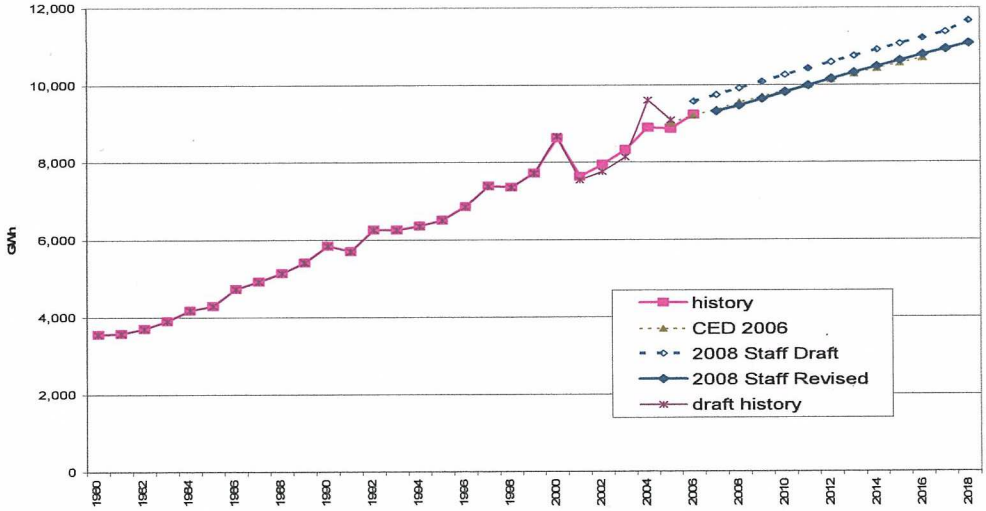


Source: California Energy Commission, 2007

Commercial Building Sector

Figures 86 and **87** provide a comparison of the commercial building sector forecasts. The revised forecast is lower than the draft forecast. This difference is caused by lower estimates of historic consumption, provided by SDG&E, of both commercial retail sales and self-generation. The forecasted growth rates of the forecasts are essentially the same.

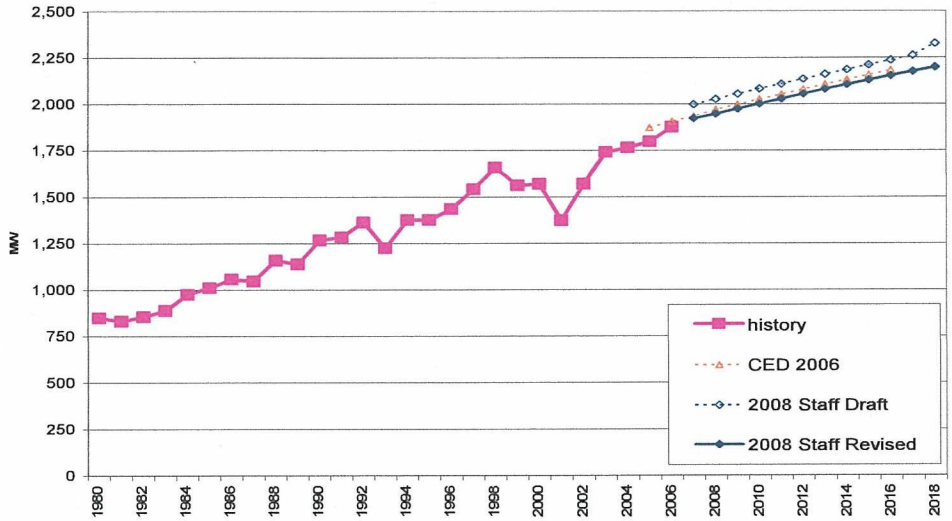
Figure 86: SDG&E Planning Area Commercial Consumption



Source: California Energy Commission, 2007.

Figure 87 provides a comparison of the commercial building sector peak demand forecasts. These differences mirror the differences in energy forecasts.

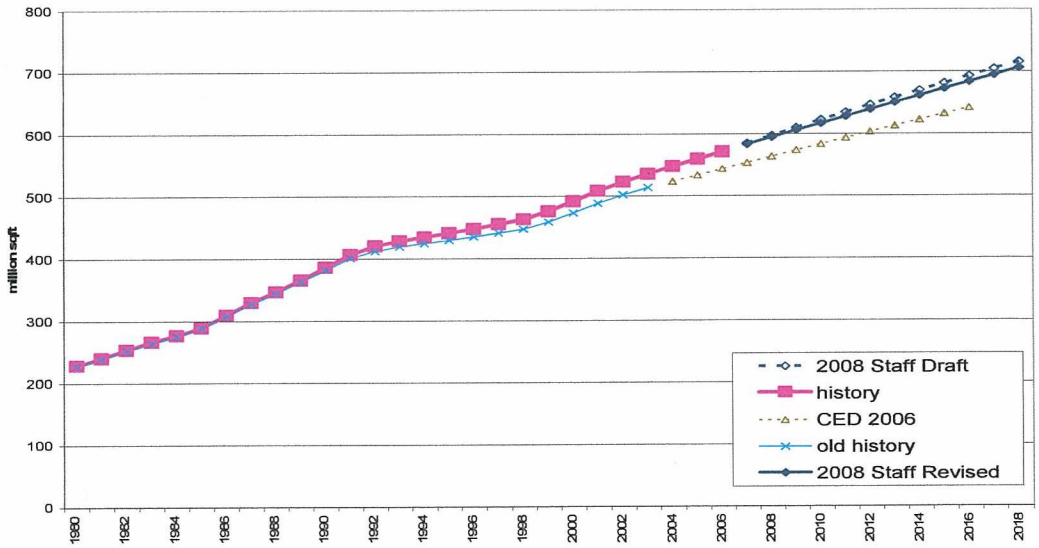
Figure 87: SDG&E Planning Area Commercial Sector Peak



Source: California Energy Commission, 2007.

In staff's commercial building sector forecasting model, projected floor space by building type, such as retail, schools, and offices, is the key driver of forecasted energy use. **Figure 88** provides a comparison of total commercial floor space projections. The revised 2008 floor space forecast is slightly lower than the draft 2008 forecast, primarily because of the lower population forecast.

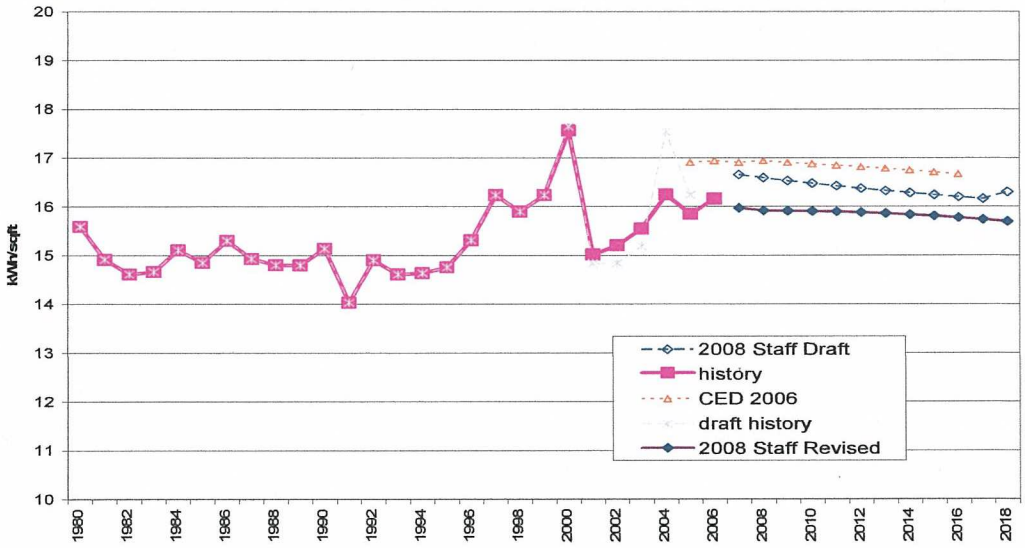
Figure 88: SDG&E Planning Area Commercial Floor Space



Source: California Energy Commission, 2007.

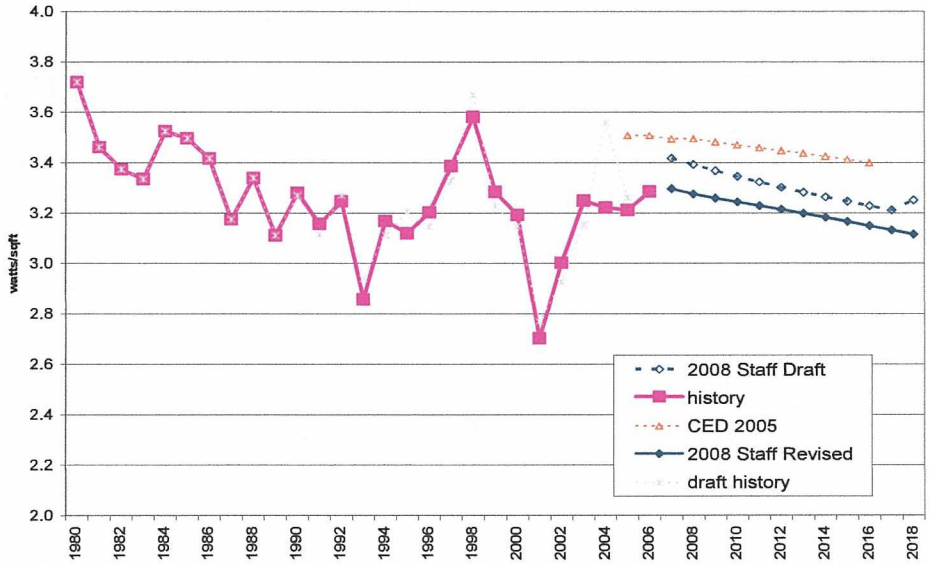
Figures 89 and **90** present historic and projected commercial sector annual and peak use per square foot, respectively. The lower values seen in the revised forecast is related to changes in historical commercial consumption estimates described previously. The revised annual use per square foot forecast, shown in Figure 89, is projected to decline at a slower rate than the draft forecast. However, the revised forecast of commercial peak use per square foot, shown in Figure 90, is projected to decline at a similar rate to the draft forecast. The energy and peak forecasts of use per square foot decline over the forecast period because of projected impacts of commercial building and appliance standards considered to be committed.

Figure 89: SDG&E Planning Area Commercial kWh per Square Foot



Source: California Energy Commission, 2007.

Figure 90: SDG&E Planning Area Commercial Watts per Square Foot

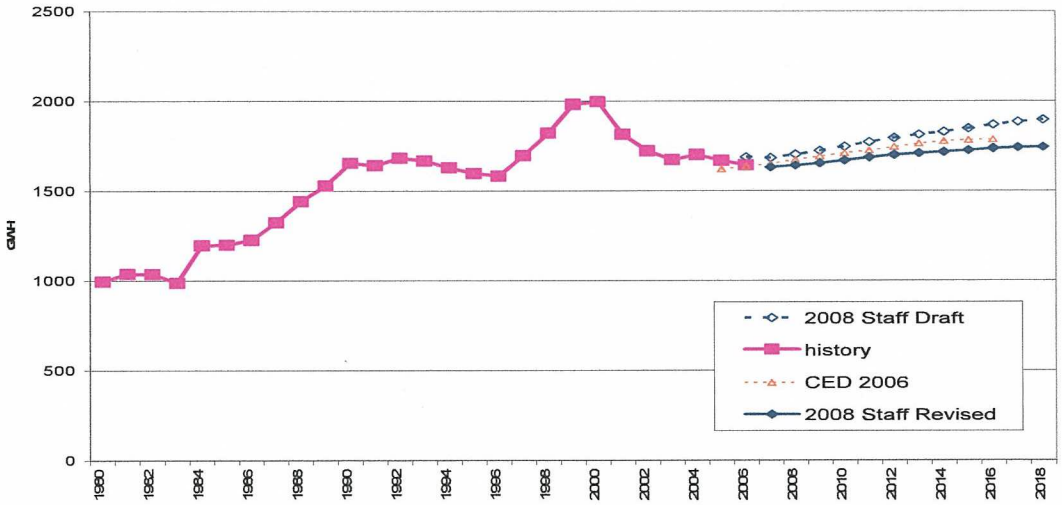


Source: California Energy Commission, 2007.

Industrial Sector

Figure 91 provides a comparison of the industrial sector electricity consumption forecasts for the SDG&E planning area. The revised forecast is lower throughout the entire forecast period than the draft forecast. This is caused by a lower 2006 starting point and revised estimates of energy intensity trends.

Figure 91: SDG&E Planning Area Industrial Consumption



Source: California Energy Commission, 2007.

Figure 92 provides a comparison of the industrial sector peak forecasts. The peak forecast differences are driven by differences in the electricity consumption

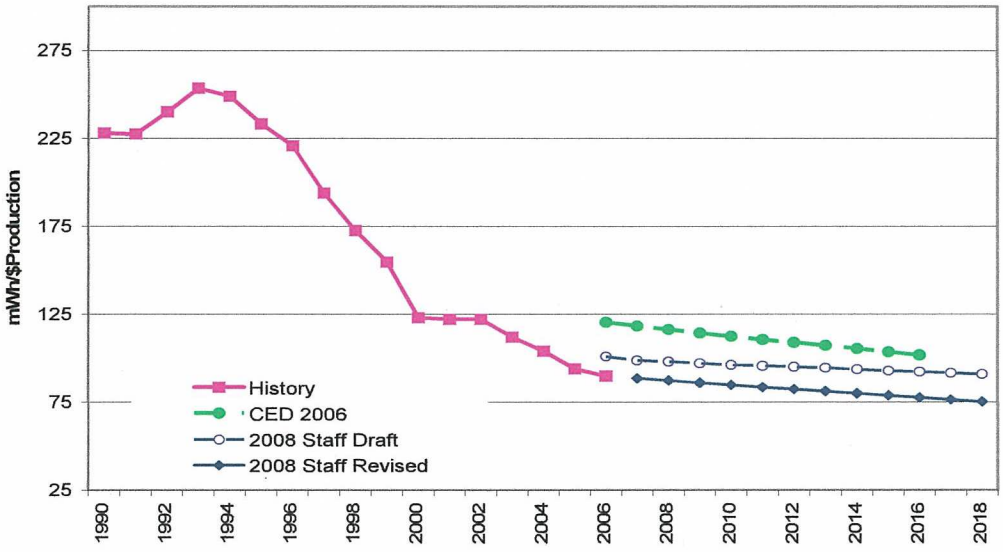
forecasts. As was the case for industrial sector consumption, the revised growth rate of peak demand is slightly lower than that projected in the draft forecast.

Figure 92: SDG&E Planning Area Industrial Sector Peak

Source: California Energy Commission, 2007

Figure 93 provides a comparison of use per dollar value of production between the forecasts. The difference in kWh per dollar of industrial value added in the forecasts is caused by different estimated starting points. The revised forecast of use per dollar of value added declines at a slightly faster rate than the draft forecast. Staff reviewed the historical energy use trends and revised the forecast model assumptions to be more consistent with observed patterns of declining use per dollar of production.

Figure 93: SDG&E Planning Area Industrial Use per Production Unit



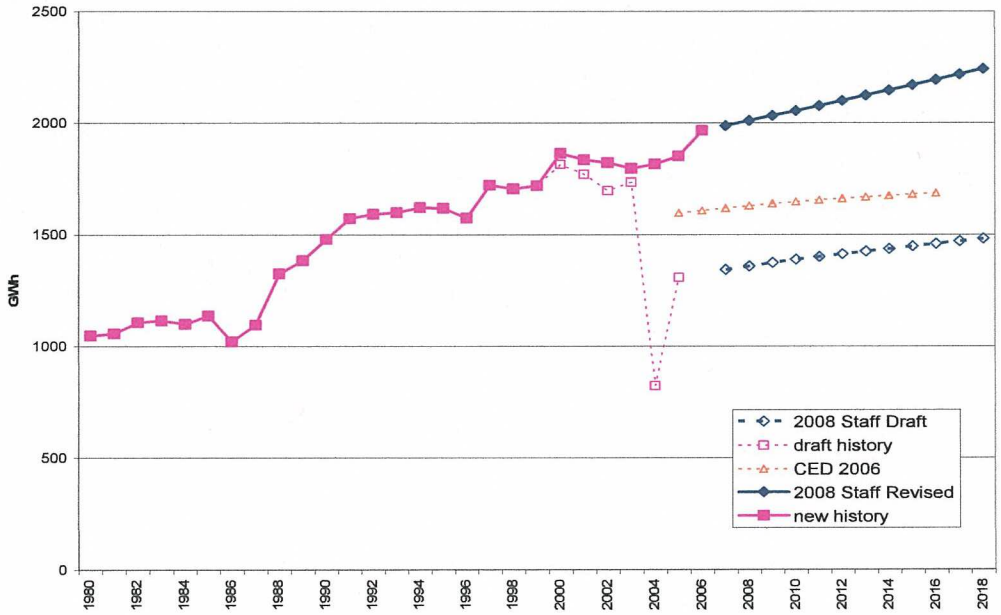
Source: California Energy Commission, 2007

Other Sectors

Figures 94 and **95** provide comparisons of the remaining sector electricity consumption forecasts. Figure 94 provides a comparison of the transportation, communication, and utilities (TCU) sector forecasts. The revised forecast is higher than the draft forecast due to reallocation of additional historical consumption to the TCU sector based on estimates from SDG&E.

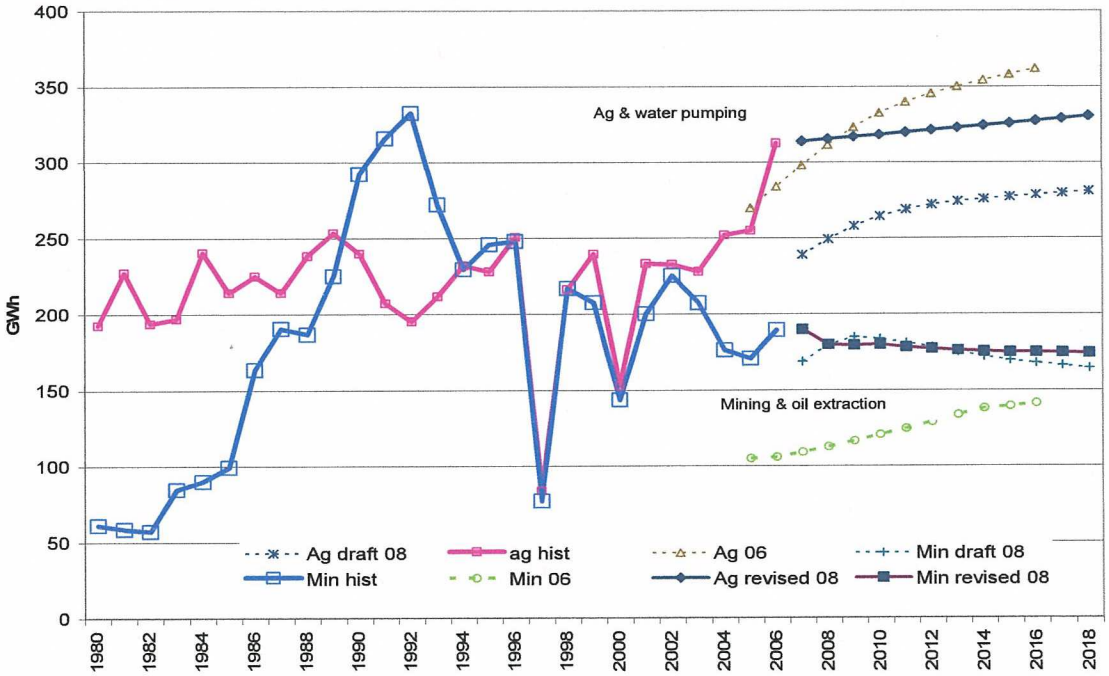
Figure 95 provides comparisons of the agriculture and water pumping and mining and oil extraction sector forecasts. The revised agriculture and water pumping forecast is higher than the draft forecast because inclusion of 2006 consumption data created a higher starting point. The revised mining and oil extraction forecast has a higher starting point because of changes in the unclassified consumption distribution. The lower growth rate of the revised forecast compared to *CED 2006* reflects the pattern of Economy.com's forecast of mining sector employment, which is used as the forecast driver.

Figure 94: SDG&E Planning Area Transportation, Communication, and Utilities Sector Electricity Consumption



Source: California Energy Commission, 2007

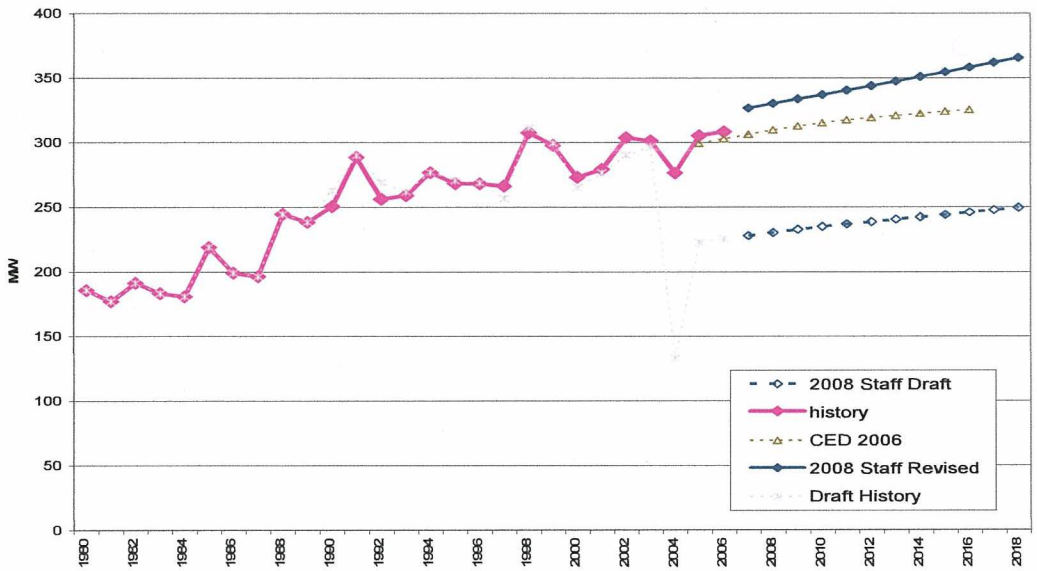
Figure 95: SDG&E Planning Area Agriculture and Water Pumping and Mining and Oil Extraction Electricity Consumption Forecasts



Source: California Energy Commission, 2007

Figure 96 provides a comparison of the combined Other Sector peaks for the draft and revised 2008 forecasts and *CED 2006* forecast. The revised 2008 forecast starts at a higher level than the draft forecast, as does the consumption forecast, because of revised historic consumption data. Both forecasts have a similar growth rate.

Figure 96: SDG&E Planning Area Other Sector Peak



Source: California Energy Commission, 2007.

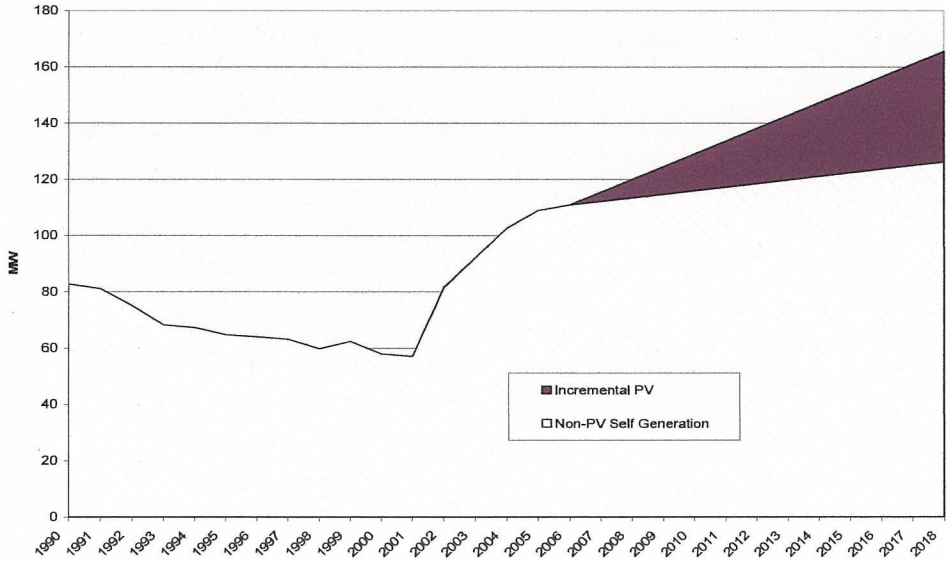
Electricity Prices

As in the draft forecast, the revised 2008 forecast used prices that are held constant (in real terms) at the 2005 level for all sectors. This is in contrast to the declining price forecast that was used in the *CED 2006* price forecast.

Self-Generation

As discussed in Chapter 1, the peak demand forecast is reduced by staff's estimate of the effects of the Self-Generation Incentive Program and California Solar Initiative programs. Both programs are forecast based on the recent trend of installations. **Figure 97** shows the resulting forecast of cumulative peak impacts. Annual impacts are reported as "Private Supply" in Forms 1.2 and 1.4 following this chapter. Because the actual energy consumption and coincident peak impacts of PV are not reported to the Energy Commission, and therefore are not included in the consumption forecast, only the incremental impacts of new PV installations are forecast and subtracted from the peak demand forecast.

Figure 97: SDG&E Planning Private Supply Peak (MW)



Source: California Energy Commission, 2007.

Conservation Savings Embedded in the Forecast

Savings from all building and appliance standards adopted through 2005 are accounted for in the Energy Commission residential and commercial demand forecast models. Savings from public agency and utility programs funded through 2008 are also included. However, there may be some overlap with effects embedded in the demand forecast with uncommitted program impacts; see Chapter 1 for a discussion of this issue. To determine the magnitude of these savings, the models are run without these programs in effect (in the chronological order of the programs' occurrence). The savings are then calculated by subtracting the results of the run with the program in effect from the results without the program in effect. A condensed version of the results of this analysis is presented here as an estimate of savings that are accounted for in the baseline forecast. Additional detail is shown in the tables at the end of this chapter. **Table 23** presents electricity consumption savings, by broad program category, for selected years. **Table 24** presents similar estimates of peak savings.

Table 23: SDG&E Planning Area Electricity Conservation Savings Estimates

	1990	2000	2005	2008	2013	2018
Residential Energy Savings (GWH)						
Building Standards	85	166	208	253	322	387
Appliance Standards	270	636	807	885	1002	1108
Utility and Public Agency Programs	28	19	51	73	73	75
Market and Price Effects	168	288	300	300	300	300
Total Residential Savings	551	1110	1365	1510	1698	1869
Commercial Energy Savings (GWH)						
Building Standards	158	437	687	857	1160	1480
Appliance Standards	99	268	399	487	636	785
Utility and Public Agency Programs	68	287	302	364	356	349
Market and Price Effects	645	524	620	621	693	740
Total Commercial Savings	970	1516	2007	2329	2845	3354
Total Energy Savings	1521	2625	3373	3839	4543	5223

Source: California Energy Commission, 2007.

Table 24: SDG&E Planning Area Peak Conservation Savings Estimates

	1990	2000	2005	2008	2013	2018
Residential Energy Savings (MW)						
Building Standards	53	102	128	145	169	191
Appliance Standards	35	83	105	115	130	144
Utility and Public Agency Programs	9	6	19	27	27	28
Market and Price Effects	39	66	69	69	69	69
Total Residential Savings	136	258	321	357	396	432
Commercial Energy Savings (GWH)						
Building Standards	36	101	158	197	267	340
Appliance Standards	23	62	92	112	146	181
Utility and Public Agency Programs	13	55	57	69	68	67
Market and Price Effects	148	120	143	143	159	170
Total Commercial Savings	221	337	450	521	640	758
Total Energy Savings	356	595	771	878	1036	1190

Source: California Energy Commission, 2007

Form 1.1 - SDG&E Planning Area
California Energy Demand 2008-2018 Staff Revised Forecast
Electricity Consumption by Sector (GWh)

Year	Residential	Commercial	Industrial	Mining	Agricultural	TCU	Street lighting	Total Consumption
1980	3,879	3,555	994	61	193	955	92	9,729
1981	3,848	3,577	1,037	58	227	968	89	9,804
1982	3,858	3,701	1,035	57	194	1,024	82	9,950
1983	3,909	3,900	987	85	197	1,038	77	10,192
1984	4,056	4,174	1,195	90	240	1,021	78	10,854
1985	4,249	4,291	1,199	99	214	1,058	77	11,187
1986	4,323	4,728	1,224	163	225	944	76	11,684
1987	4,638	4,917	1,322	190	214	1,019	77	12,377
1988	4,928	5,130	1,440	187	238	1,250	74	13,246
1989	5,144	5,406	1,527	225	253	1,311	73	13,939
1990	5,421	5,841	1,653	292	240	1,405	73	14,926
1991	5,333	5,698	1,640	316	207	1,495	76	14,764
1992	5,609	6,257	1,680	332	195	1,515	76	15,665
1993	5,549	6,253	1,665	272	212	1,521	77	15,549
1994	5,729	6,352	1,628	229	232	1,542	79	15,791
1995	5,734	6,503	1,595	246	228	1,537	81	15,923
1996	5,935	6,850	1,581	248	251	1,491	82	16,437
1997	6,123	7,384	1,694	77	84	1,637	83	17,082
1998	6,319	7,355	1,819	217	216	1,611	93	17,630
1999	6,453	7,716	1,979	207	239	1,624	93	18,312
2000	6,513	8,628	1,995	143	153	1,767	96	19,294
2001	6,116	7,629	1,813	200	233	1,736	98	17,825
2002	6,326	7,942	1,721	225	232	1,725	96	18,267
2003	6,745	8,322	1,671	207	228	1,691	105	18,968
2004	7,074	8,892	1,699	176	252	1,713	102	19,908
2005	7,105	8,863	1,667	170	255	1,746	105	19,910
2006	7,522	9,222	1,641	189	312	1,857	108	20,851
2007	7,586	9,312	1,630	190	314	1,879	109	21,019
2008	7,697	9,460	1,641	180	315	1,900	110	21,304
2009	7,833	9,634	1,653	179	317	1,922	111	21,650
2010	7,962	9,808	1,668	180	318	1,942	112	21,991
2011	8,099	9,977	1,685	178	320	1,964	113	22,337
2012	8,235	10,146	1,699	177	321	1,986	114	22,677
2013	8,363	10,310	1,708	176	323	2,008	115	23,002
2014	8,490	10,470	1,716	175	324	2,030	116	23,322
2015	8,622	10,625	1,725	175	326	2,052	118	23,643
2016	8,753	10,775	1,736	175	327	2,075	119	23,960
2017	8,881	10,923	1,741	174	329	2,098	120	24,265
2018	9,010	11,067	1,743	174	331	2,121	121	24,567
Annual Growth Rates (%)								
1980-1990	3.4	5.1	5.2	16.9	2.2	3.9	-2.2	4.4
1990-2000	1.9	4.0	1.9	-6.9	-4.4	2.3	2.7	2.6
2000-2006	2.4	1.1	-3.2	4.7	12.7	0.8	1.9	1.3
2006-2011	1.5	1.6	0.5	-1.2	0.5	1.1	1.0	1.4
2011-2018	1.5	1.5	0.5	-0.3	0.5	1.1	1.0	1.4
2006-2018	1.5	1.5	0.5	-0.7	0.5	1.1	1.0	1.4

Form 1.1b - SDG&E Planning Area
California Energy Demand 2008-2018 Staff Revised Forecast
Electricity Sales by Sector (GWh)

Year	Residential	Commercial	Industrial	Mining	Agricultural	TCU	Street lighting	Total Consumption
1980	3,879	3,555	994	61	193	955	92	9,729
1981	3,848	3,577	1,037	58	227	968	89	9,804
1982	3,858	3,695	1,028	57	194	1,024	82	9,938
1983	3,909	3,867	967	85	194	1,038	77	10,136
1984	4,056	4,118	1,131	90	238	991	78	10,701
1985	4,249	4,193	1,115	99	212	983	77	10,928
1986	4,323	4,603	1,109	163	225	861	76	11,360
1987	4,638	4,751	1,125	190	214	923	77	11,918
1988	4,927	4,924	1,191	187	238	1,148	74	12,690
1989	5,144	5,221	1,278	225	253	1,195	73	13,388
1990	5,421	5,663	1,424	292	239	1,284	73	14,397
1991	5,333	5,536	1,406	316	206	1,373	76	14,246
1992	5,609	6,112	1,456	332	195	1,404	76	15,184
1993	5,549	6,107	1,463	272	211	1,433	77	15,112
1994	5,729	6,201	1,441	229	232	1,450	79	15,361
1995	5,734	6,354	1,414	246	228	1,453	81	15,509
1996	5,935	6,701	1,400	248	251	1,412	82	16,028
1997	6,123	7,234	1,522	77	84	1,556	83	16,678
1998	6,319	7,212	1,658	217	216	1,533	93	17,247
1999	6,453	7,570	1,807	207	239	1,543	93	17,913
2000	6,513	8,489	1,843	143	153	1,687	96	18,924
2001	6,116	7,488	1,697	200	233	1,627	98	17,459
2002	6,326	7,700	1,592	225	232	1,574	96	17,745
2003	6,745	7,993	1,516	207	228	1,584	105	18,378
2004	7,074	8,528	1,543	176	252	1,577	102	19,252
2005	7,105	8,499	1,504	170	255	1,575	105	19,213
2006	7,522	8,862	1,484	189	312	1,664	108	20,141
2007	7,585	8,941	1,472	190	314	1,683	109	20,293
2008	7,694	9,078	1,481	180	315	1,703	110	20,561
2009	7,829	9,240	1,491	179	317	1,722	111	20,890
2010	7,957	9,402	1,505	180	318	1,740	112	21,214
2011	8,093	9,559	1,520	178	320	1,760	113	21,542
2012	8,226	9,715	1,532	177	321	1,779	114	21,865
2013	8,353	9,868	1,539	176	323	1,799	115	22,173
2014	8,480	10,016	1,546	175	324	1,819	116	22,476
2015	8,610	10,159	1,553	175	326	1,839	118	22,779
2016	8,740	10,298	1,562	175	327	1,859	119	23,080
2017	8,866	10,434	1,565	174	329	1,880	120	23,368
2018	8,994	10,566	1,565	174	331	1,901	121	23,652
Annual Growth Rates (%)								
1980-1990	3.4	4.8	3.7	16.9	2.2	3.0	-2.2	4.0
1990-2000	1.9	4.1	2.6	-6.9	-4.4	2.8	2.7	2.8
2000-2006	2.4	0.7	-3.5	4.7	12.7	-0.2	1.9	1.0
2006-2011	1.5	1.5	0.5	-1.2	0.5	1.1	1.0	1.4
2011-2018	1.5	1.4	0.4	-0.3	0.5	1.1	1.0	1.3
2006-2018	1.5	1.5	0.4	-0.7	0.5	1.1	1.0	1.3

Form 1.2 - SDGE
California Energy Demand 2008-2018 Staff Revised Forecast
Net Energy for Load (GWh)

Year	Total Consumption	Net Losses	Gross Generation	Non-PV Self Generation	Incremental PV	Total Private Supply	Net Energy for Load
1980	9,729	690	10,419	0	0	0	10,419
1981	9,804	695	10,499	0	0	0	10,499
1982	9,950	705	10,655	13	0	13	10,642
1983	10,192	719	10,911	56	0	56	10,855
1984	10,854	759	11,613	154	0	154	11,459
1985	11,187	775	11,962	259	0	259	11,703
1986	11,684	805	12,489	324	0	324	12,165
1987	12,377	845	13,222	459	0	459	12,763
1988	13,246	900	14,146	557	0	557	13,589
1989	13,939	949	14,888	551	0	551	14,337
1990	14,926	1,021	15,947	529	0	529	15,418
1991	14,764	1,010	15,774	519	0	519	15,256
1992	15,665	1,077	16,741	480	0	480	16,261
1993	15,549	1,071	16,620	436	0	436	16,184
1994	15,791	1,089	16,880	430	0	430	16,450
1995	15,923	1,100	17,023	414	0	414	16,609
1996	16,437	1,136	17,573	409	0	409	17,164
1997	17,082	1,182	18,264	404	0	404	17,860
1998	17,630	1,223	18,853	383	0	383	18,470
1999	18,312	1,270	19,582	399	0	399	19,183
2000	19,294	1,342	20,636	370	0	370	20,265
2001	17,825	1,238	19,063	365	0	365	18,697
2002	18,267	1,258	19,525	522	0	522	19,003
2003	18,968	1,303	20,271	590	0	590	19,681
2004	19,908	1,365	21,273	657	0	657	20,617
2005	19,910	1,362	21,272	697	0	697	20,576
2006	20,851	1,428	22,279	710	0	710	21,569
2007	21,019	1,439	22,458	717	9	726	21,733
2008	21,304	1,459	22,763	725	18	743	22,020
2009	21,650	1,483	23,133	733	27	760	22,373
2010	21,991	1,507	23,498	741	36	777	22,721
2011	22,337	1,531	23,867	749	45	795	23,073
2012	22,677	1,554	24,231	757	54	812	23,419
2013	23,002	1,577	24,579	766	63	829	23,750
2014	23,322	1,599	24,921	774	73	846	24,074
2015	23,643	1,621	25,264	782	82	863	24,400
2016	23,960	1,643	25,603	790	91	881	24,722
2017	24,265	1,664	25,929	798	100	898	25,032
2018	24,567	1,685	26,252	806	109	915	25,337
Annual Growth Rates (%)							
1990-2000	2.6	2.8	2.6	-3.5		-3.5	2.8
2000-2006	1.3	1.0	1.3	11.5		11.5	1.0
2006-2011	1.4	1.4	1.4	1.1		2.3	1.4
2011-2018	1.4	1.4	1.4	1.1	13.3	2.0	1.3
2006-2018	1.4	1.4	1.4	1.1		2.1	1.4

Form 1.3 - SDG&E Planning Area
California Energy Demand 2008-2018 Staff Revised Forecast
Coincident Peak Demand by Sector (MW)

Year	Residential	Commercial	Industrial	Agricultural	Other	Total Demand
1980	645	848	191	24	161	1,870
1981	737	830	183	26	151	1,928
1982	633	854	192	24	167	1,871
1983	647	887	179	24	160	1,896
1984	801	974	210	27	154	2,166
1985	687	1,010	256	28	191	2,172
1986	689	1,056	278	29	169	2,222
1987	686	1,046	282	26	170	2,209
1988	874	1,157	311	30	214	2,587
1989	779	1,137	316	29	209	2,470
1990	902	1,266	362	27	223	2,780
1991	856	1,282	401	27	262	2,828
1992	1,091	1,363	366	21	235	3,076
1993	870	1,223	345	24	235	2,697
1994	1,111	1,375	344	28	249	3,107
1995	1,079	1,375	333	27	241	3,055
1996	1,068	1,433	336	30	238	3,105
1997	1,326	1,540	306	21	245	3,438
1998	1,328	1,657	402	28	280	3,695
1999	1,068	1,561	409	29	268	3,335
2000	1,042	1,568	346	19	254	3,230
2001	894	1,373	336	25	254	2,882
2002	1,064	1,568	357	27	277	3,294
2003	1,229	1,739	347	26	275	3,616
2004	1,416	1,763	308	26	250	3,764
2005	1,332	1,797	327	28	277	3,761
2006	1,657	1,874	304	33	275	4,143
2007	1,661	1,922	317	35	292	4,226
2008	1,695	1,946	316	35	295	4,288
2009	1,733	1,974	318	35	299	4,358
2010	1,769	2,001	321	35	302	4,427
2011	1,807	2,027	323	35	305	4,497
2012	1,845	2,053	325	35	308	4,567
2013	1,881	2,079	327	35	312	4,634
2014	1,919	2,104	328	36	315	4,701
2015	1,957	2,128	329	36	319	4,769
2016	1,994	2,151	331	36	322	4,835
2017	2,032	2,174	332	36	326	4,900
2018	2,069	2,197	333	36	329	4,964

Annual Growth Rates (%)						
1980-1990	3.4	4.1	6.6	1.1	3.3	4.0
1990-2000	1.5	2.2	-0.4	-3.5	1.3	1.5
2000-2006	8.0	3.0	-2.2	9.7	1.3	4.2
2006-2011	1.7	1.6	1.2	1.3	2.1	1.7
2011-2018	2.0	1.2	0.4	0.3	1.1	1.4
2006-2018	1.9	1.3	0.8	0.7	1.5	1.5

Form 1.4 - SDG&E Planning Area
California Energy Demand 2008-2018 Staff Revised Forecast
Peak Demand (MW)

Year	Total End Use Load	Net Losses	Gross Generation	Non-PV Self Generation	Incremental PV	Total Private Supply	Net Peak Demand	Load Factor (%)
1980	1,870	180	2,050	0	0	0	2,050	58
1981	1,928	185	2,113	0	0	0	2,113	56.7
1982	1,871	179	2,050	2	0	2	2,048	59.4
1983	1,896	181	2,077	9	0	9	2,068	60.2
1984	2,166	206	2,372	24	0	24	2,348	56.5
1985	2,172	205	2,377	41	0	41	2,336	58.5
1986	2,222	208	2,430	51	0	51	2,380	60.0
1987	2,209	205	2,414	72	0	72	2,342	64.6
1988	2,587	240	2,827	87	0	87	2,740	59.1
1989	2,470	229	2,699	86	0	86	2,613	65.2
1990	2,780	259	3,039	83	0	83	2,956	59.5
1991	2,828	264	3,092	81	0	81	3,011	57.8
1992	3,076	288	3,364	75	0	75	3,289	56.4
1993	2,697	252	2,949	68	0	68	2,881	64.1
1994	3,107	292	3,399	67	0	67	3,332	56.4
1995	3,055	287	3,342	65	0	65	3,277	57.9
1996	3,105	292	3,397	64	0	64	3,333	58.8
1997	3,438	324	3,762	63	0	63	3,699	55.1
1998	3,695	349	4,044	60	0	60	3,984	52.9
1999	3,335	314	3,650	62	0	62	3,587	61.0
2000	3,230	304	3,534	58	0	58	3,476	66.6
2001	2,882	271	3,153	57	0	57	3,096	68.9
2002	3,294	308	3,602	82	0	82	3,520	61.6
2003	3,616	338	3,954	92	0	92	3,862	58.2
2004	3,764	351	4,115	103	0	103	4,012	58.7
2005	3,761	351	4,112	109	0	109	4,003	58.7
2006	4,143	387	4,530	111	0	111	4,419	55.7
2007	4,226	395	4,621	112	3	115	4,506	55.1
2008	4,288	401	4,688	113	7	120	4,568	55.0
2009	4,358	407	4,765	115	10	125	4,641	55.0
2010	4,427	414	4,841	116	13	129	4,712	55.0
2011	4,497	420	4,917	117	16	134	4,784	55.1
2012	4,567	427	4,994	119	20	138	4,856	55.1
2013	4,634	433	5,068	120	23	143	4,925	55.1
2014	4,701	440	5,141	121	26	147	4,994	55.0
2015	4,769	446	5,215	122	30	152	5,063	55.0
2016	4,835	452	5,287	124	33	156	5,131	55.0
2017	4,900	458	5,359	125	36	161	5,198	55.0
2018	4,964	464	5,429	126	39	166	5,263	55.0
Annual Growth Rates (%)								
1980-1990	4.0	3.7	4.0				3.7	0.3
1990-2000	1.5	1.6	1.5	-3.5		-3.5	1.6	1.1
2000-2006	4.2	4.1	4.2	11.5		11.5	4.1	-2.9
2006-2011	1.7	1.7	1.7	1.1		3.8	1.6	-0.2
2011-2018	1.4	1.4	1.4	1.1	13.3	3.1	1.4	0.0
2006-2018	1.5	1.5	1.5	1.1		3.4	1.5	-0.1

Form 1.5 - SDG&E Planning Area
California Energy Demand 2008-2018 Staff Revised Forecast
Peak Demand (MW)

Year	1-in-2 Temperatures	1-in-5 Temperatures	1-in-10 Temperatures	1-in-20 Temperatures	1-in-5 Multiplier	1-in-10 Multiplier	1-in-20 Multiplier
2006	4,419	4,720	4,808	5,078	1.068	1.088	1.149
2007	4,506	4,812	4,902	5,177	1.068	1.088	1.149
2008	4,568	4,879	4,970	5,249	1.068	1.088	1.149
2009	4,641	4,956	5,049	5,332	1.068	1.088	1.149
2010	4,712	5,032	5,127	5,414	1.068	1.088	1.149
2011	4,784	5,109	5,205	5,497	1.068	1.088	1.149
2012	4,856	5,186	5,283	5,579	1.068	1.088	1.149
2013	4,925	5,260	5,358	5,659	1.068	1.088	1.149
2014	4,994	5,333	5,433	5,738	1.068	1.088	1.149
2015	5,063	5,407	5,509	5,817	1.068	1.088	1.149
2016	5,131	5,480	5,582	5,895	1.068	1.088	1.149
2017	5,198	5,551	5,655	5,972	1.068	1.088	1.149

Form 2.2 - SDG&E Planning Area
California Energy Demand 2008-2018 Staff Revised Forecast
Planning Area Economic and Demographic Assumptions

Year	Population	Households	Persons per Household	Real Personal Income (Millions 2005$)	Industrial Value Added (Millions 2005$)	Commercial Floorspace (MM Sqft.)
1980	1,890,510	718,312	2.63	718,312	980	228
1981	1,913,432	725,903	2.64	725,903	1,026	240
1982	1,948,429	732,411	2.66	732,411	1,024	253
1983	2,033,615	752,124	2.70	752,124	976	266
1984	2,136,850	783,080	2.73	783,080	1,183	276
1985	2,235,850	819,194	2.73	819,194	1,189	289
1986	2,323,871	860,569	2.70	860,569	1,216	309
1987	2,388,259	890,272	2.68	890,272	1,315	329
1988	2,442,254	916,425	2.66	916,425	1,431	347
1989	2,495,065	933,395	2.67	933,395	1,516	365
1990	2,549,875	946,084	2.70	946,084	1,653	386
1991	2,604,754	964,042	2.70	964,042	1,640	406
1992	2,653,615	977,591	2.71	977,591	1,680	420
1993	2,670,770	988,476	2.70	988,476	1,665	428
1994	2,688,860	998,758	2.69	998,758	1,628	434
1995	2,699,012	1,008,967	2.68	1,008,967	1,595	441
1996	2,714,332	1,019,262	2.66	1,019,262	1,581	447
1997	2,780,839	1,032,431	2.69	1,032,431	1,694	455
1998	2,842,512	1,047,694	2.71	1,047,694	1,819	463
1999	2,908,551	1,064,929	2.73	1,064,929	1,979	476
2000	2,975,401	1,078,423	2.76	1,078,423	1,995	491
2001	3,055,475	1,095,189	2.79	1,095,189	1,813	508
2002	3,117,845	1,112,350	2.80	1,112,350	1,721	523
2003	3,173,141	1,128,303	2.81	1,128,303	1,671	535
2004	3,216,011	1,144,173	2.81	1,144,173	1,699	548
2005	3,248,466	1,162,228	2.80	1,162,228	1,667	560
2006	3,286,746	1,173,942	2.80	1,173,942	1,641	571
2007	3,324,761	1,185,992	2.80	1,185,992	1,630	583
2008	3,363,216	1,198,158	2.81	1,198,158	1,641	594
2009	3,402,115	1,210,445	2.81	1,210,445	1,653	606
2010	3,437,594	1,221,612	2.81	1,221,612	1,668	617
2011	3,475,667	1,233,711	2.82	1,233,711	1,685	628
2012	3,514,141	1,245,927	2.82	1,245,927	1,699	639
2013	3,553,025	1,258,255	2.82	1,258,255	1,708	650
2014	3,592,324	1,270,696	2.83	1,270,696	1,716	661
2015	3,632,036	1,283,258	2.83	1,283,258	1,725	672
2016	3,672,175	1,295,936	2.83	1,295,936	1,736	683
2017	3,712,737	1,308,733	2.84	1,308,733	1,741	694
2018	3,753,730	1,321,647	2.84	1,321,647	1,743	705

Annual Growth Rates (%)

1980-1990	3.0	2.8	0.2	2.8	5.4	5.4
1990-2000	1.6	1.3	0.2	1.3	1.9	2.4
2000-2006	1.7	1.4	0.2	1.4	-3.2	2.5
2006-2011	1.1	1.0	0.1	1.0	0.5	1.9
2011-2018	1.1	1.0	0.1	1.0	0.5	1.7
2006-2018	1.1	1.0	0.1	1.0	0.5	1.8

APCD 116 (Rev. 04/07)

SAN DIEGO AIR POLLUTION CONTROL DISTRICT
10124 OLD GROVE ROAD, SAN DIEGO CA 92131-1649
PHONE (858) 586-2600 • FAX (858) 586-2601

PERMIT / REGISTRATION APPLICATION

SUBMITTAL OF THIS APPLICATION DOES NOT GRANT PERMISSION TO CONSTRUCT OR TO OPERATE EQUIPMENT EXCEPT AS SPECIFIED IN RULE 24(d)

IMPORTANT REMINDERS: Read instructions on the reverse side of this form prior to completing this application. Please ensure that all of the following are included before you submit the application:
☒ Appropriate Permit Fee ☒ Completed Supplemental Form(s) ☒ Signature on Application

REASON FOR SUBMITTAL OF APPLICATION: (check the appropriate item and enter Application (AP) or Permit to Operate (PO) number if required)

1. ☒ New Installation 2. ☐ Existing Unpermitted Equipment or Rule 11 Change 3. ☐ Modification of Existing Permitted Equipment
4. ☐ Amendment to Existing Authority to Construct or AP 5. ☐ Change of Equipment Location 6. ☐ Change of Equipment Ownership
7. ☐ Change of Permit Conditions 8. ☐ Change Permit to Operate Status to Inactive 9. ☐ Banking Emissions
10. ☐ Registration of Portable Equipment 11. ☐ Other (Specify) _____
12. List affected AP/PO#(s): _____

APPLICANT INFORMATION

13. Name of Business (DBA) Quail Brush Genco, LLC
14. Nature of Business Electrical power production
15. Does this organization own or operate any other APCD permitted equipment at this or any other adjacent locations in San Diego County? ☐Yes ☒No
If yes, list assigned location ID's listed on your PO's _____
16. Type of Ownership ☐ Corporation ☐ Partnership ☐ Individual Owner ☐ Government Agency ☒ Other Limited Liability Company
17. Name of Legal Owner (if different from DBA) _____

		A. Equipment Owner	B. Authority to Construct (if different from A)
18.	Name	Quail Brush Genco, LLC	
19.	Mailing Address	9405 Arrowpoint Blvd	
20.	City	Charlotte	
21.	State	NC Zip 28273	Zip
22.	Phone	(704) 525-3800 FAX (704) 527-4413	( ) FAX ( )

		C. Permit to Operate (if different from A)	D. Billing Information (if different from A)
23.	Name		
24.	Mailing Address		
25.	City		
26.	State	Zip	Zip
27.	Phone	( ) FAX ( )	( ) FAX ( )

EQUIPMENT/PROCESS INFORMATION: Type of Equipment: ☒ Stationary ☐ Portable.
If portable, will operation exceed 12 consecutive months at the same location ☐ Yes ☐ No

28. Equipment Location Address Sycamore Landfill Rd City Santee Parcel No. _____
29. State CA Zip _____ Phone ( ) _____ FAX ( ) _____
30. Site Contact _____ Title _____ Phone ( ) _____
31. General Description of Equipment/Process Fossil fuel-fired electrical generating plant - NAICS 221112
Peaker facility utilizing SI-IC engine technology
32. Application Submitted by ☒ Owner ☒ Operator ☐ Contractor ☐ Consultant Affiliation _____

EXPEDITED APPLICATION PROCESSING: ☒ **I hereby request Expedited Application Processing and understand that:**

33. a) Expedited processing will incur additional fees and permits will not be issued until the additional fees are paid in full (see Rule 40(d)(8)(iv) for details).
b) Expedited processing is contingent on the availability of qualified staff. c) Once engineering review has begun this request cannot be cancelled.
d) Expedited processing does not guarantee action by any specific date nor does it guarantee permit approval.

I hereby certify that all information provided on this application is true and correct.

34. SIGNATURE _____ Date 6/24/11
35. Print Name Richard W. Gray, Jr. Title Vice President
36. Company Quail Brush Genco, LLC Phone (704) 672-2823 E-mail Address RichardGray@Cogentrix.com

APCD USE ONLY

AP # _____ ID # _____ Cust. No. _____ Sector: _____ UTM's X _____ Y _____ SIC _____
Receipt # _____ Date _____ Amt Rec'd $ _____ Fee Code _____
Engineering Contact _____ Fee Code _____ AP Fee $ _____ T&M Renewal Fee $ _____
Refund Claim # _____ Date _____ Amt $ _____
Application Generated By NV# _____ NC # _____ Other _____ Date _____ Inspector _____

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #1

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation _____ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: _____

Engine hp Rating: _____ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) _____ Model _____

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor _____ cfm ☐ pump _____ gpm

☒ generator 9300 kw ☐ other (specify) _____

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

Gaseous Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

78685 scf/hr _____ ____/wk _____ scf/yr

Exhaust Emission*:	LB/HR	g/HP-HR	g/HR	PPM
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: _____ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: _____

EPA Certification No.: _____

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

58 **1. Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	100					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

59 **2. Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

60 **Describe how unducted gases, vapors, and/or particles get into the outside air.** Provide a brief description of the
61 process or operation for each unducted emission point. If unducted emissions come out of building openings such as
62 doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

63 If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying
64 2' x 2' x 2' bread boxes).

65 _____

66 _____

67 _____

68 _____

69 _____

70 _____

71 _____

72 _____

73 **RECEPTOR DATA** A receptor is a residence or business whose occupants could be exposed to toxic emissions from
74 your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the
75 nearest residence and to the nearest business.

76 Distance to nearest residence ~2600 ft

77 Distance to nearest business ~2200 ft

78 Distance to nearest school ~4900 ft

79 **Name of Preparer:** Richard B. Booth **Title:** Sr. AQ Consultant

80 **Phone No.:** (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

NOTE TO APPLICANT:

Before acting on an application for Authority to Construct or Permit to Operate, the District may require further information, plans, or specifications. Forms with insufficient information may be returned to the applicant for completion, which will cause a delay in application processing and may increase processing fees. The applicant should correspond with equipment and material manufacturers to obtain the information requested on this supplemental form.

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #2

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation _____ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: _____

Engine hp Rating: _____ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) _____ Model _____

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor _____ cfm ☐ pump _____ gpm

☒ generator 9300 kw ☐ other (specify) _____

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

Gaseous Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

78685 scf/hr _____ ___/wk _____ scf/yr

Exhaust Emission*:	LB/HR	g/HP-HR	g/HR	PPM
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: _____ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: _____

EPA Certification No.: _____

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. **Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	100					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. **Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying 2' x 2' x 2' bread boxes).

RECEPTOR DATA A receptor is a residence or business whose occupants could be exposed to toxic emissions from your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the nearest residence and to the nearest business.

Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

NOTE TO APPLICANT:

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #3

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation _____ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: _____

Engine hp Rating: _____ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) _____ Model _____

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor _____ cfm ☐ pump _____ gpm

☒ generator 9300 kw ☐ other (specify) _____

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

Gaseous Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

78685 scf/hr _____ ___/wk _____ scf/yr

Exhaust Emission*:	LB/HR	g/HP-HR	g/HR	PPM
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: _____ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: _____

EPA Certification No.: _____

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. **Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	100					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. **Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying 2' x 2' x 2' bread boxes).

_____

_____

_____

_____

_____

_____

_____

_____

RECEPTOR DATA A receptor is a residence or business whose occupants could be exposed to toxic emissions from your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the nearest residence and to the nearest business.

Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

NOTE TO APPLICANT:

Before acting on an application for Authority to Construct or Permit to Operate, the District may require further information, plans, or specifications. Forms with insufficient information may be returned to the applicant for completion, which will cause a delay in application processing and may increase processing fees. The applicant should correspond with equipment and material manufacturers to obtain the information requested on this supplemental form.

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #4

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation _____ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: _____

Engine hp Rating: _____ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) _____ Model _____

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor _____ cfm ☐ pump _____ gpm

☒ generator 9300 kw ☐ other (specify) _____

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

Gaseous Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

78685 scf/hr _____ ___/wk _____ scf/yr

Exhaust Emission*:	LB/HR	g/HP-HR	g/HR	PPM
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: _____ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: _____

EPA Certification No.: _____

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

58 **1. Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	100					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

59 **2. Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

60 **Describe how unducted gases, vapors, and/or particles get into the outside air.** Provide a brief description of the
61 process or operation for each unducted emission point. If unducted emissions come out of building openings such as
62 doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

63 If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying
64 2' x 2' x 2' bread boxes).

65 _____

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73 **RECEPTOR DATA** A receptor is a residence or business whose occupants could be exposed to toxic emissions from
74 your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the
75 nearest residence and to the nearest business.

76 Distance to nearest residence ~2600 ft

77 Distance to nearest business ~2200 ft

78 Distance to nearest school ~4900 ft

79 **Name of Preparer:** Richard B. Booth **Title:** Sr. AQ Consultant

80 **Phone No.:** (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

NOTE TO APPLICANT:

Before acting on an application for Authority to Construct or Permit to Operate, the District may require further information, plans, or specifications. Forms with insufficient information may be returned to the applicant for completion, which will cause a delay in application processing and may increase processing fees. The applicant should correspond with equipment and material manufacturers to obtain the information requested on this supplemental form.

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #5

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation _____ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: _____

Engine hp Rating: _____ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) _____ Model _____

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor _____ cfm ☐ pump _____ gpm

☒ generator 9300 kw ☐ other (specify) _____

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

Gaseous Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

78685 scf/hr _____ ___/wk _____ scf/yr

Exhaust Emission*:	LB/HR	g/HP-HR	g/HR	PPM
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: _____ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: _____

EPA Certification No.: _____

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. **Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	100					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. **Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying 2' x 2' x 2' bread boxes).

_____

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RECEPTOR DATA A receptor is a residence or business whose occupants could be exposed to toxic emissions from your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the nearest residence and to the nearest business.

Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

NOTE TO APPLICANT:

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #6

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation _____ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: _____

Engine hp Rating: _____ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) _____ Model _____

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor _____ cfm ☐ pump _____ gpm

☒ generator 9300 kw ☐ other (specify) _____

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

Gaseous Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

78685 scf/hr _____ /wk _____ scf/yr

Exhaust Emission*:	LB/HR	g/HP-HR	g/HR	PPM
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: _____ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: _____

EPA Certification No.: _____

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

58 **1. Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	100					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

59 **2. Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

60 **Describe how unducted gases, vapors, and/or particles get into the outside air.** Provide a brief description of the
61 process or operation for each unducted emission point. If unducted emissions come out of building openings such as
62 doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

63 If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying
64 2' x 2' x 2' bread boxes).

65 _____

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73 **RECEPTOR DATA** A receptor is a residence or business whose occupants could be exposed to toxic emissions from
74 your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the
75 nearest residence and to the nearest business.

76 Distance to nearest residence ~2600 ft

77 Distance to nearest business ~2200 ft

78 Distance to nearest school ~4900 ft

79 **Name of Preparer:** Richard B. Booth **Title:** Sr. AQ Consultant

80 **Phone No.:** (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

NOTE TO APPLICANT:

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #7

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation _____ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: _____

Engine hp Rating: _____ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) _____ Model _____

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor _____ cfm ☐ pump _____ gpm

☒ generator 9300 kw ☐ other (specify) _____

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

Gaseous Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

78685 scf/hr _____ ___/wk _____ scf/yr

Exhaust Emission*:	LB/HR	g/HP-HR	g/HR	PPM
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: _____ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: _____

EPA Certification No.: _____

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

58 **1. Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	100					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

59 **2. Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

60 **Describe how unducted gases, vapors, and/or particles get into the outside air.** Provide a brief description of the
61 process or operation for each unducted emission point. If unducted emissions come out of building openings such as
62 doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

63 If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying
64 2' x 2' x 2' bread boxes).

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73 **RECEPTOR DATA** A receptor is a residence or business whose occupants could be exposed to toxic emissions from
74 your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the
75 nearest residence and to the nearest business.

76 Distance to nearest residence ~2600 ft

77 Distance to nearest business ~2200 ft

78 Distance to nearest school ~4900 ft

79 **Name of Preparer:** Richard B. Booth **Title:** Sr. AQ Consultant

80 **Phone No.:** (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #8

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation _____ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: _____

Engine hp Rating: _____ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) _____ Model _____

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor _____ cfm ☐ pump _____ gpm

☒ generator 9300 kw ☐ other (specify) _____

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

Gaseous Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

78685 scf/hr _____ /wk _____ scf/yr

Exhaust Emission*:	LB/HR	g/HP-HR	g/HR	PPM
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: _____ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: _____

EPA Certification No.: _____

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. **Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	100					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. **Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying 2' x 2' x 2' bread boxes).

RECEPTOR DATA A receptor is a residence or business whose occupants could be exposed to toxic emissions from your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the nearest residence and to the nearest business.

Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

NOTE TO APPLICANT:

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #9

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation _____ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: _____

Engine hp Rating: _____ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) _____ Model _____

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor _____ cfm ☐ pump _____ gpm

☒ generator 9300 kw ☐ other (specify) _____

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

Gaseous Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

78685 scf/hr _____ /wk _____ scf/yr

Exhaust Emission*:	LB/HR	g/HP-HR	g/HR	PPM
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: _____ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: _____

EPA Certification No.: _____

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. **Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	100					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. **Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying 2' x 2' x 2' bread boxes).

RECEPTOR DATA A receptor is a residence or business whose occupants could be exposed to toxic emissions from your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the nearest residence and to the nearest business.

Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #10

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation _____ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: _____

Engine hp Rating: _____ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) _____ Model _____

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor _____ cfm ☐ pump _____ gpm

☒ generator 9300 kw ☐ other (specify) _____

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

Gaseous Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

78685 scf/hr _____ /wk _____ scf/yr

Exhaust Emission*:	LB/HR	g/HP-HR	g/HR	PPM
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: _____ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: _____

EPA Certification No.: _____

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. **Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	100					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. **Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying 2' x 2' x 2' bread boxes).

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RECEPTOR DATA A receptor is a residence or business whose occupants could be exposed to toxic emissions from your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the nearest residence and to the nearest business.

Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC ENGINE #11

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation _____ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Wartsila Model: 20V34SG-C2 S/N: _____

Engine hp Rating: _____ Fuel Type: ☐ diesel* ☒ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☒ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) SCR and CO Catalyst

☐ crankcase (blow-by) emission control equipment

(Specify) _____ Model _____

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. CEMS will be installed on each engine to comply with Title IV Acid Rain provisions.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor _____ cfm ☐ pump _____ gpm

☒ generator 9300 kw ☐ other (specify) _____

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☒ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	16	7	37
Maximum	24	7	24

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

Gaseous Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

78685 scf/hr _____ /wk _____ scf/yr

Exhaust Emission*:	LB/HR	g/HP-HR	g/HR	PPM
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 731 °F

Fuel Supplier: SDG&E

Fuel Sulfur Content: _____ % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: 4 ppm % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: _____

EPA Certification No.: _____

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

1. **Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	100					
Stack Diameter (or length/width) (ft)	4					
Exhaust Gas Temperature* (°F)	731					
Exhaust Gas Flow (actual cfm or fps)	61980					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~300					

* Use "70 °F" or "Ambient" if unknown

2. **Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

Describe how unducted gases, vapors, and/or particles get into the outside air. Provide a brief description of the process or operation for each unducted emission point. If unducted emissions come out of building openings such as doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying 2' x 2' x 2' bread boxes).

_____

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RECEPTOR DATA A receptor is a residence or business whose occupants could be exposed to toxic emissions from your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the nearest residence and to the nearest business.

Distance to nearest residence ~2600 ft

Distance to nearest business ~2200 ft

Distance to nearest school ~4900 ft

Name of Preparer: Richard B. Booth **Title:** Sr. AQ Consultant

Phone No.: (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION
FEE SCHEDULE 34A-J

San Diego APCD Use Only
Appl. No.:
ID No.:

INTERNAL COMBUSTION ENGINES

Company Name: Quail Brush Genco, LLC Fire Pump Engine

Equipment Address: Sycamore Landfill Rd., Santee, CA.

Reason for submitting application:

☐ Existing Unit, Date of Installation _____ ☐ Compliance with 2004 Diesel Engine ATCM

☐ Replacement of Existing Unit; ☒ New or Additional Unit

A. EQUIPMENT DESCRIPTION

Engine Mfr.: Clarke Model: JU4H-UFADW8 S/N: _____

Engine hp Rating: 144 Fuel Type: ☒ diesel* ☐ natural gas ☐ gasoline

Combination of fuels (specify) No

Engine Equipment: ☒ turbocharger ☐ aftercooler ☐ 4-degree retard of fuel injection

☐ exhaust gas recirculation ☐ lean burn

☐ pre-chamber combustion ☒ air/fuel controller

☐ diesel particulate filter (attach manufacturer's specification for efficiency, and/or ARB verification.)

☐ other add-on control technology (attach manufacturer's specification for efficiency, and/or ARB verification.)

(Specify) _____

☐ crankcase (blow-by) emission control equipment

(Specify) _____ Model _____

Describe any in stack emission control and/or monitoring devices. (i.e., catalytic converter)

See AFC Section 4.7 (Air Quality) and Appendices F.1 and F.6 for data on stack emission controls and monitoring devices. Mfg's spec sheet in Appendix F.1.

* Diesel fuel must be Certified California Diesel (CARB Diesel).

B PROCESS DESCRIPTION

Engine Drives: ☐ compressor _____ cfm ☒ pump _____ gpm

☐ generator _____ kw ☐ other (specify) _____

Equipment is: ☐ portable ☒ stationary ☐ continuous service

☐ peak shaving electrical supply ☐ cogeneration

☐ emergency electrical supply ☐ used at any time

C. OPERATING SCHEDULE (typical)

	Hours/day	Days/week	Weeks/year
Average	1	1	50
Maximum	1	1	50

Equipped with a non-resettable hour meter? ☒ yes ☐ no

D. FUEL CONSUMPTION AND EMISSIONS (@100% Load)

Liquid Fuel: 10 gal/hr 10 gal/wk 500 gal/yr

Gaseous Fuel: _____ gal/hr _____ gal/wk _____ gal/yr

_____ ___/hr _____ ___/wk _____ ___/yr

Exhaust Emission*:	LB/HR	g/HP-HR	g/HR	PPM
Carbon Monoxides (CO)	see	AFC	for	data
Nitrogen Oxides (NOx)	on	fuel	use	rates
Hydrocarbons (HC) (Non CH4)	and	EMIS	SIONS	
Sulfur Oxides (SOx) @ 12% CO2				
Particulate Matter (PM)				

*Please attach manufacturer's specifications or source of exhaust emission data.

Exhaust Temperature 1040 °F

Fuel Supplier: TBD

Fuel Sulfur Content: .0015 % Sulfur (% wt. as S. (Liquid Fuel))

Fuel Sulfur Content: _____ % Sulfur (% vol. as H2S (Gaseous Fuel))

Engine year of manufacture: ~2013

CARB Certification No.: U-R-004-0429

EPA Certification No.: _____

E. RULE 1200 TOXICS EVALUATION:

FACILITY SITE MAP Please provide a copy of a **Thomas Bros. Map** showing the geographic location of your facility. This helps by making it possible for the District to use a Geographic Information System to identify community residents and workers who may be impacted by emissions from your facility.

PLOT PLAN Please also provide a **facility plot plan or diagram** (need not be to scale as long as distances of key features from reference points are shown) showing the **location of emission point(s)** at the facility, property lines, and the **location** and **dimensions of buildings** (estimated height, width, and length) that are closer than 100 ft. from the emission point. This diagram helps by making it possible for the District to efficiently set-up the inputs for a health risk evaluation. Inaccurate information may adversely affect the outcome of the evaluation.

EMISSION POINT DATA Determine if your emission source(s) are ducted sources or if they are unducted/fugitive sources and provide the necessary data below. (**Examples** of commonly encountered emission points: **Ducted or Stack Emissions** - an exhaust pipe or stack, a roof ventilation duct; **Unducted Emissions** - anything not emitted through a duct, pipe, or stack, for instance, an open window or an outdoor area or volume.)

58 **1. Ducted or Stack Emissions** (For 1 or more emission points). Estimate values if you are unsure.

Parameter	Point #1	Point #2	Point #3	Point #4	Point #5	Point #6
Height of Exhaust above ground (ft)	30					
Stack Diameter (or length/width) (ft)	.33					
Exhaust Gas Temperature* (°F)	1040					
Exhaust Gas Flow (actual cfm or fps)	740					
Is Exhaust Vertical (Yes or No)	Yes					
Raincap? (None, Flapper Valve, Raincap)	None					
Distance to Property Line (+/- 10 ft)	~250					

* Use "70 °F" or "Ambient" if unknown

59 **2. Unducted Emissions** (For 1 or more emission points). Estimate if you are unsure.

60 **Describe how unducted gases, vapors, and/or particles get into the outside air.** Provide a brief description of the
61 process or operation for each unducted emission point. If unducted emissions come out of building openings such as
62 doors or windows, estimate the **size of the opening** (example – 3 ft x 4 ft window).

63 If unducted emissions originate outside your buildings, estimate the **size of the emission zone** (example - paint spraying
64 2' x 2' x 2' bread boxes).

65 _____

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73 **RECEPTOR DATA** A receptor is a residence or business whose occupants could be exposed to toxic emissions from
74 your facility. In order to estimate the risk to nearby receptors, please provide the distance from the emission point to the
75 nearest residence and to the nearest business.

76 Distance to nearest residence ~2600 ft

77 Distance to nearest business ~2200 ft

78 Distance to nearest school ~4900 ft

79 **Name of Preparer:** Richard B. Booth **Title:** Sr. AQ Consultant

80 **Phone No.:** (530) 474-1893 E-mail: altitude3000@gmail.com **Date:** 6/23/11

NOTE TO APPLICANT:

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION
CERTIFICATE OF EXEMPTION Rule 11

San Diego APCD Use Only
Appl. No:
ID No.:

CERTIFICATE OF EXEMPTION (COE)

Company Name: Quail Brush Genco, LLC

Equipment Address: Sycamore Landfill Rd., Santee, CA.

1. Describe the process, operation, or equipment and the source of associated air emissions. List all raw materials used and provide MSDS for each material. (Attach separate supporting document or drawings.)

2 - Warm Start Heaters, each rated at 4 mmbtu/hr fired exclusively on natural gas

1 - Fuel Gas heater, rated at 4 mmbtu/hr, fired exclusively on natural gas

*** See Section 4.7 (Air Quality) of the AFC and Appendix F.1 for operational specifications and emissions for these units.

2. List the manufacturer, make, model # and serial # of the equipment, or other identifying information.

TBD

3. If known, list any other operations in San Diego County that have similar types of equipment/operations:

None

4. How are air emissions limited from this source? (Mechanical, operational, usage or other limits.)

1. use of clean fuels (nat gas), low unit heat rates, moderate use rates, Low NOx Burners

5. What are the estimated average and maximum daily emissions from this source?

Average see #1 lbs/day Maximum:_____ lbs/day of ☐ VOC, ☐ PM10, ☐ Nox (Check One)

6. Provide emission calculations and/or explain how emission estimates were determined.

*** See Section 4.7 (Air Quality) of the AFC and Appendix F.1 for operational specifications and emissions for these units.

I certify that the information provided above is correct to the best of my knowledge. The above equipment, process or operation will not be modified in such a manner as to result in an increase in emissions without prior written approval of the San Diego Air Pollution Control District.

Signature: _____ Title: Vice President.

Name: Richard W. Gray, Jr. Phone: (704) 672-2823

APPENDIX F.10

MISCELLANEOUS SUPPORT DATA