APPENDIX A (of the PEA)

PROPOSED AMENDED REGULATION XX:

Proposed Amended Rule 2002

In order to save space and avoid repetition, please refer to the latest version of proposed amended Rule 2002 located elsewhere in the Governing Board Package. The version of Proposed Amended Rule 2002 that was circulated with the Draft PEA and released on August 18, 2010 for a 45-day public review and comment period ending October 1, 2010 was dated August 17, 2010.

Original hard copies of the Draft PEA, which include the draft version of the proposed amended rule listed above, can be obtained through the SCAQMD Public Information Center at the Diamond Bar headquarters or by calling (909) 396-2039.

APPENDIX B

CONSTRUCTION AND OPERATIONS CALCULATIONS

LIST OF WORKSHEETS

Worksheet B-1
Phase I: Demolition

Activity	No. of WGSs	
Phase I: Demolition	1	Preparation to Install WGS

Activity	Days/ wk	Wks/ month	Days/ month	Months	Total Days	Crew Size
Demolition	5	4.33	21.67	1	21.67	50
Construction	5	4.33	21.67	17	368.33	175
			Total	18	390	

Phase I: Demolition		Rating	Number	Operation Schedule	2012 Off-Road Emission Factors							
Off-Road Equipment Type	Fuel	(hp)	Needed	(hr/day)	VOC (lb/hr)	CO (lb/hr)	NOx (lb/hr)	SOx (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)	CO2 (lb/hr)	CH4 (lb/hr)
crane	diesel	comp.	1	8	0.1425	0.4946	1.2753	0.0014	0.0553	0.0509	129	0.0129
front end loader	diesel	comp.	1	8	0.0862	0.3824	0.5816	0.0008	0.0435	0.0401	66.8	0.0078
forklift	diesel	comp.	1	8	0.0585	0.2257	0.4330	0.0006	0.0231	0.0212	54.4	0.0053
concrete saw	diesel	comp.	1	8	0.1090	0.4148	0.5910	0.0007	0.0491	0.0452	58.5	0.0098
jack hammer	diesel	comp.	1	8	0.0925	0.3847	0.8599	0.0013	0.0366	0.0337	123	0.0083

Phase I: Demolition		Number	Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	Needed	miles/day	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Construction Worker Vehicle)	gasoline	50	30	20	0.0008	0.0077	0.0008	0.0000	0.0001	0.0001	1.1015	0.0001
Offsite (Flatbed Truck - Heavy-Heavy Duty)	diesel	3	50	4.89	0.0025	0.0102	0.0309	0.0000	0.0015	0.0013	4.2159	0.0001
Offsite (Delivery Truck - Medium Duty)	diesel	5	50	6	0.0022	0.0155	0.0173	0.0000	0.0006	0.0005	2.7663	0.0001
Onsite (Pickup Truck)	gasoline	1	10	20	0.0008	0.0077	0.0008	0.0000	0.0001	0.0001	1.1015	0.0001
Onsite (Watering Truck - Medium Duty)	diesel	1	10	6	0.0022	0.0155	0.0173	0.0000	0.0006	0.0005	2.7663	0.0001

Incremental Increase in Onsite Combustion Emissions from Construction Equipment	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/day)	CH4 (lb/day)
crane	1.14	3.96	10.20	0.01	0.44	0.41	1029.16	0.10
front end loader	0.69	3.06	4.65	0.01	0.35	0.32	534.42	0.06
forklift	0.47	1.81	3.46	0.00	0.18	0.17	435.17	0.04
concrete saw	0.87	3.32	4.73	0.01	0.39	0.36	467.71	0.08
jack hammer	0.74	3.08	6.88	0.01	0.29	0.27	981.57	0.07
SUBTOTAL	3.91	16.22	29.93	0.04	1.66	1.53	3448.02	0.35

Equation: Emission Factor (lb/hr) x No. of Equipment x Work Day (hr/day) = Onsite Construction Emissions (lbs/day)

Worksheet B-1
Phase I: Demolition

Incremental Increase in Offsite Combustion Emissions from Construction Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/day)	CH4 (lb/day)
Offsite (Construction Worker Vehicle)	1.19	11.48	1.16	0.02	0.13	0.09	1652.29	0.11
Offsite (Flatbed Truck - Heavy-Heavy Duty)	0.38	1.53	4.64	0.01	0.22	0.19	632.39	0.02
Offsite (Delivery Truck - Heavy Duty)	0.56	3.86	4.33	0.01	0.16	0.14	691.57	0.03
Onsite (Pickup Truck)	0.01	0.08	0.01	0.00	0.00	0.00	11.02	0.00
Onsite (Watering Truck - Medium Duty)	0.02	0.15	0.17	0.00	0.01	0.01	27.66	0.00
SUBTOTAL	**2.16**	**17.11**	**10.31**	**0.03**	**0.53**	**0.42**	**3014.92**	**0.15**

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day x Round-Trip length (mile) = Offsite Construction Emissions (lb/day)

Total Incremental Combustion Emissions from Construction Activities	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/day)	CH4 (lb/day)	CO2e (lb/day)	CO2e (MT*)
Phase I: Demolition TOTAL	**6**	**32**	**40**	**0.07**	**2**	**2**	**6453**	**1**	**6474**	**64**
Significant Threshold	75	550	100	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**n/a**	**n/a**	**n/a**	**n/a**

*1 metric ton (MT) = 2,205 pounds

Incremental Increase in Fuel Usage From Construction Equipment and Workers' Vehicles	Total Demolition Hours	Equipment Type	Diesel Fuel Usage (gal/hr)	Diesel Fuel Usage (gal/day)	Gasoline Fuel Usage (gal/day)
Operation of Portable Equipment	173	crane	1.085	8.68	N/A
Operation of Portable Equipment	173	front end loader	3.048	24.38	N/A
Operation of Portable Equipment	173	Forklift	2.476	19.81	N/A
Operation of Portable Equipment	173	Concrete Saw	2.68	21.44	N/A
Operation of Portable Equipment	173	jack hammer	2.68	21.44	N/A
Workers' Vehicles - Commuting	N/A	Light-Duty Vehicles	N/A	N/A	75.00
Workers' Vehicles - Offsite Delivery/Haul	N/A	Flatbed Truck	N/A	30.67	N/A
Workers' Vehicles - Offsite Delivery/Haul	N/A	Delivery Truck	N/A	41.67	N/A
Workers' Vehicles - Onsite Hauling	N/A	Pickup Truck	N/A	N/A	0.50
Workers' Vehicles - Onsite Hauling	N/A	Watering Truck	N/A	1.67	N/A
		TOTAL	**170**	**76**	

Sources:
1. Off-Road Mobile Emission Factors, Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/offroad/offroad.html/offroadEF07_25.xls
2. PM2.5 Significance Thresholds and Calculation Methodology, Appendix A - Updated CEIDARS Table with PM2.5 Fractions
http://www.aqmd.gov/ceqa/handbook/PM2_5/PM2_5.html/finalAppA.doc
3. On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEF07_26.xls
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

Worksheet B-2
Phase II: Construction

Activity	No. of WGSs	
Phase II: Construction	1	Install WGS

Activity	Days/wk	Wks/month	Days/month	Months	Total Days	Crew Size
Demolition	5	4.33	21.67	1	21.67	50
Construction	5	4.33	21.67	17	368.33	175
			Total	18	390	

Phase II: Construction		Rating	Number	Operation Schedule	2012 Off-Road Emission Factors							
Off-Road Equipment Type	Fuel	(hp)	Needed	(hr/day)	VOC (lb/hr)	CO (lb/hr)	NOx (lb/hr)	SOx (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)	CO2 (lb/hr)	CH4 (lb/hr)
backhoe	diesel	comp.	1	8	0.0862	0.3824	0.5816	0.0008	0.0435	0.0401	66.8	0.0078
crane	diesel	comp.	2	8	0.1425	0.4946	1.2753	0.0014	0.0553	0.0509	129	0.0129
aerial lift	diesel	comp.	3	8	0.0576	0.1976	0.3249	0.0004	0.0219	0.0202	34.7	0.0052
forklift	diesel	comp.	1	8	0.0585	0.2257	0.4330	0.0006	0.0231	0.0212	54.4	0.0053
generator	diesel	comp.	1	8	0.0832	0.3121	0.5779	0.0007	0.0351	0.0343	61.0	0.0075
welder	diesel	comp.	10	8	0.0703	0.2150	0.2702	0.0003	0.0243	0.0234	25.6	0.0063
cement mixer	diesel	comp.	1	2	0.0093	0.0425	0.0564	0.0001	0.0029	0.0027	7.2	0.0008

Phase II: Construction		Number	Round-trip Distance	Mileage Rate (miles/	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	Needed	(miles/day)	gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Construction Worker Vehicle)	gasoline	175	30	20	0.0008	0.0077	0.0008	0.0000	0.0001	0.0001	1.1015	0.0001
Offsite (Flatbed Truck - Heavy-Heavy Duty)	diesel	3	50	4.89	0.0025	0.0102	0.0309	0.0000	0.0015	0.0013	4.2159	0.0001
Offsite (Delivery Truck - Medium Duty)	diesel	5	50	6	0.0022	0.0155	0.0173	0.0000	0.0006	0.0005	2.7663	0.0001
Onsite (Pickup Truck)	gasoline	1	10	20	0.0008	0.0077	0.0008	0.0000	0.0001	0.0001	1.1015	0.0001

Incremental Increase in Onsite Combustion Emissions from Construction Equipment	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/day)	CH4 (lb/day)
backhoe	0.69	3.06	4.65	0.01	0.35	0.32	534.42	0.06
crane	2.28	7.91	20.41	0.02	0.88	0.81	2058.32	0.21
aerial lift	1.38	4.74	7.80	0.01	0.53	0.48	833.32	0.12
forklift	0.47	1.81	3.46	0.00	0.18	0.17	435.17	0.04
generator	0.67	2.50	4.62	0.01	0.28	0.27	487.94	0.06
welder	5.62	17.20	21.61	0.03	1.94	1.87	2048.21	0.51
cement mixer	0.02	0.08	0.11	0.00	0.01	0.01	14.50	0.00
SUBTOTAL	11.13	37.31	62.67	0.07	4.17	3.94	6411.88	1.00

Equation: Emission Factor (lb/hr) x No. of Equipment x Work Day (hr/day) = Onsite Construction Emissions (lbs/day)

Incremental Increase in Offsite Combustion Emissions from Construction Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/day)	CH4 (lb/day)
Offsite (Construction Worker Vehicle)	4.18	40.19	4.07	0.06	0.47	0.30	5783.01	0.38
Offsite (Flatbed Truck - Heavy-Heavy Duty)	0.38	1.53	4.64	0.01	0.22	0.19	632.39	0.02
Offsite (Delivery Truck - Medium Duty)	0.56	3.86	4.33	0.01	0.16	0.14	691.57	0.03
Onsite (Pickup Truck)	0.01	0.08	0.01	0.00	0.00	0.00	11.02	0.00
SUBTOTAL	5.13	45.66	13.05	0.07	0.86	0.63	7117.98	0.42

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day x Round-Trip length (mile) = Offsite Construction Emissions (lb/day)

FUGITIVE PM10 EMISSIONS SUMMARY				
Activity	Unmitigated PM10 (lbs/day)	Mitigated PM10 [1] (lbs/day)	Unmitigated PM2.5 (lbs/day)	Mitigated PM2.5 [1] (lbs/day)
1. Grading	46.70	23.35	9.71	4.86
2. Trenching/Stockpile Loading	1.75	0.87	0.36	0.18
3. Storage Piles - Wind Erosion	1.05	0.52	0.22	0.11
4. Truck Filling/Dumping	15.56	7.78	3.24	1.62
SUBTOTAL:	**65.06**	**32.53**	**13.53**	**6.77**

[1] Water two times per day per SCAQMD Rule 403 (50% control efficiency)

Total Incremental Combustion Emissions from Construction Activities	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/day)	CH4 (lb/day)	CO2e (lb/day)	CO2e (MT)*
Phase II: Construction TOTAL	**16**	**83**	**76**	**0.14**	**38**	**11**	**13530**	**1**	**13560**	**2265**
Significant Threshold	75	550	100	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**n/a**	**n/a**	**n/a**	**n/a**

*1 metric ton (MT) = 2,205 pounds

Incremental Increase in Fuel Usage From Construction Equipment and Workers' Vehicles	Total Construction Hours	Equipment Type	Diesel Fuel Usage (gal/hr)	Total Diesel Fuel Usage (gal/day)	Total Gasoline Fuel Usage (gal/day)
Operation of Portable Equipment	2947	backhoe	3.048	24.38	N/A
Operation of Portable Equipment	2947	crane	1.085	8.68	N/A
Operation of Portable Equipment	2947	aerial lift	1.587	12.70	N/A
Operation of Portable Equipment	2947	forklift	2.476	19.81	N/A
Operation of Portable Equipment	2947	generator	2.781	22.25	N/A
Operation of Portable Equipment	2947	welder	1.18	9.44	N/A
Operation of Portable Equipment	737	cement mixer	0.331	0.66	N/A
Workers' Vehicles - Commuting	N/A	Light-Duty Vehicles	N/A	N/A	262.50
Workers' Vehicles - Offsite Delivery/Haul	N/A	Flatbed Truck	N/A	30.67	N/A
Workers' Vehicles - Offsite Delivery/Haul	N/A	Delivery Truck	N/A	41.67	N/A
Workers' Vehicles - Onsite Hauling	N/A	Pickup Truck	N/A	N/A	0.50
		TOTAL		**170**	**263**

Sources:
1. Off-Road Mobile Emission Factors, Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/offroad/offroad.html/offroadEF07_25.xls
2. PM2.5 Significance Thresholds and Calculation Methodology, Appendix A - Updated CEIDARS Table with PM2.5 Fractions
http://www.aqmd.gov/ceqa/handbook/PM2_5/PM2_5.html/finalAppA.doc
3. On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEF07_26.xls
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

Worksheet B-3
Phase II: Fugitive Dust

Fugitive PM10 Emissions Associated with foundation work for WGS Installation

1. GRADING ACTIVITIES (Backhoe)		
G = Fugitive PM10 Emission Rate (lbs/day) = 0.75 x T x 1.0 x $(S)^{1.5}$ x $(M)^{1.4}$		*Source: AP-42, 10/98, Table 11.9-1 (PM10 Equation for Overburden Bulldozing)*
S = Silt Content	7.5 %	*Source: AP-42, 10/98, Table 11.9-3 (Correction Factors for Overburden Bulldozing)*
M = Moisture Content	2 %	*Source: AP-42, 10/98, Table 11.9-3 (Correction Factors for Overburden Bulldozing)*
T = max hours of operation/day	8 hr/day	
G = Fugitive PM10 =	**46.70 lbs/day**	

2. TRENCHING/STOCKPILE LOADING (Backhoe)		
LPM10 = Emission Factor per particle size (lbs/ton) = kPM10 x (0.0032) x $(U/5)^{1.3}$ x $(M/2)^{1.4}$		*Source: AP-42, 01/95, p. 13.2.4-3 (Equation 1 for English Units)*
U = Mean Wind Speed	12 mile/hr	*Source: AP-42, 10/98, Table 11.9-5 (See Mine I)*
M = Material Moisture Content	2 %	*Source: AP-42, 10/98, Table 11.9-3 (Overburden Bulldozing)*
kPM10 = Particle Size Multiplier for PM10	0.35 dimensionless	*Source: AP-42, 01/95, p. 13.2.4-3*
G = Maximum Daily Weight of Material Moved	500 tons/day	Note: One backhoe can trench approximately 0.1 acre per day or 4,356 square feet per day, with a cut of 3 feet in depth, 13,068 cubic feet = 484 cubic yards and 1 cubic yard = 1 ton soil.
Tday, t = Truck Operating time, maximum	10 hr/day	
LPM10 = Emission Factor per particle size =	0.0035 lbs PM10/ton soil moved	
PPM10 = Emission Rate based on particle size = (LPMx G) =	**1.75 lbs PM10/day**	

3. STOCKPILE WIND EROSION		
Q = Wind Erosion Emission Rate based on particle size (lbs/day) = kPM10* 0.72 x U x Tc * (A x B /43,560 sq. ft/acre)		*Source: AP-42, 10/98, Table 11.9-1 (Emission Factor Equation for Active Storage Pile)*
A = Length of Stockpile	21 ft	
B = Width of Stockpile	21 ft	
U = Mean Wind Speed	12 mile/hr	*Source: AP-42, 10/98, Table 11.9-5 (General Characteristics of Surface Coal Mines - Mine I)*
kPM10 = Particle Size Multiplier for PM10	0.5 dimensionless	*Source: AP-42, 01/95, p. 13.2.5-3 (PM10 Aerodynamic Particle Size Multiplier (k) for Equation 2)*
Tc = Time Piles Remain Uncovered	24 hr/day	Note: This calculation assumes that the piles remain uncovered for 24 hours/day.
QPM10 =	**1.05 lbs PM10/day**	

4. TRUCK FILLING/DUMPING		
TF = Fugitive PM10 Emissions From Truck Filling = G (ton/day) x TF, PM10 (lb/ton)		
TD = Fugitive PM10 Emissions From Truck Dumping = G (ton/day) x TD, PM10 (lb/ton)		
TFPM10 = Emission Factor for Truck Filling =	0.0221 lb/ton of material moved	
TDPM10 = Emission Factor for Truck Dumping =	0.0091 lb/ton of material moved	
G = Maximum Daily Weight of Material Trucked Away	500 ton/day	
TF =	**11.03 lbs PM10/day**	
TD =	**4.54 lbs PM10/day**	

FUGITIVE PM10 EMISSIONS SUMMARY		
Activity	Unmitigated PM10 (lbs/day)	Mitigated PM10 [1] (lbs/day)
1. Grading	46.70	23.35
2. Trenching/Stockpile Loading	1.75	0.87
3. Storage Piles - Wind Erosion	1.05	0.52
4. Truck Filling/Dumping	15.56	7.78
TOTAL	**65.06**	**32.53**

[1] Water two times per day per SCAQMD Rule 403 (50% control efficiency)

Worksheet B-4
Overlapping Phase I and Phase II

One Facility Undergoing Demolition Overlapping with One Facility Under Construction										
Total Incremental Combustion Emissions from Construction Activities	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/day)	CH4 (lb/day)	CO2e (lb/day)	CO2e (MT*)
Phase I: Demolition TOTAL	6	32	40	0	2	2	6,463	1	6,474	64
Phase II: Construction TOTAL	16	83	76	0	38	11	13,530	1	13,560	2,265
Overlapping Phase I + Phase II TOTAL	22	115	116	0	40	13	19,993	2	20,033	2,329
Significant Threshold	75	550	100	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	YES	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Incremental Increase in Fuel Usage From Construction Equipment and Workers' Vehicles	Total Diesel Fuel Usage (gal/day)	Total Gasoline Fuel Usage (gal/day)
Phase I: Demolition TOTAL	170	76
Phase II: Construction TOTAL	170	263
Overlapping Phase I + Phase II TOTAL	340	339

Four Facilities Undergoing Demolition Overlapping with Four Facilities Under Construction										
Total Incremental Combustion Emissions from Construction Activities	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/day)	CH4 (lb/day)	CO2e (lb/day)	CO2e (MT*)
Phase I: Demolition TOTAL	24	129	161	0	9	8	25,852	2	25,894	254
Phase II: Construction TOTAL	65	332	303	1	150	45	54,119	6	54,239	9,060
Overlapping Phase I + Phase II TOTAL	89	461	464	1	159	53	79,971	8	80,133	9,315
Significant Threshold	75	550	100	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	YES	NO	YES	NO	YES	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Incremental Increase in Fuel Usage From Construction Equipment and Workers' Vehicles	Total Diesel Fuel Usage (gal/day)	Total Gasoline Fuel Usage (gal/day)
Phase I: Demolition TOTAL	679	302
Phase II: Construction TOTAL	681	1,052
Overlapping Phase I + Phase II TOTAL	1,360	1,354

PROPOSED PROJECT - OPTION 1: GRAND TOTALS

Fuel Gas Treatment 6 refineries Usage Rates		
-34	MMbtu/day	Natural Gas
22,649	kWh/day	Electricity
52,055	gal/day	Water
46,575	gal/day	Wastewater
13	Mmbtu/day	Cooling Water
17,233	scf/day	Compressed Air
2.33	tons/day	Solid Waste Disposal
807	pounds/day	Sulfur sales*
16	pounds/day	Merox Catalyst
3	tons/day	NaOH (50%)
11	gallons/day	TG-10 amine additive
2173	gallons/day	sulfinol
-1373.95	gallons/day	MEA
-769.04	gallons/day	DEA
18,300	sf	plot space needed
3900	round trip miles/day	truck miles driven
12	trucks/day	no. of trucks
77800	round trip miles/year	truck miles driven
80	trucks/year	no. of trucks

SRU/TGTU - part 1 2 refineries - 3 WGSs Usage Rates		
0	MMbtu/day	Natural Gas
18,748	kWh/day	Electricity
354,247	gal/day	Water
70,959	gal/day	Wastewater
1,748	Mmbtu/day	Cooling Water
548	scf/day	Compressed Air
2.25	tons/day	Solid Waste Disposal
1	tons/day	Soda Ash
13,836	sf	plot space needed
900	round trip miles/day	truck miles driven
4	trucks/day	no. of trucks
13,850	round trip miles/year	truck miles driven
46	trucks/year	no. of trucks

SRU/TGTU - part 2 1 refinery - gas treating Usage Rates		
30	MMbtu/day	Natural Gas
2,973	kWh/day	Electricity
0	gal/day	Water
0	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
2,110	scf/day	Compressed Air
0.00	tons/day	Solid Waste Disposal
1	pounds/day	ESX Catalyst
145	pounds/day	Sulfur sales
2,500	sf	plot space needed
450	round trip miles/day	truck miles driven
2	trucks/day	no. of trucks
500	round trip miles/year	truck miles driven
3	trucks/year	no. of trucks

Worksheet B-5
Proposed Project - Option 1: Grand Totals

FCCU 4 reinnedes - 4 WGS#		
Usage Rates		
0	MMbtu/day	Natural Gas
103,217	kWh/day	Electricity
241,096	gal/day	Water
112,329	gal/day	Wastewater
3	Mmbtu/day	Cooling Water
3,808	scf/day	Compressed Air
4.19	tons/day	Solid Waste Disposal
4.45	tons/day	NaOH (50%)
7,150	sf	plot space needed
1,800	round trip miles/day	truck miles driven
8	trucks/day	no. of trucks
27,450	round trip miles/year	truck miles driven
108	trucks/year	no. of trucks

Coke Calciner 1 facility - 1 WGS		
Usage Rates		
0	MMbtu/day	Natural Gas
17,711	kWh/day	Electricity
40,896	gal/day	Water
16,992	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0.44	tons/day	Solid Waste Disposal
3.37	tons/day	NaOH (50%)
1,200	sf	plot space needed
450	round trip miles/day	truck miles driven
2	trucks/day	no. of trucks
4,400	round trip miles/year	truck miles driven
39	trucks/year	no. of trucks

Sulfuric Acid Plant - part 1 1 facility - 1 WGS		
Usage Rates		
0	MMbtu/day	Natural Gas
9,659	kWh/day	Electricity
19,589	gal/day	Water
10,800	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0.00	tons/day	Solid Waste Disposal
1	tons/day	NaOH (50%)
500	sf	plot space needed
50	round trip miles/day	truck miles driven
1	trucks/day	no. of trucks
650	round trip miles/year	truck miles driven
13	trucks/year	no. of trucks

Worksheet B-5
Proposed Project - Option 1: Grand Totals

Sulfuric Acid Plant - part 2 1 facility - existing system upgrade Usage Rates		
0	MMbtu/day	Natural Gas
0	kWh/day	Electricity
6,336	gal/day	Water* (as steam)
0	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0.00	tons/day	Solid Waste Disposal
0	gal/day	Amine
0	sf	plot space needed
0	round trip miles/day	truck miles driven
0	trucks/day	no. of trucks
0	round trip miles/year	truck miles driven
0	trucks/year	no. of trucks

Cement Kilns 1 facility - 2 limestone absorbers Usage Rates		
0	MMbtu/day	Natural Gas
23,288	kWh/day	Electricity
110,685	gal/day	Water
0	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
1,096	scf/day	Compressed Air
2.49	tons/day	Solid Waste Disposal
2	tons/day	Limestone - $CaCO_3$
4,000	sf	plot space needed
143	round trip miles/day	truck miles driven
2	trucks/day	no. of trucks
2,585	round trip miles/year	truck miles driven
64	trucks/year	no. of trucks

Cement Boiler 1 facility - 1 limestone absorber or 1 DGS Usage Rates		EXCLUDE
0	MMbtu/day	Natural Gas
2,822	kWh/day	Electricity
27,397	gal/day	Water
35,616	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
274	scf/day	Compressed Air
1.51	tons/day	Solid Waste Disposal
1	tons/day	Limestone - $CaCO_3$
1,225	sf	plot space needed
0	round trip miles/day	truck miles driven
0	trucks/day	no. of trucks
0	round trip miles/year	truck miles driven
0	trucks/year	no. of trucks

excluded - equipment is not in operation

Worksheet B-5
Proposed Project - Option 1: Grand Totals

Glass Plant		
1 facility - 2 WGSs		
Usage Rates		
0	MMbtu/day	Natural Gas
5,694	kWh/day	Electricity
58,464	gal/day	Water
12,877	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
110	scf/day	Compressed Air
0.05	tons/day	Solid Waste Disposal
1	tons/day	NaOH (50%)
640	sf	plot space needed
183	round trip miles/day	truck miles driven
2	trucks/day	no. of trucks
533	round trip miles/year	truck miles driven
9	trucks/year	no. of trucks

Worksheet B-5
Proposed Project - Option 1: Grand Totals

GRAND TOTALS (For Operation)									
Usage Rates				Notes	Net Effect of Project		Percentage Change	Significant?	
-4.11	MMbtu/day	-4029.01	scf/day	Natural Gas	Significance Threshold: 1% of supply (9330 MMcf of Natural Gas /day)	-0.0040	MMscf/day	-0.00004%	NO
203,938	kWh/day	203.94	MWh/day	Electricity	Significance Threshold: 1% of supply (8362 MW - instantaneous electricity)	8.50	MW (instantaneous)	0.10%	NO
883,367	gal/day	0.88	MMgal/day	Water	Significance Threshold: 5,000,000 gal/day water	883,367	gal/day	17.67%	NO
270,532	gal/day	0.27	MMgal/day	Wastewater	Significance Threshold: 25% increase above permitted wastewater limits	270,532	gal/day	<25%*	NO
		1,764	MMbtu/day	Cooling Water	This data already included in energy calculations.				
		24,904	scf/day	Compressed Air	This data already included in energy calculations.				
		11.75	tons/day	Solid Waste Disposal	Solid Waste Disposal, Air Quality off-site transportation emissions, & Energy (fuel usage)				
		952.15	pounds/day	Sulfur sales*	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		16.44	pounds/day	Merox Catalyst	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		10.98	gal/day	TG-10 amine additive	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		0.86	tons/day	Soda Ash (Na_2CO_3)	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		1.10	pounds/day	ESX Catalyst	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		13.24	tons/day	NaOH (50% by weight)	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		2.98	tons/day	Limestone - $CaCO_3$	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		2173	gallons/day	sulfinol	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		-1373.95	gallons/day	MEA	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		-789.04	gallons/day	DEA	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		48,126	sf	Plot Space Needed	Air Quality: grading/site-preparation construction emissions				
		7,876	round trip miles/day	Daily truck miles driven	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		33	trucks/day	Daily no. of trucks	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		127,768	round trip miles/year	Annual truck miles driven	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		362	trucks/year	Annual no. of trucks	Air Quality: off-site transportation emissions & Energy (fuel usage)				

Note 1: Instantaneous Electricity Equation: 197,611 kW-hr/day x 1 work day/24 hr x 1 MW/1000 kW = 8.2 MW

*See Hydrology/Water Quality Analysis

*See Hydrology/Water Quality Analysis

Note 2: This calculation takes into account the electricity needed to make 9.9 tons per day of NaOH to satisfy demand (22,444 kWh/day).

Key:
Cooling water already accounted for in both water demand and energy demand.
NaOH is 50% by weight, usually delivered by tanker truck in an aqueous solution due to high concentration

1 scf = 1020 BTU for natural gas

1 MW = 1000 KW
1 tcf (trillion cubic feet) = 1000 bcf (billion cubic feet) = 1,000,000 MMcf (million cubic feet)

1 metric ton = 2205 lbs

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	127,768	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	1.24	5.02	15.20	0.020	0.73	0.64	538,657	14.89	538,970	244
SUBTOTAL	1	5	15	0	1	1	538,657	15	538,970	244
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	127,768	4.89	624,784	2,403
*Assumes 260 days/year			TOTAL	624,784	2,403

Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012

http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

PROPOSED PROJECT - OPTION 1: GHG GRAND TOTALS

Phase III: Operations - GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - reduction	-0.0040	MMscf/day	Natural Gas GHGs	-80.03	-0.0004	-0.0015	-80
electricity - increased use*	203.94	MWh/day	Electricity GHGs	37134.30	0.0000	0.0000	37,134
water - increased use[1]	**0.88**	**MMgal/day**	**Water Conveyance GHGs**	**398.45**	**0.0023**	**0.0042**	**399**
Facility A	0.08	MMgal/day	Water Conveyance GHGs	10.10	0.0001	0.0001	10
Facility B	0.22	MMgal/day	Water Conveyance GHGs	27.55	0.0002	0.0003	28
Facility C	0.01	MMgal/day	Water Conveyance GHGs	12.21	0.0001	0.0001	12
Facility D	0.23	MMgal/day	Water Conveyance GHGs	28.98	0.0002	0.0003	29
Facility E	0.06	MMgal/day	Water Conveyance GHGs	84.78	0.0005	0.0009	85
Facility F	0.04	MMgal/day	Water Conveyance GHGs	58.98	0.0003	0.0006	59
Facility G	0.01	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	2
Facility H	0.04	MMgal/day	Water Conveyance GHGs	55.02	0.0003	0.0006	55
Facility I	0.06	MMgal/day	Water Conveyance GHGs	78.66	0.0005	0.0008	79
Facility J	0.02	MMgal/day	Water Conveyance GHGs	26.36	0.0002	0.0003	26
Facility K	0.11	MMgal/day	Water Conveyance GHGs	14.07	0.0001	0.0001	14
wastewater - increased generation	**0.27**	**MMgal/day**	**Wastewater Processing GHGs**	**154.04**	**0.0009**	**0.0016**	**154**
Facility A	0.04	MMgal/day	Wastewater Processing GHGs	4.88	0.0000	0.0001	5
Facility B	0.06	MMgal/day	Wastewater Processing GHGs	8.08	0.0000	0.0001	8
Facility C	0.00	MMgal/day	Wastewater Processing GHGs	3.69	0.0000	0.0000	4
Facility D	0.06	MMgal/day	Wastewater Processing GHGs	7.21	0.0000	0.0001	7
Facility E	0.03	MMgal/day	Wastewater Processing GHGs	44.23	0.0003	0.0005	44
Facility F	0.02	MMgal/day	Wastewater Processing GHGs	29.49	0.0002	0.0003	30
Facility G	0.01	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
Facility H	0.02	MMgal/day	Wastewater Processing GHGs	22.86	0.0001	0.0002	23
Facility I	0.01	MMgal/day	Wastewater Processing GHGs	17.32	0.0001	0.0002	17
Facility J	0.01	MMgal/day	Wastewater Processing GHGs	14.53	0.0001	0.0002	15
Facility K	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
temporary construction activities[3]	34931	MT/project	Construction GHGs in CO2e				1,168
operational truck trips	244.43	MT/project	Operation GHGs in CO2e				244
						TOTAL CO2e	**39,020**
						Significance Threshold	**10,000**
						Exceed Significance?	**YES**

Worksheet B-6
Proposed Project - Option 1: GHG Grand Totals

Phase III: Operations - GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - reduction	-0.0040	MMscf/day	Natural Gas GHGs	-80.03	-0.0004	-0.0015	-80
electricity - increased use*	203.94	MWh/day	Electricity GHGs	37134.30	0.0000	0.0000	37,134
water - increased use[2]	**0.88**	**MMgal/day**	**Water Conveyance GHGs**	**233.35**	**0.0013**	**0.0024**	**234**
Facility A	0.079	MMgal/day	Water Conveyance GHGs	10.10	0.0001	0.0001	10
Facility B	0.217	MMgal/day	Water Conveyance GHGs	27.55	0.0002	0.0003	28
Facility C	0.009	MMgal/day	Water Conveyance GHGs	1.15	0.0000	0.0000	1
Facility D	0.228	MMgal/day	Water Conveyance GHGs	28.98	0.0002	0.0003	29
Facility E	0.063	MMgal/day	Water Conveyance GHGs	8.01	0.0000	0.0001	8
Facility F	0.044	MMgal/day	Water Conveyance GHGs	5.57	0.0000	0.0001	6
Facility G	0.014	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	2
Facility H	0.041	MMgal/day	Water Conveyance GHGs	55.02	0.0003	0.0006	55
Facility I	0.058	MMgal/day	Water Conveyance GHGs	78.66	0.0005	0.0008	79
Facility J	0.020	MMgal/day	Water Conveyance GHGs	2.49	0.0000	0.0000	2
Facility K	0.111	MMgal/day	Water Conveyance GHGs	14.07	0.0001	0.0001	14
wastewater - increased generation[3]	**0.27**	**MMgal/day**	**Wastewater Processing GHGs**	**70.78**	**0.0004**	**0.0007**	**71**
Facility A	0.04	MMgal/day	Wastewater Processing GHGs	4.88	0.0000	0.0001	5
Facility B	0.06	MMgal/day	Wastewater Processing GHGs	8.08	0.0000	0.0001	8
Facility C	0.00	MMgal/day	Wastewater Processing GHGs	0.35	0.0000	0.0000	0
Facility D	0.06	MMgal/day	Wastewater Processing GHGs	7.21	0.0000	0.0001	7
Facility E	0.03	MMgal/day	Wastewater Processing GHGs	4.18	0.0000	0.0000	4
Facility F	0.02	MMgal/day	Wastewater Processing GHGs	2.79	0.0000	0.0000	3
Facility G	0.01	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
Facility H	0.02	MMgal/day	Wastewater Processing GHGs	22.86	0.0001	0.0002	23
Facility I	0.01	MMgal/day	Wastewater Processing GHGs	17.32	0.0001	0.0002	17
Facility J	0.01	MMgal/day	Wastewater Processing GHGs	1.37	0.0000	0.0000	1
Facility K	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
temporary construction activities[3]	34931	MT/project	Construction GHGs in CO2e				1,168
operational truck trips	244.43	MT/project	Operation GHGs in CO2e				244
						TOTAL CO2e	**38,771**
						Significance Threshold	**10,000**
						Exceed Significance?	**YES**

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water[1]
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation[2]
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005. http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005. http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[3] GHGs from temporary construction activities are amortized over 30 years.

PROPOSED PROJECT - OPTION 2: GRAND TOTALS

Fuel Gas Treatment 6 refineries Usage Rates		
-34	MMbtu/day	Natural Gas
22,649	kWh/day	Electricity
52,055	gal/day	Water
46,575	gal/day	Wastewater
13	Mmbtu/day	Cooling Water
17,233	scf/day	Compressed Air
2	tons/day	Solid Waste Disposal
807	pounds/day	Sulfur sales*
16	pounds/day	Merox Catalyst
3	tons/day	NaOH
11	gallons/day	TG-10 amine additive
2173	gallons/day	sulfinol
-1374	gallons/day	MEA
-789	gallons/day	DEA
18,300	sf	plot space needed
3900	round trip miles/day	truck miles driven
12	trucks/day	no. of trucks
77800	round trip miles/year	truck miles driven
80	trucks/year	no. of trucks

SRU/TGTU - part 1 2 refineries - 3 WGSs Usage Rates		
0	MMbtu/day	Natural Gas
18,748	kWh/day	Electricity
354,247	gal/day	Water
70,959	gal/day	Wastewater
1,748	Mmbtu/day	Cooling Water
548	scf/day	Compressed Air
2	tons/day	Solid Waste Disposal
1	tons/day	Soda Ash
13,836	sf	plot space needed
900	round trip miles/day	truck miles driven
4	trucks/day	no. of trucks
13,850	round trip miles/year	truck miles driven
46	trucks/year	no. of trucks

SRU/TGTU - part 2 1 refinery - gas treating Usage Rates		
30	MMbtu/day	Natural Gas
2,973	kWh/day	Electricity
0	gal/day	Water
0	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
2,110	scf/day	Compressed Air
0	tons/day	Solid Waste Disposal
1	pounds/day	ESX Catalyst
145	pounds/day	Sulfur sales
2,500	sf	plot space needed
450	round trip miles/day	truck miles driven
2	trucks/day	no. of trucks
500	round trip miles/year	truck miles driven
3	trucks/year	no. of trucks

FCCUs 6 Refineries Using SOx Reducing Additives to meet 5 ppm SOx limit Usage Rates		
0	Mmbtu/day	Natural Gas
0	kWh/day	Electricity
0	gal/day	Water
0	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0	tons/day	Solid Waste Disposal
2500	pounds/day	SOx Reducing Catalyst
0	sf	Plot Space Needed
2000	round trip miles/day	1 Truck Delivering SOx Reducing Catalyst
5	trucks/day	No. of Trucks Delivering SOx Reducing Catalyst
0	round trip miles/day	1 Truck Hauling Away Solid Waste
0	trucks/day	No. of Trucks Hauling Away Solid Waste
8000	round trip miles/year	Annual Truck Miles
20	trucks/year	Annual Trucks

Coke Calciner 1 facility - 1 WGS Usage Rates		
0	MMbtu/day	Natural Gas
17,711	kWh/day	Electricity
40,896	gal/day	Water
16,992	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0.44	tons/day	Solid Waste Disposal
3	tons/day	NaOH (50%)
1,200	sf	plot space needed
450	round trip miles/day	truck miles driven
2	trucks/day	no. of trucks
4,400	round trip miles/year	truck miles driven
39	trucks/year	no. of trucks

Sulfuric Acid Plant - part 1 1 facility - 1 WGS Usage Rates		
0	MMbtu/day	Natural Gas
9,659	kWh/day	Electricity
19,589	gal/day	Water
10,800	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0	tons/day	Solid Waste Disposal
1	tons/day	NaOH (50%)
500	sf	plot space needed
50	round trip miles/day	truck miles driven
1	trucks/day	no. of trucks
650	round trip miles/year	truck miles driven
13	trucks/year	no. of trucks

*any increase in SOx Reducing Catalyst is a direct reduction in FCCU regenerator catalyst

Notes:

Facility A already uses SOx reducing additives, but not sure how much

Facility B already uses 800 lb/day of SOx reducing additives

Facility C no longer needs to use SOx reducing additives
Facility D does not currently use SOx reducing additives
Facility E has been testing with SOx reducing additives
Facility F already uses SOx reducing additives, but not sure how much

Brands of SOx reducing additives:
Intercat Super SOx-Getter
Grace Davison Super DeSOx

Most refineries are already using Grace Davison's base catalyst and sox reducing catalyst.

Worksheet B-7
Proposed Project - Option 2: Grand Totals

Sulfuric Acid Plant - part 2		
1 facility - existing system upgrade		
Usage Rates		
0	MMbtu/day	Natural Gas
0	kWh/day	Electricity
6,336	gal/day	Water* (as steam)
0	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0	tons/day	Solid Waste Disposal
0	gal/day	Amine
0	sf	plot space needed
0	round trip miles/day	truck miles driven
0	trucks/day	no. of trucks
0	round trip miles/year	truck miles driven
0	trucks/year	no. of trucks

Cement Kilns		
1 facility - 2 limestone absorbers		
Usage Rates		
0	MMbtu/day	Natural Gas
23,288	kWh/day	Electricity
110,685	gal/day	Water
0	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
1,096	scf/day	Compressed Air
2	tons/day	Solid Waste Disposal
2	tons/day	Limestone - $CaCO_3$
4,000	sf	plot space needed
143	round trip miles/day	truck miles driven
2	trucks/day	no. of trucks
2,585	round trip miles/year	truck miles driven
64	trucks/year	no. of trucks

Cement Boiler		
1 facility - 1 limestone absorber or DGS		
Usage Rates		EXCLUDE
0	MMbtu/day	Natural Gas
2,822	kWh/day	Electricity
27,397	gal/day	Water
35,616	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
274	scf/day	Compressed Air
2	tons/day	Solid Waste Disposal
1	tons/day	Limestone - $CaCO_3$
1,225	sf	plot space needed
0	round trip miles/day	truck miles driven
0	trucks/day	no. of trucks
0	round trip miles/year	truck miles driven
0	trucks/year	no. of trucks

excluded - equipment is not in operation

Glass Plant		
1 facility - 2 NGSs		
Usage Rates		
0	MMbtu/day	Natural Gas
5,694	kWh/day	Electricity
58,464	gal/day	Water
12,877	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
110	scf/day	Compressed Air
0	tons/day	Solid Waste Disposal
1	tons/day	NaOH (50%)
640	sf	plot space needed
183	round trip miles/day	truck miles driven
2	trucks/day	no. of trucks
533	round trip miles/year	truck miles driven
9	trucks/year	no. of trucks

Worksheet B-7
Proposed Project - Option 2: Grand Totals

GRAND TOTALS (For Operation)									
Usage Rates					Notes	Net Effect of Project		Percentage Change	Significant?
-4.11	MMbtu/day	-4029.01	scf/day	Natural Gas	Significance Threshold: 1% of supply (9330 MMcf of Natural Gas /day)	-0.0040	MMscf/day	-0.00004%	NO
100,721	kWh/day	100.72	MWh/day	Electricity	Significance Threshold: 1% of supply (8362 MW - instantaneous electricity)	4.20	MW (instantaneous)	0.05%	NO
642,271	gal/day	0.64	MMgal/day	Water	Significance Threshold: 5,000,000 gal/day water	642,271	gal/day	12.85%	NO
158,203	gal/day	0.16	MMgal/day	Wastewater	Significance Threshold: 25% increase above permitted wastewater limits	158,203	gal/day	<25%*	NO
		1,761	MMbtu/day	Cooling Water	This data already included in energy calculations.				
		21,096	scf/day	Compressed Air	This data already included in energy calculations.				
		7.56	tons/day	Solid Waste Disposal	Solid Waste Disposal, Air Quality off-site transportation emissions, & Energy (fuel usage)				
		952.15	pounds/day	Sulfur sales*	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		16.44	pounds/day	Merox Catalyst	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		2500.00	pounds/day	SOx Reducing Catalyst	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		10.96	gal/day	TG-10 amine additive	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		0.86	tons/day	Soda Ash (Na_2CO_3)	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		1.10	pounds/day	ESX Catalyst	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		8.79	tons/day	NaOH (50% by weight)	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		2.98	tons/day	Limestone - $CaCO_3$	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		2173	gal/day	sulfinol	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		-1373.95	gal/day	MEA	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		-789.041	gal/day	DEA	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		40,976	sf	Plot Space Needed	Air Quality: grading/site-preparation construction emissions				
		16,076	round trip miles/day	Daily truck miles driven	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		30	trucks/day	Daily no. of trucks	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		108,318	round trip miles/year	Annual truck miles driven	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		274	trucks/year	Annual no. of trucks	Air Quality: off-site transportation emissions & Energy (fuel usage)				

Note 1: Instantaneous Electricity Equation: 100,721 kW-hr/day x 1 work day/24 hr x 1 MW/1000 kW = 4.2 MW

Note 2: This calculation takes into account the electricity needed to make 8.79 tons per day of NaOH to satisfy demand (19,940 kWh/day).

*See Hydrology/Water Quality Analysis

*See Hydrology/Water Quality Analysis

Key:
Cooling water already accounted for in both water demand and energy demand.
NaOH is 50% by weight; usually delivered by tanker truck in an aqueous solution due to high concentration.
1 scf = 1020 BTU for natural gas
1 MW = 1000 KW
1 tcf (trillion cubic feet) = 1000 bcf (billion cubic feet) = 1,000,000 MMcf (million cubic feet)
1 metric ton = 2205 lbs

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	108,318	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	1.05	4.26	12.88	0.017	0.62	0.54	456,658	12.62	456,923	207
SUBTOTAL	1	4	13	0	1	1	456,658	13	456,923	207
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	108,318	4.89	529,674	2,037
*Assumes 260 days/year			TOTAL	529,674	2,037

Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012

http://www.aqmd.gov/cega/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

PROPOSED PROJECT - OPTION 2: GHG GRAND TOTALS

Worksheet B-8
Proposed Project - Option 2: GHG Grand Totals

Phase III: Operations - GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - reduction	-0.0040	MMscf/day	Natural Gas GHGs	-80.03	-0.0004	-0.0015	-80
electricity - increased use	100.7209	MWh/day	Electricity GHGs	18339.88	0.0000	0.0000	18,340
water - increased use[1]	**0.6423**	**MMgal/day**	**Water Conveyance GHGs**	**254.32**	**0.0016**	**0.0027**	**255**
Facility A	0.0082	MMgal/day	Water Conveyance GHGs	1.04	0.0000	0.0000	1
Facility B	0.1400	MMgal/day	Water Conveyance GHGs	17.80	0.0001	0.0002	18
Facility C	0.01	MMgal/day	Water Conveyance GHGs	12.21	0.0001	0.0001	12
Facility D	0.2279	MMgal/day	Water Conveyance GHGs	28.98	0.0002	0.0003	29
Facility E	0.0137	MMgal/day	Water Conveyance GHGs	18.43	0.0001	0.0002	18
Facility F	0.0000	MMgal/day	Water Conveyance GHGs	0.00	0.0000	0.0000	0
Facility G	0.01	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	2
Facility H	0.04	MMgal/day	Water Conveyance GHGs	55.02	0.0003	0.0006	55
Facility I	0.06	MMgal/day	Water Conveyance GHGs	78.66	0.0005	0.0008	79
Facility J	0.02	MMgal/day	Water Conveyance GHGs	26.36	0.0002	0.0003	26
Facility K	0.11	MMgal/day	Water Conveyance GHGs	14.07	0.0001	0.0001	14
wastewater - increased generation[1]	**0.1582**	**MMgal/day**	**Wastewater Processing GHGs**	**86.35**	**0.00**	**0.00**	**87**
Facility A	0.0055	MMgal/day	Wastewater Processing GHGs	0.70	0.0000	0.0000	1
Facility B	0.0279	MMgal/day	Wastewater Processing GHGs	3.55	0.0000	0.0000	4
Facility C	0.00	MMgal/day	Wastewater Processing GHGs	3.69	0.0000	0.0000	4
Facility D	0.0567	MMgal/day	Wastewater Processing GHGs	7.21	0.0000	0.0001	7
Facility E	0.0110	MMgal/day	Wastewater Processing GHGs	14.74	0.0001	0.0002	15
Facility F	0.0000	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
Facility G	0.01	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
Facility H	0.02	MMgal/day	Wastewater Processing GHGs	22.86	0.0001	0.0002	23
Facility I	0.01	MMgal/day	Wastewater Processing GHGs	17.32	0.0001	0.0002	17
Facility J	0.01	MMgal/day	Wastewater Processing GHGs	14.53	0.0001	0.0002	15
Facility K	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
temporary construction activities[3]	25616	MT/project	Construction GHGs in CO2e				854
operational truck trips	207.2212	MT/project	Operation GHGs in CO2e				207
						TOTAL CO2e	**19,662**
						Significance Threshold	**10,000**
						Exceed Significance?	**YES**

Phase III: Operations - GHG Emissions - Mitigated by Using Recycled Water **Worksheet B-8**

Proposed Project - Option 2: GHG Grand Totals

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - reduction	-0.0040	MMscf/day	Natural Gas GHGs	-80.03	-0.0004	-0.0015	-80
electricity - increased use	100.72	MWh/day	Electricity GHGs	18339.88	0.0000	0.0000	18,340
water - increased use[2]	**0.64**	**MMgal/day**	**Water Conveyance GHGs**	**202.70**	**0.0012**	**0.0021**	**203**
Facility A	0.01	MMgal/day	Water Conveyance GHGs	1.04	0.0000	0.0000	1
Facility B	0.14	MMgal/day	Water Conveyance GHGs	17.80	0.0001	0.0002	18
Facility C	0.009	MMgal/day	Water Conveyance GHGs	1.15	0.0000	0.0000	1
Facility D	0.23	MMgal/day	Water Conveyance GHGs	28.98	0.0002	0.0003	29
Facility E	0.01	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	2
Facility F	0.0000	MMgal/day	Water Conveyance GHGs	0.00	0.0000	0.0000	0
Facility G	0.014	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	2
Facility H	0.041	MMgal/day	Water Conveyance GHGs	55.02	0.0003	0.0006	55
Facility I	0.058	MMgal/day	Water Conveyance GHGs	78.66	0.0005	0.0008	79
Facility J	0.020	MMgal/day	Water Conveyance GHGs	2.49	0.0000	CH4 (MT/yr)	2
Facility K	0.111	MMgal/day	Water Conveyance GHGs	14.07	0.0001	0.0001	14
wastewater - increased generation[2]	**0.16**	**MMgal/day**	**Wastewater Processing GHGs**	**56.50**	**0.0003**	**0.0006**	**57**
Facility A	0.01	MMgal/day	Wastewater Processing GHGs	0.70	0.0000	0.0000	1
Facility B	0.03	MMgal/day	Wastewater Processing GHGs	3.55	0.0000	0.0000	4
Facility C	0.003	MMgal/day	Wastewater Processing GHGs	0.35	0.0000	0.0000	0
Facility D	0.06	MMgal/day	Wastewater Processing GHGs	7.21	0.0000	0.0001	7
Facility E	0.01	MMgal/day	Wastewater Processing GHGs	1.39	0.0000	0.0000	1
Facility F	0.0000	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
Facility G	0.01	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
Facility H	0.02	MMgal/day	Wastewater Processing GHGs	22.86	0.0001	0.0002	23
Facility I	0.01	MMgal/day	Wastewater Processing GHGs	17.32	0.0001	0.0002	17
Facility J	0.01	MMgal/day	Wastewater Processing GHGs	1.37	0.0000	0.0000	1
Facility K	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
temporary construction activities[3]	25616	MT/project	Construction GHGs in CO2e				854
operational truck trips	207.22	MT/project	Operation GHGs in CO2e				207
						TOTAL CO2e	**19,580**
						Significance Threshold	**10,000**
						Exceed Significance?	**YES**

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water[1]
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation[2]
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005. http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005. http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[3] GHGs from temporary construction activities are amortized over 30 years.

ALTERNATIVE B: GRAND TOTALS

Coke Calciner 1 facility - 1 WGS		
Usage Rates		Facility H
0	MMbtu/day	Natural Gas
17,711	kWh/day	Electricity
40,896	gal/day	Water
16,992	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0.44	tons/day	Solid Waste Disposal
3	tons/day	NaOH (50%)
1,200	sf	plot space needed
450	round trip miles/day	truck miles driven
2	trucks/day	no. of trucks
4,400	round trip miles/year	truck miles driven
39	trucks/year	no. of trucks

Recycled Water not available at Facility H

Sulfuric Acid Plant - part 1 1 facility - 1 WGS		
Usage Rates		Facility J
0	MMbtu/day	Natural Gas
9,659	kWh/day	Electricity
19,589	gal/day	Water
10,800	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0	tons/day	Solid Waste Disposal
1	tons/day	NaOH (50%)
500	sf	plot space needed
50	round trip miles/day	truck miles driven
1	trucks/day	no. of trucks
650	round trip miles/year	truck miles driven
13	trucks/year	no. of trucks

Future Access to Recycled Water may be available at Facility J

Sulfuric Acid Plant - part 2 1 facility - existing system upgrade		
Usage Rates		Facility C
0	MMbtu/day	Natural Gas
0	kWh/day	Electricity
6,336	gal/day	Water* (as steam)
0	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0	tons/day	Solid Waste Disposal
0	gal/day	Amine
0	sf	plot space needed
0	round trip miles/day	truck miles driven
0	trucks/day	no. of trucks
0	round trip miles/year	truck miles driven
0	trucks/year	no. of trucks

Future Access to Recycled Water may be available at Facility C

Glass Plant 1 facility - 2 WGSs		
Usage Rates		Facility I
0	MMbtu/day	Natural Gas
5,694	kWh/day	Electricity
58,464	gal/day	Water
12,877	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
110	scf/day	Compressed Air
0	tons/day	Solid Waste Disposal
1	tons/day	NaOH (50%)
640	sf	plot space needed
183	round trip miles/day	truck miles driven
2	trucks/day	no. of trucks
533	round trip miles/year	truck miles driven
9	trucks/year	no. of trucks

Recycled Water not available at Facility I

GRAND TOTALS (For Operation)									
Usage Rates					Notes	Net Effect of Project		Percentage Change	Significant?
0	MMbtu/day	0	scf/day	Natural Gas	Significance Threshold: 1% of supply (9330 MMcf of Natural Gas /day)	0	MMscf/day	0.00000%	NO
33064	kWh/day	33.06	MWh/day	Electricity	Significance Threshold: 1% of supply (8362 MW - instantaneous electricity)	1.38	MW (instantaneous)	0.02%	NO
125285	gal/day	0.13	MMgal/day	Water	Significance Threshold: 5,000,000 gal/day water	125,285	gal/day	2.51%	NO
40669	gal/day	0.04	MMgal/day	Wastewater	Significance Threshold: 25% increase above permitted wastewater limits	40,669	gal/day	<25%*	NO
		0	MMbtu/day	Cooling Water	This data already included in energy calculations.				
		110	scf/day	Compressed Air	This data already included in energy calculations.				
		0.49	tons/day	Solid Waste Disposal	Solid Waste Disposal, Air Quality off-site transportation emissions, & Energy (fuel usage)				
		5.45	tons/day	NaOH (50% by weight)	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		2,340	sf	Plot Space Needed	Air Quality: grading/site-preparation construction emissions				
		683	round trip miles/day	Daily truck miles driven	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		5	trucks/day	Daily no. of trucks	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		5,583	round trip miles/year	Annual truck miles driven	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		61	trucks/year	Annual no. of trucks	Air Quality: off-site transportation emissions & Energy (fuel usage)				
99360	gal/day	0.10	MMgal/day	No access to recycled water					
25925	gal/day	0.03	MMgal/day	future access to recycled water					
29869	gal/day	0.03	MMgal/day	Wastewater (with no access to recycled water)					
10800	gal/day	0.01	MMgal/day	Wastewater (with future access to recycled water)					

Note 1: Instantaneous Electricity Equation: 33,064 kW-hr/day x 1 work day/24 hr x 1 MW/1000 kW = 1.4 MW

Note 2: This calculation takes into account the electricity needed to make 5.45 tons per day of NaOH to satisfy demand (12,361 kWh/day)

*See Hydrology/Water Quality Analysis

*See Hydrology/Water Quality Analysis

Key:
Cooling water already accounted for in both water demand and energy demand.
NaOH is 50% by weight usually delivered by tanker truck in an aqueous solution due to high concentration.
1 scf = 1020 BTU for natural gas

1 MW = 1000 kW
1 tcf (trillion cubic feet) = 1000 bcf (billion cubic feet) = 1,000,000 MMcf (million cubic feet)
1 metric ton = 2205 lbs

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	5,583	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.05	0.22	0.66	0.001	0.03	0.03	23,536	0.65	23,550	11
SUBTOTAL	0	0	1	0	0	0	23,536	1	23,550	11
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	5,583	4.89	27,300	105
			TOTAL:	27,300	105

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

ALTERNATIVE B: GHG GRAND TOTALS

Phase III: Operations - GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - reduction	0.0000	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.0000	0
electricity - increased use	33.06	MWh/day	Electricity GHGs	6020.48	0.0000	0.0000	6,020
water - increased use[1]	0.13	MMgal/day	Water Conveyance GHGs	168.56	0.0010	0.0018	169
wastewater - increased generation[1]	0.04	MMgal/day	Wastewater Processing GHGs	54.72	0.0003	0.0006	55
temporary construction activities[3]	9315	MT/project	Construction GHGs in CO2e				312
operational truck trips	10.68	MT/project	Operation GHGs in CO2e				11
						TOTAL CO2e	6,567
						Significance Threshold	10,000
						Exceed Significance?	NO

Phase III: Operations - GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - reduction	0.0000	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.0000	0
electricity - increased use	33.06	MWh/day	Electricity GHGs	6020.48	0.0000	0.0000	6,020
water - increased use[2]	**0.13**	**MMgal/day**	**Water Conveyance GHGs**	**136.98**	**0.0007**	**0.0014**	**137**
Facility C	0.01	MMgal/day	Water Conveyance GHGs	0.81	0.0000	0.0000	1
Facility H	0.04	MMgal/day	Water Conveyance GHGs	55.02	0.0003	0.0006	55
Facility I	0.06	MMgal/day	Water Conveyance GHGs	78.66	0.0003	0.0008	79
Facility J	0.02	MMgal/day	Water Conveyance GHGs	2.49	0.0000	0.0000	2
wastewater - increased generatic	**0.04**	**MMgal/day**	**Wastewater Processing GHG**	**41.56**	**0.0003**	**0.0004**	**42**
Facility C	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
Facility H	0.02	MMgal/day	Wastewater Processing GHGs	22.86	0.0001	0.0002	23
Facility I	0.01	MMgal/day	Wastewater Processing GHGs	17.32	0.0001	0.0002	17
Facility J	0.01	MMgal/day	Wastewater Processing GHGs	1.37	0.0000	0.0000	1
temporary construction activities[3]	9315	MT/project	Construction GHGs in CO2e				312
operational truck trips	10.68	MT/project	Operation GHGs in CO2e				11
						TOTAL CO2e	6,522
						Significance Threshold	10,000
						Exceed Significance?	NO

Note: The mitigation calculations assume that the total water demand for Facilities C & J can potentially supplied by future recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water[1]
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation[2]
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005. http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005. http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

ALTERNATIVE C - OPTION 1: GRAND TOTALS

Fuel Gas Treatment 6 refineries Usage Rates		
-34	MMbtu/day	Natural Gas
22,649	kWh/day	Electricity
52,055	gal/day	Water
46,575	gal/day	Wastewater
13	Mmbtu/day	Cooling Water
17,233	scf/day	Compressed Air
2	tons/day	Solid Waste Disposal
807	pounds/day	Sulfur sales*
16	pounds/day	Merox Catalyst
3	tons/day	NaOH
11	gallons/day	TG-10 amine additive
2173	gallons/day	sulfinol
-1373.94521	gallons/day	MEA
-789.041096	gallons/day	DEA
18,300	sf	plot space needed
3900	round trip miles/day	truck miles driven
12	trucks/day	no. of trucks
77800	round trip miles/year	truck miles driven
80	trucks/year	no. of trucks

FCCU 4 refineries - 4 WGSs Usage Rates		
0	MMbtu/day	Natural Gas
103,217	kWh/day	Electricity
241,096	gal/day	Water
112,329	gal/day	Wastewater
3	Mmbtu/day	Cooling Water
3,808	scf/day	Compressed Air
4	tons/day	Solid Waste Disposal
4	tons/day	NaOH (50%)
7,150	sf	plot space needed
1,800	round trip miles/day	truck miles driven
8	trucks/day	no. of trucks
27,450	round trip miles/year	truck miles driven
108	trucks/year	no. of trucks

Coke Calciner 1 facility - 1 WGS Usage Rates		
0	MMbtu/day	Natural Gas
17,711	kWh/day	Electricity
40,896	gal/day	Water
16,992	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0.44	tons/day	Solid Waste Disposal
3	tons/day	NaOH (50%)
1,200	sf	plot space needed
450	round trip miles/day	truck miles driven
2	trucks/day	no. of trucks
4,400	round trip miles/year	truck miles driven
39	trucks/year	no. of trucks

Sulfuric Acid Plant - part 1 1 facility - 1 WGS Usage Rates		
0	MMbtu/day	Natural Gas
9,659	kWh/day	Electricity
19,589	gal/day	Water
10,800	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0	tons/day	Solid Waste Disposal
1	tons/day	NaOH (50%)
500	sf	plot space needed
50	round trip miles/day	truck miles driven
1	trucks/day	no. of trucks
650	round trip miles/year	truck miles driven
13	trucks/year	no. of trucks

Worksheet B-11
Alternative C - Option 1: Grand Totals

Sulfuric Acid Plant - part 2 1 facility - existing system upgrade Usage Rates		
0	MMbtu/day	Natural Gas
0	kWh/day	Electricity
6,336	gal/day	Water* (as steam)
0	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0	tons/day	Solid Waste Disposal
0	gal/day	Amine
0	sf	plot space needed
0	round trip miles/day	truck miles driven
0	trucks/day	no. of trucks
0	round trip miles/year	truck miles driven
0	trucks/year	no. of trucks

Cement Kilns 1 facility - 2 limestone absorbers* Usage Rates		
0	MMbtu/day	Natural Gas
23,288	kWh/day	Electricity
110,685	gal/day	Water
0	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
1,096	scf/day	Compressed Air
2	tons/day	Solid Waste Disposal
2	tons/day	Limestone - $CaCO_3$
4,000	sf	plot space needed
143	round trip miles/day	truck miles driven
2	trucks/day	no. of trucks
2,585	round trip miles/year	truck miles driven
64	trucks/year	no. of trucks

Glass Plant 1 facility - 2 WGSs Usage Rates		
0	MMbtu/day	Natural Gas
5,694	kWh/day	Electricity
58,464	gal/day	Water
12,877	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
110	scf/day	Compressed Air
0	tons/day	Solid Waste Disposal
1	tons/day	NaOH (50%)
640	sf	plot space needed
183	round trip miles/day	truck miles driven
2	trucks/day	no. of trucks
533	round trip miles/year	truck miles driven
9	trucks/year	no. of trucks

GRAND TOTALS (For Operation)									
Usage Rates				Notes	Net Effect of Project		Percentage Change	Significant?	
-34.25	MMbtu/day	-33575.07	scf/day	Natural Gas	Significance Threshold: 1% of supply (9330 MMcf of Natural Gas /day)	-0.0336 MMscf/day	-0.00036%	NO	
182,218	kWh/day	182.22	MWh/day	Electricity	Significance Threshold: 1% of supply (8362 MW - instantaneous electricity)	7.59 MW (instantaneous)	0.09%	NO	Note 1: Instantaneous Electricity Equation: 182,218 kW-hr/day x 1 work day/24 hr x 1 MW/1000 kW = 7.6 MW
529,121	gal/day	0.53	MMgal/day	Water	Significance Threshold: 5,000,000 gal/day water	529,121 gal/day	10.58%	NO	*See Hydrology/Water Quality Analysis
199,573	gal/day	0.20	MMgal/day	Wastewater	Significance Threshold: 25% increase above permitted wastewater limits	199,573 gal/day	<25%*	NO	*See Hydrology/Water Quality Analysis
		16	MMbtu/day	Cooling Water	This data already included in energy calculations.				
		22,247	scf/day	Compressed Air	This data already included in energy calculations.				
		9.50	tons/day	Solid Waste Disposal	Solid Waste Disposal, Air Quality off-site transportation emissions, & Energy (fuel usage)				
		806.95	pounds/day	Sulfur sales*	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		16.44	pounds/day	Merox Catalyst	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		10.96	gal/day	TG-10 amine additive	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		13.24	tons/day	NaOH (50% by weight)	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		1.84	tons/day	Limestone - $CaCO_3$	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		2173	gal/day	sulfinol	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		-1373.95	gal/day	MEA	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		-789.041	gal/day	DEA	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		31,790	sf	Plot Space Needed	Air Quality: grading/site-preparation construction emissions				
		6,526	round trip miles/day	Daily truck miles driven	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		27	trucks/day	Daily no. of trucks	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		113,418	round trip miles/year	Annual truck miles driven	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		313	trucks/year	Annual no. of trucks	Air Quality: off-site transportation emissions & Energy (fuel usage)				

Note 2: This calculation takes into account the electricity needed to make 13.24 tons per day of NaOH to satisfy demand (30,023 kWh/day).

Key:
Cooling water already accounted for in both water demand and energy demand.
NaOH is 50% by weight, usually delivered by tanker truck in an aqueous solution due to high concentration.

1 scf = 1020 BTU for natural gas

1 MW = 1000 KW
1 tcf (trillion cubic feet) = 1000 bcf (billion cubic feet) = 1,000,000 MMcf (million cubic feet)
1 metric ton = 2205 lbs

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	113,418	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	1.10	4.46	13.49	0.018	0.65	0.56	478,159	13.21	478,436	217
SUBTOTAL	1	4	13	0	1	1	478,159	13	478,436	217
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	113,418	4.89	554,613	2,133
			TOTAL	554,613	2,133

*Assumes 260 days/year

Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012

http://www.aqmd.gov/cega/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

ALTERNATIVE C - OPTION 1: GHG GRAND TOTALS

Phase III: Operations - GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - reduction	-0.0336	MMscf/day	Natural Gas GHGs	-666.93	-0.0036	-0.0128	-668
electricity - increased use*	182.22	MWh/day	Electricity GHGs	33179.29	0.0000	0.0000	33,179
water - increased use'	**0.53**	**MMgal/day**	**Water Conveyance GHGs**	**353.42**	**0.0020**	**0.0037**	**354**
Facility A	0.079	MMgal/day	Water Conveyance GHGs	10.10	0.0001	0.0001	10.12
Facility B	0.077	MMgal/day	Water Conveyance GHGs	9.75	0.0001	0.0001	9.77
Facility C	0.009	MMgal/day	Water Conveyance GHGs	12.21	0.0001	0.0001	12.24
Facility D	0.014	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	1.75
Facility E	0.063	MMgal/day	Water Conveyance GHGs	84.78	0.0005	0.0009	84.95
Facility F	0.044	MMgal/day	Water Conveyance GHGs	58.98	0.0003	0.0006	59.10
Facility G	0.014	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	1.75
Facility H	0.041	MMgal/day	Water Conveyance GHGs	55.02	0.0003	0.0006	55.13
Facility I	0.058	MMgal/day	Water Conveyance GHGs	78.66	0.0005	0.0008	78.82
Facility J	0.020	MMgal/day	Water Conveyance GHGs	26.36	0.0002	0.0003	26.41
Facility K	0.111	MMgal/day	Water Conveyance GHGs	14.07	0.0001	0.0001	14.10
wastewater - increased generatic	**0.20**	**MMgal/day**	**Wastewater Processing GHG**	**145.01**	**0.0008**	**0.0015**	**145**
Facility A	0.038	MMgal/day	Wastewater Processing GHGs	4.88	0.0000	0.0001	4.89
Facility B	0.036	MMgal/day	Wastewater Processing GHGs	4.53	0.0000	0.0000	4.54
Facility C	0.003	MMgal/day	Wastewater Processing GHGs	3.69	0.0000	0.0000	3.69
Facility D	0.014	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	1.75
Facility E	0.033	MMgal/day	Wastewater Processing GHGs	44.23	0.0003	0.0005	44.32
Facility F	0.022	MMgal/day	Wastewater Processing GHGs	29.49	0.0002	0.0003	29.55
Facility G	0.014	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	1.75
Facility H	0.017	MMgal/day	Wastewater Processing GHGs	22.86	0.0001	0.0002	22.91
Facility I	0.013	MMgal/day	Wastewater Processing GHGs	17.32	0.0001	0.0002	17.36
Facility J	0.011	MMgal/day	Wastewater Processing GHGs	14.53	0.0001	0.0002	14.56
Facility K	0.000	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0.00
temporary construction activities[3]	27944	MT/project	Construction GHGs in CO2e				932
operational truck trips	216.98	MT/project	Operation GHGs in CO2e				217
						TOTAL CO2e	**34,159**
						Significance Threshold	**10,000**
						Exceed Significance?	**YES**

Worksheet B-12
Alternative C - Option 1: GHG Grand Totals

Phase III: Operations - GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - reduction	-0.0336	MMscf/day	Natural Gas GHGs	-666.93	-0.0036	-0.0128	-668
electricity - increased use*	182.22	MWh/day	Electricity GHGs	33179.29	0.0000	0.0000	33,179
water - increased use[2]	**0.53**	**MMgal/day**	**Water Conveyance GHGs**	**188.32**	**0.0011**	**0.0020**	**189**
Facility A	0.079	MMgal/day	Water Conveyance GHGs	10.10	0.0001	0.0001	10.12
Facility B	0.077	MMgal/day	Water Conveyance GHGs	9.75	0.0001	0.0001	9.77
Facility C	0.009	MMgal/day	Water Conveyance GHGs	1.15	0.0000	0.0000	1.16
Facility D	0.014	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	1.75
Facility E	0.063	MMgal/day	Water Conveyance GHGs	8.01	0.0000	0.0001	8.03
Facility F	0.044	MMgal/day	Water Conveyance GHGs	5.57	0.0000	0.0001	5.58
Facility G	0.014	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	1.75
Facility H	0.041	MMgal/day	Water Conveyance GHGs	55.02	0.0003	0.0006	55.13
Facility I	0.058	MMgal/day	Water Conveyance GHGs	78.66	0.0005	0.0008	78.82
Facility J	0.020	MMgal/day	Water Conveyance GHGs	2.49	0.0000	0.0000	2.50
Facility K	0.111	MMgal/day	Water Conveyance GHGs	14.07	0.0001	0.0001	14.10
wastewater - increased generatic	**0.20**	**MMgal/day**	**Wastewater Processing GHG**	**61.76**	**0.0004**	**0.0006**	**62**
Facility A	0.038	MMgal/day	Wastewater Processing GHGs	4.88	0.0000	0.0001	4.89
Facility B	0.036	MMgal/day	Wastewater Processing GHGs	4.53	0.0000	0.0000	4.54
Facility C	0.003	MMgal/day	Wastewater Processing GHGs	0.35	0.0000	0.0000	0.35
Facility D	0.014	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	1.75
Facility E	0.033	MMgal/day	Wastewater Processing GHGs	4.18	0.0000	0.0000	4.19
Facility F	0.022	MMgal/day	Wastewater Processing GHGs	2.79	0.0000	0.0000	2.79
Facility G	0.014	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	1.75
Facility H	0.017	MMgal/day	Wastewater Processing GHGs	22.86	0.0001	0.0002	22.91
Facility I	0.013	MMgal/day	Wastewater Processing GHGs	17.32	0.0001	0.0002	17.36
Facility J	0.011	MMgal/day	Wastewater Processing GHGs	1.37	0.0000	0.0000	1.38
Facility K	0.000	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0.00
temporary construction activities[3]	27944	MT/project	Construction GHGs in CO2e				932
operational truck trips	216.98	MT/project	Operation GHGs in CO2e				217
						TOTAL CO2e	**33,911**
						Significance Threshold	**10,000[1]**
						Exceed Significance?	**YES**

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water[1]
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation[2]
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005. http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005. http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[3] GHGs from temporary construction activities are amortized over 30 years.

ALTERNATIVE C - OPTION 2: GRAND TOTALS

FCCUs 5 Refineries Using SOx Reducing Additives to meet 5 ppm SOx limit Usage Rates		
0	Mmbtu/day	Natural Gas
0	kWh/day	Electricity
0	gal/day	Water
0	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0	tons/day	Solid Waste Disposal
2500	pounds/day	SOx Reducing Catalyst
0	sf	Plot Space Needed
2000	round trip miles/day	1 Truck Delivering SOx Reducing Catalyst
5	trucks/day	No. of Trucks Delivering SOx Reducing Catalyst
0	round trip miles/day	1 Truck Hauling Away Solid Waste[2]
0	trucks/day	No. of Trucks Hauling Away Solid Waste[2]
8000	round trip miles/year	Annual Truck Miles
20	trucks/year	Annual Trucks

Coke Calciner 1 facility - 1 WGS Usage Rates		
0	MMbtu/day	Natural Gas
17,711	kWh/day	Electricity
40,896	gal/day	Water
16,992	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0.44	tons/day	Solid Waste Disposal
3	tons/day	NaOH (50%)
1,200	sf	plot space needed
450	round trip miles/day	truck miles driven
2	trucks/day	no. of trucks
4,400	round trip miles/year	truck miles driven
39	trucks/year	no. of trucks

Sulfuric Acid Plant - part 1 1 facility - 1 WGS Usage Rates		
0	MMbtu/day	Natural Gas
9,659	kWh/day	Electricity
19,589	gal/day	Water
10,800	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0	tons/day	Solid Waste Disposal
1	tons/day	NaOH (50%)
500	sf	plot space needed
50	round trip miles/day	truck miles driven
1	trucks/day	no. of trucks
650	round trip miles/year	truck miles driven
13	trucks/year	no. of trucks

Sulfuric Acid Plant - part 2 1 facility - existing system upgrade Usage Rates		
0	MMbtu/day	Natural Gas
0	kWh/day	Electricity
6,336	gal/day	Water* (as steam)
0	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0	tons/day	Solid Waste Disposal
0	gal/day	Amine
0	sf	plot space needed
0	round trip miles/day	truck miles driven
0	trucks/day	no. of trucks
0	round trip miles/year	truck miles driven
0	trucks/year	no. of trucks

*any increase in SOx Reducing Catalyst is a direct reduction in FCCU regenerator catalyst

Notes:
Facility A already uses SOx reducing additives, but not sure how much
Facility B already uses 800 lb/day of SOx reducing additives
Facility C no longer needs to use SOx reducing additives
Facility D does not currently use SOx reducing additives
Facility E has been testing with SOx reducing additives
Facility F already uses SOx reducing additives, but not sure how much

Brands of SOx reducing additives:
Intercat Super SOx-Getter
Grace Davison Super DeSOx
Most refineries are using Grace Davison's base catalyst and sox reducing catalyst.

[1]Assumes catalyst deliveries are made by a 25 ton capacity truck. It will take an extra 19 trucks to deliver one year's worth of catalyst, but the peak would be one truck per day.
456.25 tons/yr catalyst x 1 truck/25 tons = 18.25 trucks/year to deliver extra catalyst

[2]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 78 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.
1938.15 tons/yr solid waste x 1 truck/25 tons = 78 trucks/year to haul extra solid waste away for recycling

Worksheet B-13
Alternative C - Option 2: Grand Totals

Glass Plant 1 facility - 2 WGSs Usage Rates		
0	MMbtu/day	Natural Gas
5,694	kWh/day	Electricity
58,464	gal/day	Water
12,877	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
110	scf/day	Compressed Air
0	tons/day	Solid Waste Disposal
1	tons/day	NaOH (50%)
640	sf	plot space needed
183	round trip miles/day	truck miles driven
2	trucks/day	no. of trucks
533	round trip miles/year	truck miles driven
9	trucks/year	no. of trucks

Cement Kilns 1 facility - 2 limestone absorbers Usage Rates		
0	MMbtu/day	Natural Gas
23288	kWh/day	Electricity
110685	gal/day	Water
0	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
1096	scf/day	Compressed Air
2	tons/day	Solid Waste Disposal
2	tons/day	Limestone - $CaCO_3$
4000	sf	plot space needed
143	round trip miles/day	truck miles driven
2	trucks/day	no. of trucks
2585	round trip miles/year	truck miles driven
64	trucks/year	no. of trucks

Fuel Gas Treatment 6 refineries Usage Rates		
-34	MMbtu/day	Natural Gas
22,649	kWh/day	Electricity
52,055	gal/day	Water
46,575	gal/day	Wastewater
13	Mmbtu/day	Cooling Water
17,233	scf/day	Compressed Air
2	tons/day	Solid Waste Disposal
807	pounds/day	Sulfur sales*
16	pounds/day	Merox Catalyst
3	tons/day	NaOH (50%)
11	gallons/day	TG-10 amine additive
2173	gallons/day	sulfinol
-1374	gallons/day	MEA
-789	gallons/day	DEA
18,300	sf	plot space needed
3,900	round trip miles/day	truck miles driven
12	trucks/day	no. of trucks
77,800	round trip miles/year	truck miles driven
80	trucks/year	no. of trucks

Worksheet B-13
Alternative C - Option 2: Grand Totals

GRAND TOTALS (For Operation)									
Usage Rates					Notes	Net Effect of Project		Percentage Change	Significant?
-34.25	MMbtu/day	-33575.07	scf/day	Natural Gas	Significance Threshold: 1% of supply (9330 MMcf of Natural Gas /day)	-0.0336	MMscf/day	-0.00036%	NO
79,000	kWh/day	79.00	MWh/day	Electricity	Significance Threshold: 1% of supply (8362 MW - instantaneous electricity)	3.29	MW (instantaneous)	0.04%	NO
288,025	gal/day	0.29	MMgal/day	Water	Significance Threshold: 5,000,000 gal/day water	288,025	gal/day	5.76%	NO
87,244	gal/day	0.09	MMgal/day	Wastewater	Significance Threshold: 25% increase above permitted wastewater limits	87,244	gal/day	<25%*	NO
		13	MMbtu/day	Cooling Water	This data already included in energy calculations.				
		18,438	scf/day	Compressed Air	This data already included in energy calculations.				
		5.31	tons/day	Solid Waste Disposal	Solid Waste Disposal, Air Quality off-site transportation emissions, & Energy (fuel usage)				
		807	pounds/day	Sulfur sales*	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		16	pounds/day	Merox Catalyst	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		2,500	pounds/day	SOx Reducing Catalyst	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		8.79	tons/day	NaOH (50% by weight)	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		2	tons/day	Limestone - $CaCO_3$	Air Quality: on-site transportation emissions & Energy (fuel usage)				
		11	tons/day	TG-10 amine additive	Air Quality: on-site transportation emissions & Energy (fuel usage)				
		2173	gal/day	sulfinol	Air Quality: on-site transportation emissions & Energy (fuel usage)				
		-1374	gal/day	MEA	Air Quality: on-site transportation emissions & Energy (fuel usage)				
		-789	gal/day	DEA	Air Quality: on-site transportation emissions & Energy (fuel usage)				
		24,640	sf	Plot Space Needed	Air Quality: grading/site-preparation construction emissions				
		6,726	round trip miles/day	Daily truck miles driven	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		24	trucks/day	Daily no. of trucks	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		93,968	round trip miles/year	Annual truck miles driven	Air Quality: off-site transportation emissions & Energy (fuel usage)				
		225	trucks/year	Annual no. of trucks	Air Quality: off-site transportation emissions & Energy (fuel usage)				

Note 1: Instantaneous Electricity Equation: 79,000 kW-hr/day x 1 work day/24 hr x 1 MW/1000 kW = 3.3 MW

Note 2: This calculation takes into account the electricity needed to make 8.79 tons per day of NaOH to satisfy demand (19,940 kWh/day).

*See Hydrology/Water Quality Analysis

*See Hydrology/Water Quality Analysis

Key:
Cooling water already accounted for in both water demand and energy demand.
NaOH is 50% by weight, usually delivered by tanker truck in an aqueous solution due to high concentration.

1 scf = 1020 BTU for natural gas.

1 MW = 1000 KW
1 tcf (trillion cubic feet) = 1000 bcf (billion cubic feet) = 1,000,000 MMcf (million cubic feet).
1 metric ton = 2205 lbs

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	93,968	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.91	3.69	11.18	0.015	0.54	0.47	396,159	10.95	396,389	180
SUBTOTAL	1	4	11	0	1	0	396,159	11	396,389	180
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	93,968	4.89	459,502	1,767
			TOTAL	459,502	1,767

*Assumes 260 days/year

Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012

http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

ALTERNATIVE C - OPTION 2: GHG GRAND TOTALS

Phase III: Operations - GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - reduction	-0.0336	MMscf/day	Natural Gas GHGs	-666.93	-0.0036	-0.0128	-668
electricity - increased use	79.00	MWh/day	Electricity GHGs	14384.87	0.0000	0.0000	14,385
water - increased use[1]	**0.29**	**MMgal/day**	**Water Conveyance GHGs**	**209.28**	**0.0012**	**0.0022**	**210**
Facility A	0.01	MMgal/day	Water Conveyance GHGs	1.04	0.0000	0.0000	1
Facility B	0.00	MMgal/day	Water Conveyance GHGs	0.00	0.0000	0.0000	0
Facility C	0.01	MMgal/day	Water Conveyance GHGs	12.21	0.0001	0.0001	12
Facility D	0.01	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	2
Facility E	0.01	MMgal/day	Water Conveyance GHGs	18.43	0.0001	0.0002	18
Facility F	0.00	MMgal/day	Water Conveyance GHGs	0.00	0.0000	0.0000	0
Facility G	0.01	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	2
Facility H	0.04	MMgal/day	Water Conveyance GHGs	55.02	0.0003	0.0006	55
Facility I	0.06	MMgal/day	Water Conveyance GHGs	78.66	0.0005	0.0008	79
Facility J	0.02	MMgal/day	Water Conveyance GHGs	26.36	0.0002	0.0003	26
Facility K	0.11	MMgal/day	Water Conveyance GHGs	14.07	0.0001	0.0001	14
wastewater - increased generatic	**0.09**	**MMgal/day**	**Wastewater Processing GHG**	**77.33**	**0.0004**	**0.0008**	**77**
Facility A	0.01	MMgal/day	Wastewater Processing GHGs	0.70	0.0000	0.0000	1
Facility B	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
Facility C	0.00	MMgal/day	Wastewater Processing GHGs	3.69	0.0000	0.0000	4
Facility D	0.01	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
Facility E	0.01	MMgal/day	Wastewater Processing GHGs	14.74	0.0001	0.0002	15
Facility F	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
Facility G	0.01	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
Facility H	0.02	MMgal/day	Wastewater Processing GHGs	22.86	0.0001	0.0002	23
Facility I	0.01	MMgal/day	Wastewater Processing GHGs	17.32	0.0001	0.0002	17
Facility J	0.01	MMgal/day	Wastewater Processing GHGs	14.53	0.0001	0.0002	15
Facility K	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
temporary construction activities[3]	18630	MT/project	Construction GHGs in CO2e				621
operational truck trips	179.77	MT/project	Operation GHGs in CO2e				180
						TOTAL CO2e	**14,805**
						Significance Threshold	**10,000**
						Exceed Significance?	**YES**

Worksheet B-14
Alternative C - Option 2: GHG Grand Totals

Phase III: Operations - GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - reduction	-0.0336	MMscf/day	Natural Gas GHGs	-666.93	-0.0036	-0.0128	-668
electricity - increased use	79.00	MWh/day	Electricity GHGs	14384.87	0.0000	0.0000	14,385
water - increased use[2]	**0.29**	**MMgal/day**	**Water Conveyance GHGs**	**157.67**	**0.0009**	**0.0017**	**158**
Facility A	0.01	MMgal/day	Wastewater Processing GHGs	1.04	0.0000	0.0000	1
Facility B	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
Facility C	0.01	MMgal/day	Wastewater Processing GHGs	1.15	0.0000	0.0000	1
Facility D	0.01	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
Facility E	0.01	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
Facility F	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
Facility G	0.01	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
Facility H	0.04	MMgal/day	Wastewater Processing GHGs	55.02	0.0003	0.0006	55
Facility I	0.06	MMgal/day	Wastewater Processing GHGs	78.66	0.0005	0.0008	79
Facility J	0.02	MMgal/day	Wastewater Processing GHGs	2.49	0.0000	0.0000	2
Facility K	0.11	MMgal/day	Wastewater Processing GHGs	14.07	0.0001	0.0001	14
wastewater - increased generatic	**0.09**	**MMgal/day**	**Wastewater Processing GHG**	**47.4810**	**0.0003**	**0.0005**	**48**
Facility A	0.01	MMgal/day	Wastewater Processing GHGs	0.70	0.0000	0.0000	1
Facility B	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
Facility C	0.00	MMgal/day	Wastewater Processing GHGs	0.35	0.0000	0.0000	0
Facility D	0.01	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
Facility E	0.01	MMgal/day	Wastewater Processing GHGs	1.39	0.0000	0.0000	1
Facility F	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
Facility G	0.01	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
Facility H	0.02	MMgal/day	Wastewater Processing GHGs	22.86	0.0001	0.0002	23
Facility I	0.01	MMgal/day	Wastewater Processing GHGs	17.32	0.0001	0.0002	17
Facility J	0.01	MMgal/day	Wastewater Processing GHGs	1.37	0.0000	0.0000	1
Facility K	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
temporary construction activities[3]	18630	MT/project	Construction GHGs in CO2e				621
operational truck trips	179.77	MT/project	Operation GHGs in CO2e				180
						TOTAL CO2e	**14,723**
						Significance Threshold	**10,000**
						Exceed Significance?	**YES**

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water[1]
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation[2]
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005. http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005. http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[3] GHGs from temporary construction activities are amortized over 30 years.

Facility K - Cement Plant
BoldEco Limestone
Absorber

TWO UNITS Required

Utility/Infrastructure	Annual Usage/unit		Daily Usage/unit		Daily Usage		Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu	0	MMbtu	**Natural Gas**	0 scf
Electricity	4,250,000	kWh	11643.84	kWh	23287.67	Kwh	**Electricity**	23.29 MWh
Water	20.2	MMgal	55342.47	gal	110684.94	gal	**Water**	0.11 Mmgal
Wastewater	0	MMgal	0.00	gal	0	gal	**Wastewater**	0 Mmgal
Cooling Water	0	MMbtu	0.00	MMbtu	0	MMbtu	**Cooling Water**	
Compressed Air	200	1000 scf	547.95	scf	1095.9	scf	**Compressed Air**	
Solid Waste Disposal	454	tons	1.24	tons	2.49	tons	**Solid Waste Disposal**	
Limestone - $CaCO_3$	336	tons	0.92	tons	1.84	tons	**Limestone - $CaCO_3$**	
Plot Space Needed	2000	sf	2000	sf	4000	sf	**Plot Space Needed**	
1 Truck Hauling Away Solid Waste[1]	2558.00	round trip miles	142.12	round trip miles	143.12	Daily round trip miles	**Total Daily Truck Miles**	
1 Truck Delivering Limestone[2]	27	round trip miles	1.00	round trip miles	2.00	Daily trucks	**Total No. of Trucks**	
No. of Trucks Hauling Away Solid Waste	37	trucks	1	truck	2585.00	Annual round trip miles	**Annual Truck Miles**	
No. of Trucks Delivering Limestone	27	trucks	1	truck	64	Annual trucks	**Annual Trucks**	

GRAND TOTAL FOR TWO UNITS

*All of the injected water is evaporated, so there is no wastewater per ETS email on 09/15/09

[1]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take 37 extra trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.
454 tons/yr solid waste x 2 units X 1 truck/25 tons = 36.32 trucks/year to haul extra solid waste away for recycling
This facility sends its solid waste to a Class III landfill for disposal which is 71.06 miles (one-way) away.

[2]Assumes Hauling Limestone from quarry to unit in a 25 ton capacity truck. It will take 27 extra truck trips to haul one year's worth of limestone, but the peak would be one truck per day.
336 tons/yr limestone x 2 units x 1 truck/25 tons = 26.88 trucks/year to haul limestone from the quarry to the equipment
The distance between the quarry and the facility is less than one mile (one-way) away because the cement plant is located on its own quarry.

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation On-Road Equipment Type	Fuel	Annual Round-trip Distance (miles/year)	Mileage Rate (miles/ gallon)	2012 Mobile Source Emission Factors VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	2,585	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.03	0.10	0.31	0.000	0.01	0.01	10,898	0.30	10,904	5
SUBTOTAL	0	0	0	0	0	0	10,898	0	10,904	5
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	2,585	4.89	12,641	49
			TOTAL	12,641	49

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.0000	MMscf/day	Natural Gas	0.00	0.0000	0.0000	0
electricity - increased use	23.29	MWh/day	Electricity GHGs	4240.36	0.0000	0.0000	4,240
water - increased use[2]	0.11	MMgal/day	Water Conveyance GHGs	14.07	0.0001	0.0001	14
wastewater - increased generation[1]	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
temporary construction activities[3]	4657	MT/year	Construction GHGs in CO2e				155
operational truck trips	4.95	MT/year	Operation GHGs in CO2e				5
						TOTAL CO2e	4,416

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.00	MMscf/day	Natural Gas	0.00	0.00	0.00	0
electricity - increased use	23.29	MWh/day	Electricity GHGs	4240.36	0.00	0.00	4,240
water - increased use[2]	0.11	MMgal/day	Water Conveyance GHGs	14.07	0.00	0.00	14
wastewater - increased generation[2]	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.00	0.00	0
temporary construction activities[3]	4657.40	MT/year	Construction GHGs in CO2e				155
operational truck trips	4.95	MT/year	Operation GHGs in CO2e				5
						TOTAL CO2e	4,415

Note: This facility does not have current access or future access to recycled water but does have access to industrial use water from their own wells. In the absense of GHG emission factors for groundwater pumping, the GHG emission factors for recycled water conveyance will be applied to the GHG calculation for unmitigated emissions.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005. http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005. http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3]GHGs from temporary construction activities are amortized over 30 years.

Facility I - Glass Plant
Tri-Mer Non-regenerative wet gas scrubber

TWO UNITS Required

GRAND TOTAL FOR TWO UNITS

Utility/Infrastructure	Annual Usage/unit		Daily Usage/unit	Daily Usage		Daily Usage
Natural Gas	0	MMbtu	0.00 MMbtu	0 MMbtu	**Natural Gas**	0 scf
Electricity	939,800	kWh	2574.79 kWh	5694.26 Kwh	**Electricity**	5.69 MWh
Water	10.7	MMgal	29232.00 gal	58,464 gal	**Water**	0.06 Mmgal
Wastewater	2.35	MMgal	6438.36 gal	12876.72 gal	**Wastewater**	0.01 Mmgal
Cooling Water	0	MMbtu	0.00 MMbtu	0 MMbtu	**Cooling Water**	
Compressed Air	20	1000 scf	54.79 scf	109.58 scf	**Compressed Air**	
Solid Waste Disposal	10	tons	0.03 tons	0.054 tons	**Solid Waste Disposal**	
NaOH (50%)	144	tons	0.40 tons	0.79 tons	**NaOH (50%)**	
Plot Space Needed	320	sf	320 sf	640 sf	**Plot Space Needed**	
1 Truck Hauling Away Solid Waste[1]	132.78	round trip miles	round trip 132.78 miles	Daily round 132.78 trip miles	**1 Truck Hauling Away Solid Waste[1]**	
1 Truck Delivering NaOH[2]	200	round trip miles	round trip 50.00 miles	Daily round 50.00 trip miles	**1 Truck Delivering NaOH[2]**	
No. of Trucks Hauling Away Solid Waste	1	trucks	1 truck	1.00 daily trucks	**No. of Trucks Hauling Away Solid Waste**	
No. of Trucks Delivering NaOI	4	trucks	1 truck	1 daily trucks	**No. of Trucks Delivering NaOH**	
				Daily round 182.78 trip miles	**Total Daily Truck Miles**	
				Daily 2.00 trucks	**Total No. of Trucks**	
				Annual round trip 532.78 miles	**Annual Truck Miles**	
				Annual 9 trucks	**Annual Trucks**	

Note: This calculation takes into account the electricity needed to make 0.79 ton per day of NaOH to satisfy demand (1,791 kWh/day).

[1]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take 1 extra truck to haul away one year's worth of solid waste, but the peak would be one truck per day.
10 tons/yr solid waste x 2 units x 1 truck/25 tons = 0.8 trucks/year to haul extra solid waste away for recycling
This facility sends its solid waste to a Class III landfill for disposal which is 66.4 miles (one-way) away.

[2]Assumes that one 10,000 gallon capacity storage tank will be installed for NaOH storage. It will take 8 trucks to deliver one year's worth of NaOH 50% solution, but the peak would be one truck per day.
144 tons/yr NaOH x 2 units x 2,000 lbs/ ton = 576,000 lbs/yr x 1 gal NaOH @ 50%/12.77 lbs = 45,106 gal/year x 1 truck/6,000 gallons = 7.5 trucks/year

This facility is not tied into Central Basin Municipal Water District's recycled water pipeline. Access to the pipeline is approx. 800 feet away from the facility.

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	533	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Worksheet B-16
Facility I: Glass Plant

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.01	0.02	0.06	0.000	0.00	0.00	2,246	0.06	2,247	1
SUBTOTAL	0	0	0	0	0	0	2,246	0	2,247	1
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	533	4.89	2,605	10
			TOTAL	2,605	10

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.0000	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.0000	0
electricity - increased use	5.69	MWh/day	Electricity GHGs	1036.85	0.0000	0.0000	1,037
water - increased use[2]	0.06	MMgal/day	Water Conveyance GHGs	78.66	0.0005	0.0008	79
wastewater - increased generation[1]	0.01	MMgal/day	Wastewater Processing GHGs	17.32	0.0001	0.0002	17
temporary construction activities[3]	4657	MT/year	Construction GHGs in CO2e				155
operational truck trips	1.02	MT/year	Operation GHGs in CO2e				1
						TOTAL CO2e	1,289

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.00	MMscf/day	Natural Gas GHGs	0.00	0.00	0.00	0
electricity - increased use	5.69	MWh/day	Electricity GHGs	1036.85	0.00	0.00	1,037
water - increased use[2]	0.06	MMgal/day	Water Conveyance GHGs	78.66	0.0005	0.0008	79
wastewater - increased generation[1]	0.01	MMgal/day	Wastewater Processing GHGs	17.32	0.0001	0.0002	17
temporary construction activities[3]	4657.40	MT/year	Construction GHGs in CO2e				155
operational truck trips	1.02	MT/year	Operation GHGs in CO2e				1
						TOTAL CO2e	1,289

Note: This facility does not have current access or future access to recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005. http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005. http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[3] GHGs from temporary construction activities are amortized over 30 years.

Facility C - Sulfuric Acid Plant
Cansolv

Facility C
(existing system going from 20 ppm to 10 ppm)

Utility/Infrastructure	Annual Usage		Daily Usage		Usage/Ratings		
Natural Gas	0	MMbtu	0.00	MMbtu		MMbtu	
Electricity	0	kWh	0.00	kWh		kW	
Water*	2.31	MMgal	6336	gal	0.006336	mmgal/day	(1,100 lb/hr steam = 2.2 gal/min water plus 2.2 gal/min extra cooling tower water = 4.4 gal/min)
Wastewater	0	MMgal	0.00	gal	0.00	mmgal/day	
Cooling Water	0	MMbtu	0.00	MMbtu			
Compressed Air	0	1000 scf	0.00	scf			
Solid Waste Disposal	0	tons	0.00	tons			
Amine	0	gal	0.00	gal		gal/hr	
Plot Space Needed	0	sf					

***as steam**

Facility J - Sulfuric Acid Plant
Belco wet gas scrubber

Utility/Infrastructure	Annual Usage		Daily Usage		Daily Usage		
Natural Gas	0	MMbtu	0.00	MMbtu	0	scf	Note: This calculation takes into account the electricity needed to make 1.30 tons per day of NaOH to satisfy demand (2,939 kWh/day).
Electricity	2,452,800	kWh	9658.78	kWh	9.66	MWh	
Water	7.15	MMgal	19589.04	gal	0.02	Mmgal	
Wastewater	3.94	MMgal	10800.00	gal	0.01	Mmgal	
Cooling Water	0	MMbtu	0.00	MMbtu			
Compressed Air	0	1000 scf	0.00	scf			
Solid Waste Disposal	0	tons	0.00	tons			
NaOH (50%)	473	tons	1.30	tons			
Plot Space Needed	500	sf					
		round trip		round trip			
1 Truck Delivering NaOH	650	miles	50.00	miles			
No. of Trucks Delivering NaOH	13	trucks	1	truck			

[1]Assumes that one 10,000 gallon capacity storage tank will be installed for NaOH storage. It will take 13 trucks to deliver one year's worth of NaOH 50% solution, but the peak would be one truck per day.
473 tons/yr NaOH x 2,000 lbs/ ton = 946,000 lbs/yr x 1 gal NaOH @ 50%/12.77 lbs = 74,080 gal/year x 1 truck/6,000 gallons = 12.35 trucks/year

Phase III: Operations - On-Road Vehicles and Fuel Use

[illegible]		Annual Round-trip Distance	Mileage Rate	[illegible]							
On-Road Equipment Type	**Fuel**	**(miles/year)**	**(miles/ gallon)**	**VOC (lb/mile)**	**CO (lb/mile)**	**NOx (lb/mile)**	**SOx (lb/mile)**	**PM10 (lb/mile)**	**PM2.5 (lb/mile)**	**CO2 (lb/mile)**	**CH4 (lb/mile)**
Offsite (Heavy-Heavy Duty Truck)	diesel	650	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

[illegible]	**VOC (lb/day)**	**CO (lb/day)**	**NOx (lb/day)**	**SOx (lb/day)**	**PM10 (lb/day)**	**PM2.5 (lb/day)**	**CO2 (lb/year)**	**CH4 (lb/year)**	**CO2e (lb/year)**	**CO2e (MT*/year)**
Offsite (Heavy-Heavy Duty Truck)	0.01	0.03	0.08	0.000	0.00	0.00	2,740	0.08	2,742	1
SUBTOTAL	0	0	0	0	0	0	2,740	0	2,742	1
Significance Threshold	550	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**n/a**	**n/a**	**n/a**	**n/a**

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

[redacted]	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day) *
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	650	4.89	3,179	12
			[redacted]		

*Assumes 260 days/year

Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

[redacted]	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.0000	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.0000	0
electricity - increased use	9.66	MWh/day	Electricity GHGs	1758.73	0.0000	0.0000	1,759
water - increased use[2]	0.03	MMgal/day	Water Conveyance GHGs	34.88	0.0002	0.0004	35
wastewater - increased generation[1]	0.01	MMgal/day	Wastewater Processing GHGs	14.53	0.0001	0.0002	15
temporary construction activities[3]	2329	MT/year	Construction GHGs in CO2e	[redacted]			78
operational truck trips	1.24	MT/year	Operation GHGs in CO2e				1
						[redacted]	

GHG Emissions - Mitigated by Using Recycled Water

[redacted]	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.00	MMscf/day	Natural Gas GHGs	0.00	0.00	0.00	0
electricity - increased use	9.66	MWh/day	Electricity GHGs	1758.73	0.00	0.00	1,759
water - increased use[2]	0.03	MMgal/day	Water Conveyance GHGs	3.30	0.0000	0.0000	3
wastewater - increased generation[1]	0.01	MMgal/day	Wastewater Processing GHGs	1.37	0.0000	0.0000	1
temporary construction activities[3]	2328.70	MT/year	Construction GHGs in CO2e	[redacted]			78
operational truck trips	1.24	MT/year	Operation GHGs in CO2e				1
						[redacted]	

Note: The mitigation calculations assume that 100% of the total water demand for Sulfuric Acid Manufacturing at Facilities C & J can potentially be supplied by future access to recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[3]GHGs from temporary construction activities are amortized over 30 years.

Facility H - Coke Calciner
Belco wet gas scrubber

Utility/Infrastructure	Annual Usage		Daily Usage		Daily Usage		
Natural Gas	0	MMbtu	0.00	MMbtu	0.00	scf	
Electricity	3,679,200	kWh	17710.86	kWh	17.71	MWh	Note: This calculation takes into account the electricity needed to make 3.37 tons per day of NaOH to satisfy demand (7,631 kWh/day).
Water	14.93	MMgal	40896.00	gal	0.04	Mmgal	
Wastewater	6.2	MMgal	16992.00	gal	0.02	Mmgal	
Cooling Water	0	MMbtu	0.00	MMbtu			
Compressed Air	0	1000 scf	0.00	scf			
Solid Waste Disposal	160	tons	0.44	tons			
NaOH (50%)	1,228	tons	3.37	tons	22	gal/hr	280.434 lb/hr
Plot Space Needed	1200	sf			density = 12.747 lb/gal for NaOH at 50%		
1 Truck Hauling Away Solid Waste[1]	2800	round trip miles	400.00	round trip miles			
1 Truck Delivering NaOH[2]	1,600	round trip miles	50.00	round trip miles			
No. of Trucks Hauling Away Solid Waste	7	trucks	1	truck			
No. of Trucks Delivering NaOH	32	trucks	1	truck			
Total Truck Miles	4400.00	round trip miles	450.00	round trip miles			
Total No. of Trucks	39.00	trucks	2.00	trucks			

[1]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 7 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.
160 tons/yr solid waste x 1 truck/25 tons = 6.4 trucks/year to haul extra solid waste away for recycling
This facility sends its solid waste to a cement plant for recycling which is 67.7 miles (one-way) away. However, the cement plant has shut-down its kilns on 11/20/2009 so the solid waste may be sent a different cement l

[2]Assumes that one 10,000 gallon capacity storage tank will be installed for NaOH storage. It will take 32 trucks to deliver one year's worth of NaOH 50% solution, but the peak would be one truck per day.
1,228 tons/yr NaOH x 2,000 lbs/ ton = 854,000 lbs/yr x 1 gal NaOH @ 50%/12.77 lbs = 192,326 gal/year x 1 truck/6,000 gallons = 32 trucks/year

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors*							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	4,400	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.04	0.17	0.52	0.001	0.03	0.02	18,550	0.51	18,561	8
SUBTOTAL	0	0	1	0	0	0	18,550	1	18,561	8
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	4,400	4.89	21,516	83
			TOTAL	21,516	83

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

[redacted]	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.0000	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.0000	0
electricity - increased use	17.71	MWh/day	Electricity GHGs	3224.90	0.0000	0.0000	3,225
water - increased use[1]	0.04	MMgal/day	Water Conveyance GHGs	55.02	0.0003	0.0006	55
wastewater - increased generation[1]	0.02	MMgal/day	Wastewater Processing GHGs	22.86	0.0001	0.0002	23
temporary construction activities[3]	2329	MT/year	Construction GHGs in CO2e	[redacted]			78
operational truck trips	8.42	MT/year	Operation GHGs in CO2e				8
						TOTAL CO2e	3,389

GHG Emissions - Mitigated by Using Recycled Water

[redacted]	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.00	MMscf/day	Natural Gas GHGs	0.00	0.00	0.00	0
electricity - increased use	17.71	MWh/day	Electricity GHGs	3224.90	0.00	0.00	3,225
water - increased use[2]	0.04	MMgal/day	Water Conveyance GHGs	55.02	0.00	0.00	55
wastewater - increased generation[2]	0.02	MMgal/day	Wastewater Processing GHGs	22.86	0.00	0.00	23
temporary construction activities[3]	2328.70	MT/year	Construction GHGs in CO2e	[redacted]			78
operational truck trips	8.42	MT/year	Operation GHGs in CO2e				8
						TOTAL CO2e	3,389

Note: This facility does not have current access or future access to recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

Module 2: Fuel Gas Systems/Treatment

M22: Add TG-10 to MDEA

Utility/Infrastructure	Annual Usage		Facility F Daily Usage	
Natural Gas	2,000	MMbtu	5 48	MMbtu
Electricity	20,000	kWh	54 79	kWh
Water	0	MMgal	0 00	MMgal
Wastewater	0	MMgal	0 00	MMgal
Cooling Water	2,000	MMbtu	5 48	MMbtu
Compressed Air	0	1000 scf	0 00	scf
Solid Waste Disposal	0	tons	0 00	tons
Sulfur sales*	10 35	long tons	63 52	pounds
TG-10 amine additive	4,000	gallons	10 96	gallons
Plot Space Needed	100	sf		
		round trip		round trip
1 Truck Delivering TG-10	400	miles	400 00	miles
1 Truck Hauling Sulfur		round trip		round trip
Away	50	miles	50 00	miles
No. of Trucks Delivering TG-10	1	truck	1	truck
No. of Trucks Hauling Away Sulfur	1	truck	1	truck

Facility F will have future access to recycled water.

M21A: Parallel Merox treatment for excess coker gas

Utility/Infrastructure	Annual Usage		Facility D Daily Usage	
Natural Gas	440	MMbtu	1 21	MMbtu
Electricity	156,400	kWh	1422 50	kWh
Water	5	MMgal	0 01	MMgal
Wastewater	5	MMgal	0 01	MMgal
Cooling Water	176	MMbtu	0 48	MMbtu
Compressed Air	780	1000 scf	2136 99	scf
Solid Waste Disposal	110	tons	0 30	tons
Sulfur sales*	11	long tons	67 51	pounds
Merox Catalyst	3,000	pounds	8 22	pounds
NaOH (50%)	160	tons	0 44	tons
Plot Space Needed	6000	sf		
1 Truck Hauling Away		round trip		round trip
Solid Waste	2000	miles	400 00	miles
1 Truck Delivering		round trip		round trip
Merox Catalyst	500	miles	500 00	miles
1 Truck Delivering		round trip		round trip
NaOH	250	miles	50 00	miles
1 Truck Hauling Sulfur		round trip		round trip
Away	50	miles	50 00	miles
No of Trucks Hauling Away Solid Waste	5	trucks	1	truck
No of Trucks Delivering Merox	1	trucks	1	truck
No of Trucks Delivering NaOH	5	trucks	1	truck
No. of Trucks Hauling Away Sulfur	1	trucks	1	truck

Facility D has current and increased future access to recycled water.

M20A: Convert all amine absorbers to Sulfinol

Utility/Infrastructure	Annual Usage		Facility C Daily Usage	
Natural Gas	-1,030	MMbtu	-2 82	MMbtu
Electricity	476,580	kWh	1305 70	kWh
Water	1	MMgal	0 003	MMgal
Wastewater	1	MMgal	0 003	MMgal
Cooling Water	140	MMbtu	0 38	MMbtu
Compressed Air	100	1000 scf	273 97	scf
Solid Waste Disposal	0	tons	0 00	tons
Sulfur sales*	6 58	long tons	40 38	pounds
Plot Space Needed	6000	sf		
No. of Trucks Delivering Sulfinol	47	trucks	1 00	trucks
1 Truck Delivering		round trip		round trip
Sulfinol	23500	miles	500	miles
1 Truck Hauling Sulfur		round trip		round trip
Away	50	miles	50 00	miles
No of Trucks Hauling Away Sulfur	1	trucks	1	truck
sulfinol	277400	gallons	760 00	gallons
1 Existing Truck		round trip		round trip
Delivering MEA	-2400 00	miles	-50 00	miles
No of Existing Trucks Delivering MEA	-48 00	trucks	-1 00	truck
MEA usage	-288000 00	gallons	-789 04	gallons

Facility C will have future access to recycled water.

Excluded - not cost effective
M20: Sulfinol conversion for FCC/coker

Utility/Infrastructure	Annual Usage		Facility B Daily Usage	
Natural Gas	-47,740	MMbtu	-130 79	MMbtu
Electricity	1,992,190	kWh	5458 05	kWh
Water	4	MMgal	10958 90	gal
Wastewater	3	MMgal	8219 18	gal
Cooling Water	590	MMbtu	1 62	MMbtu
Compressed Air	100	1000 scf	273 97	scf
Solid Waste Disposal	0	tons	0 00	tons
Sulfur sales*	6 47	long tons	39 71	pounds
Plot Space Needed	100	sf		

M21B: Merox treatment of delayed coker off-gas	Facility G				
	Annual Usage		Daily Usage		
Utility/Infrastructure					
Natural Gas	2,950	MMbtu	8 08	MMbtu	
Electricity	1,042,900	kWh	9442 54	kWh	
Water	5	MMgal	0 01	MMgal	
Wastewater	5	MMgal	0 01	MMgal	
Cooling Water	1,180	MMbtu	3 23	MMbtu	
Compressed Air	5,210	1000 scf	14273 97	scf	
Solid Waste Disposal	740	tons	2.03	tons	
Sulfur sales*	47	long tons	288 44	pounds	
Merox Catalyst	3,000	pounds	8 22	pounds	
NaOH (50%)	1,060	tons	2 90	tons	
Plot Space Needed	6000	sf			
1 Truck Hauling Away Solid Waste	12000	round trip miles	400 00	round trip miles	
1 Truck Delivering Merox Catalyst	500	round trip miles	500 00	round trip miles	
1 Truck Delivering NaOH	1400	round trip miles	50 00	round trip miles	
1 Truck Hauling Sulfur Away	100	round trip miles	50 00	round trip miles	
No of Trucks Hauling Away Solid Waste	30	trucks	1 00	truck	
No of Trucks Delivering Merox	1	trucks	1.00	truck	
No of Trucks Delivering NaOH	28	trucks	1 00	truck	
No of Trucks Hauling Away Sulfur	2	trucks	1 00	truck	

Facility G will not have future access to recycled water, but has current access to non-potable groundwater

M20B: Sulfinol conversion for two H2S absorbers	Facility A				
	Annual Usage		Daily Usage		
Utility/Infrastructure					
Natural Gas	-2,080	MMbtu	-5 70	MMbtu	
Electricity	1,385,870	kWh	3796 90	kWh	
Water	3	MMgal	0 01	MMgal	
Wastewater	2	MMgal	0 01	MMgal	
Cooling Water	400	MMbtu	1.10	MMbtu	
Compressed Air	100	1000 scf	273 97	scf	
Solid Waste Disposal	0	tons	0.00	tons	
Plot Space Needed	100	sf			
1 Truck Delivering Sulfinol	11000 00	round trip miles	500 00	round trip miles	
No of Trucks Delivering Sulfinol	22 00	trucks	1 00	truck	
Sulfinol	130670 00	gallons	358 00	gallons	
1 Existing Truck Delivering DEA	-1100 00	round trip miles	-50 00	round trip miles	
No. of Existing Trucks Delivering DEA	-22 00	trucks	-1 00	truck	
DEA usage .	-127000 00	gallons	-347.95	gallons	

Facility A has current and increased future access to recycled water.

M20: Convert amine absorbers to Sulfinol	Facility E				
	Annual Usage		Daily Usage		
Utility/Infrastructure					
Natural Gas	-14,780	MMbtu	-40 49	MMbtu	
Electricity	2,418,610	kWh	6626 33	kWh	
Water	5	MMgal	0 01	MMgal	
Wastewater	4	MMgal	0 01	MMgal	
Cooling Water	700	MMbtu	1.92	MMbtu	
Compressed Air	100	1000 scf	273 97	scf	
Solid Waste Disposal	0	tons	0 00	tons	
Sulfur sales*	56 56	long tons	347.11	pounds	
Plot Space Needed	100	sf			
1 Truck Hauling Sulfur Away	150	round trip miles	50 00	round trip miles	
No of Trucks Hauling Away Sulfur	3	trucks	1	truck	
No of Trucks Delivering Sulfinol	65 00	trucks	1 00	truck	
sulfinol	385075 00	gallons	1055 00	gallons	
1 Truck Delivering Sulfinol	32500 00	round trip miles	500 00	round trip miles	
1 Existing Truck Delivering DEA	-3150 00	round trip miles	-50 00	round trip miles	
No of Existing Trucks Delivering DEA	-63 00	trucks	-1 00	truck	
DEA usage	-374490 00	gallons	-1026 00	gallons	

Facility E will have future access to recycled water.

GRAND TOTAL		GRAND TOTAL			Daily Usage		
Annual Usage		Daily Usage					
-12,500	MMbtu	-34	MMbtu	Natural Gas	-33575 07	scf	Note This calculation takes into account the electricity needed to make 3 34 tons per day of NaOH to satisfy demand at Facilities D & G (7,579 kWh/day)
5,500,360	kWh	22,649	kWh	Electricity	22 65	MWh	
19	MMgal	0 05	MMgal	Water	52,055	gal	
17	MMgal	0 05	MMgal	Wastewater	46,575	gal	
4,596	MMbtu	13	MMbtu	Cooling Water			
6,290	1000 scf	17,233	scf	Compressed Air			
850	tons	2	tons	Solid Waste Disposal			
231	long tons	807	pounds	Sulfur sales*			
6,000	pounds	16	pounds	Merox Catalyst			
1,220	tons	3 34	tons	NaOH (50%)			
4,000	gallons	10 96	gallons	TG-10 amine additive			
793145	gallons	2173	gallons	sulfinol			
-501490 00	gallons	-1373 95	gallons	DEA			
-288000 00	gallons	-789 04	gallons	MEA			
18300	sf	18300	sf	Plot Space Needed			
	round trip		round trip				
400	miles	400 00	miles	1 Truck Delivering TG-10			
	round trip		round trip				
400	miles	250 00	miles	1 Truck Hauling Sulfur Away			
	round trip		round trip	1 Truck Hauling Away Solid			
14000	miles	800 00	miles	Waste			
	round trip		round trip	1 Truck Delivering Merox			
1000	miles	1000 00	miles	Catalyst			
	round trip		round trip				
1650	miles	100 00	miles	1 Truck Delivering NaOH			
	round trip		round trip				
67,000	miles	1500 00	miles	1 Truck Delivering Sulfinol			
	round trip		round trip				
-2400 00	miles	-50 00	miles	1 Truck Delivering MEA			
	round trip		round trip				
-4250 00	miles	-100 00	miles	1 Truck Delivering DEA			
1	trucks	1	trucks	No of Trucks Delivering TG-10			
8	trucks	5	trucks	No of Trucks Hauling Sulfur Away			
35	trucks	2	trucks	No of Trucks Hauling Away Solid Waste			
2	trucks	2	trucks	No of Trucks Delivering Merox Catalyst			
33	trucks	2	trucks	No of Trucks Delivering NaOH			
134 00	trucks	3 00	trucks	No of Trucks Delivering Sulfinol			
-48 00	trucks	-1 00	trucks	No of Trucks Delivering MEA			
-85 00	trucks	-2 00	trucks	No of Trucks Delivering DEA			
	round trip		round trip				
77800 00	miles	3900 00	miles	Truck Miles			
80 00	trucks	12 00	trucks	Trucks			

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors								
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	77,800	4 89	0 0025	0 0102	0 0309	0 00004	0 0015	0 0013	4 2159	0 0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0 76	3.06	9 25	0 012	0 45	0 39	327,998	9 06	328,188	149
SUBTOTAL	1	3	9	0	0	0	327,998	9	328,188	149
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	77,800	4 89	380,442	1,463
*Assumes 260 days/year			TOTAL	380,442	1,463

Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.egmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	-0 0336	MMscf/day	Natural Gas GHGs	-666 93	-0 0036	-0 0128	-668
electricity - increased use	22 65	MWh/day	Electricity GHGs	4124 03	0 0000	0.0000	4,124
water - increased use[1]	0 05	MMgal/day	Water Conveyance GHGs	26 64	0 0002	0 0003	27
wastewater - increased generation[1]	0 05	MMgal/day	Wastewater Processing GHGs	22 61	0 0001	0 0002	23
temporary construction activities[3]	4657	MT/year	Construction GHGs in CO2e	[redacted]			155
operational truck trips	148.84	MT/year	Operation GHGs in CO2e				149
						TOTAL CO2e	3,809

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	-0 03	MMscf/day	Natural Gas GHGs	-666 93	-0 0036	-0 0128	-668
electricity - increased use	22 65	MWh/day	Electricity GHGs	4124 03	0 0000	0.0000	4,124
water - increased use[2]	0 05	MMgal/day	Water Conveyance GHGs	6 62	0 0000	0 0001	7
wastewater - increased generation[2]	0.05	MMgal/day	Wastewater Processing GHGs	5 92	0 0000	0 0001	6
temporary construction activities[3]	4657.40	MT/year	Construction GHGs in CO2e	[redacted]			155
operational truck trips	148 84	MT/year	Operation GHGs in CO2e				149
						TOTAL CO2e	3,772

Note: The mitigation calculations assume that 100% of the total water demand for FGT can potentially be supplied by recycled water for Facilities A, C, D, E & F.
Facilities A & D already have access to recycled water and Facility G already has access to non-potable groundwater.
Facilities C, E & F may have new future access to recycled water.

GHG Emission Factors
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0 64 lb N2O/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water[1]
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation[2]
640 lb CO2/MWh for electricity use due to water conveyance
0 0067 lb CH4/MWh for electricity use due to water conveyance
0 0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3]GHGs from temporary construction activities are amortized over 30 years

Module 3A: SRU/TGTU Systems
M17: Tail Gas NWGS Tri-Mer Cloud Chamber

Facility B (2 units)			Facility D			SUBTOTAL			Module 3A: SRU/TGTU Systems M17: Tail Gas NWGS Tri-Mer Cloud
Utility/Infrastructure	Annual Usage	Daily Usage	Annual Usage	Daily Usage		Annual Usage	Daily Usage		
Natural Gas	0 MMbtu	0.00 MMbtu	0 MMbtu	0.00 MMbtu		0 MMbtu	0.00 MMbtu		Natural Gas
Electricity	4,395,600 kWh	12042.74 kWh	2,447,400 kWh	6705.21 kWh		6,843,000 kWh	18747.95 kWh		Electricity
Water*	51.1 MMgal	140000.00 gal	78.2 MMgal	214246.58 gal		129.3 MMgal	354246.58 gal		Water
Wastewater*	10.2 MMgal	27945.21 gal	15.7 MMgal	43013.70 gal		25.9 MMgal	70958.90 gal		Wastewater
Cooling Water	409,880 MMbtu	1122.96 MMbtu	228,200 MMbtu	625.21 MMbtu		638,080 MMbtu	1748.16 MMbtu		Cooling Water
Compressed Air	100 1000 scf	273.97 scf	100 1000 scf	273.97 scf		200 1000 scf	547.95 scf		Compressed Air
Solid Waste Disposal	500 tons	1.37 tons	320 tons	0.88 tons		820 tons	2.25 tons		Solid Waste Disposal
Soda Ash	190 tons	0.52 tons	123 tons	0.34 tons		313 tons	0.86 tons		Soda Ash
Plot Space Needed	7906 sf		5930 sf			13836 sf	13836 sf		Plot Space Needed
1 Truck Hauling Away	round trip	round trip	round trip	round trip		round trip	round trip		1 Truck Hauling Away
Solid Waste	8000 miles	400.00 miles	5200 miles	400.00 miles		13200 miles	800 miles		Solid Waste
1 Truck Delivering Soda Ash	round trip 400 miles	round trip 50.00 miles	round trip 250 miles	round trip 50.00 miles		round trip 650 miles	round trip 100 miles		1 Truck Delivering Soda Ash
No. of Trucks Hauling Away Solid Waste	20 trucks	1 truck	13 trucks	1 truck		33 trucks	2 truck		No. of Trucks Hauling Away Solid Waste
No. of Trucks Delivering Soda Ash	8 trucks	1 truck	5 trucks	1 truck		13 trucks round trip	2 truck round trip		No. of Trucks Delivering Soda Ash
						13850 miles	900 miles		Truck Miles
						46 trucks	4 trucks		Trucks

*Updated water/wastewater data from Tri-Mer

Facility B will have increased access to recycled water.

Facility D will have future access to recycled water.

Module 2: SRU/TGTU Systems
M13: EmeraChem ESx Gas Treating

Facility A			SUBTOTAL			Module 2: SRU/TGTU Systems M13: EmeraChem ESx Gas Treating
Utility/Infrastructure	Annual Usage	Daily Usage	Annual Usage	Daily Usage		
Natural Gas	11,000 MMbtu	30.14 MMbtu	11,000 MMbtu	30.14 MMbtu		Natural Gas
Electricity	1,085,000 kWh	2972.60 kWh	1,085,000 kWh	2972.60 kWh		Electricity
Water	0 MMgal	0.00 gal	0 MMgal	0.00 gal		Water
Wastewater	0 MMgal	0.00 gal	0 MMgal	0.00 gal		Wastewater
Cooling Water	40 MMbtu	0.11 MMbtu	40 MMbtu	0.11 MMbtu		Cooling Water
Compressed Air	770 1000 scf	2109.59 scf	770 1000 scf	2109.59 scf		Compressed Air
Solid Waste Disposal	0 tons	0.00 tons	0 tons	0.00 tons		Solid Waste Disposal
Esx Catalyst	400 pounds	1.10 pounds	400 pounds	1.10 pounds		Esx Catalyst
Sulfur sales*	23.66 long tons	145.20 pounds	24 long tons	145.20 pounds		Sulfur sales*
Plot Space Needed	2500 sf		2500 sf	2500 sf		Plot Space Needed
1 Truck Hauling Sulfur Away	round trip 100.00 miles	round trip 50.00 miles	100 miles round trip	50 miles round trip		1 Truck Hauling Sulfur Away
1 Truck Delivering ESX Catalyst	round trip 400.00 miles	round trip 400.00 miles	400 miles	400 miles		1 Truck Delivering Esx Catalyst
No. of Trucks Hauling Away Sulfur	2.00 trucks	1.00 trucks	1 trucks	1 trucks		No. of Trucks Delivering EsX Catalyst
No. of Trucks Delivering ESX Catalyst	1.00 trucks	1.00 trucks	2 trucks round trip	1 trucks round trip		No. of Trucks Hauling Away Sulfur
			500 miles	450 miles		Truck Miles
			3 trucks	2 trucks		Trucks

Facility A will have increased access to recycled water.

Excluded - not cost effective

Module 2: SRU/TGTU Systems
M13: EmeraChem ESx Gas Treating

Facility E

Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	50,400	MMbtu	138.08	MMbtu
Electricity	703,600	kWh	1927.67	kWh
Water	0	MMgal	0.00	gal
Wastewater	0	MMgal	0.00	gal
Cooling Water	20	MMbtu	0.05	MMbtu
Compressed Air	720	1000 scf	1972.60	scf
Solid Waste Disposal	0	tons	0.00	tons
ESX Catalyst	400	pounds	1.10	pounds
Sulfur sales*	6.11	long tons	37.50	pounds
Plot Space Needed	2500	sf		

Excluded - not cost effective
Module 3A: SRU/TGTU Systems
M17: Tail Gas NWGS Tri-Mer Cloud Chamber

Facility G

Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	1,809,000	kWh	4956.16	kWh
Water	253	MMgal	693150.68	gal
Wastewater	61	MMgal	167123.29	gal
Cooling Water	168,700	MMbtu	462.19	MMbtu
Compressed Air	100	1000 scf	273.97	scf
Solid Waste Disposal	120	tons	0.33	tons
Soda Ash	45	tons	0.12	tons
Plot Space Needed	3953	sf		

Excluded - Facility F already meets the 5 ppm SOx level
Module 2: SRU/TGTU Systems
M13: EmeraChem ESx Gas Treating

Facility F

Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	96,700	MMbtu	264.93	MMbtu
Electricity	1,182,000	kWh	3238.36	kWh
Water	0	MMgal	0.00	gal
Wastewater	0	MMgal	0.00	gal
Cooling Water	40	MMbtu	0.11	MMbtu
Compressed Air	600	1000 scf	1643.84	scf
Solid Waste Disposal	0	tons	0.00	tons
ESX Catalyst	400	pounds	1.10	pounds
Sulfur sales*	20.88	long tons	128.14	pounds
Plot Space Needed	2500	sf		

GRAND TOTAL

Annual Usage		Daily Usage		
11000	MMbtu	30.14	MMbtu	Natural Gas
7928000	kWh	21720.55	kWh	Electricity
129.3	MMgal	354246.58	gal	Water
25.9	MMgal	70958.90	gal	Wastewater
638120	MMbtu	1748.27	MMbtu	Cooling Water
970	1000 scf	2657.53	scf	Compressed Air
820	tons	2.25	tons	Solid Waste Disposal
313	tons	0.86	tons	Soda Ash
400	pounds	1.10	pounds	ESX Catalyst
25	long tons	145.20	pounds	Sulfur sales*
16336	sf	16336.00	sf	Plot Space Needed
	round trip		round trip	
14,350	miles	1,350	miles	Truck Miles
49	trucks	6	trucks	Trucks

GRAND TOTAL

Daily Usage		
29546.07	scf	Natural Gas
21.72	MWh	Electricity
0.35	Mmgal	Water
0.07	Mmgal	Wastewater

Phase III: Operations - On-Road Vehicles and Fuel Use

On-Road Equipment Type	Fuel	Annual Round-trip Distance (miles/year)	Mileage Rate (miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	14,350	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.14	0.56	1.71	0.002	0.08	0.07	60,498	1.67	60,533	27
SUBTOTAL	0	0	0	0	0	0	60,498	2	60,533	27
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	14,350	4.89	70,172	270
			TOTAL	70,172	270

*Assumes 260 days/year

Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.agmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.0295	MMscf/day	Natural Gas GHGs	586.90	0.0031	0.0112	588
electricity - increased use	21.72	MWh/day	Electricity GHGs	3955.01	0.0000	0.0000	3,955
water - increased use[1]	0.35	MMgal/day	Water Conveyance GHGs	45.04	0.0003	0.0005	45
wastewater - increased generation[1]	0.07	MMgal/day	Wastewater Processing GHGs	9.02	0.0001	0.0001	9
temporary construction activities[3]	6986	MT/year	Construction GHGs in CO2e				233
operational truck trips	27.45	MT/year	Operation GHGs in CO2e				27
						TOTAL CO2e	4,858

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.0295	MMscf/day	Natural Gas GHGs	586.90	0.0031	0.0112	588
electricity - increased use	21.7205	MWh/day	Electricity GHGs	3955.01	0.0000	0.0000	3,955
water - increased use[2]	0.3542	MMgal/day	Water Conveyance GHGs	45.04	0.0003	0.0005	45
wastewater - increased generation[2]	0.0710	MMgal/day	Wastewater Processing GHGs	9.02	0.0001	0.0001	9
temporary construction activities[3]	6986.1024	MT/year	Construction GHGs in CO2e				233
operational truck trips	27.4528	MT/year	Operation GHGs in CO2e				27
						TOTAL CO2e	4,858

Note: The mitigation calculations assume that 100% of the total water demand for the SRU/TGUs can potentially be supplied by recycled water. Facilities A, B & D already have access to recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N2O/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water [1]
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation [2]
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1] California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2] California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

Module 3A: FCCU
M1: Belco wet gas scrubber

Utility/Infrastructure	Facility B Annual Usage		Facility B Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	12,080,000	kWh	33095.89	kWh
Water	28	MMgal	76712.33	gal
Wastewater	13	MMgal	35616.44	gal
Cooling Water	410	MMbtu	1.12	MMbtu
Compressed Air	440	1000 scf	1205.48	scf
Solid Waste Disposal	400	tons	1.10	tons
NaOH (50%)	427	tons	1.17	tons
Plot Space Needed	2000	sf		
1 Truck Hauling Away Solid Waste	6400	round trip miles	400.00	round trip miles
1 Truck Delivering NaOH	600	round trip miles	50.00	round trip miles
No. of Trucks Hauling Away Solid Waste	16	trucks	1	truck
No. of Trucks Delivering NaOH	12	trucks	1	truck

Facility B will have increased access to recycled water.

Utility/Infrastructure	Facility F Annual Usage		Facility F Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	5,789,000	kWh	15860.27	kWh
Water	16	MMgal	43835.62	gal
Wastewater	8	MMgal	21917.81	gal
Cooling Water	200	MMbtu	0.55	MMbtu
Compressed Air	260	1000 scf	712.33	scf
Solid Waste Disposal	690	tons	1.89	tons
NaOH (50%)	738	tons	2.02	tons
Plot Space Needed	1575	sf		
1 Truck Hauling Away Solid Waste	11200	round trip miles	400.00	round trip miles
1 Truck Delivering NaOH	1000	round trip miles	50.00	round trip miles
No. of Trucks Hauling Away Solid Waste	28	trucks	1	truck
No. of Trucks Delivering NaOH	20	trucks	1	truck

Facility F will have future access to recycled water.

Utility/Infrastructure	Facility A Annual Usage		Facility A Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	9,238,000	kWh	25309.59	kWh
Water	26	MMgal	71232.88	gal
Wastewater	12	MMgal	32876.71	gal
Cooling Water	320	MMbtu	0.88	MMbtu
Compressed Air	410	1000 scf	1123.29	scf
Solid Waste Disposal	280	tons	0.77	tons
NaOH (50%)	294	tons	0.81	tons
Plot Space Needed	2000	sf		
1 Truck Hauling Away Solid Waste	4800	round trip miles	400.00	round trip miles
1 Truck Delivering NaOH	400	round trip miles	50.00	round trip miles
No. of Trucks Hauling Away Solid Waste	12	trucks	1	truck
No. of Trucks Delivering NaOH	8	trucks	1	truck

Facility A will have increased access to recycled wate

Facility D

Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	16,084,000	kWh	44065.75	kWh
Water	40	MMgal	109589.04	gal
Wastewater	18	MMgal	49315.07	gal
Cooling Water	550	MMbtu	1.51	MMbtu
Compressed Air	630	1000 scf	1726.03	scf
Solid Waste Disposal	190	tons	0.52	tons
NaOH (50%)	193	tons	0.53	tons
Plot Space Needed	2000	sf		
Excluded - not Cost Effective				

Facility E Annual Usage		Facility E Daily Usage	GRAND TOTALS Annual Usage	GRAND TOTALS Daily Usage	Module 3A: FCCU M1: Belco wet gas scrubber	Daily Usage
0	MMbtu	0.00 MMbtu	0 MMbtu	0.00 MMbtu	**Natural Gas**	0.00 scf
6,887,000	kWh	18868.49 kWh	33,994,000 kWh	103217.18 kWh	**Electricity**	103.22 MWh
18	MMgal	49315.07 gal	88 MMgal	241095.89 gal	**Water**	0.24 Mmgal
8	MMgal	21917.81 gal	41 MMgal	112328.77 gal	**Wastewater**	0.11 Mmgal
240	MMbtu	0.66 MMbtu	1170 MMbtu	3.21 MMbtu	**Cooling Water**	
280	1000 scf	767.12 scf	1390 1000 scf	3808.22 scf	**Compressed Air**	
160	tons	0.44 tons	1530 tons	4.19 tons	**Solid Waste Disposal**	
164	tons	0.45 tons	1623 tons	4.45 tons	**NaOH (50%)**	
1575	sf		7150 sf	7150.00 sf	**Plot Space Needed**	
	round trip	round trip	round trip	round trip	**1 Truck Hauling Away**	
2800	miles	400.00 miles	25200 miles	1600 miles	**Solid Waste[1]**	
	round trip	round trip	round trip	round trip	**1 Truck Delivering**	
250	miles	50.00 miles	2250 miles	200 miles	**NaOH[2]**	
7	trucks	1 truck	63 trucks	4 trucks	**No. of Trucks Hauling Away Solid Waste**	
5	trucks	1 truck	45 trucks	4 trucks	**No. of Trucks Delivering NaOH**	
			round trip	round trip		
			27450.00 miles	1600.00 miles	**Total Truck Miles**	
			108.00 trucks	8.00 trucks	**Total No. of Trucks**	

Facility E will have future access to recycled water.

Note: This calculation takes into account the electricity needed to make 4.45 tons per day of NaOH to satisfy demand (10,083 kWh/day).

Phase III: Operations - On-Road Vehicles and Fuel Use

On-Road Equipment Type	Fuel	Annual Round-trip Distance (miles/year)	Mileage Rate (miles/gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	27,450	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.27	1.08	3.26	0.004	0.16	0.14	115,727	3.20	115,794	53
[redacted] SUBTOTAL	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

[redacted]	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	27,450	4.89	134,231	516
			TOTAL:	134,231	516

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

[redacted]	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.0000	MMscf/day	Natural Gas	0.00	0.0000	0.0000	0
electricity - increased use	103.22	MWh/day	Electricity	18794.42	0.0000	0.0000	18,794
water - increased use[1]	0.24	MMgal/day	Water Conveyance GHGs	144.14	0.0008	0.0015	144
wastewater - increased generation[1]	0.11	MMgal/day	Wastewater Processing GHGs	67.69	0.0004	0.0007	68
temporary construction activities[3]	9315	MT/year	GHGs in CO2e	[redacted]			310
operational truck trips	52.51	MT/year	GHGs in CO2e	[redacted]			53
						TOTAL CO2e	19,370

GHG Emissions - Mitigated by Using Recycled Water

[redacted]	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.00	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.00	0
electricity - increased use	103.22	MWh/day	Electricity GHGs	18794.42	0.0000	0.00	18,794
water - increased use[1]	0.24	MMgal/day	Water Conveyance GHGs	30.65	0.0002	0.0003	31
wastewater - increased generation[1]	0.11	MMgal/day	Wastewater Processing GHGs	14.26	0.0001	0.0001	14
temporary construction activities[3]	9314.80	MT/year	Construction GHGs in CO2e	[redacted]			310
operational truck trips	52.51	MT/year	Operation GHGs in CO2e	[redacted]			53
						TOTAL CO2e	19,202

Note: The mitigation calculations assume that 100% of the total water demand for FCCUs can potentially be supplied by recycled water

Facilities A & B already have access to recycled water while Facilities E & F may have future access to recycled water

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N2O/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3]GHGs from temporary construction activities are amortized over 30 years

Fuel Gas Treatment

Module 2: Fuel Gas Systems M20B: Sulfinol conversion for two H2S absorbers	Facility A			
Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	-2,080	MMbtu	-5.70	MMbtu
Electricity	1,385,870	kWh	3796.90	kWh
Water	3	MMgal	8219.18	gal
Wastewater	2	MMgal	5479.45	gal
Cooling Water	400	MMbtu	1.10	MMbtu
Compressed Air	100	1000 scf	273.97	scf
Solid Waste Disposal	0	tons	0.00	tons
Plot Space Needed	100	sf		
1 Truck Delivering Sulfinol[1]	11,000	round trip miles	500.00	round trip miles
No. of Trucks Delivering Sulfinol	22	trucks	1	truck
Sulfinol	130670	gallons	358.00	gallons
1 Existing Truck Delivering DEA	-1,100	round trip miles	-50.00	round trip miles
No. of Existing Trucks Delivering DEA	-22	trucks	-1.00	truck
DEA usage	-127000	gallons	-348	gallons

Module 3A: FCCU M1: Belco wet gas scrubber	Facility A			
Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	9,238,000	kWh	25309.59	kWh
Water	26	MMgal	71232.88	gal
Wastewater	12	MMgal	32876.71	gal
Cooling Water	320	MMbtu	0.88	MMbtu
Compressed Air	410	1000 scf	1123.29	scf
Solid Waste Disposal	280	tons	0.77	tons
NaOH (50%)	294	tons	0.81	tons
Plot Space Needed	2000	sf		
1 Truck Hauling Away Solid Waste[2]	4800	round trip miles	400.00	round trip miles
1 Truck Delivering NaOH[3]	400	round trip miles	50.00	round trip miles
No. of Trucks Hauling Away Solid Waste	12	trucks	1	truck
No. of Trucks Delivering NaOH	8	trucks	1	truck

Module 2: SRU/TGTU Systems M13: EmeraChem ESx Gas Treating	Facility A			
Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	11,000	MMbtu	30.14	MMbtu
Electricity	1,085,000	kWh	2972.60	kWh
Water	0	MMgal	0.00	gal
Wastewater	0	MMgal	0.00	gal
Cooling Water	40	MMbtu	0.11	MMbtu
Compressed Air	770	1000 scf	2109.59	scf
Solid Waste Disposal	0	tons	0.00	tons
Esx Catalyst	400	pounds	1.10	pounds
Sulfur sales*	23.66	long tons	145.20	pounds
Plot Space Needed	2500	sf		
1 Truck Hauling Sulfur Away[4]	100	round trip miles	50.00	round trip miles
1 Truck Delivering ESX Catalyst[5]	400	round trip miles	400.00	round trip miles
No. of Trucks Hauling Sulfur Away	2	trucks	1	truck
No. of Trucks Delivering ESX Catalyst	1	trucks	1	truck

Facility A already accesses recycled water and will have increased future access to recycled water.

[1]Assumes that the existing DEA amine storage tank can be used for Sulfinol storage.

[2]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 12 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.

280 tons/yr solid waste x 1 truck/25 tons = 11.2 trucks/year to haul extra solid waste away for recycling

[3]Assumes that one 10,000 gallon capacity storage tank will be installed for NaOH storage. It will take 8 trucks to deliver one year's worth of NaOH 50% solution, but the peak would be one truck per day.

294 tons/yr NaOH x 2,000 lbs/ ton = 328,000 lbs/yr x 1 gal NaOH @ 50%/12.77 lbs = 46,045 gal/year x 1 truck/6,000 gallons = 7.67 trucks/year

[4]Assumes Hauling Sulfur away in a 25 ton capacity truck. It will take an extra 2 trucks to haul away one year's worth of sulfur, but the peak would be one truck per day.
23.66 long tons/yr Sulfur x 2,240 lbs/long ton = 52,998 lbs/yr x 1 ton/2000 lbs = 26.5 tons/yr x 1 truck/25 tons = 1.06 trucks/year to haul extra sulfur away to a buyer

[5] It will take one truck to deliver one year's worth of ESX Catalyst, but the peak would be one truck per day.

Facility A estimated that a wet gas scrubber would generate 40 million gals per year wastewater = 109,589 gals per day.
Facility A has two distinct wastewater systems. System One is the un-segregated system, which handles water from cooling towers, boiler blowdowns, and stormwater.

This wastewater receives primary treatment, the maximum capacity for this system is 5000 gpm; the facility is currently running at about 3000 gpm.

System Two is the segregated system, which handles process water. This wastewater receives primary and secondary (biological) treatment. The maximum capacity for this system is 2000 gpm; the facility is currently running at about 1800 gpm.
Facility A has some wastewater storage capacity to handle surges due to storms and upsets.

Grand Totals

Daily Usage		Daily Usage	
24.44 MMbtu	Natural Gas	23959.17271 scf	
33905.58 kWh	Electricity	33.90557991 MWh	Note: This calculation takes into account the electricity needed to make 0.81 tons per day of NaOH to satisfy demand (1,826 kWh/day).
79452.05 gal	Water	0.079452055 Mmgal	
38356.16 gal	Wastewater	0.038356164 Mmgal	
2.08 MMbtu	Cooling Water		
3506.85 scf	Compressed Air		
0.77 tons	Solid Waste Disposal		
1.10 pounds	Esx Catalyst		
145.20 pounds	Sulfur sales*		
0.81 tons	NaOH (50%)		
358.00 gallons	sulfinol		
-347.95 gallons	DEA (reduction)		
4600 sf	Plot Space Needed		
Daily round trip 500.00 miles	1 Truck Delivering Sulfinol		
Daily round trip 400.00 miles	1 Truck Hauling Away Solid Waste		
Daily round trip 50.00 miles	1 Truck Delivering NaOH		
Daily round trip 50.00 miles	1 Truck Hauling Sulfur Away		
Daily round trip 400.00 miles	1 Truck Delivering Esx Catalyst		
Daily round trip -50.00 miles	1 Truck Delivering DEA (reduction)		
1 daily trucks	No. of Trucks Delivering Sulfinol		
1.00 daily trucks	No. of Trucks Hauling Away Solid Waste		
1.00 daily trucks	No. of Trucks Delivering NaOH		
1.00 daily trucks	No. of Trucks Hauling Sulfur Away		
1.00 daily trucks	No. of Trucks Delivering ESX catalyst		
-1.00 daily trucks	No. of Trucks Delivering DEA (reduction)		
Daily round trip 1350.00 miles	Total Daily Truck Miles		
4.00 Daily trucks	Total No. of Trucks		
Annual round trip 15,600 miles	Annual Truck Miles		
23 Annual trucks	Annual Trucks		

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	15,600	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.15	0.61	1.86	0.002	0.09	0.08	65,768	1.82	65,806	30
SUBTOTAL	0	1	2	0	0	0	65,768	2	65,806	30
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	15,600	4.89	76,284	293
			TOTAL	76,284	293

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/cega/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions	O2 (MT/y	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - increased use	0.0240	MMscf/day	Natural Gas GHGs	475.92	0.0025	0.0091	477
electricity - increased use	33.91	MWh/day	Electricity GHGs	6173.74	0.0000	0.0000	6,174
water - increased use	0.08	MMgal/day	Water Conveyance GHGs	10.10	0.0001	0.0001	10
wastewater - increased generation[2]	0.04	MMgal/day	Wastewater Processing GHGs	4.88	0.0000	0.0001	5
temporary construction activities[3]	2329	MT/year	Construction GHGs in CO2e				78
operational truck trips	29.84	MT/year	Operation GHGs in CO2e				30
						TOTAL CO2e	6,773

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.02	MMscf/day	Natural Gas GHGs	475.92	0.0025	0.01	477
electricity - increased use	33.91	MWh/day	Electricity GHGs	6173.74	0.0000	0.00	6,174
water - increased use[2]	0.08	MMgal/day	Water Conveyance GHGs	10.10	0.0001	0.0001	10
wastewater - increased generation[2]	0.04	MMgal/day	Wastewater Processing GHGs	4.88	0.0000	0.0001	5
temporary construction activities[3]	2328.70	MT/year	Construction GHGs in CO2e				78
operational truck trips	29.84	MT/year	Operation GHGs in CO2e				30
						TOTAL CO2e	6,773

Note: The mitigation calculations assume that 100% of the total water demand for this facility can potentially be supplied by recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO_2/MMscf fuel burned
0.64 lb N_2O/MMscf fuel burned
2.3 lb CH_4/MMscf fuel burned
1,110 lb CO_2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water[1]
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation[2]
640 lb CO_2/MWh for electricity use due to water conveyance
0.0067 lb CH_4/MWh for electricity use due to water conveyance
0.0037 lb N_2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[3] GHGs from temporary construction activities are amortized over 30 years.

Worksheet B-23
Facility B

Fuel Gas Treatment
Module 2: Fuel Gas Systems
M20: Sulfinol conversion for FCC/coker amine absorbers

Utility/Infrastructure	Facility B Annual Usage		Daily Usage
Natural Gas	-47,740	MMbtu	-130.79 MMbtu
Electricity	1,992,190	kWh	5458.05 kWh
Water	4	MMgal	10958.90 gal
Wastewater	3	MMgal	8219.18 gal
Cooling Water	590	MMbtu	1.62 MMbtu
Compressed Air	100	1000 scf	273.97 scf
Solid Waste Disposal	0	tons	0.00 tons
Sulfur sales*	6.47	long tons	39.71 pounds
Plot Space needed	100	sf	

Excluded - not cost effective

Module 3A: FCCU
M1: Belco wet gas scrubber

Utility/Infrastructure	Facility B Annual Usage		Daily Usage
Natural Gas	0	MMbtu	0.00 MMbtu
Electricity	12,080,000	kWh	33095.89 kWh
Water	28	MMgal	76712.33 gal
Wastewater	13	MMgal	35616.44 gal
Cooling Water	410	MMbtu	1.12 MMbtu
Compressed Air	440	1000 scf	1205.48 scf
Solid Waste Disposal	400	tons	1.10 tons
NaOH (50%)	427	tons	1.17 tons
Plot Space needed	2000	sf	
1 Truck Hauling Away Solid Waste[1]	6400	round trip miles	round trip 400.00 miles
1 Truck Delivering NaOH[2]	600	round trip miles	round trip 50.00 miles
No. of Trucks Hauling Away Solid Waste	16	trucks	1 truck
No. of Trucks Delivering NaOH	12	trucks	1 truck

Facility B will have increased access to recycled water.

Module 3A: SRU/TGTU Systems
M17: Tail Gas NWGS Tri-Mer Cloud Chamber

Utility/Infrastructure	Facility B Annual Usage for 2 units		Daily Usage for 2 units
Natural Gas	0	MMbtu	0.00 MMbtu
Electricity	4,395,600	kWh	12042.74 kWh
Water	51.1	MMgal	140000.00 gal
Wastewater	10.2	MMgal	27945.21 gal
Cooling Water	409,880	MMbtu	1122.96 MMbtu
Compressed Air	100	1000 scf	273.97 scf
Solid Waste Disposal	500	tons	1.37 tons
Soda Ash	190	tons	0.52 tons
Plot Space needed	7906	sf	
1 Truck Hauling Away Solid Waste[3]	8000	round trip miles	round trip 400.00 miles
1 Truck Delivering Soda Ash[4]	400	round trip miles	round trip 50.00 miles
No. of Trucks Hauling Away Solid Waste	20	trucks	1 truck
No. of Trucks Delivering Soda Ash	8	trucks	1 truck

[1]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 16 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.
400 tons/yr solid waste x 1 truck/25 tons = 16 trucks/year to haul extra solid waste away for recycling
This facility either sends its solid waste to a Class III landfill for disposal which is 80.64 miles (one-way) away or to a cement plant for recycling which is 67.48 miles (one-way) away.
However, the cement plant has shut-down its kilns on 11/20/2009 so the solid waste may be sent a different cement kiln further away or out of state (a maximum of 200 miles, one-way to the California/Arizona border).

[2]Assumes that one 10,000 gallon capacity storage tank will be installed for NaOH storage. It will take 12 trucks to deliver one year's worth of NaOH 50% solution, but the peak would be one truck per day.
427 tons/yr NaOH x 2,000 lbs/ ton = 854,000 lbs/yr x 1 gal NaOH @ 50%/12.77 lbs = 66,875 gal/year x 1 truck/6,000 gallons = 11.1 trucks/year

[3]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 20 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.
500 tons/yr solid waste x 1 truck/25 tons = 20 trucks/year to haul extra solid waste away for recycling
This facility either sends its solid waste to a Class III landfill for disposal which is 80.64 miles (one-way) away or to a cement plant for recycling which is 67.48 miles (one-way) away.
However, the cement plant has shut-down its kilns on 11/20/2009 so the solid waste may be sent a different cement kiln further away or out of state (a maximum of 200 miles, one-way to the California/Arizona border).

[4]Assumes delivery of soda ash arrives in a 25 ton capacity truck. It will take an extra 8 trucks to deliver one year's worth of soda ash.
190 tons/yr soda ash x 1 truck/25 tons = 7.6 trucks/year to deliver soda ash

For Facility B, AEC recommends Measure M1 [from Module 3A] for the FCCU, Measure M17 [from Module 3A] for the SRU/TGTU, and Measure M20 [from Module 2] for fuel gas treatment.
Can buy recycled water from California Water Service Company.

Facility B already accesses recycled water and will have increased future access to recycled water.

GRAND TOTALS (during Operation)

Daily Usage	Daily Usage		
0.00 MMbtu	0.00 scf	Natural Gas	
47791.38 Kwh	47.79 MWh	Electricity	Note: This calculation takes into account the electricity needed to make 1.17 tons per day of NaOH to satisfy demand (2,653 kWh/day).
216712.33 gal		Water	
63561.64 gal		Wastewater	
1124.08 MMbtu		Cooling Water	
1479.45 scf		Compressed Air	
2.47 tons		Solid Waste Disposal	
1.17 tons		NaOH (50% by weight)	
0.52 tons		Soda Ash (Na2CO3)	
9906.00 sf		Plot Space needed	
Daily round			
800.00 trip miles		1 Truck Hauling Away Solid Waste	
Daily round			
50.00 trip miles		1 Truck Delivering NaOH	
Daily round			
50.00 trip miles		1 Truck Delivering Soda Ash	
2.00 daily trucks		No. of Trucks Hauling Away Solid Waste	
1 daily trucks		No. of Trucks Delivering NaOH	
1 daily trucks		No. of Trucks Delivering Soda Ash	
Daily round			
900.00 trip miles		Total Daily Truck Miles	
4.00 Daily trucks		Total No. of Trucks	
Annual round			
15,400 trip miles		Annual Truck Miles	
56 Annual trucks		Annual Trucks	

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	15,400	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.15	0.61	1.83	0.002	0.09	0.08	64,925	1.79	64,963	29
SUBTOTAL	0	1	2	0	0	0	64,925	2	64,963	29
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	15,400	4.89	75,306	290
			TOTAL	75,306	290

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.agmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - increased use	0.0000	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.0000	0
electricity - increased use	47.79	MWh/day	Electricity GHGs	8702.15	0.0000	0.0000	8,702
water - increased use[1]	0.22	MMgal/day	Water Conveyance GHGs	27.55	0.0002	0.0003	28
wastewater - increased generation[1]	0.06	MMgal/day	Wastewater Processing GHGs	8.08	0.0000	0.0001	8
temporary construction activities[2]	6986	MT/year	Construction GHGs in CO2e				233
operational truck trips	29.46	MT/year	Operation GHGs in CO2e				29
						TOTAL CO2e	9,000

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.00	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.00	0
electricity - increased use	47.79	MWh/day	Electricity GHGs	8702.15	0.0000	0.00	8,702
water - increased use[1]	0.22	MMgal/day	Water Conveyance GHGs	27.55	0.0002	0.0003	28
wastewater - increased generation[1]	0.06	MMgal/day	Wastewater Processing GHGs	8.08	0.0000	0.0001	8
temporary construction activities[2]	6986.10	MT/year	Construction GHGs in CO2e				233
operational truck trips	29.46	MT/year	Operation GHGs in CO2e				29
						TOTAL CO2e	9,000

Note: The mitigation calculations assume that 100% of the total water demand for this facility can potentially be supplied by recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water[1]
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation[2]
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[3] GHGs from temporary construction activities are amortized over 30 years.

Facility C
Sulfuric Acid Plant
Cansolv **(existing system going from 20 ppm to 10 ppm)**

Utility/Infrastructure	Annual Usage		Daily Usage		Usage/Ratings	
Natural Gas	0	MMbtu	0.00	MMbtu	MMbtu	
Electricity	0	kWh	0.00	kWh	kW	
Water*	2.31	MMgal	6336	gal	0.006336 mmgal/day	(1,100 lb/hr steam = 2.2 gal/min water plus 2.2 gal/min extra cooling tower water = 4.4
Wastewater	0	MMgal	0.00	gal	0.00 mmgal/day	
Cooling Water	0	MMbtu	0.00	MMbtu		
Compressed Air	0	1000 scf	0.00	scf		
Solid Waste Disposal	0	tons	0.00	tons		
Amine	0	gal	0.00	gal		
Plot Space Needed	0	sf				

***as steam**

Facility C
Fuel Gas Treatment
Module 2: Fuel Gas Systems **M20A: Convert all amine absorbers to Sulfinol**

Utility/Infrastructure	Annual Usage		Facility C Daily Usage		Daily Usage	
Natural Gas	-1,030	MMbtu	-2.82	MMbtu	-2766.5861	scf
Electricity	476,580	kWh	1305.70	kWh	1.30569863	MWh
Water	1	MMgal	2739.73	gal	0.00273973	Mmgal
Wastewater	1	MMgal	2739.73	gal	0.00273973	Mmgal
Cooling Water	140	MMbtu	0.38	MMbtu		
Compressed Air	100	1000 scf	273.97	scf		
Solid Waste Disposal	0	tons	0.00	tons		
Sulfur sales*	6.58	long tons	40.38	pounds		
plot space needed	6000	sf				
1 Truck Delivering Sulfinol[1]	23,500	round trip miles	500.00	round trip miles		
1 Truck Hauling Sulfur Away[2]	50	round trip miles	50.00	round trip miles		
No. of Trucks Delivering Sulfinol	47	trucks	1	truck		
No. of Trucks Hauling Away Sulfur	1	trucks	1	truck		
sulfinol	277400	gallons	760.00	gallons		
1 Existing Truck Delivering MEA	-2400.00	round trip miles	-50.00	round trip miles		
No. of Existing Trucks Delivering MEA	-48.00	trucks	-1.00	truck		
MEA usage	-288000.00	gallons	-789	gallons		

Module 3A: FCCU
M1: Wet gas scrubber with wet

Utility/Infrastructure	Annual Usage		Facility C Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	0	kWh	0.00	kWh
Water	0	MMgal	0.00	gal
Wastewater	0	MMgal	0.00	gal
Cooling Water	0	MMbtu	0.00	MMbtu
Compressed Air	0	1000 scf	0.00	scf
Solid Waste Disposal	0	tons	0.00	tons
NaOH (50%)	0	tons	0.00	tons
plot space needed	2000	sf		

Excluded - This equipment has already been installed

[1]Assumes that the existing MEA amine storage tank can be used for Sulfinol storage.
[2]Assumes Hauling Sulfur away in a 25 ton capacity truck. It will take 1 extra truck to haul away one year's worth of sulfur; the peak would be one truck per day.
6.58 long tons/yr Sulfur x 2,240 lbs/long ton = 14,739 lbs/

Facility C will have future access to recycled water.
Phase III: Operations - On-Road Vehicles and Fuel Use

Facility C

Phase III: Operation / On-Road Equipment Type	Fuel	Annual Round-trip Distance (miles/year)	Mileage Rate (miles/ gallon)	2012 Mobile Source Emission Factors VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	21,150	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Facility C

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.21	0.83	2.52	0.003	0.12	0.11	89,166	2.46	89,218	40.46
SUBTOTAL	**0**	**1**	**3**	**0**	**0**	**0**	**89,166**	**2**	**89,218**	**40.46**
Significance Threshold	65	560	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Facility C

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	21,150	4.89	103,424	398
			TOTAL	**103,424**	**398**

*Assumes 260 days/year

Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012

http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

Facility C: GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - decreased use	-0.0028	MMscf/day	Natural Gas GHGs	-54.96	-0.0003	-0.0011	-55
electricity - increased use	1.31	MWh/day	Electricity GHGs	237.75	0.0000	0.0000	238
water - increased use[2]	0.0091	MMgal/day	Water Conveyance GHGs	12.21	0.0001	0.0001	12
wastewater - increased generation[1]	0.0027	MMgal/day	Wastewater Processing GHGs	3.69	0.0000	0.0000	4
temporary construction activities[3]	2329	MT/year	Construction GHGs in CO2e				78
operational truck trips	40.46	MT/year	Operation GHGs in CO2e				40
						TOTAL CO2e	**317**

Facility C: GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.00	MMscf/day	Natural Gas GHGs	-54.96	-0.0003	0.00	-55
electricity - increased use	1.31	MWh/day	Electricity GHGs	237.75	0.0000	0.00	238
water - increased use[2]	0.0091	MMgal/day	Water Conveyance GHGs	1.15	0.0000	0.0000	1
wastewater - increased generation[2]	0.0027	MMgal/day	Wastewater Processing GHGs	0.35	0.0000	0.0000	0
temporary construction activities[3]	2328.70	MT/year	Construction GHGs in CO2e				78
operational truck trips	40.46	MT/year	Operation GHGs in CO2e				40
						TOTAL CO2e	**302**

Note: The mitigation calculations assume that 100% of the total water demand for this facility can potentially be supplied by recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N2O/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[3]GHGs from temporary construction activities are amortized over 30 years.

Worksheet B-25
Facility D

Fuel Gas Treatment
Module 2: Fuel Gas Systems
M21A: Parallel Merox treatment for excess

Utility/Infrastructure	Facility D Annual Usage		Facility D Daily Usage	
Natural Gas	440	MMbtu	1.21	MMbtu
Electricity	156,400	kWh	428.49	kWh
Water	5	MMgal	13698.63	gal
Wastewater	5	MMgal	13698.63	gal
Cooling Water	176	MMbtu	0.48	MMbtu
Compressed Air	780	1000 scf	2136.99	scf
Solid Waste Disposal	110	tons	0.30	tons
Merox Catalyst	3,000	pounds	8.22	pounds
NaOH (50%)	160	tons	0.44	tons
Sulfur sales*	11	long tons	67.51	pounds
Plot Space Needed	6000	sf		
1 Truck Hauling Away Solid Waste[1]	2000	round trip miles	400.00	round trip miles
1 Truck Delivering Merox Catalyst[2]	500	round trip miles	500.00	round trip miles
1 Truck Delivering NaOH[3]	250	round trip miles	50.00	round trip miles
1 Truck Hauling Sulfur Away[4]	50	round trip miles	50.00	round trip miles
No. of Trucks Hauling Away Solid Waste	5	trucks	1	truck
No. of Trucks Delivering Merox	1	trucks	1	truck
No. of Trucks Delivering NaOH	5	trucks	1	truck
No. of Trucks Hauling Sulfur Away	1	trucks	1	truck

Facility D will have increased access to recycled water.

Module 3A: FCCU
M1: Belco wet gas scrubber

Utility/Infrastructure	Facility D Annual Usage		Facility D Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	16,084,000	kWh	44065.75	kWh
Water	40	MMgal	109589.04	gal
Wastewater	18	MMgal	49315.07	gal
Cooling Water	550	MMbtu	1.51	MMbtu
Compressed Air	630	1000 scf	1726.03	scf
Solid Waste Disposal	190	tons	0.52	tons
NaOH (50%)	193	tons	0.53	tons
Plot Space Needed	2000	sf		

Excluded - not cost effective

Module 3A: SRU/TGTU Systems
M17: Tail Gas NWGS Tri-Mer Cloud

Utility/Infrastructure	Facility D Annual Usage		Facility D Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	2,447,400	kWh	6705.21	kWh
Water	78.2	MMgal	214246.58	gal
Wastewater	15.7	MMgal	43013.70	gal
Cooling Water	228,200	MMbtu	625.21	MMbtu
Compressed Air	100	1000 scf	273.97	scf
Solid Waste Disposal	320	tons	0.88	tons
Soda Ash	123	tons	0.34	tons
Plot Space Needed	5930	sf		
1 Truck Hauling Away Solid Waste[5]	5200	round trip miles	400.00	round trip miles
1 Truck Delivering Soda Ash[6]	250	round trip miles	50.00	round trip miles
No. of Trucks Hauling Away Solid Waste	13	trucks	1	truck
No. of Trucks Delivering Soda Ash	5	trucks	1	truck

[1]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 5 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.
110 tons/yr solid waste x 1 truck/25 tons = 4.46 trucks/year to haul extra solid waste away for recycling

[2]It will take one truck to deliver one year's worth of Merox catalyst; the peak would be one truck per day.
Merox is delivered by truck from Chicago. The distance from the California/Nevada border to this facility is approximately 250 miles, one-way.

[3]Assumes that one 10,000 gallon capacity storage tank will be installed for NaOH storage. It will take 5 trucks to deliver one year's worth of NaOH 50% solution, but the peak would be one truck per day.
160 tons/yr NaOH x 2,000 lbs/ ton = 320,000 lbs/yr x 1 gal NaOH @ 50%/12.77 lbs = 25,059 gal/year x 1 truck/6,000 gallons = 4.2 trucks/year

[4]Assumes Hauling Sulfur away in a 25 ton capacity truck. It will take 1 extra truck to haul away one year's worth of sulfur; the peak would be one truck per day.
11 long tons/yr Sulfur x 2,240 lbs/long ton = 24,640 lbs/yr x 1 ton/2000 lbs = 12.32 tons/yr x 1 truck/25 tons = 0.49 trucks/year to haul extra sulfur away to a buyer

[5]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 13 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.
320 tons/yr solid waste x 1 truck/25 tons = 12.8 trucks/year to haul extra solid waste away for recycling
This facility sends its solid waste to a cement plant for recycling which is 68.42 miles (one-way) away.
However, the cement plant has shut-down its kilns on 11/20/2009 so the solid waste may be sent a different cement kiln further away or out of state (a maximum of 200 miles, one-way to the California/Arizona border).

[6]Assumes delivery of soda ash arrives in a 25 ton capacity truck. It will take an extra 5 trucks to deliver one year's worth of soda ash.
123 tons/yr soda ash x 1 truck/25 tons = 4.92 trucks/year to deliver soda ash

For Facility D, AEC recommends Measure M1 [from Module 3A] for the FCCU, Measure M17 [from Module 3A] for the SRU/TGTU, and Measure M21A [from Module 2] for the fuel gas treatment system.
Facility D can buy recycled water from California Water Service Company.

GRAND TOTALS (during Operation)

Daily Usage	Daily Usage	
1.21 MMbtu	1181.84 scf	Natural Gas
8127.70 Kwh	8.13 MWh	Electricity
227945.21 gal	0.227945205 Mmgal	Water
56712.33 gal	0.056712329 Mmgal	Wastewater
625.69 MMbtu		Cooling Water
2410.96 scf		Compressed Air
1.18 tons		Solid Waste Disposal
8.22 pounds		Merox Catalyst
0.44 tons		NaOH (50% by weight)
67.51 pounds		Sulfur sales*
0.34 tons		soda ash
11930.00 sf		Plot Space needed
	400.00 Daily round trip miles	1 Truck Hauling Away Solid Waste
	500.00 Daily round trip miles	1 Truck Delivering Merox Catalyst
	50.00 Daily round trip miles	1 Truck Delivering NaOH
	50.00 Daily round trip miles	1 Truck Hauling Sulfur Away
	400.00 Daily round trip miles	1 Truck Hauling Away Solid Waste
	50.00 Daily round trip miles	1 Truck Delivering Soda Ash
	1 daily trucks	No. of Trucks Hauling Away Solid Waste
	1 daily trucks	No. of Trucks Delivering Merox
	1.00 daily trucks	No. of Trucks Delivering NaOH
	1.00 daily trucks	No. of Trucks Hauling Sulfur Away
	1 daily trucks	No. of Trucks Hauling Away Solid Waste
	1 daily trucks	No. of Trucks Delivering Soda Ash
	1450.00 Daily round trip miles	Total Daily Truck Miles
	6 Daily trucks	Total No. of Trucks
	8250.00 Annual round trip miles	Annual Truck Miles
	30 Annual trucks	Annual Trucks

Note: This calculation takes into account the electricity needed to make 0.44 tons per day of NaOH to satisfy demand (994 kWh/day).

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	8,250	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.08	0.32	0.98	0.001	0.05	0.04	34,781	0.96	34,801	16
SUBTOTAL	0	0	1	0	0	0	34,781	1	34,801	16
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	8,250	4.89	40,343	155
*Assumes 260 days/year			TOTAL	40,343	155

Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/cega/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - increased use	0.0012	MMscf/day	Natural Gas GHGs	23.48	0.0001	0.0004	24
electricity - increased use	8.13	MWh/day	Electricity GHGs	1479.94	0.0000	0.0000	1,480
water - increased use[2]	0.23	MMgal/day	Water Conveyance GHGs	28.98	0.0002	0.0003	29
wastewater - increased generation[2]	0.06	MMgal/day	Wastewater Processing GHGs	7.21	0.0000	0.0001	7
temporary construction activities[3]	2329	MT/year	Construction GHGs in CO2e				78
operational truck trips	15.78	MT/year	Operation GHGs in CO2e				16
						TOTAL CO2e	1,633

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.00	MMscf/day	Natural Gas GHGs	23.48	0.0001	0.00	24
electricity - increased use	8.13	MWh/day	Electricity GHGs	1479.94	0.0000	0.00	1,480
water - increased use[2]	0.23	MMgal/day	Water Conveyance GHGs	28.98	0.0002	0.0003	29
wastewater - increased generation[2]	0.06	MMgal/day	Wastewater Processing GHGs	7.21	0.0000	0.0001	7
temporary construction activities[3]	2328.70	MT/year	Construction GHGs in CO2e				78
operational truck trips	15.78	MT/year	Operation GHGs in CO2e				16
						TOTAL CO2e	1,633

Facility D already accesses recycled water and will have increased future access to recycled water.

GHG Emission Factors:

1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

Fuel Gas Treatment
Module 2: Fuel Gas Systems
M20: Convert amine absorbers to Sulfinol

Facility E

Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	-14,780	MMbtu	-40.49	MMbtu
Electricity	2,418,610	kWh	6626.33	kWh
Water	5	MMgal	13698.63	gal
Wastewater	4	MMgal	10958.90	gal
Cooling Water	700	MMbtu	1.92	MMbtu
Compressed Air	100	1000 scf	273.97	scf
Solid Waste Disposal	0	tons	0.00	tons
Sulfur sales*	56.56	long tons	347.11	pounds
Plot Space Needed	100	sf		
1 Truck Hauling Sulfur Away[2]	150	round trip miles	50.00	round trip miles
No. of Trucks Hauling Sulfur Away	3	trucks	1	truck
sulfinol	385075	gallons	1055.00	gallons
1 Truck Delivering Sulfinol[1]	32500	round trip miles	500.00	round trip miles
No. of Trucks Delivering Sulfinol	65	trucks	1.00	truck
1 Existing Truck Delivering DEA	-3150.00	round trip miles	-50.00	round trip miles
No. of Existing Trucks Delivering DEA	-63.00	trucks	-1.00	truck
DEA usage	-374490.00	gallons	-1026	gallons

Facility E will have future access to recycled water.

Module 3A: FCCU
M1: Belco wet gas scrubber

Facility E

Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	6,887,000	kWh	18868.49	kWh
Water	18	MMgal	49315.07	gal
Wastewater	8	MMgal	21917.81	gal
Cooling Water	240	MMbtu	0.66	MMbtu
Compressed Air	280	1000 scf	767.12	scf
Solid Waste Disposal	160	tons	0.44	tons
NaOH (50%)	164	tons	0.45	tons
Plot Space Needed	1575	sf		
1 Truck Hauling Away Solid Waste[3]	2800	round trip miles	400.00	round trip miles
1 Truck Delivering NaOH[4]	250	round trip miles	50.00	round trip miles
No. of Trucks Hauling Away Solid Waste	7	trucks	1	truck
No. of Trucks Delivering NaOH	5	trucks	1	truck

Module 2: SRU/TGTU Systems
M13: EmeraChem ESx Gas Treating

Facility E

Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	50,400	MMbtu	138.08	MMbtu
Electricity	703,600	kWh	1927.67	kWh
Water	0	MMgal	0.00	gal
Wastewater	0	MMgal	0.00	gal
Cooling Water	20	MMbtu	0.05	MMbtu
Compressed Air	720	1000 scf	1972.60	scf
Solid Waste Disposal	0	tons	0.00	tons
ESX Catalyst	400	pounds	1.10	pounds
Sulfur sales*	6.11	long tons	37.50	pounds
Plot Space Needed	2500	sf		

Excluded - not cost effective

[1]Assumes that the existing DEA amine storage tank can be used for Sulfinol storage.

[2]Assumes Hauling Sulfur away in a 25 ton capacity truck. It will take an extra 3 trucks to haul away one year's worth of sulfur, but the peak would be one truck per day.

56.56 long tons/yr Sulfur x 2,240 lbs/long ton = 126,695 lbs/yr = 63.35 tons/yr x 1 truck/25 tons = 2.53 trucks/year to haul extra sulfur away to a buyer

[3]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 7 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.

160 tons/yr solid waste x 1 truck/25 tons = 6.4 trucks/year to haul extra solid waste away for recycling

This facility sends its solid waste to a cement plant for recycling which is 66.47 miles (one-way) away.
However, the cement plant has shut-down its kilns on 11/20/2009 so the solid waste may be sent a different cement kiln further away or out of state (a maximum of 200 miles, one-way to the California/Arizona border).

[4]Assumes that one 10,000 gallon capacity storage tank will be installed for NaOH storage. It will take 5 trucks to deliver one year's worth of NaOH 50% solution, but the peak would be one truck per day.
164 tons/yr NaOH x 2,000 lbs/ ton = 328,000 lbs/yr x 1 gal NaOH @ 50%/12.77 lbs = 25,685 gal/year x 1 truck/6,000 gallons = 4.28 trucks/year

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	32,550	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.32	1.28	3.87	0.005	0.19	0.16	137,228	3.79	137,307	62
SUBTOTAL	0	1	4	0	0	0	137,228	4	137,307	62
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

GRAND TOTALS (during Operation)

Daily Usage			Daily Usage	
-40.49	MMbtu	Natural Gas	-39699.167	scf
26513.68	kWh	Electricity	26.5136769	MWh
63013.70	gal	Water	0.0630137	Mmgal
32876.71	gal	Wastewater	0.03287671	Mmgal
2.58	MMbtu	Cooling Water		
1041.10	scf	Compressed Air		
0.44	tons	Solid Waste Disposal		
0.45	tons	NaOH (50%)		
347.11	pounds	Sulfur sales*		
1055.00	gallons	sulfinol		
-1026	gallons	DEA		
1675.00	sf	Plot Space Needed		
	Daily round trip	1 Truck Hauling Sulfur		
50.00	miles	Away		
	Daily round trip	1 Truck Hauling Away		
400.00	miles	Solid Waste		
	Daily round trip			
50.00	miles	1 Truck Delivering NaOH		
	Daily round trip			
500.00	miles	1 Truck Delivering Sulfinol		
	Daily round trip			
-50.00	miles	1 Truck Delivering DEA		
1	daily trucks	No. of Trucks Hauling Sulfur Away		
		No. of Trucks Hauling		
1	daily trucks	Away Solid Waste		
1	daily trucks	No. of Trucks Delivering NaOH		
1.00	daily trucks	No. of Trucks Delivering sulfinol		
-1.00	daily trucks	No. of Trucks Delivering DEA		
	Daily round trip			
950.00	miles	Total Daily Truck Miles		
3.00	Daily trucks	Total No. of Trucks		
	Annual round			
32550	trip miles	Annual Truck Miles		
17.00	Annual trucks	Annual Trucks		

Note: This calculation takes into account the electricity needed to make 0.45 ton per day of NaOH to satisfy demand (1,019 kWh/day).

Worksheet B-26
Facility E

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)[1]	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	32,550	4.89	159,170	612
			TOTAL	159,170	612

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)[2]
natural gas - decreased use	-0.0397	MMscf/day	Natural Gas GHGs	-788.58	-0.0042	-0.0151	-790
electricity - increased use	26.51	MWh/day	Electricity GHGs	4827.77	0.0000	0.0000	4,828
water - increased use[3]	0.06	MMgal/day	Water Conveyance GHGs	84.78	0.0005	0.0009	85
wastewater - increased generation[3]	0.03	MMgal/day	Wastewater Processing GHGs	44.23	0.0003	0.0005	44
temporary construction activities[3]	2329	MT/year	Construction GHGs in CO2e				78
operational truck trips	62.27	MT/year	Operation GHGs in CO2e				62
						TOTAL CO2e	4,307

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	-0.04	MMscf/day	Natural Gas GHGs	-788.58	-0.0042	-0.02	-790
electricity - increased use	26.51	MWh/day	Electricity GHGs	4827.77	0.0000	0.00	4,828
water - increased use[3]	0.06	MMgal/day	Water Conveyance GHGs	8.01	0.0000	0.0001	8
wastewater - increased generation[3]	0.03	MMgal/day	Wastewater Processing GHGs	4.18	0.0000	0.0000	4
temporary construction activities[3]	2328.70	MT/year	Construction GHGs in CO2e				78
operational truck trips	62.27	MT/year	Operation GHGs in CO2e				62
						TOTAL CO2e	4,190

Note: The mitigation calculations assume that 100% of the total water demand for this facility can potentially be supplied by recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

Fuel Gas Treatment
Module 2: Fuel Gas Systems
M22: Add TG-10 to MDEA

Facility F

Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	2,000	MMbtu	5.48	MMbtu
Electricity	20,000	kWh	54.79	kWh
Water	0	MMgal	0.00	gal
Wastewater	0	MMgal	0.00	gal
Cooling Water	2,000	MMbtu	5.48	MMbtu
Compressed Air	0	1000 scf	0.00	scf
Solid Waste Disposal	0	tons	0.00	tons
TG-10 amine additive	4,000	gallons	10.96	gallons
Sulfur sales*	10.35	long tons	63.52	pounds
Plot Space needed	100	sf		
1 Truck Delivering TG-10[1]	400	round trip miles	400.00	round trip miles
1 Truck Hauling Sulfur Away[2]	50	round trip miles	50.00	round trip miles
No. of Trucks Delivering TG-10	1	trucks	1	truck
No. of Trucks Hauling Sulfur Away	1	trucks	1	truck

Facility F will have future access to recycled water.

Module 3A: FCCU
M1: Belco wet gas scrubber

Facility F

Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	5,789,000	kWh	15860.27	kWh
Water	16	MMgal	43835.62	gal
Wastewater	8	MMgal	21917.81	gal
Cooling Water	200	MMbtu	0.55	MMbtu
Compressed Air	260	1000 scf	712.33	scf
Solid Waste Disposal	690	tons	1.89	tons
NaOH (50%)	738	tons	2.02	tons
Plot Space needed	1575	sf		
1 Truck Hauling Away Solid Waste[3]	11200	round trip miles	400.00	round trip miles
1 Truck Delivering NaOH[4]	1,000	round trip miles	50.00	round trip miles
No. of Trucks Hauling Away Solid Waste	28	trucks	1	truck
No. of Trucks Delivering NaOH	20	trucks	1	truck

Module 2: SRU/TGTU Systems

M13: EmeraChem ESx Gas Treater

Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	96,700	MMbtu	264.93	MMbtu
Electricity	1,182,000	kWh	3238.36	kWh
Water	0	MMgal	0.00	gal
Wastewater	0	MMgal	0.00	gal
Cooling Water	40	MMbtu	0.11	MMbtu
Compressed Air	600	1000 scf	1643.84	scf
Solid Waste Disposal	0	tons	0.00	tons
ESX Catalyst	400	pounds	1.10	pounds
Sulfur sales*	20.88	long tons	128.14	pounds
Plot Space needed	2500	sf		

Excluded - Facility F already meets the 5 ppm SOx level

[1]Assumes that one 5,000 gallon capacity storage tank will be installed for TG-10 storage. It will take 1 truck to deliver one year's worth of TG-10 solution, but the peak would be one truck per day.
4,000 gal/year x 1 truck/6,000 gallons = 0.67 trucks/year

[2]Assumes Hauling Sulfur away in a 25 ton capacity truck. It will take 1 extra truck to haul away one year's worth of sulfur; the peak would be one truck per day.

10.35 long tons/yr Sulfur x 2,240 lbs/long ton = 23,184 lbs/yr x 1 ton/2000 lbs = 11.59 tons/yr x 1 truck/25 tons = 0.46 trucks/year to haul extra sulfur away to a buyer

[3]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 28 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.
690 tons/yr solid waste x 1 truck/25 tons = 27.6 trucks/year to haul extra solid waste away for recycling
This facility sends its solid waste to a cement plant for recycling which is 67.48 miles (one-way) away.
However, the cement plant has shut-down its kilns on 11/20/2009 so the solid waste may be sent a different cement kiln further away or out of state (a maximum of 200 miles, one-way to the California/Arizona border).

[4]Assumes that one 10,000 gallon capacity storage tank will be installed for NaOH storage. It will take 20 trucks to deliver one year's worth of NaOH 50% solution, but the peak would be one truck per day.
738 tons/yr NaOH x 2,000 lbs/ ton = 1,476,000 lbs/yr x 1 gal NaOH @ 50%/12.77 lbs = 115,583 gal/year x 1 truck/6,000 gallons = 19.2 trucks/year

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	12,650	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.12	0.50	1.50	0.002	0.07	0.06	53,331	1.47	53,362	24
SUBTOTAL	0	0	2	0	0	0	53,331	1	53,362	24
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

GRAND TOTALS (during Operation)

Daily Usage	Daily Usage		
5.48 MMbtu	5372.01 scf	Natural Gas	
20499.92 Kwh	20.50 MWh	Electricity	Note: This calculation takes into account the electricity needed to make 2.02 tons per day of NaOH to satisfy demand (4,585 kWh/day).
43835.62 gal	0.043835616 Mmgal	Water	
21917.81 gal	0.021917808 Mmgal	Wastewater	
6.03 MMbtu		Cooling Water	
712.33 scf		Compressed Air	
1.89 tons		Solid Waste Disposal	
63.52 pounds		Sulfur sales*	
2.02 tons		NaOH (50% by weight)	
10.96 gallons		TG-10 amine additive	
1675.00 sf		Plot Space needed	
Daily round trip 400.00 miles		1 Truck Delivering TG-10	
Daily round trip 50.00 miles		1 Truck Hauling Sulfur Away	
Daily round trip 400.00 miles		1 Truck Hauling Away Solid Waste	
Daily round trip 50.00 miles		1 Truck Delivering NaOH	
1 daily trucks		No. of Trucks Delivering TG-10	
1 daily trucks		No. of Trucks Hauling Sulfur Away	
1.00 daily trucks		No. of Trucks Hauling Away Solid Waste	
1.00 daily trucks		No. of Trucks Delivering NaOH	
Daily round trip 900.00 miles		Total Daily Truck Miles	
4 Daily trucks		Total No. of Trucks	
Annual round trip 12650.00 miles		Annual Truck Miles	
50 Annual trucks		Annual Trucks	

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	12,650	4.89	61,859	238
			TOTAL	61,859	238

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/cega/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - increased use	0.0054	MMscf/day	Natural Gas GHGs	106.71	0.0006	0.0020	107
electricity - increased use	20.50	MWh/day	Electricity GHGs	3732.75	0.0000	0.0000	3,733
water - increased use[1]	0.04	MMgal/day	Water Conveyance GHGs	58.98	0.0003	0.0006	59
wastewater - increased generation[1]	0.02	MMgal/day	Wastewater Processing GHGs	29.49	0.0002	0.0003	30
temporary construction activities[3]	2329	MT/year	Construction GHGs in CO2e				78
operational truck trips	24.20	MT/year	Operation GHGs in CO2e				24
						TOTAL CO2e	4,030

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.01	MMscf/day	Natural Gas GHGs	106.71	0.0006	0.00	107
electricity - increased use	20.50	MWh/day	Electricity GHGs	3732.75	0.0000	0.00	3,733
water - increased use[2]	0.04	MMgal/day	Water Conveyance GHGs	5.57	0.0000	0.0001	6
wastewater - increased generation[2]	0.02	MMgal/day	Wastewater Processing GHGs	2.79	0.0000	0.0000	3
temporary construction activities[3]	2328.70	MT/year	Construction GHGs in CO2e				78
operational truck trips	24.20	MT/year	Operation GHGs in CO2e				24
						TOTAL CO2e	3,950

Note: The mitigation calculations assume that 100% of the total water demand for this facility can potentially be supplied by recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

Module 2: Fuel Gas Systems
M21B: Merox treatment of delayed coker off-gas

Facility G

Utility/Infrastructure	Annual Usage		Daily Usage	Daily Usage
Natural Gas	2,950	MMbtu	8.08 MMbtu	7923.72 scf
Electricity	1,042,900	kWh	2857.26 kWh	9.44 MWh
Water	5	MMgal	13698.63 gal	0.01 Mmgal
Wastewater	5	MMgal	13698.63 gal	0.01 Mmgal
Cooling Water	1,180	MMbtu	3.23 MMbtu	
Compressed Air	5,210	1000 scf	14273.97 scf	
Solid Waste Disposal	740	tons	2.03 tons	
Merox Catalyst	3,000	pounds	8.22 pounds	
NaOH (50%)	1,060	tons	2.90 tons	
Sulfur sales*	47	long tons	288.44 pounds	
plot space needed	6000	sf		
1 Truck Hauling Away Solid Waste[1]	12000	round trip miles	round trip 400.00 miles	
1 Truck Delivering Merox Catalyst[2]	500	round trip miles	round trip 500.00 miles	
1 Truck Delivering NaOH[3]	1400	round trip miles	round trip 50.00 miles	
1 Truck Hauling Sulfur Away[4]	100	round trip miles	round trip 50.00 miles	
No. of Trucks Hauling Away Solid Waste	30	trucks	1 truck	
No. of Trucks Delivering Merox Catalyst	1	trucks	1 truck	
No. of Trucks Delivering NaOH	28	trucks	1.00 truck	
No. of Trucks Hauling Away Sulfur	2	trucks	1.00 truck	

GRAND TOTALS (during Operation)

Daily Usage	Daily Usage	
8.08 MMbtu	7923.72 scf	Natural Gas
9442.54 Kwh	9.44 MWh	Electricity
13698.63 gal	0.01 MMgal	Water
13698.63 gal	0.01 MMgal	Wastewater
3.23 MMbtu		Cooling Water
14273.97 scf		Compressed Air
2.03 tons		Solid Waste Disposal
8.22 pounds		Merox Catalyst
2.90 tons		NaOH (50% by weight)
6000.00 sf		Plot Space needed
Daily round		1 Truck Hauling Away
400.00 trip miles		Solid Waste[1]
Daily round		1 Truck Delivering
500.00 trip miles		Merox Catalyst[2]
Daily round		1 Truck Delivering
50.00 trip miles		NaOH[3]
Daily round		1 Truck Hauling Sulfur
50.00 trip miles		Away[4]
1.00 daily trucks		No. of Trucks Hauling Away Solid Waste
1.00 daily trucks		No. of Trucks Delivering Merox Catalyst
1.00 daily trucks		No. of Trucks Delivering NaOH
1.00 daily trucks		No. of Trucks Hauling Sulfur Away
Daily round		
1000.00 trip miles		Total Daily Truck Miles
4.00 Daily trucks		Total No. of Trucks
Annual round trip		
14,000 miles		Annual Truck Miles
Annual		
61 trucks		Annual Trucks

Note: This calculation takes into account the electricity needed to make 2.9 tons per day of NaOH to satisfy demand (6,535 kWh/day).

[1]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 30 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.
740 tons/yr solid waste x 1 truck/25 tons = 29.6 trucks/year to haul extra solid waste away for recycling

[2]It will take one truck to deliver one year's worth of Merox catalyst; the peak would be one truck per day.
Merox is delivered by truck from Chicago. The distance from the California border to this facility is approximately 250 miles, one-way.

[3]Assumes that one 10,000 gallon capacity storage tank will be installed for NaOH storage. It will take 28 trucks to deliver one year's worth of NaOH 50% solution, but the peak would be one truck per day.
1,060 tons/yr NaOH x 2,000 lbs/ ton = 2,120,000 lbs/yr x 1 gal NaOH @ 50%/12.77 lbs = 166,014 gal/year x 1 truck/6,000 gallons = 27.7 trucks/year

[4]Assumes Hauling Sulfur away in a 25 ton capacity truck. It will take 2 extra trucks to haul away one year's worth of sulfur; the peak would be one truck per day.
47 long tons/yr Sulfur x 2,240 lbs/long ton = 105,280 lbs/yr x 1 ton/2000 lbs = 52.64 tons/yr x 1 truck/25 tons = 2.1 trucks/year to haul extra sulfur away to a buyer

For Facility G, consultant recommends M21B for the fuel gas treatment systems.
Measures for the SRU/TGTU are more costly, with the best opportunity at Facility G being M17 [Module 3A].
For heaters, boilers, and furnaces, M30 [Module 3A] is the best opportunity for Facility G.
Facility G will not have future access to recycled water, but currently uses non-potable well water to supply the facility.

Module 3A: SRU/TGTU Systems
M17: Tail Gas NWGS
Tri-Mer Cloud

Chamber	**Facility G**			
Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	1,809,000	kWh	4956.16	kWh
Water	253	MMgal	693150.68	gal
Wastewater	61	MMgal	167123.29	gal
Cooling Water	168,700	MMbtu	462.19	MMbtu
Compressed Air	100	1000 scf	273.97	scf
Solid Waste Disposal	120	tons	0.33	tons
Soda Ash	45	tons	0.12	tons
plot space needed	3953	sf		

Excluded - not cost effective

Phase III: Operations - On-Road Vehicles and Fuel Use
Facility G

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors*							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	14,000	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Facility G

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT/year)
Offsite (Heavy-Heavy Duty Truck)	0.14	0.55	1.67	0.002	0.08	0.07	59,023	1.63	59,057	26.78
SUBTOTAL	0	1	2	0	10	0	59,023	2	59,057	26.78
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Trucks)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	14,000	4.89	68,460	263
			TOTAL	68,460	263

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

Facility G: GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - increased use	0.008	MMscf/day	Natural Gas GHGs	157.40	0.0008	0.0030	158
electricity - increased use	9.44	MWh/day	Electricity GHGs	1719.36	0.0000	0.0000	1,719
water - increased use[2]	0.014	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	2
wastewater - increased generation[2]	0.014	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
temporary construction activities[3]	2329	MT/year	Construction GHGs in CO2e				78
operational truck trips	26.78	MT/year	Operation GHGs in CO2e				27
						TOTAL CO2e	1,985

Facility G: GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.01	MMscf/day	Natural Gas GHGs	157.40	0.0008	0.00	158
electricity - increased use	9.44	MWh/day	Electricity GHGs	1719.36	0.0000	0.00	1,719
water - increased use[2]	0.01	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	2
wastewater - increased generation[2]	0.01	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
temporary construction activities[3]	2328.70	MT/year	Construction GHGs in CO2e				78
operational truck trips	26.78	MT/year	Operation GHGs in CO2e				27
						TOTAL CO2e	1,985

Note: The mitigation calculations assume that 100% of the total water demand for this facility cannot potentially be supplied by recycled water because this facility does not have current or future access to recycled water. However, this facility has access to non-potable well water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3]GHGs from temporary construction activities are amortized over 30 years.

Facility J - Sulfuric Acid Plant
Belco wet gas scrubber

Utility/Infrastructure	Annual Usage		Daily Usage		Daily Usage		
Natural Gas	0	MMbtu	0.00	MMbtu	0	scf	
Electricity	2,452,800	kWh	9658.78	kWh	9.66	MWh	Note: This calculation takes into account the electricity needed to make 1.30 tons per day of NaOH to satisfy demand (2,939 kWh/day).
Water	7.15	MMgal	19589.04	gal	0.02	Mmgal	
Wastewater	3.94	MMgal	10800.00	gal	0.01	Mmgal	
Cooling Water	0	MMbtu	0.00	MMbtu			
Compressed Air	0	1000 scf	0.00	scf			
Solid Waste Disposal	0	tons	0.00	tons			
NaOH (50%)	473	tons	1.30	tons			
Plot Space Needed	500	sf					
		round trip		round trip			
1 Truck Delivering NaOH	650	miles	50.00	miles			
No. of Trucks Delivering NaOH	13	trucks	1	truck			

[1]Assumes that one 10,000 gallon capacity storage tank will be installed for NaOH storage. It will take 13 trucks to deliver one year's worth of NaOH 50% solution, but the peak would be one truck per day.
473 tons/yr NaOH x 2,000 lbs/ ton = 946,000 lbs/yr x 1 gal NaOH @ 50%/12.77 lbs = 74,080 gal/year x 1 truck/6,000 gallons = 12.35 trucks/year

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	650	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles:	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.01	0.03	0.08	0.000	0.00	0.00	2,740	0.08	2,742	1
SUBTOTAL	0	0	0	0	0	0	2,740	0	2,742	1
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Type)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	650	4.89	3,179	12
			TOTAL	3,179	12

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	H2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.0000	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.0000	0
electricity - increased use	9.66	MWh/day	Electricity GHGs	1758.73	0.0000	0.0000	1,759
water - increased use	0.02	MMgal/day	Water Conveyance GHGs	26.36	0.0002	0.0003	26
wastewater - increased generation	0.01	MMgal/day	Wastewater Processing GHGs	14.53	0.0001	0.0002	15
temporary construction activities	2329	MT/year	Construction GHGs in CO2e				78
operational truck trips	1.24	MT/year	Operation GHGs in CO2e				1
						TOTAL CO2e	1,879

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.00	MMscf/day	Natural Gas GHGs	0.00	0.00	0.00	0
electricity - increased use	9.66	MWh/day	Electricity GHGs	1758.73	0.00	0.00	1,759
water - increased use[2]	0.02	MMgal/day	Water Conveyance GHGs	2.49	0.0000	0.0000	2
wastewater - increased generation[2]	0.01	MMgal/day	Wastewater Processing GHGs	1.37	0.0000	0.0000	1
temporary construction activities[3]	2328.70	MT/year	Construction GHGs in CO2e	[redacted]			78
operational truck trips	1.24	MT/year	Operation GHGs in CO2e				1
						TOTAL CO2e:	1,841

Note: The mitigation calculations assume that 100% of the total water demand for Sulfuric Acid Manufacturing at Facility J can potentially be supplied by recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water[1]
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation[2]
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

Worksheet B-30
Solid Waste Handling

Facility ID	Current Solid Waste Hauled away (tons/day)	Type of Solid Waste	Solid Waste is trucked to?	Distance to local cement plant for recycling or Landfill for disposal (miles, one-way)	Distance to out of District cement plant for recycling or Landfill for disposal (miles, one-way)	Distance to out of state cement plant for recycling (miles, one-way)	Option 1: Proposed increase in Solid Waste (ton/day)	Option 1 Increase in Solid Waste will be trucked to?	Option 2: Proposed increase in Solid Waste (ton/day)	Option 2 Increase in Solid Waste will be trucked to?
A	1.12	FCCU fines	cement plant	71.9	131	200	0.77	cement plant	0.00	cement plant
B	4.66	FCCU fines	cement plant or Class III landfill	80.64	80.64	200	2.47	cement plant	1.37	cement plant
C	2.16	FCCU fines	cement plant	71.77	132	200	0.00	n/a	0.00	n/a
D	0.41	FCCU fines	cement plant	68.42	130	200	1.18	cement plant	1.18	cement plant
E	0.99	FCCU fines	cement plant	66.47	128	200	0.44	cement plant	0.00	cement plant
F	2	FCCU fines	cement plant	67.48	128	200	1.89	cement plant	0.00	cement plant
G	not provided	Catalyst fines	cement plant	65.95	127	200	2.03	cement plant	2.03	cement plant
H	175	baghouse fines	cement plant	67.7	129	200	0.44	cement plant	0.44	cement plant
I	not provided	ESP fines	Most is reused on site but some is sent to Class III Landfill	66.39	n/a	n/a	0.05	cement plant	0.05	cement plant
J	not provided						0.00	n/a	0.00	n/a
K	not provided	not provided	Reused on site or sent to Class III Landfill			n/a	2.49 11.75	Reused on site	2.49 7.56	Reused on site

Disposal Facilities Used by Facility B

Facility Name	Facility Type	Facility Class	Remaining Capacity (yds³)	Address	Mileage	Permitted Capacity (yds³)
Waste Management – Palmdale - (Los Angeles County): Antelope Valley Public Landfill	Solid waste landfill Large volume waste transfer facility	Class III	2, 980,000	1200 West City Ranch Road, Palmdale CA 93551	80.64 from Facility B 66.39 from Facility I 71.06 from Facility K	6,480,000
Waste Management - Azusa, (Los Angeles County): Azusa Land Reclamation Co. Landfill	Inert waste disposal site Major waste tire facility Asbestos Containing Materials disposal site Contaminated soil facility Solid waste disposal site	Class III	34,100,000	1211 West Gladstone Street, Azusa, CA 91702	34.34 from Facility B 23.65 from Facility I 38.77 from Facility K	66,670,000

Source:
www.cwmb.c

Facility A sends its solid waste to a cement plant for recycling which is 71.9 miles (one-way) away.
However, the cement plant has shut-down its kilns on 11/20/2009 so the solid waste may be sent a different cement kiln further away or out of state (a maximum of 200 miles, one-way to the California/Arizona border).
Facility A's catalyst fines are collected by a pneumatic tanker truck (USA Transport) and are transported to California Portland Cement, Colton, CA for recycling into cement.
In 2008 the facility shipped 408.61 tons. Analytical data has shown these catalyst fines to be non-hazardous.

Facility D sends its solid waste to a cement plant for recycling which is 68.42 miles (one-way) away.
However, the cement plant has shut-down its kilns on 11/20/2009 so the solid waste may be sent a different cement kiln further away or out of state (a maximum of 200 miles, one-way to the California/Arizona border).

Facility G sends its solid waste to a cement plant for recycling which is 66 miles (one-way) away.
However, the cement plant has shut-down its kilns on 11/20/2009 so the solid waste may be sent a different cement kiln further away or out of state (a maximum of 200 miles, one-way to the California/Arizona border).

PROPOSED PROJECT - OPTION 2: FCCUs USING SOx REDUCING ADDITIVES ONLY

FCCUs		
6 Refineries Using SOx Reducing Additives to meet 6 ppm SOx limit		
Usage Rates		
0	Mmbtu/day	Natural Gas
0	kWh/day	Electricity
0	gal/day	Water
0	gal/day	Wastewater
0	Mmbtu/day	Cooling Water
0	scf/day	Compressed Air
0	tons/day	Solid Waste Disposal
2500	pounds/day	SOx Reducing Catalyst
0	sf	Plot Space Needed
2000	round trip miles/day	1 Truck Delivering SOx Reducing Catalyst
5	trucks/day	No. of Trucks Delivering SOx Reducing Catalyst
0	round trip miles/day	1 Truck Hauling Away Solid Waste[2]
0	trucks/day	No. of Trucks Hauling Away Solid Waste[2]
8000	round trip miles/year	Annual Truck Miles
20	trucks/year	Annual Trucks

*any increase in SOx Reducing Catalyst is a direct reduction in FCCU regenerator catalyst

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	8000.00	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.08	0.31	0.95	0.001	0.05	0.04	33727.26	0.93	33746.8363	15
SUBTOTAL	0	0	1	0	0	0	33,727	1	33,747	15
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	8000.00	4.89	39120.00	150.46
			TOTAL	39,120	150

*Assumes 260 days/year

Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

Notes:
Facility A already uses SOx reducing additives, I
Facility B already uses 800 lb/day of SOx reducing additives
Facility C no longer needs to use SOx reducing additives
Facility D does not currently use SOx reducing additives
Facility E has been testing with SOx reducing additives
Facility F already uses SOx reducing additives, but not sure how much

[1]Assumes catalyst deliveries are made by a 25 ton capacity truck. It will take an extra 20 trucks to deliver one year's worth of catalyst, but the peak would be one truck per day.
[2]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take 0 extra trucks to haul away one year's worth of solid waste.

Brands of SOx reducing additives: Intercat Super SOx-Getter Grace Davison Super DeSOx Most refineries are using Grace Davison's base catalyst and SOx reducing catalyst.

Phase III: Operations - GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - reduction	0.0000	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.0000	0
electricity - increased use	0.0000	MWh/day	Electricity GHGs	0.00	0.0000	0.0000	0
water - increased use	0.00	MMgal/day	Water Conveyance GHGs	0.00	0.0000	0.0000	0
wastewater - increased generation[1]	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
temporary construction activities[3]	0	MT/project	Construction GHGs in CO2e				0
operational truck trips	15.30	MT/project	Operation GHGs in CO2e				15
						TOTAL CO2e	15
						Significance Threshold	10,000
						Exceed Significance?	NO

GHG Emission Factors:

1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF
[3]GHGs from temporary construction activities are amortized over 30 years.

PROPOSED PROJECT - OPTION 2: FACILITY A

Fuel Gas Treatment

Module 2: Fuel Gas Systems
M20B: Sulfinol conversion of two H2S absorbers

Utility/Infrastructure	Facility A Annual Usage		Daily Usage	
Natural Gas	-2,080	MMbtu	-5.70	MMbtu
Electricity	1,385,870	kWh	3796.90	kWh
Water	3	MMgal	8219.18	gal
Wastewater	2	MMgal	5479.45	gal
Cooling Water	400	MMbtu	1.10	MMbtu
Compressed Air	100	1000 scf	273.97	scf
Solid Waste Disposal	0	tons	0.00	tons
Plot Space Needed	100	sf		
		round trip		round trip
1 Truck Delivering Sulfinol	11000.00	miles	500.00	miles
No. of Trucks Delivering Sulfinol	22.00	trucks	1.00	truck
sulfinol	130670.00	gallons	358.00	gallons
		round trip		round trip
1 Existing Truck Delivering DEA	-1100.00	miles	-50.00	miles
No. of Existing Trucks Delivering DEA	-22.00	trucks	-1.00	truck
DEA usage	-127000.00	gallons	-347.95	gallons

SOx Reducing Additive for FCCU

Utility/Infrastructure	Facility A Annual Usage		Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	0	kWh	0.00	kWh
Water	0	MMgal	0.00	gal
Wastewater	0	MMgal	0.00	gal
Cooling Water	0	MMbtu	0.00	MMbtu
Compressed Air	0	1000 scf	0.00	scf
Solid Waste Disposal	0	tons	0.00	pounds
SOx Reducing catalyst	91.25	tons	500.00	pounds
Plot Space Needed	0	sf		
1 Truck Hauling Away Solid Waste[2]	0	round trip miles	0.00	round trip miles
1 Truck Delivering SOx Reducing Catalyst[3]	1,600	round trip miles	400.00	round trip miles
No. of Trucks Hauling Away Solid Waste	0	trucks	0	truck
No. of Trucks Delivering SOx Reducing Catalyst	4	trucks	1	truck

Module 2: SRU/TGTU Systems
M13: EmeraChem ESx Gas Treating

Utility/Infrastructure	Facility A Annual Usage		Daily Usage	
Natural Gas	11,000	MMbtu	30.14	MMbtu
Electricity	1,085,000	kWh	2972.60	kWh
Water	0	MMgal	0.00	gal
Wastewater	0	MMgal	0.00	gal
Cooling Water	40	MMbtu	0.11	MMbtu
Compressed Air	770	1000 scf	2109.59	scf
Solid Waste Disposal	0	tons	0.00	tons
ESX Catalyst	400	pounds	1.10	pounds
Sulfur sales*	23.66	long tons	145.20	pounds
Plot Space Needed	2500	sf		
1 Truck Hauling Sulfur Away[4]	100	round trip miles	50.00	round trip miles
1 Truck Delivering ESX Catalyst[5]	400	round trip miles	400.00	round trip miles
No. of Trucks Hauling Sulfur Away	2	trucks	1	trucks
No. of Trucks Delivering ESX Catalyst	1	trucks	1	trucks

Facility A already accesses recycled water and will have increased future access to recycled water.

[1]Assumes that the existing DEA amine storage tank can be used for Sulfinol storage.

[2]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take 0 extra trucks to haul away one year's worth of solid waste.

[3]Assumes that one 25-ton truck will deliver catalyst. It will take 4 trucks to deliver one year's worth of catalyst, but the peak would be one truck per day.

One bulk catalyst truck can transport 25 tons.

[4]Assumes Hauling Sulfur away in a 25 ton capacity truck. It will take an extra 2 trucks to haul away one year's worth of sulfur, but the peak would be one truck per day.
23.66 long tons/yr Sulfur x 2,240 lbs/long ton = 52,998 lbs/yr x 1 ton/2000 lbs = 26.5 tons/yr x 1 truck/25 tons = 1.06 trucks/year to haul extra sulfur away to a buyer

[5] It will take one truck to deliver one year's worth of ESX Catalyst, but the peak would be one truck per day.

Grand Totals

Daily Usage			Daily Usage
24.44	MMbtu	Natural Gas	23959.17 scf
6769.51	kWh	Electricity	6.769507 MWh
8219.18	gal	Water	0.008219 Mmgal
5479.45	gal	Wastewater	0.005479 Mmgal
1.21	MMbtu	Cooling Water	
2383.56	scf	Compressed Air	
0.00	pounds	Solid Waste Disposal	
500.00	pounds	SOx Reducing catalyst	
1.10	pounds	ESX Catalyst	
358.00	gallons	sulfinol	
-347.95	gallons	DEA	
2600	sf	Plot Space Needed	
500.00	Daily round trip miles	1 Truck Delivering Sulfinol	
0.00	Daily round trip miles	1 Truck Hauling Away Solid Waste	
400.00	Daily round trip miles	1 Truck Delivering SOx Reducing Catalyst	
50.00	Daily round trip miles	1 Truck Hauling Away Sulfur	
400.00	Daily round trip miles	1 Truck Delivering ESX Catalyst	
-50.00	Daily round trip miles	1 Truck Delivering DEA (reduction)	
1	daily trucks	No. of Trucks Delivering Sulfinol	
0.00	daily trucks	No. of Trucks Hauling Away Solid Waste	
1.00	daily trucks	No. of Trucks Delivering SOx Reducing catalyst	
1	daily trucks	No. of Trucks Hauling Away Sulfur	
1	daily trucks	No. of Trucks Delivering Esx Catalyst	
-1.00	daily trucks	No. of Trucks Delivering DEA (reduction)	
1300.00	Daily round trip miles	Total Daily Truck Miles	
3.00	Daily trucks	Total No. of Daily Trucks	
12,000	Annual round trip miles	Annual Truck Miles	
7	Annual trucks	Total No. of Annual Trucks	

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	12,000	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.12	0.47	1.43	0.002	0.07	0.06	50,591	1.40	50,620	23
SUBTOTAL	0	0	1	0	0	0	50,591	1	50,620	23
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	12,000	4.89	58,680	226
			TOTAL	58,680	226

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - increased use	0.0240	MMscf/day	Natural Gas GHGs	475.92	0.0025	0.0091	477
electricity - increased use	6.77	MWh/day	Electricity GHGs	1232.63	0.0000	0.0000	1,233
water - increased use[1]	0.01	MMgal/day	Water Conveyance GHGs	1.04	0.0000	0.0000	1
wastewater - increased generation[1]	0.01	MMgal/day	Wastewater Processing GHGs	0.70	0.0000	0.0000	1
temporary construction activities[3]	0	MT/year	Construction GHGs in CO2e				0
operational truck trips	22.96	MT/year	Operation GHGs in CO2e				23
						TOTAL CO2e	1,734

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.0240	MMscf/day	Natural Gas GHGs	475.92	0.0025	0.01	477
electricity - increased use	6.7695	MWh/day	Electricity GHGs	1232.63	0.0000	0.00	1,233
water - increased use[2]	0.0082	MMgal/day	Water Conveyance GHGs	1.04	0.0000	0.0000	1
wastewater - increased generation[2]	0.0055	MMgal/day	Wastewater Processing GHGs	0.70	0.0000	0.0000	1
temporary construction activities[3]	0.0000	MT/year	Construction GHGs in CO2e				0
operational truck trips	22.9570	MT/year	Operation GHGs in CO2e				23
						TOTAL CO2e	1,734

Note: The mitigation calculations assume that 100% of the total water demand for this facility can potentially be supplied by recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

PROPOSED PROJECT - OPTION 2: FACILITY B

SOx Reducing Additive

Utility/Infrastructure	Facility B Annual Usage		Facility B Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	0	kWh	0.00	kWh
Water	0	MMgal	0.00	gal
Wastewater	0	MMgal	0.00	gal
Cooling Water	0	MMbtu	0.00	MMbtu
Compressed Air	0	1000 scf	0.00	scf
Solid Waste Disposal	0	tons	0.00	tons
SOx Reducing catalyst	91.25	tons	0.25	tons
Plot Space Needed	0	sf		
1 Truck Hauling Away Solid Waste[1]	0	round trip miles	0.00	round trip miles
1 Truck Delivering SOx Reducing Catalyst[2]	1,600	round trip miles	400.00	round trip miles
No. of Trucks Hauling Away Solid Waste	0	trucks	0	truck
No. of Trucks Delivering SOx Reducing Catalyst	4	trucks	1	truck

Module 3A: SRU/TGTU Systems
M17: Tail Gas NWGS
Tri-Mer Cloud Chamber

Utility/Infrastructure	Facility B Annual Usage for 2 units		Facility B Daily Usage for 2 units	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	4,395,600	kWh	12042.74	kWh
Water	51.1	MMgal	140000.00	gal
Wastewater	10.2	MMgal	27945.21	gal
Cooling Water	409,880	MMbtu	1122.96	MMbtu
Compressed Air	100	1000 scf	273.97	scf
Solid Waste Disposal	500	tons	1.37	tons
Soda Ash	190	tons	0.52	tons
Plot Space needed	7906	sf		
1 Truck Hauling Away Solid Waste[3]	8000	round trip miles	400.00	round trip miles
1 Truck Delivering Soda Ash[4]	400	round trip miles	50.00	round trip miles
No. of Trucks Hauling Away Solid Waste	20	trucks	1	truck
No. of Trucks Delivering Soda Ash	8	trucks	1	truck

[1]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take 0 extra trucks to haul away one year's worth of solid waste.

[2]Assumes that one 25-ton truck will deliver catalyst. It will take 4 trucks to deliver one year's worth of catalyst, but the peak would be one truck per day.

One bulk catalyst truck can transport 25 tons.

[3]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 20 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.
500 tons/yr solid waste x 1 truck/25 tons = 20 trucks/year to haul extra solid waste away for recycling
This facility either sends its solid waste to a Class III landfill for disposal which is 80.64 miles (one-way) away or to a cement plant for recycling which is.67.48 miles (one-way) away.
However, the cement plant has shut-down its kilns on 11/20/2009 so the solid waste may be sent a different cement kiln further away or out of state (a maximum of 200 miles, one-way to the California/Arizona border).

[4]Assumes delivery of soda ash arrives in a 25 ton capacity truck. It will take an extra 8 trucks to deliver one year's worth of soda ash.
190 tons/yr soda ash x 1 truck/25 tons = 7.6 trucks/year to deliver soda ash

GRAND TOTALS (during Operation)

Daily Usage	Daily Usage	
0.00 MMbtu	0.00 scf	Natural Gas
12042.74 Kwh	12.04 MWh	Electricity
140000.00 gal		Water
27945.21 gal		Wastewater
1122.96 MMbtu		Cooling Water
273.97 scf		Compressed Air
1.37 tons		Solid Waste Disposal
0.25 tons		SOx Reducing catalyst
0.52 tons		Soda Ash (Na2CO3)
7906.00 sf		Plot Space needed
Daily round		1 Truck Hauling
400.00 trip miles		Away Solid Waste
		1 Truck Delivering
Daily round		SOx Reducing
400.00 trip miles		Catalyst
Daily round		1 Truck Delivering
50.00 trip miles		Soda Ash
		No. of Trucks
		Hauling Away Solid
1.00 daily trucks		Waste
1 daily trucks		No. of Trucks Delivering SOx Reducing Catalyst
1 daily trucks		No. of Trucks Delivering Soda Ash
Daily round		
850.00 trip miles		Total Daily Truck Miles
3.00 Daily trucks		Total No. of Trucks
Annual		
round trip		
10,000 miles		Annual Truck Miles
Annual		
32 trucks		Annual Trucks

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	10,000	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.10	0.39	1.19	0.002	0.06	0.05	42,159	1.17	42,184	19
SUBTOTAL	0	0	1	0	0	0	42,159	1	42,184	19
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	10,000	4.89	48,900	188
			TOTAL	48,900	188

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - increased use	0.0000	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.0000	0
electricity - increased use	12.04	MWh/day	Electricity GHGs	2192.82	0.0000	0.0000	2,193
water - increased use[2]	0.14	MMgal/day	Water Conveyance GHGs	17.80	0.0001	0.0002	18
wastewater - increased generation[2]	0.03	MMgal/day	Wastewater Processing GHGs	3.55	0.0000	0.0000	4
temporary construction activities[3]	4657	MT/year	Construction GHGs in CO2e				155
operational truck trips	19.13	MT/year	Operation GHGs in CO2e				19
						TOTAL CO2e*	2,389

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.00	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.00	0
electricity - increased use	12.04	MWh/day	Electricity GHGs	2192.82	0.0000	0.00	2,193
water - increased use[2]	0.14	MMgal/day	Water Conveyance GHGs	17.80	0.0001	0.0002	18
wastewater - increased generation[2]	0.03	MMgal/day	Wastewater Processing GHGs	3.55	0.0000	0.0000	4
temporary construction activities[3]	4657.40	MT/year	Construction GHGs in CO2e				155
operational truck trips	19.13	MT/year	Operation GHGs in CO2e				19
						TOTAL CO2e*	2,389

Note: The mitigation calculations assume that 100% of the total water demand for this facility can potentially be supplied by recycled water.

Facility B already accesses recycled water and will have increased future access to recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

PROPOSED PROJECT - OPTION 2: FACILITY D

Fuel Gas Treatment
Module 2: Fuel Gas Systems
M21A: Parallel Merox treatment for excess coker gas

Utility/Infrastructure	Facility D Annual Usage		Facility D Daily Usage	
Natural Gas	440	MMbtu	1.21	MMbtu
Electricity	156,400	kWh	428.49	kWh
Water	5	MMgal	13698.63	gal
Wastewater	5	MMgal	13698.63	gal
Cooling Water	176	MMbtu	0.48	MMbtu
Compressed Air	780	1000 scf	2136.99	scf
Solid Waste Disposal	110	tons	0.30	tons
Merox Catalyst	3,000	pounds	0.0041	tons
NaOH (50%)	160	tons	0.44	tons
Sulfur sales*	11	long tons	67.51	pounds
Plot Space Needed	6000	sf		
1 Truck Hauling Away Solid Waste[1]	2000	round trip miles	400.00	round trip miles
1 Truck Delivering Merox Catalyst[2]	500	round trip miles	500.00	round trip miles
1 Truck Delivering NaOH[3]	250	round trip miles	50.00	round trip miles
1 Truck Hauling Sulfur Away[4]	50	round trip miles	50.00	round trip miles
No. of Trucks Hauling Away Solid Waste	5	trucks	1	truck
No. of Trucks Delivering Merox Catalyst	1	trucks	1	truck
No. of Trucks Delivering NaOH	5	trucks	1	truck
No. of Trucks Hauling Sulfur Away	1	trucks	1	truck

SOx Reducing Additive

Utility/Infrastructure	Facility D Annual Usage		Facility D Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	0	kWh	0.00	kWh
Water	0	MMgal	0.00	gal
Wastewater	0	MMgal	0.00	gal
Cooling Water	0	MMbtu	0.00	MMbtu
Compressed Air	0	1000 scf	0.00	scf
Solid Waste Disposal	0	tons	0.00	tons
SOx Reducing catalyst	91.25	tons	0.25	tons
Plot Space Needed	0	sf		
1 Truck Hauling Away Solid Waste[7]	0	round trip miles	0.00	round trip miles
1 Truck Delivering SOx Reducing Catalyst[8]	1,600	round trip miles	400.00	round trip miles
No. of Trucks Hauling Away Solid Waste	0	trucks	0	truck
No. of Trucks Delivering SOx Reducing Catalyst	4	trucks	1	truck

Module 3A: SRU/TGTU Systems
M17: Tail Gas NWGS Tri-Mer Cloud Chamber

Utility/Infrastructure	Facility D Annual Usage		Facility D Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	2,447,400	kWh	6705.21	kWh
Water	78.2	MMgal	214246.58	gal
Wastewater	15.7	MMgal	43013.70	gal
Cooling Water	228,200	MMbtu	625.21	MMbtu
Compressed Air	100	1000 scf	273.97	scf
Solid Waste Disposal	320	tons	0.88	tons
Soda Ash	123	tons	0.34	tons
Plot Space Needed	5930	sf		
1 Truck Hauling Away Solid Waste[5]	5200	round trip miles	400.00	round trip miles
1 Truck Delivering Soda Ash[6]	250	round trip miles	50.00	round trip miles
No. of Trucks Hauling Away Solid Waste	13	trucks	1	truck
No. of Trucks Delivering Soda Ash	5	trucks	1	truck

[1]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 5 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.

110 tons/yr solid waste x 1 truck/25 tons = 4.48 trucks/year to haul extra solid waste away for recycling

[2]It will take one truck to deliver one year's worth of Merox catalyst; the peak would be one truck per day.
Merox is delivered by truck from Chicago. The distance from the California/Nevada border to this facility is approximately 250 miles, one-way.

[3]Assumes that one 10,000 gallon capacity storage tank will be installed for NaOH storage. It will take 5 trucks to deliver one year's worth of NaOH 50% solution, but the peak would be one truck per day.

160 tons/yr NaOH x 2,000 lbs/ ton = 320,000 lbs/yr x 1 gal NaOH @ 50%/12.77 lbs = 25,059 gal/year x 1 truck/6,000 gallons = 4.2 trucks/year

[4]Assumes Hauling Sulfur away in a 25 ton capacity truck. It will take 1 extra truck to haul away one year's worth of sulfur; the peak would be one truck per day.
11 long tons/yr Sulfur x 2,240 lbs/long ton = 24,640 lbs/yr x 1 ton/2000 lbs = 12.32 tons/yr x 1 truck/25 tons = 0.49 trucks/year to haul extra sulfur away to a buyer

[5]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 13 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.
320 tons/yr solid waste x 1 truck/25 tons = 12.8 trucks/year to haul extra solid waste away for recycling
This facility sends its solid waste to a cement plant for recycling which is 68.42 miles (one-way) away.
However, the cement plant has shut-down its kilns on 11/20/2009 so the solid waste may be sent a different cement kiln further away or out of state (a maximum of 200 miles, one-way to the California/Arizona border).

[6]Assumes delivery of soda ash arrives in a 25 ton capacity truck. It will take an extra 5 trucks to deliver one year's worth of soda ash.
123 tons/yr soda ash x 1 truck/25 tons = 4.92 trucks/year to deliver soda ash

[7]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take 0 extra trucks to haul away one year's worth of solid waste.

[8]Assumes that one 25-ton truck will deliver catalyst. It will take 4 trucks to deliver one year's worth of catalyst, but the peak would be one truck per day.
One bulk catalyst truck can transport 25 tons.

GRAND TOTALS (during Operation)

Daily Usage	Daily Usage	
1.21 MMbtu	1181.84 scf	Natural Gas
8127.70 Kwh	8.13 MWh	Electricity
227945.21 gal	0.227945205 Mmgal	Water
56712.33 gal	0.056712329 Mmgal	Wastewater
625.69 MMbtu		Cooling Water
2410.96 scf		Compressed Air
1.18 tons		Solid Waste Disposal
0.0041 tons		Merox Catalyst
0.25 tons		SOx Reducing Catalyst
0.44 tons		NaOH (50%)
67.51 pounds		Sulfur sales*
0.34 tons		soda ash
11930.00 sf		Plot Space needed

Note: This calculation takes into account the electricity needed to make 0.44 tons per day of NaOH to satisfy demand (994 kWh/day).

400.00	Daily round trip miles	1 Truck Hauling Away Solid Waste
500.00	Daily round trip miles	1 Truck Delivering Merox Catalyst
50.00	Daily round trip miles	1 Truck Delivering NaOH
50.00	Daily round trip miles	1 Truck Hauling Sulfur Away
400.00	Daily round trip miles	1 Truck Hauling Away Solid Waste
50.00	Daily round trip miles	1 Truck Delivering Soda Ash
0.00	Daily round trip miles	1 Truck Hauling Away Solid Waste
400.00	Daily round trip miles	1 Truck Delivering SOx Reducing Catalyst
2	daily trucks	No. of Trucks Hauling Away Solid Waste
1	daily trucks	No. of Trucks Delivering Merox Catalyst
1.00	daily trucks	No. of Trucks Delivering NaOH
1.00	daily trucks	No. of Trucks Hauling Sulfur Away
1	daily trucks	No. of Trucks Delivering Soda Ash
1	daily trucks	No. of Trucks Delivering SOx Reducing Catalyst
1850.00	Daily round trip miles	Total Daily Truck Miles
7	Daily trucks	Total No. of Trucks
	Annual round trip	
9850.00	miles	Annual Truck Miles
34	Annual trucks	Annual Trucks

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	9,850	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.10	0.39	1.17	0.002	0.06	0.05	41,527	1.15	41,551	19
SUBTOTAL	0	0	1	0	0	0	41,527	1	41,551	19
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	9,850	4.89	48,167	185
			TOTAL	48,167	185

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - increased use	0.0012	MMscf/day	Natural Gas GHGs	23.48	0.0001	0.0004	24
electricity - increased use	8.13	MWh/day	Electricity GHGs	1479.94	0.0000	0.0000	1,480
water - increased use[2]	0.23	MMgal/day	Water Conveyance GHGs	28.98	0.0002	0.0003	29
wastewater - increased generation[1]	0.06	MMgal/day	Wastewater Processing GHGs	7.21	0.0000	0.0001	7
temporary construction activities[3]	2329	MT/year	Construction GHGs in CO2e				78
operational truck trips	18.84	MT/year	Operation GHGs in CO2e				19
						TOTAL CO2e	1,836

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.00	MMscf/day	Natural Gas GHGs	23.48	0.0001	0.00	24
electricity - increased use	8.13	MWh/day	Electricity GHGs	1479.94	0.0000	0.00	1,480
water - increased use[2]	0.23	MMgal/day	Water Conveyance GHGs	28.98	0.0002	0.0003	29
wastewater - increased generation[1]	0.06	MMgal/day	Wastewater Processing GHGs	7.21	0.0000	0.0001	7
temporary construction activities[3]	2328.70	MT/year	Construction GHGs in CO2e				78
operational truck trips	18.84	MT/year	Operation GHGs in CO2e				19
						TOTAL CO2e	1,836

Facility D already accesses recycled water and will have increased future access to recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N2O/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

PROPOSED PROJECT - OPTION 2 & ALTERNATIVE C - OPTION 2: FACILITY E

Fuel Gas Treatment
Module 2: Fuel Gas Systems
M20: Convert amine absorbers to Sulfinol

Utility/Infrastructure	Facility E Annual Usage		Facility E Daily Usage	
Natural Gas	-14,780	MMbtu	-40.49	MMbtu
Electricity	2,418,610	kWh	6626.33	kWh
Water	5	MMgal	13698.63	gal
Wastewater	4	MMgal	10958.90	gal
Cooling Water	700	MMbtu	1.92	MMbtu
Compressed Air	100	1000 scf	273.97	scf
Solid Waste Disposal	0	tons	0.00	tons
Sulfur sales*	56.56	long tons	347.11	pounds
Plot Space Needed	100	sf		
1 Truck Hauling Sulfur Away[2]	150	round trip miles	50.00	round trip miles
No. of Trucks Hauling Sulfur Away	3	trucks	1	truck
sulfinol	385075.00	gallons	1055.00	gallons
1 Truck Delivering Sulfinol[1]	32500.00	round trip miles	500.00	round trip miles
No. of Trucks Delivering Sulfinol	65.00	trucks	1.00	truck
1 Existing Truck Delivering DEA	-3150.00	round trip miles	-50.00	round trip miles
No. of Existing Trucks Delivering DEA	-63.00	trucks	-1.00	truck
DEA usage	-374490.00	gallons	-1026.00	gallons

SOx Reducing Additive for FCCU

Utility/Infrastructure	Facility E Annual Usage		Facility E Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	0	kWh	0.00	kWh
Water	0	MMgal	0.00	gal
Wastewater	0	MMgal	0.00	gal
Cooling Water	0	MMbtu	0.00	MMbtu
Compressed Air	0	1000 scf	0.00	scf
Solid Waste Disposal	0	tons	0.00	tons
SOx Reducing catalyst	91.25	tons	0.25	tons
Plot Space Needed	0	sf		
1 Truck Hauling Away Solid Waste[3]	0	round trip miles	0.00	round trip miles
1 Truck Delivering SOx Reducing Catalyst[4]	1,600	round trip miles	400.00	round trip miles
No. of Trucks Hauling Away Solid Waste	0	trucks	0	truck
No. of Trucks Delivering SOx Reducing Catalyst	4	trucks	1	truck

GRAND TOTALS (during Operation)

Daily Usage			Daily Usage
-40.49	MMbtu	Natural Gas	-39699.2 scf
6626.33	kWh	Electricity	6.626329 MWh
13698.63	gal	Water	0.013699 Mmgal
10958.90	gal	Wastewater	0.010959 Mmgal
1.92	MMbtu	Cooling Water	
273.97	scf	Compressed Air	
0.00	tons	Solid Waste Disposal	
0.25	tons	SOx Reducing catalyst	
347.11	pounds	Sulfur sales*	
1055.00	gallons	sulfinol	
-1026.00	gallons	DEA	
100.00	sf	Plot Space Needed	
50.00	Daily round trip miles	1 Truck Hauling Sulfur Away	
0.00	Daily round trip miles	1 Truck Hauling Away Solid Waste	
400.00	Daily round trip miles	1 Truck Delivering SOx Reducing catalyst	
500	Daily round trip miles	1 Truck Delivering Sulfinol	
-50.00	Daily round trip miles	1 Truck Delivering DEA	
1	daily trucks	No. of Trucks Hauling Sulfur Away	
0	daily trucks	No. of Trucks Hauling Away Solid Waste	
1	daily trucks	No. of Trucks Delivering SOx Reducing catalyst	
1	daily trucks	No. of Trucks Delivering Sulfinol	
-1.00	daily trucks	No. of Trucks Delivering DEA	
900.00	Daily round trip miles	Total Daily Truck Miles	
2.00	Daily trucks	Total No. of Trucks	
31100	Annual round trip miles	Annual Truck Miles	
9.00	Annual trucks	Annual Trucks	

[1]Assumes that the existing DEA amine storage tank can be used for Sulfinol storage.

[2]Assumes Hauling Sulfur away in a 25 ton capacity truck. It will take an extra 3 trucks to haul away one year's worth of sulfur, but the peak would be one truck per day.
56.56 long tons/yr Sulfur x 2,240 lbs/long ton = 126,695 lbs/yr = 63.35 tons/yr x 1 truck/25 tons = 2.53 trucks/year to haul extra sulfur away to a buyer

[3]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take 0 trucks to haul away one year's worth of solid waste.

[4]Assumes that one 25-ton truck will deliver catalyst. It will take 4 trucks to deliver one year's worth of catalyst, but the peak would be one truck per day.
One bulk catalyst truck can transport 25 tons.

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation On-Road Equipment Type	Fuel	Annual Round-trip Distance (miles/year)	Mileage Rate (miles/ gallon)	2012 Mobile Source Emission Factors VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	31,100	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.30	1.22	3.70	0.005	0.18	0.15	131,115	3.62	131,191	59
SUBTOTAL	0	1	4	0	0	0	131,115	4	131,191	59
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	31,100	4.89	152,079	585
			TOTAL	152,079	585

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - decreased use	-0.0397	MMscf/day	Natural Gas GHGs	-788.58	-0.0042	-0.0151	-790
electricity - increased use	6.63	MWh/day	Electricity GHGs	1206.56	0.0000	0.0000	1,207
water - increased use[1]	0.01	MMgal/day	Water Conveyance GHGs	18.43	0.0001	0.0002	18
wastewater - increased generation[1]	0.01	MMgal/day	Wastewater Processing GHGs	14.74	0.0001	0.0002	15
temporary construction activities[3]	0	MT/year	Construction GHGs in CO2e				0
operational truck trips	59.50	MT/year	Operation GHGs in CO2e				59
						TOTAL CO2e	509

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	-0.04	MMscf/day	Natural Gas GHGs	-788.58	-0.0042	-0.02	-790
electricity - increased use	6.63	MWh/day	Electricity GHGs	1206.56	0.0000	0.00	1,207
water - increased use[2]	0.01	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	2
wastewater - increased generation[2]	0.01	MMgal/day	Wastewater Processing GHGs	1.39	0.0000	0.0000	1
temporary construction activities[3]	0.00	MT/year	Construction GHGs in CO2e				0
operational truck trips	59.50	MT/year	Operation GHGs in CO2e				59
						TOTAL CO2e	479

Note: The mitigation calculations assume that 100% of the total water demand for this facility can potentially be supplied by recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

PROPOSED PROJECT - OPTION 2 & ALTERNATIVE C - OPTION 2: FACILITY F

Fuel Gas Treatment
Module 2: Fuel Gas Systems

M22: Add TG-10 to MDEA	Facility F			
Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	2,000	MMbtu	5.48	MMbtu
Electricity	20,000	kWh	54.79	kWh
Water	0	MMgal	0.00	gal
Wastewater	0	MMgal	0.00	gal
Cooling Water	2,000	MMbtu	5.48	MMbtu
Compressed Air	0	1000 scf	0.00	scf
Solid Waste Disposal	0	tons	0.00	tons
TG-10 amine additive	4,000	gallons	10.96	gallons
Sulfur sales*	10.35	long tons	63.52	pounds
Plot Space needed	100	sf		
1 Truck Delivering TG-10[1]	400	round trip miles	400.00	round trip miles
1 Truck Hauling Sulfur Away[2]	50	round trip miles	50.00	round trip miles
No. of Trucks Delivering TG-10	1	trucks	1	truck
No. of Trucks Hauling Sulfur Away	1	trucks	1	truck

SOx Reducing Additive for FCCU	Facility F			
Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	0	kWh	0.00	kWh
Water	0	MMgal	0.00	gal
Wastewater	0	MMgal	0.00	gal
Cooling Water	0	MMbtu	0.00	MMbtu
Compressed Air	0	1000 scf	0.00	scf
Solid Waste Disposal	0	tons	0.00	tons
SOx Reducing catalyst	91.25	tons	0.25	tons
Plot Space Needed	0	sf		
1 Truck Hauling Away Solid Waste	0	round trip miles	0.00	round trip miles
1 Truck Delivering SOx Reducing Catalyst[4]	1,600	round trip miles	400.00	round trip miles
No. of Trucks Hauling Away Solid Waste	0	trucks	0	truck
No. of Trucks Delivering SOx Reducing Catalyst	4	trucks	1	truck

[1]Assumes that one 10,000 gallon capacity storage tank will be installed for TG-10 storage. It will take 1 truck to deliver one year's worth of TG-10 solution, but the peak would be one truck per day.

4,000 gal/year x 1 truck/6,000 gallons = 0.67 trucks/year

[2]Assumes Hauling Sulfur away in a 25 ton capacity truck. It will take 1 extra truck to haul away one year's worth of sulfur; the peak would be one truck per day.

10.35 long tons/yr Sulfur x 2,240 lbs/long ton = 23,184 lbs/yr x 1 ton/2000 lbs = 11.59 tons/yr x 1 truck/25 tons = 0.46 trucks/year to haul extra sulfur away to a buyer

[3]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 0 trucks to haul away one year's worth of solid waste.

[4]Assumes that one 25-ton truck will deliver catalyst. It will take 4 trucks to deliver one year's worth of catalyst, but the peak would be one truck per day.
One bulk catalyst truck can transport 25 tons.

GRAND TOTALS (during Operation)

Daily Usage	Daily Usage	
5.48 MMbtu	5372.01 scf	Natural Gas
54.79 Kwh	0.05 MWh	Electricity
0.00 gal	0 Mmgal	Water
0.00 gal	0 Mmgal	Wastewater
5.48 MMbtu		Cooling Water
0.00 scf		Compressed Air
0.00 tons		Solid Waste Disposal
63.52 pounds		Sulfur sales*
0.25 tons		SOx Reducing catalyst
10.96 gallons		TG-10 amine additive
100.00 sf		Plot Space needed
Daily round		
400.00 trip miles		1 Truck Delivering TG-10
Daily round		
50.00 trip miles		1 Truck Hauling Sulfur Away
Daily round		1 Truck Hauling Away Solid
0.00 trip miles		Waste
Daily round		1 Truck Delivering SOx
400.00 trip miles		Reducing Catalyst
1 daily trucks		No. of Trucks Delivering TG-10
1 daily trucks		No. of Trucks Hauling Sulfur Away
0.00 daily trucks		No. of Trucks Hauling Away Solid Waste
1.00 daily trucks		No. of Trucks Delivering SOx Reducing Catalyst
Daily round		
850.00 trip miles		Total Daily Truck Miles
3 Daily trucks		Total No. of Trucks
Annual round		
2050.00 trip miles		Annual Truck Miles
6 Annual trucks		Annual Trucks

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	2,050	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.02	0.08	0.24	0.000	0.01	0.01	8,643	0.24	8,648	4
SUBTOTAL	0	0	0	0	0	0	8,643	0	8,648	4
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	2,050	4.89	10,025	39
			TOTAL	10,025	39

*Assumes 260 days/year

Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - increased use	0.0054	MMscf/day	Natural Gas GHGs	106.71	0.0006	0.0020	107
electricity - increased use	0.05	MWh/day	Electricity GHGs	9.98	0.0000	0.0000	10
water - increased use[2]	0.00	MMgal/day	Water Conveyance GHGs	0.00	0.0000	0.0000	0
wastewater - increased generation[2]	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
temporary construction activities[3]	0	MT/year	Construction GHGs in CO2e				0
operational truck trips	3.92	MT/year	Operation GHGs in CO2e				4
						TOTAL CO2e	121

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.01	MMscf/day	Natural Gas GHGs	106.71	0.0006	0.00	107
electricity - increased use	0.05	MWh/day	Electricity GHGs	9.98	0.0000	0.00	10
water - increased use[2]	0.00	MMgal/day	Water Conveyance GHGs	0.00	0.0000	0.0000	0
wastewater - increased generation[2]	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
temporary construction activities[3]	0.00	MT/year	Construction GHGs in CO2e				0
operational truck trips	3.92	MT/year	Operation GHGs in CO2e				4
						TOTAL CO2e	121

Note: The mitigation calculations assume that 100% of the total water demand for this facility can potentially be supplied by recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water[1]
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation[2]
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

PROPOSED PROJECT - OPTION 1 & ALTERNATIVE C - OPTION 1: NaOH LOSSES

Facility ID	NaOH Demand (tons/day)	Q = Fill Rate = NaOH Demand (MMgal/day)	S = Saturation Factor	P = Vapor Pressure of material Loaded (psia)	M = NaOH vapor molecular weight (lb/lbmole)	T= temperature of liquid loaded (°R)	Daily PM10 Filling Loss (lb/day)	$E_{loading}$ = Hourly PM10 Filling Loss (lb/hr)	$E_{working}$ = Hourly PM10 Working Loss (lb/hr)	Total Hourly PM10 Loss (lb/hr)	Acute Screening Level - 25 meters (lb/hr)	Does Hourly Filling Loss Exceed Acute Screening Level? (Yes/No)	Significant ?
A	0.81	0.13	1.45	0.0420	24.8	544.67	4.37E-03	1.82E-04	5.46E-04	7.28E-04	4.00E-03	NO	NO
B	1.17	0.18	1.45	0.0420	24.8	544.67	6.34E-03	2.64E-04	7.93E-04	1.06E-03	4.00E-03	NO	NO
C	0.00	0	1.45	0.0420	24.8	544.67	0	0	0	0	4.00E-03	NO	NO
D	0.44	0.07	1.45	0.0420	24.8	544.67	2.38E-03	9.90E-05	2.97E-04	3.96E-04	4.00E-03	NO	NO
E	0.45	0.07	1.45	0.0420	24.8	544.67	2.44E-03	1.01E-04	3.04E-04	4.06E-04	4.00E-03	NO	NO
F	2.02	0.32	1.45	0.0420	24.8	544.67	1.10E-02	4.57E-04	1.37E-03	1.83E-03	4.00E-03	NO	NO
G	2.90	0.46	1.45	0.0420	24.8	544.67	1.57E-02	6.56E-04	1.97E-03	2.62E-03	4.00E-03	NO	NO
H	3.37	0.53	1.45	0.0420	24.8	544.67	1.82E-02	7.60E-04	2.28E-03	3.04E-03	4.00E-03	NO	NO
I	0.79	0.12	1.45	0.0420	24.8	544.67	4.28E-03	1.78E-04	5.35E-04	7.14E-04	4.00E-03	NO	NO
J	1.30	0.20	1.45	0.0420	24.8	544.67	7.03E-03	2.93E-04	8.78E-04	1.17E-03	4.00E-03	NO	NO
K	0	0	1.45	0.0420	24.8	544.67	0	0	0	0	4.00E-03	NO	NO
TOTAL	**13.24**	**2.08**					**0.07**						

Facility ID	Electricity Needed to Produce NaOH* (kWh/day)
A	1826
B	2653
C	0
D	994
E	1019
F	4585
G	6585
H	7631
I	1791
J	2939
K	0
TOTAL	30023

NaOH @ 50% solution density = 12.747 lb/gal
Mv for NaOH solution = 24.8 lb/lbmol
Vapor Pressure for NaOH = 2.18 mmHg at 29.4oC or 85oF = 0.042 psia
Loading Temperature = 85oF to 100oF (544.67oR to 559.67oR)
Breathing Loss = 3 * Filling Loss

Filling Loss:

$$E_{Loading}, \, {}^{lb}/_{day} = (12.46)\frac{(S)(P)(M)(Q)}{T}$$ where:

S = saturation factor (dimensionless; obtained from Table 5.2-1 in AP-42)
= 1.45 (Splash loading: dedicated normal service)
P = vapor pressure of the material loaded at temperature T (psia)
M = vapor molecular weight (lb/lb-mole)
Q = volume of material loaded (1,000 gal/day)
T = temperature of liquid loaded (°R).

*It takes approximately 2,500 kWh to produce one metric ton of NaOH.
Thus, approximately 22,444 kWh per day of additional electricity may be needed to produce additional NaOH to meet the needs of the proposed project, calculated as follows:

$$\frac{9.9 \text{ tons NaOH}}{\text{Day}} \times \frac{2{,}000 \text{ lbs}}{\text{ton}} \times \frac{1 \text{ metric ton}}{2{,}205 \text{ lbs}} \times \frac{2{,}500 \text{ kWh}}{1 \text{ metric ton of NaOH produced}} = 22{,}444 \text{ kWh/day}$$

PROPOSED PROJECT - OPTION 2: NaOH LOSSES

Facility ID	NaOH Demand (tons/day)	Q = Fill Rate = NaOH Demand (MMgal/day)	S = Saturation Factor	P = Vapor Pressure of material Loaded (psia)	M = NaOH vapor molecular weight (lb/lbmole)	T= temperature of liquid loaded (°R)	Daily PM10 Filling Loss (lb/day)	$E_{loading}$ = Hourly PM10 Filling Loss (lb/hr)	$E_{working}$ = Hourly PM10 Working Loss (lb/hr)	Total Hourly PM10 Loss (lb/hr)	Acute Screening Level - 25 meters (lb/hr)	Does Hourly Filling Loss Exceed Acute Screening Level? (Yes/No)	Significant ?
A	0.00	0.00	1.45	0.0420	24.8	544.67	0.00	0.00E+00	0.00E+00	0.00E+00	4.00E-03	NO	NO
B	0.00	0.00	1.45	0.0420	24.8	544.67	0.00	0.00E+00	0.00E+00	0.00E+00	4.00E-03	NO	NO
C	0.00	0	1.45	0.0420	24.8	544.67	0	0	0.00E+00	0.00E+00	4.00E-03	NO	NO
D	0.44	0.07	1.45	0.0420	24.8	544.67	0	0	2.97E-04	3.96E-04	4.00E-03	NO	NO
E	0.00	0.00	1.45	0.0420	24.8	544.67	0.00	0.00E+00	0.00E+00	0.00E+00	4.00E-03	NO	NO
F	0.00	0.00	1.45	0.0420	24.8	544.67	0.00	0.00E+00	0.00E+00	0.00E+00	4.00E-03	NO	NO
G	2.90	0.46	1.45	0.0420	24.8	544.67	0	0	1.97E-03	2.62E-03	4.00E-03	NO	NO
H	3.37	0.53	1.45	0.0420	24.8	544.67	0.02	7.60E-04	2.28E-03	3.04E-03	4.00E-03	NO	NO
I	0.79	0.12	1.45	0.0420	24.8	544.67	0.00	1.78E-04	5.35E-04	7.14E-04	4.00E-03	NO	NO
J	1.30	0.20	1.45	0.0420	24.8	544.67	0.01	2.93E-04	8.78E-04	1.17E-03	4.00E-03	NO	NO
K	0	0	1.45	0.0420	24.8	544.67	0	0	0.00E+00	0.00E+00	4.00E-03	NO	NO
TOTAL	**8.79**	**1.38**					**0.05**						

Facility ID	Electricity Needed to Produce NaOH* (kWh/day)
A	0
B	0
C	0
D	994
E	0
F	0
G	6585
H	7631
I	1791
J	2939
K	0
TOTAL	19940

NaOH @ 50% solution density = 12.747 lb/gal
Mv for NaOH solution = 24.8 lb/lbmol
Vapor Pressure for NaOH = 2.18 mmHg at 29.4oC or 85oF = 0.042 psia
Loading Temperature = 85oF to 100oF (544.67oR to 559.67oR)
Breathing Loss = 3 * Filling Loss

Filling Loss:

$$E_{Loading}, {}^{lb}/_{day} = (12.46)\frac{(S)(P)(M)(Q)}{T}$$ where:

S = saturation factor (dimensionless; obtained from Table 5.2-1 in AP-42)
= 1.45 (Splash loading: dedicated normal service)
P = vapor pressure of the material loaded at temperature T (psia)
M = vapor molecular weight (lb/lb-mole)
Q = volume of material loaded (1,000 gal/day)
T = temperature of liquid loaded (°R).

*It takes approximately 2,500 kWh to produce one metric ton of NaOH.
Thus, approximately 12,361 kWh per day of additional electricity may be needed to produce additional NaOH to meet the needs of the proposed project, calculated as follows:

$$\frac{5.45 \text{ tons NaOH}}{\text{Day}} \times \frac{2{,}000 \text{ lbs}}{\text{ton}} \times \frac{1 \text{ metric ton}}{2{,}205 \text{ lbs}} \times \frac{2{,}500 \text{ kWh}}{1 \text{ metric ton of NaOH produced}} = 12{,}361 \text{ kWh/day}$$

ALTERNATIVE B: NaOH LOSSES

Facility ID	NaOH Demand (tons/day)	Q = Fill Rate = NaOH Demand (MMgal/day)	S = Saturation Factor	P = Vapor Pressure of material Loaded (psia)	M = NaOH vapor molecular weight (lb/lbmole)	T= temperature of liquid loaded (°R)	Daily PM10 Filling Loss (lb/day)	$E_{loading}$ = Hourly PM10 Filling Loss (lb/hr)	$E_{working}$ = Hourly PM10 Working Loss (lb/hr)	Total Hourly PM10 Loss (lb/hr)	Acute Screening Level - 25 meters (lb/hr)	Does Hourly Filling Loss Exceed Acute Screening Level? (Yes/No)	Significant ?
A	0	0.00	1.45	0.0420	24.8	544.67	0.00	0.00E+00	0.00E+00	0.00E+00	4.00E-03	NO	NO
B	0	0.00	1.45	0.0420	24.8	544.67	0.00	0.00E+00	0.00E+00	0.00E+00	4.00E-03	NO	NO
C	0	0	1.45	0.0420	24.8	544.67	0	0	0.00E+00	0.00E+00	4.00E-03	NO	NO
D	0	0	1.45	0.0420	24.8	544.67	0	0	0.00E+00	0.00E+00	4.00E-03	NO	NO
E	0	0.00	1.45	0.0420	24.8	544.67	0.00	0.00E+00	0.00E+00	0.00E+00	4.00E-03	NO	NO
F	0	0.00	1.45	0.0420	24.8	544.67	0.00	0.00E+00	0.00E+00	0.00E+00	4.00E-03	NO	NO
G	0	0	1.45	0.0420	24.8	544.67	0	0	0.00E+00	0.00E+00	4.00E-03	NO	NO
H	3.37	0.53	1.45	0.0420	24.8	544.67	0.02	7.60E-04	2.28E-03	3.04E-03	4.00E-03	NO	NO
I	0.79	0.12	1.45	0.0420	24.8	544.67	0.00	1.78E-04	5.35E-04	7.14E-04	4.00E-03	NO	NO
J	1.30	0.20	1.45	0.0420	24.8	544.67	0.01	2.93E-04	8.78E-04	1.17E-03	4.00E-03	NO	NO
K	0	0	1.45	0.0420	24.8	544.67	0	0	0.00E+00	0.00E+00	4.00E-03	NO	NO
TOTAL	**5.45**	**0.86**					**0.03**						

Facility ID	Electricity Needed to Produce NaOH* (kWh/day)
A	0
B	0
C	0
D	0
E	0
F	0
G	0
H	7631
I	1791
J	2939
K	0
TOTAL	12361

NaOH @ 50% solution density = 12.747 lb/gal
Mv for NaOH solution = 24.8 lb/lbmol
Vapor Pressure for NaOH = 2.18 mmHg at 29.4oC or 85oF = 0.042 psia
Loading Temperature = 85oF to 100oF (544.67oR to 559.67oR)
Breathing Loss = 3 * Filling Loss

Filling Loss:

$$E_{Loading}, {}^{lb}/_{day} = (12.46)\frac{(S)(P)(M)(Q)}{T}$$ where:

S = saturation factor (dimensionless; obtained from Table 5.2-1 in AP-42)
= 1.45 (Splash loading: dedicated normal service)
P = vapor pressure of the material loaded at temperature T (psia)
M = vapor molecular weight (lb/lb-mole)
Q = volume of material loaded (1,000 gal/day)
T = temperature of liquid loaded (°R).

*It takes approximately 2,500 kWh to produce one metric ton of NaOH.
Thus, approximately 12,361 kWh per day of additional electricity may be needed to produce additional caustic to meet the needs of the proposed project, calculated as follows:

$$\frac{5.45 \text{ tons NaOH}}{\text{Day}} \times \frac{2{,}000 \text{ lbs}}{\text{ton}} \times \frac{1 \text{ metric ton}}{2{,}205 \text{ lbs}} \times \frac{2{,}500 \text{ kWh}}{1 \text{ metric ton of NaOH produced}} = 12{,}361 \text{ kWh/day}$$

ALTERNATIVE C - OPTION 2: NaOH LOSSES

Facility ID	NaOH Demand (tons/day)	Q = Fill Rate = NaOH Demand (MMgal/day)	S = Saturation Factor	P = Vapor Pressure of material Loaded (psia)	M = NaOH vapor molecular weight (lb/lbmole)	T= temperature of liquid loaded (°R)	Daily PM10 Filling Loss (lb/day)	$E_{loading}$ = Hourly PM10 Filling Loss (lb/hr)	$E_{working}$ = Hourly PM10 Working Loss (lb/hr)	Total Hourly PM10 Loss (lb/hr)	Acute Screening Level - 25 meters (lb/hr)	Does Hourly Filling Loss Exceed Acute Screening Level? (Yes/No)	Significant ?
A	0.00	0.00	1.45	0.0420	24.8	544.67	0.00	0.00E+00	0.00E+00	0.00E+00	4.00E-03	NO	NO
B	0.00	0.00	1.45	0.0420	24.8	544.67	0.00	0.00E+00	0.00E+00	0.00E+00	4.00E-03	NO	NO
C	0.00	0.00	1.45	0.0420	24.8	544.67	0	0	0.00E+00	0.00E+00	4.00E-03	NO	NO
D	0.44	0.07	1.45	0.0420	24.8	544.67	0	0	2.97E-04	3.96E-04	4.00E-03	NO	NO
E	0.00	0.00	1.45	0.0420	24.8	544.67	0.00	0.00E+00	0.00E+00	0.00E+00	4.00E-03	NO	NO
F	0.00	0.00	1.45	0.0420	24.8	544.67	0.00	0.00E+00	0.00E+00	0.00E+00	4.00E-03	NO	NO
G	2.90	0.46	1.45	0.0420	24.8	544.67	0	0	1.97E-03	2.62E-03	4.00E-03	NO	NO
H	3.37	0.53	1.45	0.0420	24.8	544.67	0.02	7.60E-04	2.28E-03	3.04E-03	4.00E-03	NO	NO
I	0.79	0.12	1.45	0.0420	24.8	544.67	0.00	1.78E-04	5.35E-04	7.14E-04	4.00E-03	NO	NO
J	1.30	0.20	1.45	0.0420	24.8	544.67	0.01	2.93E-04	8.78E-04	1.17E-03	4.00E-03	NO	NO
K	0.00	0.00	1.45	0.0420	24.8	544.67	0	0	0.00E+00	0.00E+00	4.00E-03	NO	NO
TOTAL	**8.79**	**1.38**					**0.05**						

Facility ID	Electricity Needed to Produce NaOH* (kWh/day)
A	0
B	0
C	0
D	994
E	0
F	0
G	6585
H	7631
I	1791
J	2939
K	0
TOTAL	19940

NaOH @ 50% solution density = 12.747 lb/gal
Mv for NaOH solution = 24.8 lb/lbmol
Vapor Pressure for NaOH = 2.18 mmHg at 29.4oC or 85oF = 0.042 psia
Loading Temperature = 85oF to 100oF (544.67oR to 559.67oR)
Breathing Loss = 3 * Filling Loss

Filling Loss:

$$E_{Loading}, \, {}^{lb}/_{day} = (12.46)\frac{(S)(P)(M)(Q)}{T}$$ where:

S = saturation factor (dimensionless; obtained from Table 5.2-1 in AP-42)
= 1.45 (Splash loading: dedicated normal service)
P = vapor pressure of the material loaded at temperature T (psia)
M = vapor molecular weight (lb/lb-mole)
Q = volume of material loaded (1,000 gal/day)
T = temperature of liquid loaded (°R).

*It takes approximately 2,500 kWh to produce one metric ton of NaOH.
Thus, approximately 12,361 kWh per day of additional electricity may be needed to produce additional caustic to meet the needs of the proposed project, calculated as follows:

$$\frac{5.45 \text{ tons NaOH}}{\text{Day}} \times \frac{2{,}000 \text{ lbs}}{\text{ton}} \times \frac{1 \text{ metric ton}}{2{,}205 \text{ lbs}} \times \frac{2{,}500 \text{ kWh}}{1 \text{ metric ton of NaOH produced}} = 12{,}361 \text{ kWh/day}$$

ALTERNATIVE B: Facility C

Facility C - Sulfuric Acid Plant **Facility C**
Cansolv **(existing system going from 20 ppm to 10 ppm)**

Utility/Infrastructure	Annual Usage		Daily Usage		Usage/Ratings
Natural Gas	0	MMbtu	0.00	MMbtu	MMbtu
Electricity	0	kWh	0.00	kWh	kW
Water*	2.31	MMgal	6336.00	gal	0.006336 mmgal/day (1,100 lb/hr steam = 2.2 gal/min water plus 2.2 gal/min ext
Wastewater	0	MMgal	0.00	gal	0 mmgal/day
Cooling Water	0	MMbtu	0.00	MMbtu	
Compressed Air	0	1000 scf	0.00	scf	
Solid Waste Disposal	0	tons	0.00	tons	
Amine	0	gal	0.00	gal	
Plot Space Needed	0	sf			

*as steam

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	0	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.00	0.00	0.00	0.000	0.00	0.00	0	0.00	0	0
SUBTOTAL	0	0	0	0	0	0	0	0	0	0
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	0	4.89	0	0
			TOTAL	0	0

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.0000	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.0000	0
electricity - increased use	0.00	MWh/day	Electricity GHGs	0.00	0.0000	0.0000	0
water - increased use	0.01	MMgal/day	Water Conveyance GHGs	8.52	0.0000	0.0001	9
wastewater - increased generation	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
temporary construction activities	0	MT/year	Construction GHGs in CO2e				0
operational truck trips	0.00	MT/year	Operation GHGs in CO2e				0
						TOTAL CO2e	9

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.00	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.00	0
electricity - increased use	0.00	MWh/day	Electricity GHGs	0.00	0.0000	0.00	0
water - increased use[1]	0.01	MMgal/day	Water Conveyance GHGs	0.81	0.0000	0.0000	1
wastewater - increased generation	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
temporary construction activities[3]	0.00	MT/year	Construction GHGs in CO2e				0
operational truck trips	0.00	MT/year	Operation GHGs in CO2e				0
						TOTAL CO2e	1

Note: The mitigation calculations assume that 100% of the total water demand for FCCUs can potentially be supplied by recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water[2]
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation[2]
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

ALTERNATIVE C - OPTION 1: FACILITY A

Fuel Gas Treatment
Module 2: Fuel Gas Systems
M20B: Sulfinol conversion for two H2S absorbers

Utility/Infrastructure	Facility A Annual Usage		Facility A Daily Usage	
Natural Gas	-2,080	MMbtu	-5.70	MMbtu
Electricity	1,385,870	kWh	3796.90	kWh
Water	3	MMgal	8219.18	gal
Wastewater	2	MMgal	5479.45	gal
Cooling Water	400	MMbtu	1.10	MMbtu
Compressed Air	100	1000 scf	273.97	scf
Solid Waste Disposal	0	tons	0.00	tons
Plot Space Needed	100	sf		
1 Truck Delivering Sulfinol[1]		round trip 11000		round trip 500 miles
No. of Trucks Delivering Sulfinol		22 trucks		1 truck
Sulfinol		130670 gallons		358 gallons
1 Existing Truck Delivering DEA		round trip -1100 miles		round trip -50 miles
No. of Existing Trucks Delivering DEA		-22 trucks		-1 truck
DEA usage		-127000 gallons		-348 gallons

Module 3A: FCCU
M1: Belco wet gas scrubber

Utility/Infrastructure	Facility A Annual Usage		Facility A Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	9,238,000	kWh	25309.59	kWh
Water	26	MMgal	71232.88	gal
Wastewater	12	MMgal	32876.71	gal
Cooling Water	320	MMbtu	0.88	MMbtu
Compressed Air	410	1000 scf	1123.29	scf
Solid Waste Disposal	280	tons	0.77	tons
NaOH (50%)	294	tons	0.81	tons
Plot Space Needed	2000	sf		
1 Truck Hauling Away Solid Waste[2]	4800	round trip miles	400.00	round trip miles
1 Truck Delivering NaOH[3]	400	round trip miles	50.00	round trip miles
No. of Trucks Hauling Away Solid Waste	12	trucks	1	truck
No. of Trucks Delivering NaOH	8	trucks	1	truck

[1]Assumes that the existing DEA amine storage tank can be used for Sulfinol storage.

[2]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 12 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.
280 tons/yr solid waste x 1 truck/25 tons = 11.2 trucks/year to haul extra solid waste away for recycling

[3]Assumes that one 10,000 gallon capacity storage tank will be installed for NaOH storage. It will take 8 trucks to deliver one year's worth of NaOH 50% solution, but the peak would be one truck per day.

294 tons/yr NaOH x 2,000 lbs/ ton = 328,000 lbs/yr x 1 gal NaOH @ 50%/12.77 lbs = 46,045 gal/year x 1 truck/6,000 gallons = 7.67 trucks/year

Facility A estimated that a wet gas scrubber would generate 40 million gals per year wastewater = 109,589 gals per day.
Facility A has two distinct wastewater systems. System One is the un-segregated system, which handles water from cooling towers, boiler blowdowns, and stormwater.
This wastewater receives primary treatment, the maximum capacity for this system is 5000 gpm; the facility is currently running at about 3000 gpm.
System Two is the segregated system, which handles process water. This wastewater receives primary and secondary (biological) treatment.
The maximum capacity for this system is 2000 gpm; the facility is currently running at about 1800 gpm.
Facility A has some wastewater storage capacity to handle surges due to storms and upsets.

Grand Totals

Daily Usage			Daily Usage	
-5.70	MMbtu	Natural Gas	-5586.89	scf
30933	kWh	Electricity	30.93	MWh
79452.05	gal	Water	0.08	Mmgal
38356.16	gal	Wastewater	0.04	Mmgal
1.97	MMbtu	Cooling Water		
1397.26	scf	Compressed Air		
0.77	tons	Solid Waste Disposal		
0.81	tons	NaOH (50%)		
358.00	gallons	sulfinol		
-348	gallons	DEA		
2100	sf	Plot Space Needed		
	Daily round trip	1 Truck Delivering		
500.00	miles	Sulfinol		
	Daily round trip	1 Truck Hauling Away		
400.00	miles	Solid Waste		
	Daily round trip	1 Truck Delivering		
50.00	miles	NaOH		
	Daily round trip			
-50	miles	1 Truck Delivering DEA		
		No. of Trucks Delivering		
1	*daily trucks*	Sulfinol		
		No. of Trucks Hauling		
1.00	daily trucks	Away Solid Waste		
1.00	daily trucks	No. of Trucks Delivering NaOH		
-1	daily trucks	No. of Trucks Delivering DEA		
	Daily round trip			
900.00	miles	Total Daily Truck Miles		
2.00	Daily trucks	Total No. of Trucks		
	Annual round trip			
15,100	miles	Annual Truck Miles		
20	Annual trucks	Annual Trucks		

Note: This calculation takes into account the electricity needed to make 0.81 tons per day of NaOH to satisfy demand (1,826 kWh/day).

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	15,100	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.15	0.59	1.80	0.002	0.09	0.08	63,660	1.76	63,697	29
SUBTOTAL	0	1	2	0	0	0	63,660	2	63,697	29
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	15,100	4.89	73,839	284
			TOTAL	73,839	284

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - increased use	-0.0056	MMscf/day	Natural Gas GHGs	-110.98	-0.0006	-0.0021	-111
electricity - increased use	30.93	MWh/day	Electricity GHGs	5632.47	0.0000	0.0000	5,632
water - increased use[2]	0.08	MMgal/day	Water Conveyance GHGs	10.10	0.0001	0.0001	10
wastewater - increased generation[2]	0.04	MMgal/day	Wastewater Processing GHGs	4.88	0.0000	0.0001	5
temporary construction activities[3]	1164	MT/year	Construction GHGs in CO2e				39
operational truck trips	28.89	MT/year	Operation GHGs in CO2e				29
						TOTAL CO2e	5,604

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	-0.0056	MMscf/day	Natural Gas GHGs	-110.98	-0.0006	0.00	-111
electricity - increased use	30.9330	MWh/day	Electricity GHGs	5632.47	0.0000	0.00	5,632
water - increased use[2]	0.0795	MMgal/day	Water Conveyance GHGs	10.10	0.0001	0.0001	10
wastewater - increased generation[2]	0.0384	MMgal/day	Wastewater Processing GHGs	4.88	0.0000	0.0001	5
temporary construction activities[3]	1164.3504	MT/year	Construction GHGs in CO2e				39
operational truck trips	28.8876	MT/year	Operation GHGs in CO2e				29
						TOTAL CO2e	5,604

Note: The mitigation calculations assume that 100% of the total water demand for this facility can potentially be supplied by recycled water.

Facility A already accesses recycled water and will have increased future access to recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water[1]
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation[2]
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3]GHGs from temporary construction activities are amortized over 30 years.

ALTERNATIVE C - OPTION 1: FACILITY B

Module 3A: FCCU

M1: Belco wet gas scrubber			**Facility B**	
Utility/Infrastructure	Annual Usage		Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	12,080,000	kWh	33095.89	kWh
Water	28	MMgal	76712.33	gal
Wastewater	13	MMgal	35616.44	gal
Cooling Water	410	MMbtu	1.12	MMbtu
Compressed Air	440	1000 scf	1205.48	scf
Solid Waste Disposal	400	tons	1.10	tons
NaOH (50%)	427	tons	1.17	tons
Plot Space needed	2000	sf		
1 Truck Hauling Away Solid Waste[1]	6400	round trip miles	400.00	round trip miles
1 Truck Delivering NaOH[2]	600	round trip miles	50.00	round trip miles
No. of Trucks Hauling Away Solid Waste	16	trucks	1	truck
No. of Trucks Delivering NaOH	12	trucks	1	truck

[1]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 16 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.
400 tons/yr solid waste x 1 truck/25 tons = 16 trucks/year to haul extra solid waste away for recycling
This facility either sends its solid waste to a Class III landfill for disposal which is 80.64 miles (one-way) away or to a cement plant for recycling which is.67.48 miles (one-way) away.
However, the cement plant has shut-down its kilns on 11/20/2009 so the solid waste may be sent a different cement kiln further away or out of state (a maximum of 200 miles, one-way to the California/Arizona border).

[2]Assumes that one 10,000 gallon capacity storage tank will be installed for NaOH storage. It will take 12 trucks to deliver one year's worth of NaOH 50% solution, but the peak would be one truck per day.
427 tons/yr NaOH x 2,000 lbs/ ton = 854,000 lbs/yr x 1 gal NaOH @ 50%/12.77 lbs = 66,875 gal/year x 1 truck/6,000 gallons = 11.1 trucks/year

GRAND TOTALS (during Operation)

Daily Usage		Daily Usage		
0.00	MMbtu	0.00 scf	Natural Gas	
35748.64	Kwh	35.75 MWh	Electricity	Note: This calculation takes into account the electricity needed to make 1.17 tons per day of NaOH to satisfy demand (2,653 kWh/day).
76712.33	gal		Water	
35616.44	gal		Wastewater	
1.12	MMbtu		Cooling Water	
1205.48	scf		Compressed Air	
1.10	tons		Solid Waste Disposal	
1.17	tons		NaOH (50% by weight)	
2000.00	sf		Plot Space needed	
Daily round				
400.00	trip miles		1 Truck Hauling Away Solid Waste	
Daily round				
50.00	trip miles		1 Truck Delivering NaOH	
1.00	daily trucks		No. of Trucks Hauling Away Solid Waste	
1	daily trucks		No. of Trucks Delivering NaOH	
Daily round				
450.00	trip miles		Total Daily Truck Miles	
2.00	Daily trucks		Total No. of Trucks	
Annual round				
7,000	trip miles		Annual Truck Miles	
28	Annual trucks		Annual Trucks	

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	7,000	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.07	0.28	0.83	0.001	0.04	0.03	29,511	0.82	29,528	13
SUBTOTAL	0	0	1	0	0	0	29,511	1	29,528	13
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	7,000	4.89	34,230	132
*Assumes 260 days/year			TOTAL	34,230	132

Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - increased use	0.0000	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.0000	0
electricity - increased use	35.75	MWh/day	Electricity GHGs	6509.33	0.0000	0.0000	6,509
water - increased use[2]	0.08	MMgal/day	Water Conveyance GHGs	9.75	0.0001	0.0001	10
wastewater - increased generation[2]	0.04	MMgal/day	Wastewater Processing GHGs	4.53	0.0000	0.0000	5
temporary construction activities[3]	2329	MT/year	Construction GHGs in CO2e				78
operational truck trips	13.39	MT/year	Operation GHGs in CO2e				13
						TOTAL CO2e:	6,615

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.00	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.00	0
electricity - increased use	35.75	MWh/day	Electricity GHGs	6509.33	0.0000	0.00	6,509
water - increased use[2]	0.08	MMgal/day	Water Conveyance GHGs	9.75	0.0001	0.0001	10
wastewater - increased generation[2]	0.04	MMgal/day	Wastewater Processing GHGs	4.53	0.0000	0.0000	5
temporary construction activities[3]	2328.70	MT/year	Construction GHGs in CO2e				78
operational truck trips	13.39	MT/year	Operation GHGs in CO2e				13
						TOTAL CO2e:	6,615

Note: The mitigation calculations assume that 100% of the total water demand for this facility can potentially be supplied by recycled water.
Facility B already accesses recycled water and will have increased future access to recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water[1]
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation[2]
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

ALTERNATIVE C - OPTION 1: FACILITY D

Fuel Gas Treatment
Module 2: Fuel Gas Systems
M21A: Parallel Merox treatment for excess coker gas

Facility D

Utility/Infrastructure	Annual Usage		Daily Usage		**GRAND TOTALS (during Operation)** Daily Usage		Daily Usage		
Natural Gas	440	MMbtu	1.21	MMbtu	1.21	MMbtu	1181.84	scf	Natural Gas
Electricity	156,400	kWh	428.49	kWh	1422.50	Kwh	1.42	MWh	Electricity
Water	5	MMgal	13698.63	gal	13698.63	gal	0.01369863	Mmgal	Water
Wastewater	5	MMgal	13698.63	gal	13698.63	gal	0.01369863	Mmgal	Wastewater
Cooling Water	176	MMbtu	0.48	MMbtu	0.48	MMbtu			Cooling Water
Compressed Air	780	1000 scf	2136.99	scf	2136.99	scf			Compressed Air
Solid Waste Disposal	110	tons	0.30	tons	0.30	tons			Solid Waste Disposal
Merox Catalyst	3,000	pounds	8.22	pounds	8.22	pounds			Merox Catalyst
NaOH	160	tons	0.44	tons	0.44	tons			NaOH
Sulfur sales*	11	long tons	67.51	pounds	67.51	pounds			Sulfur sales*
Plot Space Needed	6000	sf			6000.00	sf			Plot Space needed
1 Truck Hauling Away Solid Waste[1]	2000	round trip miles	400.00	round trip miles	400.00	Daily round trip miles			1 Truck Hauling Away Solid Waste[1]
1 Truck Delivering Merox Catalyst[2]	500	round trip miles	500.00	round trip miles	500.00	Daily round trip miles			1 Truck Delivering Merox Catalyst[2]
1 Truck Delivering NaOH[3]	250	round trip miles	50.00	round trip miles	50.00	Daily round trip miles			1 Truck Delivering NaOH[3]
1 Truck Hauling Sulfur Away[4]	50	round trip miles	50.00	round trip miles	50.00	Daily round trip miles			1 Truck Hauling Sulfur Away[4]
No. of Trucks Hauling Away Solid Waste	5	trucks	1	truck	1	daily trucks			No. of Trucks Hauling Away Solid Waste
No. of Trucks Delivering Merox	1	trucks	1	truck	1	daily trucks			No. of Trucks Delivering Merox
No. of Trucks Delivering NaOH	5	trucks	1	truck	1	daily trucks			No. of Trucks Delivering NaOH
No. of Trucks Hauling Sulfur Away	1	trucks	1	truck	1	daily trucks			No. of Trucks Hauling Sulfur Away
					1000.00	Daily round trip miles			Total Daily Truck Miles
					4.00	Daily trucks			Total No. of Trucks
					2800.00	Annual round trip			Annual Truck Miles
					12	Annual trucks			Annual Trucks

Note: This calculation takes into account the electricity needed to make 0.44 tons per day of NaOH to satisfy demand (994 kWh/day).

[1]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 5 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.
110 tons/yr solid waste x 1 truck/25 tons = 4.46 trucks/year to haul extra solid waste away for recycling

[2]It will take one truck to deliver one year's worth of Merox catalyst; the peak would be one truck per day.

Merox is delivered by truck from Chicago. The distance from the California/Nevada border to this facility is approximately 250 miles, one-way.

[3]Assumes that one 10,000 gallon capacity storage tank will be installed for NaOH storage. It will take 5 trucks to deliver one year's worth of NaOH 50% solution, but the peak would be one truck per day.
160 tons/yr NaOH x 2,000 lbs/ ton = 320,000 lbs/yr x 1 gal NaOH @ 50%/12.77 lbs = 25,059 gal/year x 1 truck/6,000 gallons = 4.2 trucks/year

[4]Assumes Hauling Sulfur away in a 25 ton capacity truck. It will take 1 extra truck to haul away one year's worth of sulfur; the peak would be one truck per day.
11 long tons/yr Sulfur x 2,240 lbs/long ton = 24,640 lbs/yr x 1 ton/2000 lbs = 12.32 tons/yr x 1 truck/25 tons = 0.49 trucks/year to haul extra sulfur away to a buyer

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	2,800	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.03	0.11	0.33	0.000	0.02	0.01	11,805	0.33	11,811	5
SUBTOTAL	0	0	0	0	0	0	11,805	0	11,811	5
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	2,800	4.89	13,692	53
			TOTAL	13,692	53

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - increased use	0.0012	MMscf/day	Natural Gas GHGs	23.48	0.0001	0.0004	24
electricity - increased use	1.42	MWh/day	Electricity GHGs	259.02	0.0000	0.0000	259
water - increased use[1]	0.01	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	2
wastewater - increased generation[1]	0.01	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
temporary construction activities[3]	1164	MT/year	Construction GHGs in CO2e				39
operational truck trips	5.36	MT/year	Operation GHGs in CO2e				5
						TOTAL-CO2e	330

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.00	MMscf/day	Natural Gas GHGs	23.48	0.0001	0.00	24
electricity - increased use	1.42	MWh/day	Electricity GHGs	259.02	0.0000	0.00	259
water - increased use[2]	0.01	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	2
wastewater - increased generation[2]	0.01	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
temporary construction activities[3]	1164.35	MT/year	Construction GHGs in CO2e				39
operational truck trips	5.36	MT/year	Operation GHGs in CO2e				5
						TOTAL CO2e	330

Facility D already accesses recycled water and will have increased future access to recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

ALTERNATIVE C - OPTION 2: FACILITY A

Fuel Gas Treatment
Module 2: Fuel Gas Systems
M20B: Sulfinol conversion for #5 and #6 H2S

Utility/Infrastructure	Facility A Annual Usage		Facility A Daily Usage	
Natural Gas	-2,080	MMbtu	-5.70	MMbtu
Electricity	1,385,870	kWh	3796.90	kWh
Water	3	MMgal	8219.18	gal
Wastewater	2	MMgal	5479.45	gal
Cooling Water	400	MMbtu	1.10	MMbtu
Compressed Air	100	1000 scf	273.97	scf
Solid Waste Disposal	0	tons	0.00	tons
Plot Space Needed	100	sf		
		round trip		round trip
1 Truck Delivering Sulfinol	11000	miles	500	miles
No. of Trucks Delivering Sulfinol	22	trucks	1	truck
Sulfinol	130670	gallons	358	gallons
		round trip		round trip
1 Existing Truck Delivering DEA	-1100	miles	-50	miles
No. of Existing Trucks Delivering DEA	-22	trucks	-1	truck
DEA usage	-127000	gallons	-348	gallons

SOx Reducing Additive for FCCU

Utility/Infrastructure	Facility A Annual Usage		Facility A Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	0	kWh	0.00	kWh
Water	0	MMgal	0.00	gal
Wastewater	0	MMgal	0.00	gal
Cooling Water	0	MMbtu	0.00	MMbtu
Compressed Air	0	1000 scf	0.00	scf
Solid Waste Disposal	0	tons	0.00	pounds
SOx Reducing catalyst	91.25	tons	500.00	pounds
Plot Space Needed	0	sf		
		round trip		round trip
1 Truck Hauling Away Solid Waste[2]	0	miles	0.00	miles
		round trip		round trip
1 Truck Delivering SOx Reducing Catalyst[3]	1,600	miles	400.00	miles
No. of Trucks Hauling Away Solid Waste	0	trucks	0	truck
No. of Trucks Delivering SOx Reducing Catalyst	4	trucks	1	truck

Grand Totals

Daily Usage		Daily Usage
-5.70 MMbtu	Natural Gas	-5586.89 scf
3796.90 kWh	Electricity	3.796904 MWh
8219.18 gal	Water	0.008219 Mmgal
5479.45 gal	Wastewater	0.005479 Mmgal
1.10 MMbtu	Cooling Water	
273.97 scf	Compressed Air	
0.00 pounds	Solid Waste Disposal	
500.00 pounds	SOx Reducing catalyst	
358.00 gallons	sulfinol	
-348 gallons	DEA	
100 sf	Plot Space Needed	
500.00 Daily round trip miles	1 Truck Delivering Sulfinol	
0.00 Daily round trip miles	1 Truck Hauling Away Solid Waste	
400.00 Daily round trip miles	1 Truck Delivering SOx Reducing Catalyst	
-50 Daily round trip miles	1 Truck Delivering DEA	
1 daily trucks	No. of Trucks Delivering Sulfinol	
0.00 daily trucks	No. of Trucks Hauling Away Solid Waste	
1.00 daily trucks	No. of Trucks Delivering SOx Reducing catalyst	
-1 daily trucks	No. of Trucks Delivering DEA	
850.00 Daily round trip miles	Total Daily Truck Miles	
1.00 Daily trucks	Total No. of Daily Trucks	
11,500 Annual round trip miles	Annual Truck Miles	
4 Annual trucks	Total No. of Annual Trucks	

[1]Assumes that the existing DEA amine storage tank can be used for Sulfinol storage.

[2]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take no extra trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.

[3]Assumes that one 25-ton truck will deliver catalyst. It will take 4 trucks to deliver one year's worth of catalyst, but the peak would be one truck per day. One bulk catalyst truck can transport 25 tons.

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	11,500	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.11	0.45	1.37	0.002	0.07	0.06	48,483	1.34	48,511	22
SUBTOTAL	0	0	1	0	0	0	48,483	1	48,511	22
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage from Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	11,500	4.89	56,235	216
*Assumes 260 days/year			TOTAL:	56,235	216

Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - increased use	-0.0056	MMscf/day	Natural Gas GHGs	-110.98	-0.0006	-0.0021	-111
electricity - increased use	3.80	MWh/day	Electricity GHGs	691.36	0.0000	0.0000	691
water - increased use[1]	0.01	MMgal/day	Water Conveyance GHGs	1.04	0.0000	0.0000	1
wastewater - increased generation[1]	0.01	MMgal/day	Wastewater Processing GHGs	0.70	0.0000	0.0000	1
temporary construction activities[3]	582	MT/year	Construction GHGs in CO2e				20
operational truck trips	22.00	MT/year	Operation GHGs in CO2e				22
						TOTAL CO2e	624

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	-0.0056	MMscf/day	Natural Gas GHGs	-110.98	-0.0006	0.00	-111
electricity - increased use	3.7969	MWh/day	Electricity GHGs	691.36	0.0000	0.00	691
water - increased use[2]	0.0082	MMgal/day	Water Conveyance GHGs	1.04	0.0000	0.0000	1
wastewater - increased generation[2]	0.0055	MMgal/day	Wastewater Processing GHGs	0.70	0.0000	0.0000	1
temporary construction activities[3]	582.1752	MT/year	Construction GHGs in CO2e				19
operational truck trips	22.0005	MT/year	Operation GHGs in CO2e				22
						TOTAL CO2e	623

Note: The mitigation calculations assume that 100% of the total water demand for this facility can potentially be supplied by recycled water.

Facility A already accesses recycled water and will have increased future access to recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

ALTERNATIVE C - OPTION 2: FACILITY B

SOx Reducing Additive

Utility/Infrastructure	Facility B Annual Usage		Facility B Daily Usage	GRAND TOTALS (during Operation) Daily Usage	Daily Usage	
Natural Gas	0	MMbtu	0.00 MMbtu	0.00 MMbtu	0.00 scf	Natural Gas
Electricity	0	kWh	0.00 kWh	0.00 Kwh	0.00 MWh	Electricity
Water	0	MMgal	0.00 gal	0.00 gal		Water
Wastewater	0	MMgal	0.00 gal	0.00 gal		Wastewater
Cooling Water	0	MMbtu	0.00 MMbtu	0.00 MMbtu		Cooling Water
Compressed Air	0	1000 scf	0.00 scf	0.00 scf		Compressed Air
Solid Waste Disposal	0	tons	0.00 tons	0.00 tons		Solid Waste Disposal
SOx Reducing catalyst	91.25	tons	0.25 tons	0.25 tons		SOx Reducing catalyst
Plot Space Needed	0	sf		0.00 sf		Plot Space needed
1 Truck Hauling Away Solid Waste[1]	0	round trip miles	round trip 0.00 miles	Daily round trip 0.00 miles		1 Truck Hauling Away Solid Waste[1]
1 Truck Delivering SOx Reducing Catalyst[2]	1,600	round trip miles	round trip 400.00 miles	Daily round trip 400.00 miles		1 Truck Delivering SOx Reducing Catalyst[2]
No. of Trucks Hauling Away Solid Waste	0	trucks	0 truck	0.00 daily trucks		No. of Trucks Hauling Away Solid Waste
No. of Trucks Delivering SOx Reducing Catalyst	4	trucks	1 truck	1 daily trucks		No. of Trucks Delivering SOx Reducing Catalyst
				0 daily trucks		No. of Trucks Delivering Soda Ash
				Daily round trip 400.00 miles		Total Daily Truck Miles
				Daily 1.00 trucks		Total No. of Trucks
				round trip 1,600 miles		Annual Truck Miles
				Annual 4 trucks		Annual Trucks

[1]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take no extra trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.

[2]Assumes that one 25-ton truck will deliver catalyst. It will take 4 trucks to deliver one year's worth of catalyst, but the peak would be one truck per day.

One bulk catalyst truck can transport 25 tons.

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation On-Road Equipment Type	Fuel	Annual Round-trip Distance (miles/year)	Mileage Rate (miles/ gallon)	2012 Mobile Source Emission Factors VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	1,600	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.02	0.06	0.19	0.000	0.01	0.01	6,745	0.19	6,749	3
SUBTOTAL	0	0	0	0	0	0	6,745	0	6,749	3
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	1,600	4.89	7,824	30
			TOTAL	7,824	30

*Assumes 260 days/year

Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - increased use	0.0000	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.0000	0
electricity - increased use	0.00	MWh/day	Electricity GHGs	0.00	0.0000	0.0000	0
water - increased use[2]	0.00	MMgal/day	Water Conveyance GHGs	0.00	0.0000	0.0000	0
wastewater - increased generation[1]	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
temporary construction activities[3]	0	MT/year	Construction GHGs in CO2e				0
operational truck trips	3.06	MT/year	Operation GHGs in CO2e				3
						TOTAL CO2e	3

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.00	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.00	0
electricity - increased use	0.00	MWh/day	Electricity GHGs	0.00	0.0000	0.00	0
water - increased use[2]	0.00	MMgal/day	Water Conveyance GHGs	0.00	0.0000	0.0000	0
wastewater - increased generation[1]	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
temporary construction activities[3]	0.00	MT/year	Construction GHGs in CO2e				0
operational truck trips	3.06	MT/year	Operation GHGs in CO2e				3
						TOTAL CO2e	3

Note: The mitigation calculations assume that 0% of the total water demand for this facility can potentially be supplied by recycled water.

Facility B already accesses recycled water and will have increased future access to recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

ALTERNATIVE C - OPTION 2: FACILITY D

Fuel Gas Treatment
Module 2: Fuel Gas Systems
M21A: Parallel Merox treatment for excess coker gas

Utility/Infrastructure	Facility D Annual Usage		Facility D Daily Usage	
Natural Gas	440	MMbtu	1.21	MMbtu
Electricity	156,400	kWh	428.49	kWh
Water	5	MMgal	13698.63	gal
Wastewater	5	MMgal	13698.63	gal
Cooling Water	176	MMbtu	0.48	MMbtu
Compressed Air	780	1000 scf	2136.99	scf
Solid Waste Disposal	110	tons	0.30	tons
Merox Catalyst	3,000	pounds	0.0041	tons
NaOH (50% by weight)	160	tons	0.44	tons
Sulfur sales*	11	long tons	67.51	pounds
Plot Space Needed	6000	sf		
1 Truck Hauling Away Solid Waste[1]	2000	round trip miles	400.00	round trip miles
1 Truck Delivering Merox Catalyst[2]	500	round trip miles	500.00	round trip miles
1 Truck Delivering NaOH[3]	250	round trip miles	50.00	round trip miles
1 Truck Hauling Sulfur Away[4]	50	round trip miles	50.00	round trip miles
No. of Trucks Hauling Away Solid Waste	5	trucks	1	truck
No. of Trucks Delivering Merox	1	trucks	1	truck
No. of Trucks Delivering NaOH	5	trucks	1	truck
No. of Trucks Hauling Sulfur Away	1	trucks	1	truck

SOx Reducing Additive

Utility/Infrastructure	Facility D Annual Usage		Facility D Daily Usage	
Natural Gas	0	MMbtu	0.00	MMbtu
Electricity	0	kWh	0.00	kWh
Water	0	MMgal	0.00	gal
Wastewater	0	MMgal	0.00	gal
Cooling Water	0	MMbtu	0.00	MMbtu
Compressed Air	0	1000 scf	0.00	scf
Solid Waste Disposal	0	tons	0.00	tons
SOx Reducing catalyst	91.25	tons	0.25	tons
Plot Space Needed	0	sf		
1 Truck Hauling Away Solid Waste[5]	0	round trip miles	0.00	round trip miles
1 Truck Delivering SOx Reducing Catalyst[6]	1,600	round trip miles	400.00	round trip miles
No. of Trucks Hauling Away Solid Waste	0	trucks	0	truck
No. of Trucks Delivering SOx Reducing Catalyst	4	trucks	1	truck

[1]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take an extra 5 trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.

110 tons/yr solid waste x 1 truck/25 tons = 4.46 trucks/year to haul extra solid waste away for recycling

[2]It will take one truck to deliver one year's worth of Merox catalyst; the peak would be one truck per day.

Merox is delivered by truck from Chicago. The distance from the California/Nevada border to this facility is approximately 250 miles, one-way.

[3]Assumes that one 10,000 gallon capacity storage tank will be installed for NaOH storage. It will take 5 trucks to deliver one year's worth of NaOH 50% solution, but the peak would be one truck per day.
160 tons/yr NaOH x 2,000 lbs/ ton = 320,000 lbs/yr x 1 gal NaOH @ 50%/12.77 lbs = 25,059 gal/year x 1 truck/6,000 gallons = 4.2 trucks/year

[4]Assumes Hauling Sulfur away in a 25 ton capacity truck. It will take 1 extra truck to haul away one year's worth of sulfur; the peak would be one truck per day.
11 long tons/yr Sulfur x 2,240 lbs/long ton = 24,640 lbs/yr x 1 ton/2000 lbs = 12.32 tons/yr x 1 truck/25 tons = 0.49 trucks/year to haul extra sulfur away to a buyer

[5]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take no extra trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.

[6]Assumes that one 25-ton truck will deliver catalyst. It will take 4 trucks to deliver one year's worth of catalyst, but the peak would be one truck per day.
One bulk catalyst truck can transport 25 tons.

GRAND TOTALS (during Operation)

Daily Usage	Daily Usage		
1.21 MMbtu	1181.84 scf	Natural Gas	
			Note: This calculation takes into account the electricity needed to make 0.44 tons per day of NaOH to satisfy demand (994 kWh/day).
1422.50 Kwh	1.42 MWh	Electricity	
13698.63 gal	0.01369863 Mmgal	Water	
13698.63 gal	0.01369863 Mmgal	Wastewater	
0.48 MMbtu		Cooling Water	
2136.99 scf		Compressed Air	
0.30 tons		Solid Waste Disposal	
0.0041 tons		Merox Catalyst	
0.44 tons		SOx Reducing Catalyst	
0.44 tons		NaOH	
67.51 pounds		Sulfur sales*	
6000.00 sf		Plot Space needed	
Daily round trip			
400.00 miles		1 Truck Hauling Away Solid Waste[1]	
Daily round trip			
500.00 miles		1 Truck Delivering Merox Catalyst[2]	
Daily round trip			
50.00 miles		1 Truck Delivering NaOH[3]	
Daily round trip			
50.00 miles		1 Truck Hauling Sulfur Away[4]	
Daily round trip			
0.00 miles		1 Truck Hauling Away Solid Waste[5]	
Daily round trip			
400.00 miles		1 Truck Delivering SOx Reducing Catalyst[6]	
1 daily trucks		No. of Trucks Hauling Away Solid Waste	
1 daily trucks		No. of Trucks Delivering M	
1.00 daily trucks		No. of Trucks Delivering N	
1.00 daily trucks		No. of Trucks Hauling Sulfi	
1 daily trucks		No. of Trucks Hauling Delivering SOx Reducing Catalyst	
Daily round trip			
1400.00 miles	Total Daily Truck Miles		
5.00 Daily trucks	Total No. of Trucks		
Annual round trip			
4400.00 miles	Annual Truck Miles		
16 Annual trucks	Annual Trucks		

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	4,400	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase in Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.04	0.17	0.52	0.001	0.03	0.02	18,550	0.51	18,561	8
SUBTOTAL	0	10	1	0	0	0	18,550	1	18,561	8
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase in Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	4,400	4.89	21,516	83
			TOTAL:	21,516	83

*Assumes 260 days/year
Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - increased use	0.0012	MMscf/day	Natural Gas GHGs	23.48	0.0001	0.0004	24
electricity - increased use	1.42	MWh/day	Electricity GHGs	259.02	0.0000	0.0000	259
water - increased use[2]	0.01	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	2
wastewater - increased generation[2]	0.01	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
temporary construction activities[3]	582	MT/year	Construction GHGs in CO2e				20
operational truck trips	8.42	MT/year	Operation GHGs in CO2e				8
						TOTAL CO2e	314

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.00	MMscf/day	Natural Gas GHGs	23.48	0.0001	0.00	24
electricity - increased use	1.42	MWh/day	Electricity GHGs	259.02	0.0000	0.00	259
water - increased use[2]	0.01	MMgal/day	Water Conveyance GHGs	1.74	0.0000	0.0000	2
wastewater - increased generation[2]	0.01	MMgal/day	Wastewater Processing GHGs	1.74	0.0000	0.0000	2
temporary construction activities[3]	582.18	MT/year	Construction GHGs in CO2e				19
operational truck trips	8.42	MT/year	Operation GHGs in CO2e				8
						TOTAL CO2e	314

Facility D already accesses recycled water and will have increased future access to recycled water.

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, *Final Staff Report*, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

ALTERNATIVE C - OPTION 2: FCCUs only for FACILITIES A, B, D, E, & F*

* The assumptions for SOx reducing additive are the same for Facility A, B, D, E & F.

SOx Reducing Additive

Utility/Infrastructure	Facility A Annual Usage		Daily Usage
Natural Gas	0	MMbtu	0.00 MMbtu
Electricity	0	kWh	0.00 kWh
Water	0	MMgal	0.00 gal
Wastewater	0	MMgal	0.00 gal
Cooling Water	0	MMbtu	0.00 MMbtu
Compressed Air	0	1000 scf	0.00 scf
Solid Waste Disposal	0	tons	0.00 pounds
SOx Reducing catalyst	91.25	tons	500.00 pounds
Plot Space Needed	0	sf	
1 Truck Hauling Away Solid Waste[2]	0	round trip miles	round trip 0.00 miles
1 Truck Delivering SOx Reducing Catalyst[3]	1,600	round trip miles	round trip 400.00 miles
No. of Trucks Hauling Away Solid Waste	0	trucks	0 truck
No. of Trucks Delivering SOx Reducing Catalyst	4	trucks	1 truck

Grand Totals

Daily Usage			Daily Usage
0.00	MMbtu	Natural Gas	0 scf
0.00	kWh	Electricity	0 MWh
0.00	gal	Water	0 Mmgal
0.00	gal	Wastewater	0 Mmgal
0.00	MMbtu	Cooling Water	
0.00	scf	Compressed Air	
0.00	pounds	Solid Waste Disposal	
2500.00	pounds	SOx Reducing catalyst	
0	sf	Plot Space Needed	
0.00	Daily round trip miles	1 Truck Hauling Away Solid Waste	
2000.00	Daily round trip miles	1 Truck Delivering SOx Reducing Catalyst	
0.00	daily trucks	No. of Trucks Hauling Away Solid Waste	
5.00	daily trucks	No. of Trucks Delivering SOx Reducing catalyst	
2000.00	Daily round trip miles	Total Daily Truck Miles	
5.00	Daily trucks	Total No. of Trucks	
8,000	Annual round trip miles	Annual Truck Miles	
20	Annual trucks	Total No. of Annual Trucks	

[1]Assumes that one 10,000 gallon capacity storage tank will be installed for Sulfinol storage. It will take 2 trucks to deliver one year's worth of Sulfinol, but the peak would be one truck per day.

[2]Assumes Hauling Solid Waste away in a 25 ton capacity truck. It will take no extra trucks to haul away one year's worth of solid waste, but the peak would be one truck per day.

[3]Assumes that one 25-ton truck will deliver catalyst. It will take 4 trucks to deliver one year's worth of catalyst, but the peak would be one truck per day.
One bulk catalyst truck can transport 25 tons.

Phase III: Operations - On-Road Vehicles and Fuel Use

Phase III: Operation		Annual Round-trip Distance	Mileage Rate	2012 Mobile Source Emission Factors							
On-Road Equipment Type	Fuel	(miles/year)	(miles/ gallon)	VOC (lb/mile)	CO (lb/mile)	NOx (lb/mile)	SOx (lb/mile)	PM10 (lb/mile)	PM2.5 (lb/mile)	CO2 (lb/mile)	CH4 (lb/mile)
Offsite (Heavy-Heavy Duty Truck)	diesel	8,000	4.89	0.0025	0.0102	0.0309	0.00004	0.0015	0.0013	4.2159	0.0001

*Assumes 260 days/year

Incremental Increase In Offsite Combustion Emissions from Operation Vehicles	VOC (lb/day)	CO (lb/day)	NOx (lb/day)	SOx (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2 (lb/year)	CH4 (lb/year)	CO2e (lb/year)	CO2e (MT*/year)
Offsite (Heavy-Heavy Duty Truck)	0.08	0.31	0.95	0.001	0.05	0.04	33,727	0.93	33,747	15
SUBTOTAL	0	0	1	0	0	0	33,727	1	33,747	15
Significance Threshold	55	550	55	150	150	55	n/a	n/a	n/a	n/a
Exceed Significance?	NO	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a

*1 metric ton (MT) = 2,205 pounds

Equation: No. of Vehicles x Emission Factor (lb/mile) x No. of Round-Trips/Day or year x Round-Trip length (mile/day or year) = Offsite Operation Emissions (lb/day or year)

Incremental Increase In Fuel Usage From Operation (Truck Trips)	Equipment Type	Total Miles Driven (miles/year)	Mileage Rate (miles/gal)	Total Diesel Fuel Usage (gal/year)	Total Diesel Fuel Usage (gal/day)*
Workers' Vehicles - Offsite Delivery/Haul	Heavy Duty Truck	8,000	4.89	39,120	150
			TOTAL	39,120	150

*Assumes 260 days/year

Source: On-Road Mobile Emission Factors (EMFAC 2007 v2.3), Scenario Year 2012
http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html/onroadEFHHDT07_26.xls

GHG Emissions - Unmitigated

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas - increased use	0.0000	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.0000	0
electricity - increased use	0.00	MWh/day	Electricity GHGs	0.00	0.0000	0.0000	0
water - increased use[2]	0.00	MMgal/day	Water Conveyance GHGs	0.00	0.0000	0.0000	0
wastewater - increased generation[1]	0.00	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
temporary construction activities[3]	0	MT/year	Construction GHGs in CO2e				0
operational truck trips	15.30	MT/year	Operation GHGs in CO2e				15
						TOTAL CO2e	15

GHG Emissions - Mitigated by Using Recycled Water

GHG Activity	Amount	Units	GHG Emissions Source	CO2 (MT/yr)	N2O (MT/yr)	CH4 (MT/yr)	Total CO2e (MT/yr)
natural gas use	0.0000	MMscf/day	Natural Gas GHGs	0.00	0.0000	0.00	0
electricity - increased use	0.0000	MWh/day	Electricity GHGs	0.00	0.0000	0.00	0
water - increased use[2]	0.0000	MMgal/day	Water Conveyance GHGs	0.00	0.0000	0.0000	0
wastewater - increased generation[2]	0.0000	MMgal/day	Wastewater Processing GHGs	0.00	0.0000	0.0000	0
temporary construction activities[3]	0.0000	MT/year	Construction GHGs in CO2e				0
operational truck trips	15.3047	MT/year	Operation GHGs in CO2e				15
						TOTAL CO2e	15

GHG Emission Factors:
1 metric ton (MT) = 2,205 pounds
120,000 lb CO2/MMscf fuel burned
0.64 lb N20/MMscf fuel burned
2.3 lb CH4/MMscf fuel burned
1,110 lb CO2e/MWh for electricity when source of power is not identified
(CEC, September 6, 2007 - Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector)
12,700 kWh/MMgallons for electricity use for water conveyance - potable water
1,200 kWh/MMgallons for electricity use for water conveyance - recycled water as mitigation
640 lb CO2/MWh for electricity use due to water conveyance
0.0067 lb CH4/MWh for electricity use due to water conveyance
0.0037 lb N2O/MWh for electricity use due to water conveyance

[1]California's Water – Energy Relationship, Table 1-3, Page 11, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[2]California's Water – Energy Relationship, Table 1-2, Page 9, California Energy Commission, Final Staff Report, CEC-700-2005-011-SF, November 2005.
http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF

[3] GHGs from temporary construction activities are amortized over 30 years.

APPENDIX C

NOTICE OF PREPARATION AND INITIAL STUDY

South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 • www.aqmd.gov

SUBJECT: **NOTICE OF PREPARATION OF A DRAFT ENVIRONMENTAL ASSESSMENT**

PROJECT TITLE: **PROPOSED AMENDED REGULATION XX: REGIONAL CLEAN AIR INCENTIVES MARKET (RECLAIM)**

In accordance with the California Environmental Quality Act (CEQA), the South Coast Air Quality Management District (SCAQMD), as the Lead Agency, has prepared this Notice of Preparation (NOP) and Initial Study (IS). This NOP serves two purposes: 1) to solicit information on the scope of the environmental analysis for the proposed project, and 2) to notify the public that the SCAQMD will prepare a Draft Environmental Assessment (EA) to further assess potential environmental impacts that may result from implementing the proposed project.

This letter, NOP and the attached IS are not SCAQMD applications or forms requiring a response from you. Their purpose is simply to provide information to you on the above project. If the proposed project has no bearing on you or your organization, no action on your part is necessary.

Comments focusing on your area of expertise, your agency's area of jurisdiction, or issues relative to the environmental analysis should be addressed to Ms. Barbara Radlein (c/o CEQA) at the address shown above, or sent by FAX to (909) 396-3324 or by e-mail to bradlein@aqmd.gov. Comments must be received no later than 5:00 PM on Tuesday, July 21, 2009. Please include the name and phone number of the contact person for your agency. Questions relative to the proposed amended regulation should be directed to Ms. Minh Pham at (909) 396-2613.

The Public Hearing for the proposed amended regulation is scheduled for November 6, 2009. (Note: Public meeting dates are subject to change).

Date: June 18, 2009 **Signature:** Steve Smith

Steve Smith, Ph.D.
Program Supervisor
Planning, Rules, and Area Sources

Reference: California Code of Regulations, Title 14, Sections 15082(a), 15103, and 15375

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
21865 Copley Drive, Diamond Bar, CA 91765-4178

NOTICE OF PREPARATION OF A DRAFT ENVIRONMENTAL ASSESSMENT

Project Title:
Draft Environmental Assessment for Proposed Amended Regulation XX – Regional Clean Air Incentives Market (RECLAIM)

Project Location:
South Coast Air Quality Management District (SCAQMD) area of jurisdiction consisting of the four-county South Coast Air Basin (Orange County and the non-desert portions of Los Angeles, Riverside and San Bernardino counties), and the Riverside County portions of the Salton Sea Air Basin and the Mojave Desert Air Basin

Description of Nature, Purpose, and Beneficiaries of Project:
SCAQMD staff is proposing amendments to Regulation XX – Regional Clean Air Incentives Market (RECLAIM), Rule 2002 – Allocations for Oxides of Nitrogen (NOx) and Oxides of Sulfur (SOx), to reduce the allowable SOx emission limits based on current Best Available Retrofit Control Technology (BARCT) for the following industrial equipment and processes: 1) fluid catalytic cracking units (FCCUs); 2) refinery boilers and heaters; 3) sulfur recovery – tail gas treatment units; 4) sulfuric acid manufacturing process; 5) container glass manufacturing process; 6) coke calcining; and, 7) portland cement manufacturing. Additional amendments are proposed to establish procedures and criteria for reducing RECLAIM Trading Credits (RTCs) and RTC adjustment factors for year 2013 and later. Other minor changes are proposed for clarity and consistency throughout the regulation. The Initial Study identifies the topics of aesthetics, air quality, energy, hydrology and water quality, hazards and hazardous materials, and transportation/traffic as areas that may be adversely affected by the proposed project. Impacts to these environmental areas will be further analyzed in the Draft EA.

Lead Agency:	**Division:**
South Coast Air Quality Management District	Planning, Rule Development and Area Sources

Initial Study and all supporting documentation are available at:	**or by calling:**	**or by accessing the SCAQMD's website at:**
SCAQMD Headquarters 21865 Copley Drive Diamond Bar, CA 91765	(909) 396-2039	http://www.aqmd.gov/ceqa/aqmd.html

The Public Notice of Preparation is provided through the following:

☑ Los Angeles Times (June 19, 2009) ☑ AQMD Website ☑ AQMD Mailing List

Initial Study 30-day Review Period:
June 19, 2009 – July 21, 2009

Scheduled Public Meeting Dates (subject to change):
Public Workshop/CEQA Scoping Meeting: June 23, 2009, 2:00pm to 4:00pm; SCAQMD Headquarters
SCAQMD Governing Board Hearing: November 6, 2009, 9:00 a.m.; SCAQMD Headquarters

The proposed project may have statewide, regional or areawide significance; therefore, a CEQA scoping meeting is required (pursuant to Public Resources Code §21083.9(a)(2)).

Send CEQA Comments to:	**Phone:**	**Email:**	**Fax:**
Ms. Barbara Radlein	(909) 396-2716	bradlein@aqmd.gov	(909) 396-3324

Direct Questions on Proposed Amendments:	**Phone:**	**Email:**	**Fax:**
Ms. Minh Pham	(909) 396-2613	mpham@aqmd.gov	(909) 396-3324

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Initial Study for Proposed Amended Regulation XX – Regional Clean Air Incentives Market (RECLAIM)

June 2009

SCAQMD No. 06182009BAR
State Clearinghouse No: To Be Determined

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SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
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Mayor, City of Chino
Cities Representative, San Bernardino County

EXECUTIVE OFFICER:
BARRY R. WALLERSTEIN, D.Env.

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INTRODUCTION

The California Legislature created the South Coast Air Quality Management District (SCAQMD) in 1977[1] as the agency responsible for developing and enforcing air pollution control rules and regulations in the South Coast Air Basin (Basin) and portions of the Salton Sea Air Basin and Mojave Desert Air Basin, referred to herein as the district. By statute, the SCAQMD is required to adopt an air quality management plan (AQMP) demonstrating compliance with all federal and state ambient air quality standards for the district[2]. Furthermore, the SCAQMD must adopt rules and regulations that carry out the AQMP[3]. The 2007 AQMP concluded that major reductions in emissions of volatile organic compounds (VOCs), oxides of sulfur (SOx) and oxides of nitrogen (NOx) are necessary to attain the air quality standards for ozone (the key ingredient of smog) and particulate matter (PM10 and PM2.5). Ozone, a criteria pollutant which has been shown to adversely affect human health, is formed when VOCs react with NOx in the atmosphere. VOCs, NOx, SOx (especially sulfur dioxide) and ammonia also contribute to the formation of PM10 and PM2.5.

The Basin is designated by the United States Environmental Protection Agency (EPA) as a non-attainment area for PM2.5 emissions because the federal PM2.5 standards have been exceeded. For this reason, the SCAQMD is required to evaluate all feasible control measures in order to reduce direct PM2.5 emissions, as well as PM2.5 precursors, such as NOx and SOx. The 2007 AQMP contains a multi-pollutant control strategy to achieve attainment with the federal PM2.5 standards with NOx and SOx reductions identified as the two most effective tools in reaching attainment with the PM2.5 standards.

As part of this ongoing PM2.5 reduction effort, SCAQMD staff is proposing amendments to Regulation XX – Regional Clean Air Incentives Market (RECLAIM) to achieve additional SOx emission reductions as outlined in the 2007 AQMP in Control Measure CMB-02: Further SOx Reduction for RECLAIM (CM #2007CMB-02). Amendments are proposed to Rule 2002 – Allocations for Oxides of Nitrogen (NOx) and Oxides of Sulfur (SOx), to address Best Available Retrofit Control Technology (BARCT) requirements, which may require installation or modification of SOx emission control equipment. Other changes proposed are administrative in nature and include minor clarifications for continuity.

The primary focus of the proposed project is to bring the SOx RECLAIM program up-to-date with the latest BARCT requirements to achieve, at a minimum, the proposed SOx emission reductions in CM #2007CMB-02 (at least 2.9 tons per day by compliance year 2014). The proposed project may achieve additional SOx emission reductions depending on the actual BARCT SOx emission control efficiencies. The proposed project will affect the following types of equipment and processes at SOx RECLAIM facilities: 1) petroleum coke calciners; 2) cement kilns; 3) coal-fired boiler (cogeneration); 4) container glass melting furnace; 5) diesel combustion; 6) fluid catalytic cracking units (FCCUs); 7) refinery boilers/heaters; 8) sulfur recovery units/tail gas treatment units; and, 9) sulfuric acid manufacturing. Additional amendments are proposed to establish procedures and criteria for reducing RECLAIM Trading Credits (RTCs) and RTC adjustment factors for year 2013 and later. Other minor changes are proposed for clarity and consistency throughout the proposed amended rules.

[1] The Lewis-Presley Air Quality Management Act, 1976 Cal. Stats., ch 324 (codified at Health & Safety Code, §§40400-40540).
[2] Health & Safety Code, §40460 (a).
[3] Health & Safety Code, §40440 (a).

The proposed project is estimated to reduce at least 2.9 tons per day of SOx emissions or more by 2014. Despite this projected environmental benefit to air quality, this Initial Study, prepared pursuant to the California Environmental Quality Act (CEQA), identifies the following environmental topics as areas that may be adversely affected by the proposed project: aesthetics, air quality, energy, hydrology and water quality, hazards and hazardous materials, and transportation/traffic. A Draft Environmental Assessment (EA) will be prepared to analyze further whether the potential impacts to these environmental topics are significant. Any other potentially significant environmental impacts identified through this Notice of Preparation/Initial Study process will also be analyzed in the Draft EA.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

The proposed amendments to Regulation XX are considered a "project" as defined by CEQA. CEQA requires that the potential adverse environmental impacts of proposed projects be evaluated and that methods to reduce or avoid identified significant adverse environmental impacts of these projects be implemented if feasible. The purpose of the CEQA process is to inform the SCAQMD's Governing Board, public agencies, and interested parties of potential adverse environmental impacts that could result from implementing the proposed project and to identify feasible mitigation measures or alternatives, when an impact is significant.

California Public Resources Code §21080.5 allows public agencies with regulatory programs to prepare a plan or other written documents in lieu of an environmental impact report once the Secretary of the Resources Agency has certified the regulatory program. The SCAQMD's regulatory program was certified by the Secretary of Resources Agency on March 1, 1989, and is codified as SCAQMD Rule 110. Pursuant to Rule 110 (the rule which implements the SCAQMD's certified regulatory program), SCAQMD is preparing a Draft Environmental Assessment (EA) to evaluate potential adverse impacts from the proposed project.

The SCAQMD as Lead Agency for the proposed project, has prepared this Initial Study (which includes an Environmental Checklist and project description). The Environmental Checklist provides a standard evaluation tool to identify a project's adverse environmental impacts. The Initial Study is also intended to provide information about the proposed project to other public agencies and interested parties prior to the release of the Draft Environmental Assessment (EA). Written comments on the scope of the environmental analysis will be considered (if received by the SCAQMD during the 30-day review period) when preparing the Draft EA.

PROJECT LOCATION

The proposed amendments to Regulation XX would apply to equipment and processes operated at SOx RECLAIM facilities located throughout the entire SCAQMD jurisdiction. The SCAQMD has jurisdiction over an area of approximately 10,743 square miles, consisting of the four-county South Coast Air Basin (Basin) (Orange County and the non-desert portions of Los Angeles, Riverside and San Bernardino counties), and the Riverside County portions of the Salton Sea Air Basin (SSAB) and Mojave Desert Air Basin (MDAB). The Basin, which is a subarea of the SCAQMD's jurisdiction, is bounded by the Pacific Ocean to the west and the San Gabriel, San Bernardino, and San Jacinto mountains to the north and east. It includes all of Orange County and the nondesert portions of Los Angeles, Riverside, and San Bernardino counties. The Riverside County portion of the SSAB is bounded by the San Jacinto Mountains in the west and spans eastward up to the Palo Verde Valley. The federal nonattainment area (known as the Coachella Valley Planning Area) is a subregion of Riverside County and the

SSAB that is bounded by the San Jacinto Mountains to the west and the eastern boundary of the Coachella Valley to the east (Figure 1-1).

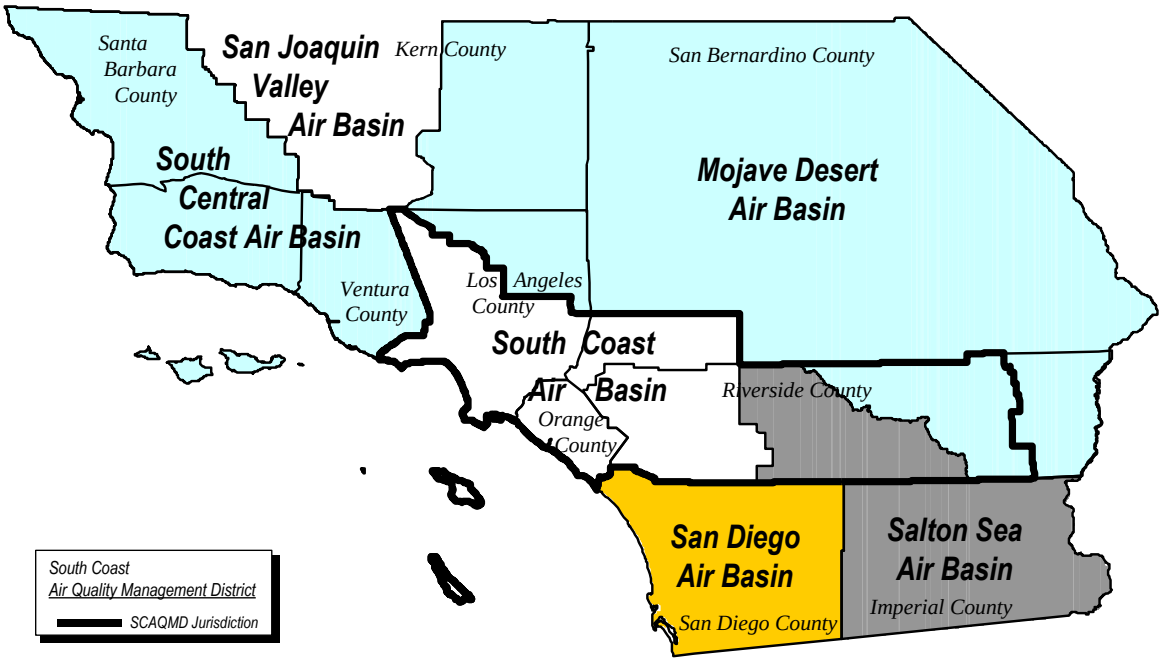

Figure 1-1
South Coast Air Quality Management District

PROJECT BACKGROUND

Adopted in October 1993, Regulation XX – RECLAIM, is comprised of 11 rules which contain a declining cap and trade mechanism to reduce NOx and SOx emissions from the largest stationary sources in the Basin. The portion of Regulation XX that focuses on reducing NOx emissions is referred to as "NOx RECLAIM" while the portion that focuses on reducing SOx emissions is referred to as "SOx RECLAIM." Regulation XX contains applicability requirements, NOx and SOx facility allocations, general requirements, as well as monitoring, reporting, and recordkeeping requirements for NOx and SOx sources located at RECLAIM facilities. The RECLAIM program started with 41 SOx facilities and 392 NOx facilities, but by the end of the 2005 compliance year, the program is populated with 33 SOx facilities and 304 NOx facilities. The reduction in the number of facilities participating in the RECLAIM program since inception has been primarily due to facility shutdowns.

Under the SOx RECLAIM program, the RECLAIM facilities were issued annual allocations of SOx emissions (also known as facility caps), which declined annually from 1993 until 2003 and remained constant after 2003. In 1993, annual allocations were issued to the RECLAIM facilities and the facility cap reflected BARCT in effect at that time. SCAQMD staff has since

conducted a BARCT reassessment for NOx in 2005, but not for SOx. A BARCT reassessment is now necessary for SOx RECLAIM to assure that the participating facilities will continue to achieve emission reductions as expeditiously as possible. Under the RECLAIM program, the facilities have the flexibility to install air pollution control equipment, change method of operations, or purchase RTCs to meet BARCT levels.

PROJECT OBJECTIVE

The primary focus of the proposed project is to bring the SOx RECLAIM program up-to-date with the latest BARCT requirements to achieve, at a minimum, the proposed SOx emission reductions in CM #2007CMB-02 (at least 2.9 tons per day by compliance year 2014). Another objective of the proposed project is to establish procedures and criteria for reducing RTCs and RTC adjustment factors for year 2013 and later. Other minor changes are proposed for clarity and consistency throughout the proposed amended rules. The proposed project is estimated to reduce at least 2.9 tons per day of SOx emissions by 2014, which will assist the SCAQMD with attaining state and federal ambient air quality standards for PM10 and PM2.5.

PROJECT DESCRIPTION

The proposed project will affect the following types of equipment and processes at 12 SOx RECLAIM facilities: 1) petroleum coke calciners; 2) cement kilns; 3) coal-fired boiler (cogeneration); 4) container glass melting furnace; 5) diesel combustion; 6) fluid catalytic cracking units; 7) refinery boilers/heaters; 8) sulfur recovery units/tail gas treatment units; and, 9) sulfuric acid manufacturing. The following is a summary of the key proposed amendments to Rule 2002. Other minor changes are also proposed for clarity and consistency throughout the rule. A copy of the proposed amended rule can be found in Appendix A.

Proposed Amended Rule 2002 – Allocations for Oxides of Nitrogen (NOx) and Oxides of Sulfur (SOx)

<u>RECLAIM Allocations - subdivision (b)</u>

Cross-references in paragraph (b)(3) have been modified for clarity and continuity with the proposed revisions in subdivision (f) regarding annual allocations for NOx and SOx and adjustments to RTC holdings.

<u>Establishment of Starting Allocations - subdivision (c)</u>

Cross-references to procedures for reducing SOx RTCs for compliance year 2014 and later have been added to paragraph (c)(3) and subparagraph (c)(5)(C).

<u>Annual Allocations for NOx and SOx and Adjustments to RTC Holdings - subdivision (f)</u>

In accordance with the analysis prepared for Control Measure #2007CMB-02 in the 2007 AQMP which estimates an additional reduction in SOx RECLAIM emissions of 2.9 tons per day by 2014, new criteria, procedures, and adjustment factors for adjusting SOx RTC holdings have been added to paragraph (f)(2) in order to achieve these projected emission reductions from SOx RTC holders by compliance year 2013 and later. The actual amount of reductions will depend on the analysis of what is technically and economically feasible. It is expected that the adjustment factors for compliance year 2013 and later will be developed based on current BARCT evaluations and are expected to be within the range of three tons per day to eight tons per day. The proposed changes would also comply with the BARCT requirements applicable to market-based incentive programs. Specifically, the BARCT adjustment that will be made to

each facility's holdings will be implemented on a programmatic basis, with an equal percentage reduction to all RTC holdings beginning in compliance year 2013.

RECLAIM SOx 2014 BARCT – Table 4

New Table 4 has been added to Rule 2002 to establish BARCT for petroleum coke calciners, cement kilns and coal-fired boilers, container glass melting furnaces, diesel combustion, fluid catalytic cracking units, refinery boilers and heaters, sulfur recovery units/tail gas treatment units, and sulfuric acid manufacturing. Currently, Table 4 contains a list of the control technologies that could be used to achieve BARCT. However, Table 4 does not yet contain the BARCT emission rates, for all of the aforementioned equipment except diesel combustion, which has a limit of 15 parts per million by volume (ppmv) to be consistent with existent emission limits in SCAQMD Rule 431.2 – Sulfur Content of Liquid Fuels. Initial estimates show that a range of SOx emission reductions between three tons per day to eight tons per day are under consideration for the proposed project, but the actual amount of SOx reductions will depend on the analysis of what is technically and economically feasible. As the rule development process progresses, eventually Table 4 will contain BARCT emission rates appropriate to the basic equipment listed.

TECHNOLOGY OVERVIEW

SOx Emission Sources

The SOx RECLAIM program consists of 33 facilities as of the 2005 Compliance Year. Of these 33, 12 RECLAIM facilities represent the top emitters of SOx (i.e., emit 95 percent of the total SOx emissions from all RECLAIM facilities). For this reason, the proposed project will focus on reducing SOx emissions from these top emitters. They are:

- Six refineries: BP (Carson location); ConocoPhillips (Wilmington location); Chevron; ExxonMobil; Ultramar (also referred to as Valero); and, Equilon (also referred to as Tesoro)
- Two sulfuric acid plants: Rhodia Inc. and ConocoPhillips (Carson location)
- One coke calciner plant: BP (Wilmington location)
- One cement manufacturing plant: California Portland Cement
- Two container glass manufacturing plants: Owens-Brockway Glass Container Inc. and Saint-Gobain Containers Inc.

On an equipment/process basis, Table 1-1 shows the distribution of SOx emissions with respect to the equipment/processes at these 12 SOx RECLAIM facilities. These source categories are responsible for 80 percent of the facility emissions.

Table 1-1
Distribution of SOx Emissions at RECLAIM Facilities By Equipment/Process

Equipment/Process	Percentage of Emissions
FCCUs	33%
Refinery Process Heaters and Boilers	31%
Sulfuric Acid Manufacturing	12%
Sulfur Recovery Units and Tail Gas Units	10%
Cement Kilns and Glass Melting Furnaces	7%
Other Miscellaneous Processes/Equipment	7%

Reference: Baseline emissions from Compliance Year 2005

Of the 12 facilities, six refineries operate one FCCU each, one sulfur recovery and tail gas unit each, and a multitude of refinery process heaters and boilers. The quantity of SOx emissions from the six refineries alone comprise approximately 74 percent of the total SOx emitted from the 12 RECLAIM facilities that will be affected by the proposed project. The remaining six facilities emit 26 percent of the total.

To appreciate the mechanics of SOx control equipment and techniques, it is necessary to first understand how SOx emissions are generated from the equipment and processes listed in Table 1-1.

FCCUs

The purpose of a FCCU at a refinery is to convert or "crack" heavy oils (hydrocarbons), with the assistance of a catalyst, into gasoline and lighter petroleum products. Each FCCU consists of three main components: a reaction chamber, a catalyst regenerator and a fractionator. All six refineries each operate one FCCU.

The cracking process begins in the reaction chamber where fresh catalyst is mixed with pre-heated heavy oils (crude) known as the fresh feed. The catalyst typically used for cracking is a fine powder made up of tiny particles with surfaces covered by several microscopic pores. A high heat-generating chemical reaction occurs that converts the heavy oil liquid into a cracked hydrocarbon vapor mixed with catalyst. As the cracking reaction progresses, the cracked hydrocarbon vapor is routed to a distillation column or fractionator for further separation into lighter hydrocarbon components than crude such as light gases, gasoline, light gas oil, and cycle oil.

Towards the end of the reaction, the catalyst surface becomes inactive or spent because the pores are gradually coated with a combination of heavy oil liquid residue and solid carbon (coke), thereby reducing its efficiency or ability to react with fresh heavy liquid oil in the feed. To prepare the spent catalyst for re-use, the remaining oil residue is removed by steam stripping. The spent catalyst is later cycled to the second component of the FCCU, the regenerator, where hot air burns the coke layer off of the surface of each catalyst particle to produce reactivated or regenerated catalyst. Subsequently, the regenerated catalyst is cycled back to the reaction chamber and mixed with more fresh heavy liquid oil feed. Thus, as the heavy oils enter the cracking process through the reaction chamber and exit the fractionator as lighter components, the catalyst continuously circulates between the reaction chamber and the regenerator.

During the regeneration cycle, large quantities of catalyst are lost in the form of catalyst fines or particulates thus making FCCUs a major source of primary particulate emissions at refineries. In addition, particulate precursor emissions such as SOx (because crude oil naturally contains sulfur) and NOx, additional secondary particulates (i.e., formed as a result of various chemical reactions), plus carbon monoxide (CO) and carbon dioxide (CO2) are produced due to coke burn-off during the regenerator process.

The potential available control technologies to reduce SOx emissions from a FCCU are:

1. Processing of low sulfur feed stocks;
2. Feed hydro-treating;
3. Flue gas scrubbing via wet gas scrubbers;

4. Using SOx reducing catalyst; or,
5. Using a combination of these control technologies.

The type of SOx control option to be utilized in response to the proposed project for FCCUs will depend on each refinery's individual operations and the current control technologies and techniques in place. For example, all six refineries already process low sulfur feed stocks and utilize feed hydrotreating for their FCCUs. Thus, the Draft EA will evaluate the possibility that each refinery may rely on wet gas scrubbers or SOx reducing additives or a combination of both control options in order to comply with the BARCT requirements for the FCCU portion of the proposed project.

Refinery Process Heaters and Boilers

Refinery process heaters and boilers are used extensively throughout various processes in refinery operations such as distillation, hydrotreating, fluid catalytic cracking, alkylation, reforming, and delayed coking. There are approximately 300 refinery process heaters and boilers operating throughout the six aforementioned refineries and the top 16 emitters in this category collectively emitted about one ton per day of SOx in 2005. Refinery process heaters and boilers are primarily fueled by refinery gas, one of several products generated at the refinery. In addition, most of the refinery process heaters and boilers are designed to also operate on natural gas, but liquid or solid fuels are rarely used.

SOx is created from the combustion of fuel that contains sulfur or sulfur compounds. To reduce SOx emissions from these refinery process heaters and boilers, the refinery operators can opt to use lower sulfur-containing fuels to reduce the sulfur input on the front end (e.g., fuel gas treatment), or to install flue gas scrubber (wet scrubber) to reduce SOx emissions in the flue gas after it exits the refinery process heaters and boilers on the back end. The Draft EA will evaluate the possibility that each refinery may rely on either control option in order to comply with the refinery process heaters and boilers portion of the proposed project.

Sulfur Recovery Units and Tail Gas Units

Because sulfur is a naturally occurring and undesirable component of crude oil, refineries employ a sulfur recovery system to maximize sulfur removal. A typical sulfur removal or recovery system will include a sulfur recovery unit (e.g., Claus unit) followed by a tail gas treatment unit (e.g., amine treating) for maximum removal of hydrogen sulfide (H2S). A Claus unit consists of a reactor, catalytic converters and condensers. Two chemical reactions occur in a Claus unit. The first reaction occurs in the reactor, where a portion of H2S reacts with air to form sulfur dioxide (SO2) followed by a second reaction in the catalytic converters where SO2 reacts with H2S to form liquid elemental sulfur. Side reactions producing carbonyl sulfide (COS) and carbon disulfide (CS2) can also occur. These side reactions are problematic for Claus plant operators because COS and CS2 cannot be easily converted to elemental sulfur and carbon dioxide. Liquid sulfur is recovered after the final condenser. The combination of two converters with two condensers in series will generally remove as much as 95 percent of the sulfur from the incoming acid gas. To increase removal efficiency, some newer sulfur recovery units may be designed with three to four sets of converters and condensers.

To recover the remaining sulfur compounds after the final pass through the last condenser, the gas is sent to a tail gas treatment process such as a SCOT or Wellman-Lord treatment process. For example, the SCOT tail gas treatment is a process where the tail gas is sent to a catalytic reactor and the sulfur compounds in the tail gas are converted to H2S. The H2S is absorbed by a

solution of amine or diethanol amine (DEA) in the H2S absorber, steam-stripped from the absorbent solution in the H2S stripper, concentrated, and recycled to the front end of the sulfur recovery unit. This approach typically increases the overall sulfur recovery efficiency of the Claus unit to 99.8 percent or higher. However, the fresh acid gas feed rate to the sulfur recovery unit is reduced by the amount of recycled stream, which reduces the capacity of the sulfur recovery unit. The residual H2S in the treated gas from the absorber is typically vented to a thermal oxidizer where it is oxidized to sulfur dioxide (SO2) before venting to the atmosphere.

The Wellman-Lord tail gas treatment process is when the sulfur compounds in the tail gas are first incinerated to oxidize to SO2. After the incinerator, the tail gas enters a SO2 absorber, where the SO2 is absorbed in a sodium sulfite (Na_2SO_3) solution to form sodium bisulfite ($NaHSO_3$) and sodium pyrosulfate ($Na_2S_2O_5$). The absorbent rich in SO_2 is then stripped, and the SO_2 is recycled back to the beginning of the Claus unit. The residual sulfur compounds in the treated tail gas from the SO2 absorber is then vented to a thermal oxidizer where it is oxidized to SO2 before venting to the atmosphere.

There are three main strategies that can be employed to further reduce SO2 emissions from each sulfur recovery/tail gas treatment unit operating at the six refineries: 1) increase the efficiency of the sulfur recovery unit; 2) improve the efficiency of the tail gas treatment process; and, 3) install a wet gas scrubber as an alternative to the thermal oxidizer[4]. The type of SOx control option to be utilized in response to this portion of the proposed project will depend on each refinery's individual operations and the current control technologies and techniques in place. Thus, the Draft EA will evaluate the possibility that each refinery may rely on the SOx control strategies identified above in order to comply with the sulfur recovery/tail gas treatment unit portion of the proposed project.

Sulfuric Acid Manufacturing

Sulfuric acid is a commodity chemical that is used in manufacturing phosphate and nitrogen fertilizers, detergents, paper, rust removers. It is also used extensively in automobile manufacturing, metal smelting, water treatment and oil refining processes.

There are two facilities in the Basin that manufacture sulfuric acid. The sulfuric acid manufacturing process includes three basic operations. First, the sulfur in the feedstock is oxidized to sulfur dioxide (SO2) in a furnace. The SO2 is then catalytically oxidized (using vanadium as the catalyst) to sulfur trioxide (SO3) in a multi-staged catalytic reactor (or converter). Lastly, the sulfur trioxide is absorbed (e.g., combined with water) to create a strong sulfuric acid (H_2SO_4) solution.

In a dual or two-stage absorption process, the SO3 gas formed from the primary converter is sent to a first absorber where most of the SO3 is removed to form H_2SO_4. The remaining unconverted SO2 and SO3 are directed to a secondary converter and absorber set to further remove H_2SO_4.

The conversion of SO2 to H_2SO_4 is an incomplete, exothermic reaction which means that there is always one to two percent of SO2 that does not get converted to H_2SO_4. The success of conversion is affected by the number of stages in the catalytic converter, the amount of catalyst used, temperature and pressure, and the concentrations of the reactants, SO2 and elemental

[4] All six refineries have thermal oxidizers at the end of their tail gas treatment units.

oxygen (O_2). The remaining SO2 in the exhaust gas stream from the absorbers is vented to ESPs, scrubbers, and mist eliminators to remove SO_2 and acid mist prior to venting to the atmosphere. Because the conversion of SO2 to H_2SO_4 is exothermic (e.g., produces a great deal of heat), the heat is recovered and converted into useful energy for operating steam-driven compressors, waste heat boilers, and heat exchangers. The Draft EA will evaluate the possibility that each sulfuric acid manufacturing facility may rely on wet gas scrubbers in order to comply with the BARCT requirements for this portion of the proposed project

Container Glass Melting Furnace

A container glass melting furnace is the main equipment used for manufacturing glass products, such as bottles, glass wares, pressed and blown glass, tempered glass, and safety glass. The manufacturing process consists of four phases: 1) preparation of the raw materials; 2) melting the mixture of raw materials in the furnace; 3) forming the desired shape; and, 4) finishing the final product. Raw materials, such as sand, limestone, and soda ash, are crushed and mixed with cullets (recycled glass pieces) to ensure homogeneous melting. The raw materials mixture is then conveyed to a continuous regenerative side-port melting furnace. As the mixture enters the furnace through a feeder, it melts and blends with the molten glass already in the furnace, and eventually flows to a refiner section, forming machine, and annealing ovens. The final products undergo inspection, testing, packaging and storage. Any damaged or undesirable glass is transferred back to be recycled as cullets.

SOx is generated from a container glass melting furnace in two ways: 1) during the decomposition of the sulfates in the raw materials; and, 2) from combusting fuel (that contains sulfur) to generate high heating values in the furnace. The container glass melting furnace contributes over 99 percent of the total SOx emissions from a glass manufacturing plant.

SOx emissions from a container glass melting furnace are typically controlled by a scrubber followed by a dry electrostatic precipitator (ESP) to control particulates. Two glass melting facilities are in the SOx RECLAIM program, but only one of these facilities is currently operating. The type of SOx control option to be utilized in response to the proposed project will depend on this facility's individual operations and the current control technologies and techniques in place. Thus, the Draft EA will evaluate the possibility that operators of the glass melting facility may rely on a wet gas scrubber or dry gas scrubber to further control SOx emissions in order to comply with the BARCT requirements for the FCCU portion of the proposed project.

Petroleum Coke Calciner

Petroleum coke, the heaviest portion of crude oil, cannot be recovered in the normal oil refinining process. Instead, it is processed in a delayed coker unit to generate a carbonaceous solid referred to as "green coke," a commodity. To improve quality of the product, if the green coke has a low metals content, it will be sent to a calciner to make calcined petroleum coke. Calcined petroleum coke can be used to make anodes for the aluminum, steel, and titanium smelting industry. If the green coke has a high metals content, it is used a fuel grade coke by the fuel, cement, steel, calciner and specialty chemicals industries.

The process of making calcined petroleum coke begins when the green coke feed from the delayed coker unit is screened and transported to the calciner unit where it is stored in a covered coke storage barn. The screened and dried green coke is introduced into the top end of a rotary kiln and is tumbled by rotation under high temperatures that range between 2,000 and 2,500

degrees Fahrenheit (^{o}F). The rotary kiln relies on gravity to move coke through the kiln countercurrent to a hot stream of combustion air produced by the combustion of natural gas or fuel oil. As the green coke flows to the bottom of the kiln, it rests in the kiln for approximately one additional hour to eliminate any remaining moisture, impurities, and hydrocarbons. Once discharged from the kiln, the calcined coke is dropped into a cooling chamber, where it is quenched with water, treated with de-dusting agents to minimize dust, carried by conveyors to storage tanks. Eventually, the calcined coke is transported by truck to the Port of Long Beach for export, or is loaded onto railcars for shipping to domestic customers.

Because sulfur is a naturally occurring and undesirable component of crude oil, it remains a component of the green coke after it exits the delayed coking unit. As the green coke is processed under high heat conditions in the rotary kiln, SOx emissions are generated. SOx is also generated from combusting fuel oil (that contains sulfur) to generate high heating values in the rotary kiln.

There is only one petroleum coke calciner in the Basin and the SOx emissions from the unit are controlled by a dry scrubber. The existing control system also includes a spray dryer, a reverse-air baghouse, a slurry storage system, a slurry circulating system, and a pneumatic conveying system. Calcium hydroxide (CaOH) slurry is the absorbing medium for SO2 control. The type of SOx control option to be utilized in response to the proposed project will depend on this facility's individual operations and the current control technologies and techniques in place. Thus, the Draft EA will evaluate the possibility that operators of the petroleum coke calcining facility may rely on a wet gas scrubber to further control SOx emissions in order to comply with the BARCT requirements for the petroleum coke calcining portion of the proposed project.

Cement Kiln and Coal-Fired Boiler

Of the two Portland cement manufacturing facilities located in the Basin, California Portland Cement Company (CPCC) and TXI Riverside Cement Company (TXI), the quantity of SOx emissions from CPCC at 100.5 tons per year is substantially greater than TXI's SOx emissions at 0.7 ton per year for compliance year 2005. Because the proposed project is directed at reducing emissions from the top 12 SOx emitters, the following discussion is limited to reducing SOx emissions at the CPCC facility.

CPCC manufactures gray Portland cement in two cement kilns and follows a four-step process of: 1) acquiring raw materials; 2) preparing the raw materials to be blended into a raw mix; 3) pyroprocessing of the raw mix to make clinker; and, 4) grinding and milling clinker into cement. The raw materials used for manufacturing cement include calcium, silica, alumina and iron, with calcium having the highest concentration. These raw materials are obtained from a limestone quarry for calcium, sand for silica; and shale and clay for alumina and silica.

The raw materials are crushed, milled, blended into a raw mix and stored. Primary, secondary and tertiary crushers are used to crush the raw materials until they are about ¾-inch or smaller in size. Raw materials are then conveyed to rock storage silos. Belt conveyors are typically used for this transport. Roller mills or ball mills are used to blend and pulverize raw materials into fine powder. Pneumatic conveyors are typically used to transport the fine raw mix to be stored in silos until it is ready to be pyroprocessed.

The pyroprocess in a kiln consists of three phases during which clinker is produced from raw materials undergoing physical changes and chemical reactions. The first phase in a kiln, the

drying and pre-heating zone, operates at a temperature between 70 ^{o}F and 1650 ^{o}F and evaporates any remaining water in the raw mix of materials entering the kiln. Essentially this is the warm-up phase which stabilizes the temperature of the refractory fire brick inside the mouth opening of the kiln. The second phase, the calcining zone, operates at a temperature between 1100 ^{o}F and 1650 ^{o}F and converts the calcium carbonate from the limestone in the kiln feed into calcium oxide and releases carbon dioxide. During the third phase, the burning zone operates on average at 2200 ^{o}F to 2700 ^{o}F (though the flame temperature can exceed 3400 ^{o}F) during which several reactions and side reactions occur. The first reaction is calcium oxide (produced during the calcining zone) with silicate to form dicalcium silicate and the second reaction is the melting of calcium oxide with alumina and iron oxide to form the liquid phase of the materials. Despite the high temperatures, the constituents of the kiln feed do not combust during pyroprocessing. As the materials move towards the discharge end of the kiln, the temperature drops and eventually clinker nodules form and volatile constituents, such as sodium, potassium, chlorides, and sulfates, evaporate. Any excess calcium oxide reacts with dicalcium silicate to form tricalcium silicate. The red hot clinker exits the kiln, is cooled in the clinker cooler, passes through a crusher and is conveyed to storage for protection from moisture. Since clinker is water reactive, if it gets wet, it will set into concrete.

Heat used in CPCC's kilns is supplied through the combustion of different fuels such as coal, coke, oil, natural gas, and discarded automobile tires. The combustion gases are vented to a baghouse for dust control, and the collected dust is returned to the process or recycled if they meet certain criteria, or is discarded to landfills. Post-combustion control for SOx is not currently used at CPCC.

In addition to the cement kilns, another potential source of SOx emissions at CPCC could be from the coal-fired steam boiler due to the high sulfur content in coal. While CPCC reported that the coal-fired steam boiler has not been in operation since 2002, CPCC may begin operating the boiler again in the near future if circumstances in energy costs or fuel sources change.

SOx emissions from the cement kilns and coal-fired boiler are generated from the following: 1) combustion of sulfur in the fuel; and, 2) oxidation of sulfides (e.g. pyrites) in the raw materials entering the cement kiln. Fuel switching, process alterations, dry and wet scrubbers are commercially available control technologies to reduce SOx emissions. The type of scrubber to be utilized in response to the proposed project will depend on this facility's individual operations and how it will function with the current control technologies and techniques in place at CPCC (e.g., the baghouse). Thus, the Draft EA will evaluate the possibility that operators of CPCC may rely on a wet gas scrubber or dry gas scrubber, or a hybrid of dry gas scrubber with a baghouse, to further control SOx emissions in order to comply with the BARCT requirements for the cement kiln and coal-fired boiler portion of the proposed project.

SOx Control Technologies

On an equipment/process basis, Table 1-2 shows the control technologies that will be considered as part of the BARCT analysis for the proposed project. The following discussions will elaborate on the various technologies listed in Table 1-2.

Table 1-2
BARCT Control Technologies Under Consideration
for SOx Emitting Equipment/Processes

Equipment/Process	BARCT Control Technology
Petroleum Coke Calciner	Wet Gas Scrubber
Cement Kilns and Coal-Fired Boiler	1. Dry Gas Scrubber 2. Wet Gas Scrubber 3. Combination of both
Container Glass Melting Furnaces	1. Dry Gas Scrubber 2. Wet Gas Scrubber
FCCUs	1. Wet Gas Scrubber 2. SOx Reducing Catalyst 3. Combination of both
Refinery Process Heaters and Boilers	1. Wet Gas Scrubber 2. Fuel Gas Treatment
Sulfuric Acid Manufacturing	Wet Gas Scrubber
Sulfur Recovery Units/Tail Gas Units	1. Wet Gas Scrubber 2. Selective Oxidation Catalyst

Wet Gas Scrubbers

Wet gas scrubbers are used to control both SOx and particulate emissions and can be installed on petroleum coke calciners, cement kilns and coal-fired boilers, container glass melting furnaces, FCCUs, refinery process heaters and boilers, sulfuric acid manufacturing, and sulfur recovery units/tail gas units. There are two types of wet gas scrubbers: 1) caustic-based non-regenerative wet gas scrubber; and, 2) regenerative wet gas scrubber. Both systems can be used to achieve below a 25 ppmv SOx outlet concentration.

In non-regenerative wet gas scrubbing, caustic soda (sodium hydroxide - NaOH) or other alkaline reagents, such as soda ash and magnesium hydroxide, are used as an alkaline absorbing reagent (absorbent) to capture SO2 emissions. The absorbent captures SO2 and sulfuric acid mist (H2SO4) and converts it to various types of sulfites and sulfates (e.g., NaHSO3, Na2SO3, and Na2SO4). The absorbed sulfites and sulfates are later separated by a purge treatment system and the treated water, free of suspended solids, is either discharged or recycled.

One example of the caustic-based non-regenerative scrubbing system is the proprietary Electro Dynamic Venturi (EDV) scrubbing system offered by BELCO Technologies Corporation. An EDV scrubbing system consists of three main modules: 1) a spray tower module; 2) a filtering module; and, 3) a droplet separator module. The flue gas enters the spray tower module, which is an open tower with multiple layers of spray nozzles. The nozzles supply a high density stream of caustic water that is directed in a countercurrent flow to the gas flow and encircles, encompasses, wets, and saturates the flue gas. Multiple stages of liquid/gas absorption occur in the spray tower module and SO2 and acid mist are captured and converted to sulfites and sulfates. Large particles in the flue gas are also removed by impaction with the water droplets.

The flue gas saturated with heavy water droplets continues to move up the wet scrubber to the filtering module where the flue gas reaches super-saturation. At this point, water continues to

condense and the fine particles in the gas stream begin to cluster together, to form larger and heavier groups of particles. Next, the flue gas, super-saturated with heavy water droplets, enters the droplet separator module causing the water droplets to impinge on the walls of parallel spin vanes and drain to the bottom of the scrubber.

The spent caustic water purged from the wet scrubber is later processed in a purge treatment unit. The purge treatment unit contains a clarifier that removes suspended solids for disposal. The effluent from the clarifier is oxidized with agitated air which helps convert sulfites to sulfates and also reduces the chemical oxygen demand (COD) so that the effluent can be safely discharged to a waste water system.

A regenerative wet gas scrubber removes SO2 from the flue gas by using a buffer solution that can be regenerated. The buffer is then sent to a regenerative plant where the SO2 is extracted as concentrated SO2. The concentrated SO2 is then sent to a sulfur recovery unit (SRU) to recover the liquid SO2, sulfuric acid and elemental sulfur as a by-product. When the inlet SO2 concentrations are high, a substantial amount of sulfur-based by-products can be recovered and later sold as a commodity for use in the fertilizer, chemical, pulp and paper industries. For this reason, the use of regenerative wet gas scrubber is favored over non-regenerative wet gas scrubber.

One example of a regenerative scrubber is the proprietary LABSORB offered by BELCO Technologies Corporation. [5, 6] The LABSORB scrubbing process uses a patented non-organic aqueous solution of sodium phosphate salts as a buffer. This buffer is made from two common available products, caustic and phosphoric acid. The LABSORB scrubbing system is capable of reducing SOx to below 25 ppmv. The LABSORB system consists of: 1) a quench pre-scrubber; 2) an absorber; and, 3) a regeneration section which typically includes a stripper and a heat exchanger.

In the scrubbing side of the regenerative scrubbing system, the quench pre-scrubber is used to wash out any large particles that are carried over, plus any acid components in the flue gas such as hydrofluoric acid (HF), hydrochloric acid, and SO3. The absorption of SO2 is carried out in the absorber. The absorber typically consists of one single, high-efficiency packed bed scrubber filled with high-efficiency structural packing material. However, if the inlet SO2 concentration is low, a multiple-staged packed bed scrubber, or a spray-and-plate tower scrubber, may be used instead to achieve an outlet SO2 concentration of less than 25 ppmv.

The third step in the regenerative wet gas scrubbing system is the regenerative section in which the SO2-rich buffer stream is steam heated to evaporate the water from the buffer. The buffer stream is then sent to a stripper/condenser unit to separate the SO2 from the buffer. The buffer free of SO2 is returned to the buffer mixing tank while the condensed-SO2 gas stream is sent back to the SRU for further treatment.

[5] *Evaluating Wet Scrubbers*, Edwin H. Weaver of BELCO Technologies Corporation, Petroleum Technology Quarterly, Quarter 3, 2006.

[6] *A Logical and Cost Effective Approach for Reducing Refinery FCCU Emissions.* S.T. Eagleson, G. Billemeyer, N. Confuorto, and E. H. Weaver of BELCO, and S. Singhania and N. Singhania of Singhania Technical Services Pvt., India, Presented at PETROTECH 6th International Petroleum Conference in India, January 2005.

Dry Gas Scrubbers

Dry gas scrubbers are used to control SOx emissions and can be installed to control emissions from cement kilns and coal-fired boilers, container glass melting furnaces, and refinery boilers and heaters. In dry gas scrubbers, a dry calcium- and sodium-based alkaline powdered sorbent is used to absorb SO2 from the flue (outlet) gas stream. There are two types of dry scrubbers: 1) spray dryer scrubbers; and, 2) dry injection scrubbers.

A spray dryer scrubber is configured so that the reaction between SO2 in the flue gas and the dry sorbent takes place in a separate, dedicated reactor (or scrubber). A dry injection scrubber is configured so that the sorbent is injected directly via multiple injection ports into the SO2-producing equipment or ducting system. Spray dryer scrubbers can achieve about 80 percent to 90 percent SO2 removal efficiency, while dry injection scrubbers can achieve about 50 percent to 80 percent SO2 removal efficiency.

Dry gas scrubbers require high temperatures in the range of 1,800 ^{o}F to 2,000 ^{o}F in order to decompose the sorbent into porous solids with high adsorbing surface area to ensure efficient SO2 removal. Because particulates are formed during the dry gas scrubbing process, cyclones and ESPs are additional control equipment units that are typically installed downstream of a dry scrubber.

SOx Reducing Additives

To help reduce condensable particulate matter from sulfur, SOx reducing catalysts are used for reducing the production of SOx by-products in FCCUs. SOx reducing catalyst is a metal oxide compound such as aluminum oxide (Al_2O_3), magnesium oxide (MgO), vanadium pentoxide (V_2O_5) or a combination of the three that is added to the FCCU catalyst as it circulates throughout the reactor. In the regenerator of the FCCU, sulfur bearing coke is burned and SO2, CO, and CO2 by-products are formed. A portion of SO2 will react with excess oxygen and form SO3 which will either stay in the flue gas or react with the metal oxide in the SOx reducing catalyst to form metal sulfate. In the FCCU reactor, the metal sulfate will react with hydrogen to form either metal sulfide and water, or more metal oxide. In the steam stripper section of the FCCU reactor, metal sulfide reacts with steam to form metal oxide and hydrogen sulfide. The net effect of these reactions is that the quantity of SOx in the regenerator is typically reduced between 40 to 65 percent while the quantity of hydrogen sulfide (H_2S) in the reactor is increased. Generally, the increase in H_2S is handled by sulfur recovery processes located elsewhere within the refinery.

Fuel Gas Treatment

Currently, SCAQMD Rule 431.1 – Sulfur Content of Gaseous Fuels, limits the sulfur content in refinery fuel gas to 40 ppmv sulfur. This limit has already been incorporated in the SOx RECLAIM allocations and resulted in an emission factor of 6.76 pounds of SOx per million cubic feet of refinery gas. However, the sulfur content in refinery fuel gas may be further reduced to a range between 25 ppmv and 35 ppmv and the outlet SOx concentrations from refinery boilers and process heaters may also be limited to less than 20 ppmv by implementing efficiency improvements to fuel gas treatment.

Refinery fuel gas, commonly used for operating refinery process heaters and boilers, is treated in various acid gas processing units such as an amine or Merox treating unit for removal of sour components such as hydrogen sulfide, carbonyl sulfide, mercaptan, and ammonia. Lean amine is generally used as an absorbent. At the end of the process, the lean amine is regenerated to form

rich amine, and H2S is recovered in acid gas which is then fed to the sulfur recovery unit/tail gas treatment unit for more processing. By improving the efficiency of the amine treating unit to recover more sulfur from the inlet acid gas stream, the sulfur content in the refinery fuel gas at the outlet, and subsequently the SOx emissions from boilers and heaters that use these refinery fuel gases can be reduced.

Selective Oxidation Catalyst

EmeraChem Power LLC markets a proprietary catalytic gas treatment called selective oxidation catalyst "ESx" that is typically used as a sulfur reducing agent in conjunction with its "EMx NOx trap" catalyst to treat combustion exhaust gases from incinerators, process heaters, turbines and boilers. The ESx catalyst can also be used as part of SOx reduction for sulfur recovery units/tail gas treatment units. The ESx catalyst can reduce multiple sulfur species, including SO2, SO3, and H2S from the tail gas stream while also removing CO, VOC, and PM10 emissions. ESx catalyst is a platinum group metal catalyst that stores sulfur species and simultaneously assists in the catalytic oxidation of CO and VOCs. The ESx units are typically outfitted with multiple chambers such that at least one chamber is always in regeneration while the other units are working to store SOx. In the storage process, SO2 is oxidized to SO3 and is stored by EmeraChem's sorber. The catalyst regeneration process releases sulfur as SO2.

ALTERNATIVES

The Draft EA will discuss and compare alternatives to the proposed project as required by CEQA and by SCAQMD Rule 110. Alternatives must include realistic measures for attaining the basic objectives of the proposed project and provide a means for evaluating the comparative merits of each alternative. In addition, the range of alternatives must be sufficient to permit a reasoned choice and it need not include every conceivable project alternative. The key issue is whether the selection and discussion of alternatives fosters informed decision making and public participation. A CEQA document need not consider an alternative whose effect cannot be reasonably ascertained and whose implementation is remote and speculative.

SCAQMD Rule 110 does not impose any greater requirements for a discussion of project alternatives in an environmental assessment than is required for an Environmental Impact Report under CEQA. Alternatives will be developed based in part on the major components of the proposed rule. The rationale for selecting alternatives rests on CEQA's requirement to present "realistic" alternatives; that is alternatives that can actually be implemented. CEQA also requires an evaluation of a "No Project Alternative."

SCAQMD's policy document Environmental Justice Program Enhancements for fiscal year (FY) 2002-03, Enhancement II-1 recommends that all SCAQMD CEQA assessments include a feasible project alternative with the lowest air toxics emissions. In other words, for any major equipment or process type under the scope of the proposed project that creates a significant environmental impact, at least one alternative, where feasible, shall be considered from a "least harmful" perspective with regard to hazardous air emissions.

The Governing Board may choose to adopt any portion or all of any alternative presented in the EA. The Governing Board is able to adopt any portion or all of any of the alternatives presented because the impacts of each alternative will be fully disclosed to the public and the public will have the opportunity to comment on the alternatives and impacts generated by each alternative.

Written suggestions on potential project alternatives received during the comment period for the Initial Study will be considered when preparing the Draft EA.

CHAPTER 2 - ENVIRONMENTAL CHECKLIST

Introduction

General Information

Potentially Significant Impact Areas

Determination

Environmental Checklist and Discussion

INTRODUCTION

The environmental checklist provides a standard evaluation tool to identify a project's adverse environmental impacts. This checklist identifies and evaluates potential adverse environmental impacts that may be created by adopting the proposed amendments to Regulation XX.

GENERAL INFORMATION

Project Title:	Proposed Amended Regulation XX – Regional Clean Air Incentives Market (RECLAIM)
Lead Agency Name:	South Coast Air Quality Management District
Lead Agency Address:	21865 Copley Drive, Diamond Bar, CA 91765
CEQA Contact Person:	Barbara Radlein, (909) 396-2716
Rule Contact Person:	Minh Pham, (909) 396-2613
Project Sponsor's Name:	South Coast Air Quality Management District
Project Sponsor's Address:	21865 Copley Drive, Diamond Bar, CA 91765
General Plan Designation:	Not applicable
Zoning:	Not applicable
Description of Project:	SCAQMD staff is proposing amendments to Regulation XX – Regional Clean Air Incentives Market (RECLAIM), Rule 2002 – Allocations for Oxides of Nitrogen (NOx) and Oxides of Sulfur (SOx), to reduce the allowable SOx emission limits based on current Best Available Retrofit Control Technology (BARCT) for the following industrial equipment and processes: 1) fluid catalytic cracking units (FCCUs); 2) refinery boilers and heaters; 3) sulfur recovery – tail gas treatment units; 4) sulfuric acid manufacturing process; 5) container glass manufacturing process; 6) coke calcining; and, 7) portland cement manufacturing. Additional amendments are proposed to establish procedures and criteria for reducing RECLAIM Trading Credits (RTCs) and RTC adjustment factors for year 2013 and later. Other minor changes are proposed for clarity and consistency throughout the regulation. The Initial Study identifies the topics of aesthetics, air quality, energy, hydrology and water quality, hazards and hazardous materials, and transportation/traffic as areas that may be adversely affected by the proposed project. Impacts to these environmental areas will be further analyzed in the Draft EA.
Surrounding Land Uses and Setting:	Residential, but primarily commercial, industrial and/or institutional
Other Public Agencies Whose Approval is Required:	Not applicable

POTENTIALLY SIGNIFICANT IMPACT AREAS

The following environmental impact areas have been assessed to determine their potential to be affected by the proposed project. Any checked items represent areas that may be adversely affected by the proposed project. An explanation relative to the determination of impacts can be found following the checklist for each area.

☑	Aesthetics	☐	Geology and Soils	☐	Population and Housing
☐	Agricultural Resources	☑	Hazards and Hazardous Materials	☐	Public Services
☑	Air Quality	☑	Hydrology and Water Quality	☐	Recreation
☐	Biological Resources	☐	Land Use and Planning	☐	Solid/Hazardous Waste
☐	Cultural Resources	☐	Mineral Resources	☑	Transportation/Traffic
☑	Energy	☐	Noise	☑	Mandatory Findings

DETERMINATION
On the basis of this initial evaluation:

☐ I find the proposed project, in accordance with those findings made pursuant to CEQA Guideline §15252, COULD NOT have a significant effect on the environment, and that an ENVIRONMENTAL ASSESSMENT with no significant impacts has been prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will NOT be significant effects in this case because revisions in the project have been made by or agreed to by the project proponent. An ENVIRONMENTAL ASSESSMENT with no significant impacts will be prepared.

☑ I find that the proposed project MAY have a significant effect(s) on the environment, and an ENVIRONMENTAL ASSESSMENT will be prepared.

☐ I find that the proposed project MAY have a "potentially significant impact" on the environment, but at least one effect 1)has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL ASSESSMENT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier ENVIRONMENTAL ASSESSMENT pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier ENVIRONMENTAL ASSESSMENT, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Date: June 18, 2009 **Signature:** Steve Smith

Steve Smith, Ph.D.
Program Supervisor, CEQA Section
Planning, Rules, and Area Sources

ENVIRONMENTAL CHECKLIST AND DISCUSSION

Since SOx is a precursor pollutant to fine particulate matter as PM10 and PM2.5, SCAQMD staff is proposing amendments to Regulation XX – RECLAIM to achieve additional SOx emission reductions as outlined in the 2007 AQMP. Specifically, amendments are proposed to SCAQMD Rule 2002, to address BARCT requirements, which may require installation or modification of SOx emission control equipment. Other changes proposed are administrative in nature and include minor clarifications for continuity.

The amendments proposed in Rule 2002 for the overall reductions in SOx RTC allocations, which include the anticipated feasible SOx emissions reductions due to compliance with proposed BARCT requirements, are expected to involve physical changes at affected facilities which may cause potentially significant impacts to the following environmental topics: aesthetics, air quality, energy, hydrology and water quality, hazards and hazardous materials, and transportation/traffic. Therefore, the type of emission reduction projects that may be undertaken to comply with the proposed project, primarily the reduced total amounts of SOx credits available in the RECLAIM program, are the main focus of the analysis in this Initial Study.

Preliminary review of the SCAQMD's RECLAIM database indicates that certain equipment at 12 SOx RECLAIM facilities are currently not operating at proposed BARCT levels. This analysis assumes that operators at RECLAIM facilities will elect to reduce emissions at their facilities through further control of emissions from equipment not operating at BARCT rather than purchasing SOx RTCs, as is currently allowed under the RECLAIM program. The rationale for this assumption is that controlling emissions from equipment not operating at BARCT will be the most cost effective approach and produces the most conservative analysis of secondary adverse environmental impacts.

The physical changes involved with the type of emission control strategies that are expected to occur focus on the installation of new or the modification of existing control equipment at the following stationary sources of SOx: petroleum coke calciners, cement kilns, coal-fired boiler, container glass melting furnaces, diesel combustion of liquid fuels, FCCUs, refinery boilers and process heaters, sulfur recovery units/tail gas treatment units, and sulfuric acid manufacturing facilities. To control SOx emissions from these sources, the following technologies are proposed as BARCT: wet gas scrubbers, dry gas scrubbers, hybrid dry gas scrubber (dry gas scrubber plus a baghouse), SOx reducing catalysts, fuel gas treatment, and selective oxidation catalyst treatment.

		Potentially Significant Impact	Less Than Significant Impact	No Impact
I.	**AESTHETICS.** Would the project:			
a)	Have a substantial adverse effect on a scenic vista?	☐	☐	☑
b)	Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☑
c)	Substantially degrade the existing visual character or quality of the site and its surroundings?	☑	☐	☐
d)	Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☑	☐

Significance Criteria

The proposed project impacts on aesthetics will be considered significant if:

- The project will block views from a scenic highway or corridor.
- The project will adversely affect the visual continuity of the surrounding area.
- The impacts on light and glare will be considered significant if the project adds lighting which would add glare to residential areas or sensitive receptors.

Discussion

I. a), & b) Implementation of the proposed project is expected to involve construction activities related to the modification of existing equipment at the top 12 SOx emitting RECLAIM facilities. The distribution of these SOx RECLAIM facilities is as follows: six are oil refineries, two are sulfuric acid manufacturing plants, one is a coke calciner plant, one is a cement manufacturing plant, and two are container glass manufacturing plants.

The physical changes involved with the type of SOx emission control strategies that are expected focus on the installation of new or the modification of existing control equipment at the following stationary sources of SOx: petroleum coke calciners, cement kilns, coal-fired boiler, container glass melting furnaces, diesel combustion of liquid fuels, FCCUs, refinery boilers and process heaters, sulfur recovery units/tail gas treatment units, and sulfuric acid manufacturing facilities. To control SOx emissions from these sources, the following technologies are proposed as BARCT: wet gas scrubbers, dry gas scrubbers, hybrid dry gas scrubber (dry gas scrubber plus a baghouse), SOx reducing catalysts, fuel gas treatment, and selective oxidation catalyst treatment.

Construction activities are expected as part of the proposed project. However, the construction activities are not expected to adversely impact views and aesthetics resources since most of the heavy equipment and activities are expected to occur within the confines of each existing facility and are expected to introduce only minor visual changes to areas outside each facility, if at all, depending on the location of the construction activities within the facility. Except for the use of cranes, the majority of the construction equipment is expected to be low in height and not

substantially visible to the surrounding area due to existing fencing along the property lines and existing structures currently within the facilities that would buffer the views of the construction activities. Further, the construction activities are expected to be temporary in nature and will cease following completion of the equipment installation or modifications.

Depending on the type of SOx emissions control employed, the proposed project could potentially introduce minor visual changes at some facilities. The affected units, depending upon their locations within each facility, could potentially be visible to areas outside of each facility. However, the affected units are expected to be about the same size profile as existing equipment present at each affected facility. The general appearance of the affected units is not expected to differ significantly from other equipment units such that no significant impacts to aesthetics are expected. Further, no scenic highways or corridors are located in the vicinities of the affected facilities such that the proposed project would not obstruct scenic resources or degrade the existing visual character of a site, including but not limited to, trees, rock outcroppings, or historic buildings.

I. c) All construction and operational activities associated with the proposed project are expected to take place within the boundaries of the existing RECLAIM facilities. The new equipment to be installed, or the existing equipment to be modified as part of the proposed project, will be similar in size, appearance, and profile to the existing equipment, with the exception of any installation of a wet gas scrubber

Except for the use of cranes, the majority of construction equipment that will be used to comply with the proposed project will be low in height and will not be visible to the surrounding areas due to the presence of existing fences and other structures that buffer views. During construction, cranes may be visible to the surrounding areas. Since the construction activities are temporary in nature, all construction equipment will be removed following completion of the proposed project.

Wet gas scrubber technology is potentially BARCT for six oil refineries (for six FCCUs and six sulfur recovery units/tail gas treatment units), two sulfuric acid manufacturing plants, one coke calciner plant, one cement manufacturing plant, and two container glass manufacturing plants. Upon completion of construction of all of these wet gas scrubbers, the operational activities of these units will emit flue gas that is saturated with water, forming a visible steam plume from a relatively high flue gas stack (approximately 200 feet above grade). Each stack and subsequent plume will have the potential to generate significant aesthetic impacts. Therefore, these potential impacts to aesthetics will be addressed in the Draft Environmental Assessment (EA) for the proposed project.

I. d) There are no components in the proposed project that would require construction activities to occur at night. Therefore, no additional lighting at the affected facilities would be required as a result of complying with the proposed project. However, if facility operators determine that the construction schedule requires nighttime activities, temporary lighting may be required. Nonetheless, since construction of the proposed project would be completely located within the boundaries of each affected facility, additional temporary lighting is not expected to be discernable from the existing permanent night lighting.

Additional permanent light sources may be installed on any installation of new equipment, to provide illumination for operations personnel at night, in accordance with applicable safety standards. Similarly, any existing equipment that would be modified as part of the proposed project are located in existing structures or areas that already have lighting systems in place for the same reasons. These additional light sources are not expected to create an impact because each component of the proposed project will be located within an existing industrial facility that operates up to 24 hours per day and the equipment is not restricted to operate during a specific time of day. The proposed project contains no provisions that would require affected equipment to operate differently during existing daytime or nighttime operations. Further, any new lighting that will be installed on the proposed equipment will be consistent in intensity and type with the existing lighting on equipment and other structures within each affected facility. While residential areas are located near some of the affected facilities, any additional lighting will be placed by and focused on the new equipment. For the aforementioned reasons, the proposed project is not expected to create a new source of substantial light or glare that would adversely affect day or nighttime views in the area. Therefore, less than significant impacts to light and glare are expected from the proposed project.

Based upon these considerations, significant adverse impacts to aesthetics are expected from the implementation of the proposed project and will be further analyzed in the Draft EA.

		Potentially Significant Impact	Less Than Significant Impact	No Impact
II.	**AGRICULTURE RESOURCES.** Would the project:			
a)	Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☑
b)	Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☑
c)	Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☑

Significance Criteria

Project-related impacts on agricultural resources will be considered significant if any of the following conditions are met:

- The proposed project conflicts with existing zoning or agricultural use or Williamson Act contracts.

- The proposed project will convert prime farmland, unique farmland or farmland of statewide importance as shown on the maps prepared pursuant to the farmland mapping and monitoring program of the California Resources Agency, to non-agricultural use.
- The proposed project would involve changes in the existing environment, which due to their location or nature, could result in conversion of farmland to non-agricultural uses.

Discussion

II. a), b), & c) All construction and operational activities that would occur as a result of implementing the proposed project are expected to occur within the confines of the existing affected facilities. The proposed project would be consistent with the commercial, industrial and institutional zoning requirements for the various facilities and there are no agricultural resources or operations on or near the affected facilities. No agricultural resources including Williamson Act contracts are located within or would be impacted by construction activities at the affected facilities. Therefore, the proposed project would not result in any new construction of buildings or other structures that would convert farmland to non-agricultural use or conflict with zoning for agricultural use or a Williamson Act contract. Since the proposed project would not substantially change the facility or process for which the affected units are utilized, there are no provisions in the proposed project that would affect land use plans, policies, or regulations. Land use and other planning considerations are determined by local governments and no land use or planning requirements relative to agricultural resources will be altered by the proposed project

Based upon these considerations, significant agricultural resource impacts are not expected from the implementation of the proposed project and will not be further analyzed in the Draft EA.

	Potentially Significant Impact	**Less Than Significant Impact**	**No Impact**
III. AIR QUALITY. Would the project:			
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☑
b) Violate any air quality standard or contribute to an existing or projected air quality violation?	☑	☐	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?	☑	☐	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☑	☐	☐

	Potentially Significant Impact	Less Than Significant Impact	No Impact
e) Create objectionable odors affecting a substantial number of people?	☐	☑	☐
f) Diminish an existing air quality rule or future compliance requirement resulting in a significant increase in air pollutant(s)?	☐	☐	☑

Significance Criteria
To determine whether or not air quality impacts from the proposed project may be significant, impacts will be evaluated and compared to the criteria in Table 2-1. If impacts exceed any of the criteria in Table 2-1, they will be considered further in the Draft EA. As necessary, all feasible mitigation measures will be identified in the Draft EA and implemented to reduce significant impacts to the maximum extent feasible.

Discussion
Upon initial examination of the proposed project, the main focus of this analysis pertains to establishing BARCT for the following top 12 stationary sources in the SOx RECLAIM program: petroleum coke calciners, cement kilns, coal-fired boiler, container glass melting furnaces, diesel combustion of liquid fuels, FCCUs, refinery boilers and process heaters, sulfur recovery units/tail gas treatment units, and sulfuric acid manufacturing facilities. To control SOx emissions from these sources, the following technologies are proposed as BARCT: wet gas scrubbers, dry gas scrubbers, hybrid dry gas scrubber (dry gas scrubber plus a baghouse), SOx reducing catalysts, fuel gas treatment, and selective oxidation catalyst treatment. The physical changes involved with the type of SOx emission control strategies that are expected to occur focus on the installation of new or the modification of existing control equipment. The possibility of these types of SOx control technologies being used to comply with the proposed project and potential secondary adverse air quality impacts they may generate will be further evaluated in the Draft EA. The remaining portions of the proposed project are procedural in nature and will not result in an adverse air quality impact.

III. a) The SCAQMD is required by law to prepare a comprehensive district-wide AQMP which includes strategies (e.g., control measures) to reduce emission levels to achieve and maintain state and federal ambient air quality standards, and to ensure that new sources of emissions are planned and operated to be consistent with the SCAQMD's air quality goals. The AQMP's air pollution reduction strategies include control measures which target stationary, mobile and indirect sources. These control measures are based on feasible methods of attaining ambient air quality standards. Pursuant to the provisions of both the state and federal Clean Air Acts, the SCAQMD is required to attain the state and federal ambient air quality standards for all criteria pollutants, including PM10 and PM2.5. Although the District is currently classified as attainment for both state and federal SO2 ambient air quality standards, SOx is a precursor pollutant to PM10 and PM2.5. The proposed project implements AQMP Control Measure CM #2007CMB-02 which will bring the SOx RECLAIM program up-to-date with the latest BARCT

Table 2-1
SCAQMD Air Quality Significance Thresholds

Mass Daily Thresholds [a]		
Pollutant	**Construction [b]**	Operation [c]
NOx	100 lbs/day	55 lbs/day
VOC	75 lbs/day	55 lbs/day
PM10	150 lbs/day	150 lbs/day
PM2.5	55 lbs/day	55 lbs/day
SOx	150 lbs/day	150 lbs/day
CO	550 lbs/day	550 lbs/day
Lead	3 lbs/day	3 lbs/day
Toxic Air Contaminants (TACs) and Odor Thresholds		
TACs (including carcinogens and non-carcinogens)	Maximum Incremental Cancer Risk ≥ 10 in 1 million Hazard Index ≥ 1.0 (project increment)	
Odor	Project creates an odor nuisance pursuant to SCAQMD Rule 402	
Ambient Air Quality for Criteria Pollutants [d]		
NO2 1-hour average annual average	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards: 0.25 ppm (state) 0.053 ppm (federal)	
PM10 24-hour average annual geometric average annual arithmetic mean	10.4 $\mu g/m^3$ (construction)[e] & 2.5 $\mu g/m^3$ (operation) 1.0 $\mu g/m^3$ 20 $\mu g/m^3$	
PM2.5 24-hour average	10.4 $\mu g/m^3$ (construction)[e] & 2.5 $\mu g/m^3$ (operation)	
Sulfate 24-hour average	1 $\mu g/m^3$	
CO 1-hour average 8-hour average	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards: 20 ppm (state) 9.0 ppm (state/federal)	

[a] Source: SCAQMD CEQA Handbook (SCAQMD, 1993)
[b] Construction thresholds apply to both the South Coast Air Basin and Coachella Valley (Salton Sea and Mojave Desert Air Basins).
[c] For Coachella Valley, the mass daily thresholds for operation are the same as the construction thresholds.
[d] Ambient air quality thresholds for criteria pollutants based on SCAQMD Rule 1303, Table A-2 unless otherwise stated.
[e] Ambient air quality threshold based on SCAQMD Rule 403.

KEY: lbs/day = pounds per day; ppm = parts per million; $\mu g/m^3$ = microgram per cubic meter; ≥ greater than or equal to

requirements to achieve, at a minimum, the proposed SOx emission reductions in CM #2007CMB-02 (at least 2.9 tons per day by compliance year 2014). Therefore, the proposed project will not obstruct or conflict with the implementation of the AQMP.

Although the proposed project has the potential to temporarily increase VOC, NOx, CO, PM10 and TAC emissions (as diesel PM) that could exceed the air quality significance thresholds for construction activities, the proposed project is not expected to interfere with achieving at least 2.9 tons per day of SOx emission reductions by the year 2014, which is consistent with the goals of the 2007 AQMP to achieve additional SOx emission reductions (and reduce SOx precursors as PM 2.5 and PM10) from stationary sources, which will assist in attaining state and federal PM2.5 and PM10 ambient air quality standards. Further, the temporary increase in VOC, NOx, CO, PM10 and TAC emissions (as diesel PM) due to construction is not expected to impede the emission reduction goals of the 2007 AQMP because the inventory prepared for the 2007 AQMP already takes into account the future emission estimates from all construction activities associated with implementing the proposed control measures[7]. Further, implementation of all other SCAQMD SOx rules along with AQMP control measures, when considered together, is expected to reduce SOx emissions throughout the region overall by 2020. Therefore, implementing the proposed project will not conflict or obstruct implementation of the AQMP.

III. b) The objective of the proposed project is to reduce SOx emissions from the following top 12 stationary sources in the SOx RECLAIM program: petroleum coke calciners, cement kilns, coal-fired boiler, container glass melting furnaces, diesel combustion of liquid fuels, FCCUs, refinery boilers and process heaters, sulfur recovery units/tail gas treatment units, and sulfuric acid manufacturing facilities. The proposed project is estimated to reduce emissions, at a minimum, of up to 2.9 tons per day of SOx by 2014 from these affected units. Compliance with the proposed project is expected to be achieved by the following SOx control technologies: wet gas scrubbers, dry gas scrubbers, hybrid dry gas scrubber (dry gas scrubber plus a baghouse), SOx reducing catalysts, fuel gas treatment, and selective oxidation catalyst treatment.

Implementation of the proposed project is expected to involve construction activities related to the installation or modification of the aforementioned SOx control technologies at 12 industrial facilities. The proposed project may also involve the construction of new buildings or other structures as part of installation or modification of the SOx controls. Construction-related activities are also expected to generate emissions from worker vehicles, trucks, and construction equipment. Due to the large scale of construction that would be expected from implementing the proposed project, project-specific construction emissions are potentially significant.

While the operational-related activities are expected to reduce emissions of SOx, a simultaneous increase in emissions of other criteria pollutants such as NOx and VOCs are expected from operations of stationary support equipment associated with the installed or modified SOx control equipment, as well as operational emissions associated with periodic truck deliveries of supplies needed to operate the SOx control equipment. Thus, the air quality impacts associated with the construction and operational phases of the proposed project are potentially significant and will be evaluated in the Draft EA.

[7] SCAQMD's Final Program Environmental Impact Report for the 2007 Air Quality Management Plan, SCH#2006111064, June 2007.

III. c) The anticipated SOx emission reductions that would result from implementing the proposed project are expected to improve the overall air quality in the Basin by enhancing the probability of attaining and maintaining state and federal ambient air quality standards for PM10 and PM2.5. However, the secondary construction and operation impacts associated with reducing SOx have the potential for creating significant adverse cumulative air quality impacts that will be evaluated in the Draft EA. In addition, operational activities associated with the proposed project also have the potential to increase emissions of greenhouse gases (GHGs); these potential increases will be evaluated in the Draft EA as part of the cumulative impacts discussion.

III. d) Emission sources associated with the construction-related activities as a result of implementing the proposed project may temporarily emit toxic air contaminants (TACs). Further, emissions sources associated with the operational-related activities as a result of implementing the proposed project may emit TACs. The impact of these emissions on sensitive populations, including individuals at hospitals, nursing facilities, daycare centers, schools, and elderly intensive care facilities, as well as residential and off-site occupational areas, will be evaluated in the Draft EA.

III. e) The proposed project is not expected to create significant adverse objectionable odors, either during construction or during operations. Sulfur compounds such as hydrogen sulfide, sulfur dioxide, sulfur trioxide, and sulfuric acid are the primary sources of odors from existing operations throughout the 12 affected SOx RECLAIM facilities. However, the objective of the proposed project is to implement BARCT which is expected to result in the installation of SOx controls and the reduction of sulfur-laden compounds that could otherwise generate odors. In other words, the proposed project is expected to reduce odor generation potential, a beneficial result of implementing the proposed project. Therefore, no significant odor impacts are expected from the proposed project.

III. f) The proposed project will be required to comply with all applicable SCAQMD, CARB, and EPA rules and regulations. Thus, the proposed project is not expected to diminish an existing air quality rule or future compliance requirements. Further, adopting and implementing the proposed project enhances existing air pollution control rules that are expected to assist the SCAQMD in its efforts to attain and maintain with a margin of safety the state and federal ambient air quality standards for PM10 and PM2.5.

Based upon these considerations, the air quality impacts associated with increased emissions of criteria air contaminants and GHGs during the construction phase and the increased emissions of GHGs during the operation phase of the proposed project will be evaluated further in the Draft EA.

	Potentially Significant Impact	Less Than Significant Impact	No Impact
IV. BIOLOGICAL RESOURCES. Would the project:			
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☑
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☑
c) Have a substantial adverse effect on federally protected wetlands as defined by §404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☑
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☑
e) Conflicting with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☑
f) Conflict with the provisions of an adopted Habitat Conservation plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☑

Significance Criteria

Impacts on biological resources will be considered significant if any of the following criteria apply:

- The project results in a loss of plant communities or animal habitat considered to be rare, threatened or endangered by federal, state or local agencies.
- The project interferes substantially with the movement of any resident or migratory wildlife species.
- The project adversely affects aquatic communities through construction or operation of the project.

Discussion

IV. a), b), c), & d) The proposed project would only affect units operating at 12 existing facilities located throughout the district. All of the affected units operating at existing facilities are located primarily in industrial areas, which have already been greatly disturbed. These areas currently do not support riparian habitat, federally protected wetlands, or migratory corridors. Additionally, special status plants, animals, or natural communities are not expected to be found within close proximity to the affected facilities. Therefore, the proposed project would have no direct or indirect impacts that could adversely affect plant or animal species or the habitats on which they rely in the SCAQMD's jurisdiction. The current and expected future land use development to accommodate population growth is primarily due to economic considerations or local government planning decisions. A conclusion in the Program Environmental Impact Report (EIR) for the 2007 AQMP was that population growth in the region would have greater adverse effects on plant species and wildlife dispersal or migration corridors in the basin than SCAQMD regulatory activities, (e.g., air quality control measures or regulations). The current and expected future land use development to accommodate population growth is primarily due to economic considerations or local government planning decisions.

IV. e) & f) The proposed project is not envisioned to conflict with local policies or ordinances protecting biological resources or local, regional, or state conservation plans. Land use and other planning considerations are determined by local governments and no land use or planning requirements will be altered by the proposed project. Additionally, the proposed project will not conflict with any adopted Habitat Conservation Plan, Natural Community Conservation Plan, or any other relevant habitat conservation plan, and would not create divisions in any existing communities because all activities associated with complying with the proposed project will occur at existing industrial facilities.

Based upon these considerations, significant biological resource impacts are not expected from the implementation of the proposed project and will not be further analyzed in the Draft EA.

		Potentially Significant Impact	Less Than Significant Impact	No Impact
V.	**CULTURAL RESOURCES.** Would the project:			
a)	Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☑
b)	Cause a substantial adverse change in the significance of an archaeological resource as defined in §15064.5?	☐	☐	☑
c)	Directly or indirectly destroy a unique paleontological resource, site, or feature?	☐	☐	☑
d)	Disturb any human remains, including those interred outside a formal cemeteries?	☐	☐	☑

Significance Criteria
Impacts to cultural resources will be considered significant if:
- The project results in the disturbance of a significant prehistoric or historic archaeological site or a property of historic or cultural significance to a community or ethnic or social group.
- Unique paleontological resources are present that could be disturbed by construction of the proposed project.
- The project would disturb human remains.

Discussion
V. a) There are existing laws in place that are designed to protect and mitigate potential impacts to cultural resources. Since construction-related activities associated with the implementation of the proposed project are expected to be confined within the existing footprint of the 12 affected facilities, no impacts to historical resources are expected to occur as a result of implementing the proposed project.

V. b), c), & d) Installing or modifying add-on controls and other associated equipment to comply with the proposed project will require disturbance of previously disturbed areas at 12 existing industrial facilities. However, since construction-related activities are expected to be confined within the existing footprint of these affected facilities, the proposed project is not expected to require physical changes to the environment, which may disturb paleontological or archaeological resources. Furthermore, it is envisioned that these areas are already either devoid of significant cultural resources or whose cultural resources have been previously disturbed. Therefore, the proposed project has no potential to cause a substantial adverse change to a historical or archaeological resource, directly or indirectly destroy a unique paleontological resource or site or unique geologic feature, or disturb any human remains, including those interred outside a formal cemeteries. The proposed project is, therefore, not anticipated to result in any activities or promote any programs that could have a significant adverse impact on cultural resources in the district.

Based upon these considerations, significant cultural resources impacts are not expected from the implementation of the proposed project and will not be further analyzed in the Draft EA.

		Potentially Significant Impact	Less Than Significant Impact	No Impact
VI.	**ENERGY.** Would the project:			
a)	Conflict with adopted energy conservation plans?	☐	☐	☑
b)	Result in the need for new or substantially altered power or natural gas utility systems?	☑	☐	☐
c)	Create any significant effects on local or regional energy supplies and on requirements for additional energy?	☑	☐	☐

		Potentially Significant Impact	Less Than Significant Impact	No Impact
d)	Create any significant effects on peak and base period demands for electricity and other forms of energy?	☑	☐	☐
e)	Comply with existing energy standards?	☐	☐	☑

Significance Criteria

Impacts to energy and mineral resources will be considered significant if any of the following criteria are met:

- The project conflicts with adopted energy conservation plans or standards.
- The project results in substantial depletion of existing energy resource supplies.
- An increase in demand for utilities impacts the current capacities of the electric and natural gas utilities.
- The project uses non-renewable resources in a wasteful and/or inefficient manner.

Discussion

The proposed project would reduce emissions of SOx from various stationary sources at 12 affected facilities. The expected options for compliance are either installing or modifying air pollution control equipment appropriate to the type of process unit. Further, it is expected that the installation and operation of any equipment used to comply with the proposed project will also comply with all applicable existing energy standards.

VI. a) & e) The proposed project is not subject to any existing energy conservation plans. If a facility that is subject to Regulation XX and the proposed project is also subject to energy conservation plans, it is not expected that the proposed project will affect in any way or interfere with that facility's ability to comply with its energy conservation plan or energy standards. Further, project construction and operation activities will not utilize non-renewable energy resources in a wasteful or inefficient manner.

VI. b), c) & d. Installation or modification of air pollution control equipment to comply with the proposed project is expected to increase demand for energy used for operating the primary equipment as well as support equipment such as pumps, fans, controllers, et cetera.

Any additional electricity required is typically either supplied by each affected facility's cogeneration units, for those that have them, or by the local electrical utility, as appropriate. It is possible that some facilities may need new or substantially altered power utility systems to be built to accommodate any additional electricity demands created by the proposed project. In some cases, an increase in natural gas use is also expected for operations subject to the proposed project.

Based upon these considerations, significant adverse impacts to energy are expected from implementation of the proposed project and will be evaluated further in the Draft EA.

	Potentially Significant Impact	Less Than Significant Impact	No Impact
VII. GEOLOGY AND SOILS. Would the project:			
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:			
• Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault?	☐	☐	☑
• Strong seismic ground shaking?	☐	☐	☑
• Seismic–related ground failure, including liquefaction?	☐	☐	☑
• Landslides?	☐	☐	☑
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☑
c) Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☑
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☑
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☑

Significance Criteria

Impacts on the geological environment will be considered significant if any of the following criteria apply:

- Topographic alterations would result in significant changes, disruptions, displacement, excavation, compaction or over covering of large amounts of soil.
- Unique geological resources (paleontological resources or unique outcrops) are present that could be disturbed by the construction of the proposed project.
- Exposure of people or structures to major geologic hazards such as earthquake surface rupture, ground shaking, liquefaction or landslides.
- Secondary seismic effects could occur which could damage facility structures, e.g., liquefaction.

- Other geological hazards exist which could adversely affect the facility, e.g., landslides, mudslides.

Discussion

VII. a) Since the proposed project would result in construction activities at 12 industrial settings to install or modify SOx control equipment, little site preparation is anticipated that could adversely affect geophysical conditions in the jurisdiction of the SCAQMD. Southern California is an area of known seismic activity. Accordingly, the installation of add-on controls at existing affected facilities to comply with the proposed project is expected to conform to the Uniform Building Code and all other applicable state and local building codes. As part of the issuance of building permits, local jurisdictions are responsible for assuring that the Uniform Building Code is adhered to and can conduct inspections to ensure compliance. The Uniform Building Code is considered to be a standard safeguard against major structural failures and loss of life. The basic formulas used for the Uniform Building Code seismic design require determination of the seismic zone and site coefficient, which represents the foundation condition at the site. The Uniform Building Code requirements also consider liquefaction potential and establish stringent requirements for building foundations in areas potentially subject to liquefaction. Thus, the proposed project would not alter the exposure of people or property to geological hazards such as earthquakes, landslides, mudslides, ground failure, or other natural hazards. As a result, substantial exposure of people or structures to the risk of loss, injury, or death involving the rupture of an earthquake fault, seismic ground shaking, ground failure or landslides is not anticipated and will not be further analyzed in the Draft EA.

VII. b) Since add-on controls will likely be installed at existing facilities, during construction of the proposed project, a slight possibility exists for temporary erosion resulting from excavating and grading activities, if required. These activities are expected to be minor since the existing facilities are generally flat and have previously been graded. Further, wind erosion is not expected to occur to any appreciable extent, because operators at dust generating sites would be required to comply with the best available control measure (BACM) requirements of SCAQMD Rule 403 – Fugitive Dust. In general, operators must control fugitive dust through a number of soil stabilizing measures such as watering the site, using chemical soil stabilizers, revegetating inactive sites, etc. The proposed project involves the installation or modification of add-on control equipment at 12 existing facilities, so that grading could be required to provide stable foundations. Potential air quality impacts related to grading are addressed elsewhere in this Initial Study (as part of construction air quality impacts). No unstable earth conditions or changes in geologic substructures are expected to result from implementing the proposed project.

VII. c) Since the proposed project will affect existing facilities, it is expected that the soil types present at the affected facilities will not be further susceptible to expansion or liquefaction. Furthermore, subsidence is not anticipated to be a problem since only minor excavation, grading, or filling activities are expected occur at affected facilities. Additionally, the affected areas are not envisioned to be prone to new landslide impacts or have unique geologic features since the affected equipment units are located at existing facilities in industrial areas.

VII. d) & e) Since the proposed project will affect equipment units at existing facilities located in industrial zones, it is expected that people or property will not be exposed to new impacts related to expansive soils or soils incapable of supporting water disposal. Further, typically each affected facility has some degree of existing wastewater treatment systems that will continue to

be used and are expected to be unaffected by the proposed project. Sewer systems are available to handle wastewater produced and treated by each affected facility. Each existing facility affected by the proposed project does not require installation of septic tanks or alternative wastewater disposal systems. As a result, the proposed project will not require facility operators to utilize septic systems or alternative wastewater disposal systems. Thus, implementation of the proposed project will not adversely affect soils associated with a septic system or alternative wastewater disposal system.

Based upon these considerations, significant geology and soils impacts are not expected from the implementation of the proposed project and will not be further analyzed in the Draft EA.

		Potentially Significant Impact	Less Than Significant Impact	No Impact
VIII.	**HAZARDS AND HAZARDOUS MATERIALS.** Would the project:			
a)	Create a significant hazard to the public or the environment through the routine transport, use, and disposal of hazardous materials?	☑	☐	☐
b)	Create a significant hazard to the public or the environment through reasonably foreseeable upset conditions involving the release of hazardous materials into the environment?	☑	☐	☐
c)	Emit hazardous emissions, or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☑	☐	☐
d)	Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code §65962.5 and, as a result, would create a significant hazard to the public or the environment?	☑	☐	☐
e)	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☑	☐
f)	For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☑	☐
g)	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☑

		Potentially Significant Impact	Less Than Significant Impact	No Impact
h)	Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☑
i)	Significantly increased fire hazard in areas with flammable materials?	☐	☐	☑

Significance Criteria

Impacts associated with hazards will be considered significant if any of the following occur:

- Non-compliance with any applicable design code or regulation.
- Non-conformance to National Fire Protection Association standards.
- Non-conformance to regulations or generally accepted industry practices related to operating policy and procedures concerning the design, construction, security, leak detection, spill containment or fire protection.
- Exposure to hazardous chemicals in concentrations equal to or greater than the Emergency Response Planning Guideline (ERPG) 2 levels.

Discussion

VIII. a) & b) New or modified air pollution control equipment and related components are expected to be installed at most of the 12 affected facilities such that their operations may increase the quantity of hazardous materials (e.g., catalysts, scrubbing agents) used by the control equipment. In addition, the shipping, handling, storing, and disposing of hazardous materials inherently poses a certain risk of a release to the environment. Thus, the routine transport of hazardous materials, use, and disposal of hazardous materials may increase as a result of implementing the proposed project. Further, if the control option chosen by each affected facility operator is a wet gas scrubber, the proposed project may alter the transportation modes for catalyst and scrubbing agent feedstock and any other associated chemicals to/from the existing facilities.

For these reasons, implementation of the proposed project may alter the hazards associated with the existing affected facilities. At many of the affected facilities, a number of hazardous materials are currently in use. In general, the major types of public safety risks that need to be evaluated consist of impacts resulting from toxic substance releases, fires, and explosions.

Therefore, potential hazards impacts as a result of implementing the proposed project are potentially significant and will be addressed in the Draft EA.

VIII. c) Some affected facilities may be located within one-quarter mile of a sensitive receptor (e.g., a day care center). Therefore, a potential for significant impacts from hazardous emissions or the handling of acutely hazardous materials, substances and wastes near sensitive-receptors may occur and will be addressed in the Draft EA.

VIII. d) Government Code §65962.5 refers to hazardous waste handling practices at facilities subject to the Resources Conservation and Recovery Act (RCRA). Construction activities associated with implementing the proposed project will occur within the confines of the existing affected facilities. Some of the affected facilities may be included on the list of the hazardous materials sites compiled pursuant to Government Code §65962.5. Hazardous wastes from these existing facilities are managed in accordance with applicable federal, state, and local rules and regulations. The types of additional waste expected to be generated from implementing the proposed project will consist primarily of additional catalyst used by the new SOx control devices. For those affected facilities which already use catalyst for other operational activities on-site, the additional collected spent catalyst will continue to be handled in the same manner as currently handled such that it will be disposed and/or recycled at approved facilities. Further, if any of other affected facilities are new to handling catalyst waste, the same disposal/recycling procedures are expected to be followed. Accordingly, significant hazards impacts from the disposal and/or recycling of hazardous materials are not expected and will not be further analyzed in the Draft EA.

Construction activities at the affected facilities that may occur as part of implementation of the proposed project may require grading, excavating, and trenching which could potentially uncover contaminated soils. In the event that any excavated soils contain concentrations of certain substances, including heavy metals and hydrocarbons, the handling, processing, transportation and disposal of the contaminated soils will be subject to multiple hazardous waste regulations such as Title 22 of the California Code of Regulations and other local and federal rules. Title 22 has multiple requirements for hazardous waste handling, transport and disposal, such as requirements to used approved disposal and treatment facilities, to use certified hazardous waste transporters, and to have manifests for tracking the hazardous materials. If contaminated soils are encountered during grading, excavating, and trenching, the soils would need to be removed for proper decontamination and disposal in accordance with SCAQMD Rule 1166 – Volatile Organic Compound Emissions From Decontamination of Soil. Therefore, impacts related to soil contamination will be addressed in the Draft EA.

VIII. e) & f) Construction activities from implementing the proposed project are expected to occur within the existing confines of the affected facilities. However, some of these facilities may be located within two miles of an airport (either public or private) and are located within an airport land use plan. Nonetheless, the installation of the SOx control devices is expected to be constructed according to the all appropriate building, land use and fire codes and operated at a low enough height relative to existing flight patterns so that the structure would not interfere with plane flight paths consistent with Federal Aviation Regulation, Part 77. Such codes are designed to protect the public from hazards associated with normal operation. Therefore, the proposed project is not expected to result in a safety hazard for people residing or working in the area of the affected facilities even within the vicinity of an airport and as such, will not be further analyzed in the Draft EA.

VIII. g) Emergency response plans are typically prepared in coordination with the local city or county emergency plans to ensure the safety of not only the public (surrounding local communities), but the facility employees as well. The proposed project would not impair implementation of, or physically interfere with any adopted emergency response plan or emergency evacuation plan. The existing industrial facilities affected by the proposed project would typically already have their own emergency response plans in place. However, for those

operators of affected facilities who elect to install SOx control technology may need to update their emergency response plan. Thus, the proposed project is not expected to impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan and as such, will not be further analyzed in the Draft EA.

VIII. h) & i) The Uniform Fire Code and Uniform Building Code set standards intended to minimize risks from flammable or otherwise hazardous materials. Local jurisdictions are required to adopt the uniform codes or comparable regulations. Local fire agencies require permits for the use or storage of hazardous materials and permit modifications for proposed increases in their use. Permit conditions depend on the type and quantity of the hazardous materials at the facility. Permit conditions may include, but are not limited to, specifications for sprinkler systems, electrical systems, ventilation, and containment. The fire departments make annual business inspections to ensure compliance with permit conditions and other appropriate regulations. Further, businesses are required to report increases in the storage or use of flammable and otherwise hazardous materials to local fire departments. Local fire departments ensure that adequate permit conditions are in place to protect against potential risk of upset.

The proposed project is not expected to increase the existing risk of fire hazards in areas with flammable brush, grass, or trees. Additional natural gas may be used during both construction and operation of the proposed project. Natural gas is currently used at all of the affected facilities. The hazards associated with natural gas would result in a torch fire in the event that a release occurred and caught fire. Because of the locations of each facility that would be affected by the proposed project, a torch fire would be expected to remain on-site so that there would be no public exposure to the fire hazards. No substantial or native vegetation typically exists on or near the affected facilities (specifically because they could be a fire hazard) so the proposed project is not expected to expose people or structures to wild fires. Therefore, no significant increase in fire hazards are expected any of the affected facilities associated with implementing the proposed project.

Based on these considerations, the potential hazards impacts related to the construction and operations at each affected facility and the transport of hazardous materials associated with the proposed project will be addressed in the Draft EA.

	Potentially Significant Impact	**Less Than Significant Impact**	**No Impact**
IX. HYDROLOGY AND WATER QUALITY. Would the project:			
a) Violate any water quality standards or waste discharge requirements?	☑	☐	☐

		Potentially Significant Impact	Less Than Significant Impact	No Impact
b)	Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g. the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☑	☐
c)	Substantially alter the existing drainage pattern of the site or area, including through alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site?	☐	☑	☐
d)	Substantially alter the existing drainage pattern of the site or area, including through alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?	☐	☑	☐
e)	Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☑	☐
f)	Otherwise substantially degrade water quality?	☑	☐	☐
g)	Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☑
h)	Place within a 100-year flood hazard area structures which would impede or redirect flood flaws?	☐	☐	☑
i)	Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☑
j)	Inundation by seiche, tsunami, or mudflow?	☐	☐	☑

	Potentially Significant Impact	Less Than Significant Impact	No Impact
k) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☑	☐	☐
l) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☑	☐	☐
m) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☑	☐
n) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☑	☐	☐
o) Require in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☑	☐	☐

Significance Criteria

Potential impacts on water resources will be considered significant if any of the following criteria apply:

Water Quality:

- The project will cause degradation or depletion of ground water resources substantially affecting current or future uses.
- The project will cause the degradation of surface water substantially affecting current or future uses.
- The project will result in a violation of National Pollutant Discharge Elimination System (NPDES) permit requirements.
- The capacities of existing or proposed wastewater treatment facilities and the sanitary sewer system are not sufficient to meet the needs of the project.
- The project results in substantial increases in the area of impervious surfaces, such that interference with groundwater recharge efforts occurs.
- The project results in alterations to the course or flow of floodwaters.

Water Demand:

- The existing water supply does not have the capacity to meet the increased demands of the project, or the project would use a substantial amount of potable water.
- The project increases demand for water by more than five million gallons per day.

Discussion

IX. a), f), k), l) & o) Operators of facilities affected by the proposed project are expected to install new air pollution control equipment, such as wet gas scrubbers, to reduce SOx emissions. Operational activities associated with wet gas scrubbers will increase the demand for water and subsequently, will increase the amount wastewater discharged at each affected facility. In addition, construction activities associated with the proposed project may require the use of water as a dust suppressant, if grading is required. The impacts of the proposed project on each affected facility's wastewater discharge and the Industrial Wastewater Discharge Permit are expected to be potentially significant. Thus, the potential impact of the increase in water demand and wastewater discharge will be evaluated in the Draft EA.

IX. b) Implementation of the proposed project is not expected to significantly adversely affect the quantity or quality of groundwater in the area of each affected facility. No significant adverse impacts are expected to ground water quality from the proposed project because: 1) wastewater will continue to be collected and treated in each of the affected facility's wastewater treatment systems or in compliance with the current wastewater discharge permits, as applicable; 2) no underground storage tanks are expected to be constructed as part of the proposed project; 3) containment berms will be required or may already exist around any new or modified units to minimize the potential for a spill to contaminate soil and groundwater; and, 4) any new storage tanks that may be proposed will be required to comply with BACT and other safety requirements such as double bottom and monitoring requirements.

IX. c), d), e) & m) Changes to each affected facility's storm water collection systems are expected to be less than significant since most of the changes associated with the proposed project will occur within existing units (i.e., by installing SOx control equipment). Further, typically most of the areas likely to be affected by the proposed project are currently paved and are expected to remain paved. Any new units constructed will be curbed and the existing units will remain curbed to contain any runoff. Any runoff occurring will continue to be handled by each affected facility's wastewater system and sent to an on-site wastewater treatment system prior to discharge. The surface water runoff is expected to be handled with each facility's current wastewater treatment system. Storm water runoff will be collected and discharged in accordance with each facility's discharge permit terms and conditions. Storm water Pollution Prevention Plans may need to be updated, as necessary to reflect operational modifications and included additional Best Management Practices, if required. Therefore, less than significant storm water quality impacts are expected to result from the operation of the proposed project.

IX. g), h), & i) The proposed project is expected to involve construction and modification activities located within the confines of existing facilities and does not include the construction of any new housing so it would not place new housing within a 100-year flood hazard area. It is likely that most affected facilities are not located within a 100-year flood hazard area. Any affected facilities that may be located in a 100-year flood area could impede or redirect 100-year flood flows, but this would be considered part of the existing setting and not an effect of the proposed project. Since the proposed project would not require locating new facilities within a flood zone, it is not expected that implementation of the proposed project would expose people or property to any known water-related flood hazards.

IX. j) The proposed project does not require construction of new facilities in areas that could be affected by tsunamis. Of the facilities affected by the proposed project, some are located near the Ports of Long Beach, Los Angeles, and San Pedro. The port areas are protected from tsunamis by the construction of breakwaters. Construction of breakwaters combined with the distance of each facility from the water is expected to minimize the potential impacts of a tsunami or seiche so that no significant impacts are expected. The proposed project does not require construction of facilities in areas that are susceptible to mudflows (e.g., hillside or slope areas). Existing affected facilities that are currently located on hillsides or slope areas may be susceptible to mudflow, but this would be considered part of the existing setting. As a result, the proposed project is not expected to generate significant adverse mudflow impacts.

IX. n) Each affected facility may not have sufficient water supplies available for implementing the proposed project since the type of air pollution control equipment that would be installed at the affected facilities (e.g., wet gas scrubbers) heavily rely on water as part of the control process. Also, limited water demand increases may occur for dust suppression during site preparation/grading activities. Thus, the need for new or expanded water supply entitlements may be necessary. While it is not possible to predict water availability in the future, existing entitlements and resources in the district are currently at drought levels. Thus, the water demand that would result from implementing the proposed project may result in significant adverse water impacts.

Based upon these considerations, the potential hydrology and water quality impacts, especially those associated with wastewater discharge and water demand are expected to be significant and will be evaluated in the Draft EA.

		Potentially Significant Impact	Less Than Significant Impact	No Impact
X.	**LAND USE AND PLANNING.** Would the project:			
a)	Physically divide an established community?	☐	☐	☑
b)	Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☑
c)	Conflict with any applicable habitat conservation or natural community conservation plan?	☐	☐	☑

Significance Criteria

Land use and planning impacts will be considered significant if the project conflicts with the land use and zoning designations established by local jurisdictions.

Discussion

X. a) The proposed project does not require the construction of new facilities, but any physical effects that will result from the proposed project, will occur at existing industrial facilities. Thus, implementing the proposed project will not result in physically dividing any established communities.

X. b) & c) There are no provisions in the proposed project that would affect land use plans, policies, or regulations. Land use and other planning considerations are determined by local governments and no land use or planning requirements will be altered by the proposed project. Further, the proposed project would be consistent with the typical industrial zoning of the affected facilities. Typically, all proposed construction activities are expected to occur within the confines of the existing facilities. The proposed project would not affect in any way habitat conservation or natural community conservation plans, agricultural resources or operations, and would not create divisions in any existing communities. Further, no new development or alterations to existing land designations will occur as a result of the implementation of the proposed project. Therefore, present or planned land uses in the region will not be affected as a result of implementing the proposed project.

Based upon these considerations, significant land use planning impacts are not expected from the implementation of the proposed project, and thus, will not be further analyzed in the Draft EA.

		Potentially Significant Impact	Less Than Significant Impact	No Impact
XI.	**MINERAL RESOURCES.** Would the project:			
a)	Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☑
b)	Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☑

Significance Criteria

Project-related impacts on mineral resources will be considered significant if any of the following conditions are met:

- The project would result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state.
- The proposed project results in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan.

Discussion

XI. a) & b) There are no provisions in the proposed project that would result in the loss of availability of a known mineral resource of value to the region and the residents of the state such

as aggregate, coal, clay, shale, et cetera, or of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan.

Based upon these considerations, significant mineral resource impacts are not expected from the implementation of the proposed project, and thus, will not be further analyzed in the Draft EA.

		Potentially Significant Impact	Less Than Significant Impact	No Impact
XII.	**NOISE.** Would the project result in:			
a)	Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☑	☐
b)	Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☑	☐
c)	A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☑	☐
d)	A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☑	☐
e)	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☑	☐
f)	For a project within the vicinity of a private airship, would the project expose people residing or working in the project area to excessive noise levels?	☐	☑	☐

Significance Criteria

Impacts on noise will be considered significant if:

- Construction noise levels exceed the local noise ordinances or, if the noise threshold is currently exceeded, project noise sources increase ambient noise levels by more than three decibels (dBA) at the site boundary. Construction noise levels will be considered significant if they exceed federal Occupational Safety and Health Administration (OSHA) noise standards for workers.

- The proposed project operational noise levels exceed any of the local noise ordinances at the site boundary or, if the noise threshold is currently exceeded, project noise sources increase ambient noise levels by more than three dBA at the site boundary.

Discussion

XII. a), b), c), & d) Modifications or changes associated with the implementation of the proposed project will take place at existing facilities that are located in industrial settings. The existing noise environment at each of the affected facilities is typically dominated by noise from existing equipment onsite, vehicular traffic around the facilities, and trucks entering and exiting facility premises. Construction activities associated with implementing the proposed project may generate some noise associated with the use of construction equipment and construction-related traffic. However, noise from the proposed project is not expected to produce noise in excess of current operations at each of the existing facilities. If SOx control devices are installed, the operations phase of the proposed project may add new sources of noise to each affected facility. However, it is expected that each facility affected will comply with all existing noise control laws or ordinances. Further, Occupational Safety and Health Administration (OSHA) and California-OSHA (Cal/OSHA) have established noise standards to protect worker health. These potential noise increases are expected within the allowable noise levels established by the local noise ordinances for industrial areas, and thus are expected to be less than significant. Therefore, potential noise impacts will not be further evaluated in the Draft EA.

XII. e) & f) Though some of the facilities affected by the proposed project are located at sites within an airport land use plan, or within two miles of a public airport, the addition of SOx control equipment would not expose people residing or working in the project area to the same degree of excessive noise levels associated with airplanes. All noise producing equipment must comply with local noise ordinances and applicable OSHA or Cal/OSHA workplace noise reduction requirements.

Based upon these considerations, significant noise impacts are not expected from the implementation of the proposed project and will not be further analyzed in the Draft EA.

	Potentially Significant Impact	**Less Than Significant Impact**	**No Impact**
XIII. POPULATION AND HOUSING. Would the project:			
a) Induce substantial growth in an area either directly (for example, by proposing new homes and businesses) or indirectly (e.g. through extension of roads or other infrastructure)?	☐	☐	☑
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☑

		Potentially Significant Impact	Less Than Significant Impact	No Impact
c)	Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☑

Significance Criteria

Impacts of the proposed project on population and housing will be considered significant if the following criteria are exceeded:

- The demand for temporary or permanent housing exceeds the existing supply.
- The proposed project produces additional population, housing or employment inconsistent with adopted plans either in terms of overall amount or location.

Discussion

XIII. a) The construction activities associated with the proposed project at each affected facility are not expected to involve the relocation of individuals, require new housing or commercial facilities, or change the distribution of the population. The reason for this conclusion is that operators of affected facilities who need to perform any construction activities to comply with the proposed project can draw from the existing labor pool in the local southern California area. Further, it is not expected that the installation of the SOx control equipment will require new employees during operation of the equipment. In the event that new employees are hired, it is expected that the number of new employees at any one facility would be small. Human population within the jurisdiction of the SCAQMD is anticipated to grow regardless of implementing the proposed project. As a result, the proposed project is not anticipated to generate any significant adverse effects, either direct or indirect, on population growth in the district or population distribution.

XIII. b) & c) Because the proposed project includes modifications and/or changes at existing facilities located in industrial settings, the proposed project is not expected to result in the creation of any industry that would affect population growth, directly or indirectly induce the construction of single- or multiple-family units, or require the displacement of people or housing elsewhere in the district.

Based upon these considerations, significant population and housing impacts are not expected from the implementation of the proposed project and will not be further evaluated in the Draft EA.

	Potentially Significant Impact	Less Than Significant Impact	No Impact
XIV. PUBLIC SERVICES. Would the proposal result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the following public services:			
a) Fire protection?	☐	☐	☑
b) Police protection?	☐	☐	☑
c) Schools?	☐	☐	☑
d) Parks?	☐	☐	☑
e) Other public facilities?	☐	☐	☑

Significance Criteria

Impacts on public services will be considered significant if the project results in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response time or other performance objectives.

Discussion

XIV. a) & b) Implementation of the proposed project is expected to cause facility operators to install SOx control devices, all the while continuing current operations at existing affected facilities. The proposed project may result in a greater demand for catalyst and scrubbing agents, which will need to be transported to the affected facilities that install SOx controls and stored onsite prior to use. In the event of an accidental release, fire departments are typically first responders for control and clean-up and police may be need to be available to maintain perimeter boundaries. Based on the low probability of accidental releases of catalysts and scrubbing agents occurring, the proposed project is not expected to increase the need or demand for additional public services (e.g., fire departments, police departments, schools, parks, government, et cetera) above current levels.

XIV. c) & d) As noted in the previous "Population and Housing" discussion, the proposed project is not expected to induce population growth in any way because the local labor pool (e.g., workforce) is expected to be sufficient to accommodate any construction activities that may be necessary at affected facilities and operation of new SOx control equipment is not expected to require additional employees. Therefore, there will be no increase in local population and thus no impacts are expected to local schools or parks.

XIV. e) The proposed project is expected to result in the use of new or modified add-on control equipment for SOx control. Besides permitting the equipment or altering permit conditions by the SCAQMD, there is no need for other types of government services. The proposed project would not result in the need for new or physically altered government facilities in order to maintain acceptable service ratios, response times, or other performance objectives. There will be no increase in population and, therefore, no need for physically altered government facilities.

Based upon these considerations, significant public services impacts are not expected from the implementation of the proposed project and will not be further evaluated in the Draft EA.

	Potentially Significant Impact	Less Than Significant Impact	No Impact
XV. RECREATION.			
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☑
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☑

Significance Criteria

Impacts to recreation will be considered significant if:

- The project results in an increased demand for neighborhood or regional parks or other recreational facilities.
- The project adversely affects existing recreational opportunities.

Discussion

XV. a) & b) As discussed previously under "Land Use," there are no provisions in the proposed project that would affect land use plans, policies, or regulations. Land use and other planning considerations are determined by local governments; no land use or planning requirements will be altered by the proposed project. Further, the proposed project would not increase the use of existing neighborhood and regional parks or other recreational facilities or include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment because the proposed project is not expected to induce population growth.

Based upon these considerations, significant public services impacts are not expected from the implementation of the proposed project and will not be further evaluated in the Draft EA.

	Potentially Significant Impact	Less Than Significant Impact	No Impact
XVI. SOLID/HAZARDOUS WASTE. Would the project:			
a) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☑	☐
b) Comply with federal, state, and local statutes and regulations related to solid and hazardous waste?	☐	☑	☐

Significance Criteria

The proposed project impacts on solid/hazardous waste will be considered significant if the following occurs:

- The generation and disposal of hazardous and non-hazardous waste exceeds the capacity of designated landfills.

Discussion

XVI. a) Construction activities associated with installing SOx control equipment such as wet gas scrubbers, demolition and site preparation/grading/excavating could generate solid waste as result of implementing the proposed project. Demolition activities could generate demolition waste while site preparation, grading, and excavating could uncover contaminated soils since the facilities affected by the proposed project are located in existing industrial areas. Excavated soil, which may be contaminated, will need to be characterized, treated, and disposed of offsite in accordance with applicable regulations. Where appropriate, the soil will be recycled if it is considered or classified as non-hazardous waste or it can be disposed of at a landfill that accepts non-hazardous waste. Otherwise, the material will need to be disposed of at a hazardous waste facility. (Potential soil contamination is addressed in the Hazards/Hazardous Materials discussion in Section VIII. d.)

Solid or hazardous wastes generated from construction-related activities would consist primarily of materials from the demolition of existing air pollution control equipment and construction associated with new air pollution control equipment. Construction-related waste would be disposed of at a Class II (industrial) or Class III (municipal) landfill. There are 48 Class II/Class III landfills within the SCAQMD's jurisdiction. The estimated total capacity of these landfills is approximately 111,198 tons per day (SCAQMD, 2000). For these reasons, the construction impacts of the proposed project on waste treatment/disposal facilities are expected to be less than significant.

During operation of the SOx control equipment, the use of catalyst is expected to increase but the generation of catalyst fines is expected to be captured by the control equipment as wet solids. These wet catalyst solids can be collected for recycling for use in manufacturing cement. Therefore, less than significant adverse impacts to non-hazardous waste disposal facilities are expected from operational activities associated with the proposed project.

It is possible that some, if not all, of the affected facilities will address any increase in waste through their existing waste minimization plans. In addition, other affected facilities that have

existing catalyst-based operations currently regenerate, reclaim or recycle the catalysts, in lieu of disposal. Moreover, due to the heavy metal content and its relatively high cost, catalyst recycling can be a lucrative choice. Depending on operating conditions, it is expected that spent catalysts would be reclaimed and recycled, though it is possible that spent catalysts could be disposed of. The composition of the catalyst will determine in which type of landfill a catalyst would be disposed.

Based on the preceding discussion, it is likely that spent catalysts would be considered a "designated waste," which is characterized as a non-hazardous waste consisting of, or containing pollutants that, under ambient environmental conditions, could be released at concentrations in excess of applicable water objectives, or which could cause degradation of the waters of the state (California Code of Regulations, Title 23, Chapter 3 Subparagraph 2522(a)(1)). Depending on its actual waste designation, spent catalysts would likely be disposed of in a Class II landfill or a Class III landfill that is fitted with liners. According to the Program EIR for the 2007 AQMP (SCAQMD, 2007), total Class III landfill waste disposal capacity in the district is approximately 97,269 tons per day, many of which have liners and can handle Class II and Class III wastes.

Disposal of spent catalyst would typically involve crushing the material and encasing it in concrete prior to disposal. Since it is expected that most spent catalysts will be recycled and regenerated, it is anticipated that there will be sufficient landfill capacity in the district to accommodate disposal of any spent catalyst materials. Thus, the potential increase of solid waste generated by the air pollution control equipment operated at the 12 affected facilities that are expected to install SOx control equipment as a result implementing the proposed project may not necessarily be disposed of and, therefore, is not expected to exceed the capacity of designated landfills available to each affected facility.

XVI. b) Implementing the proposed project is not expected to hinder in any way any affected facility's ability to comply with existing federal, state, and local regulations related to solid and hazardous wastes.

Based upon these considerations, significant solid/hazardous waste impacts are not expected from the implementation of the proposed project and will not be further evaluated in the Draft EA.

	Potentially Significant Impact	**Less Than Significant Impact**	**No Impact**
XVII. TRANSPORTATION/TRAFFIC. Would the project:			
a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☑	☐	☐

		Potentially Significant Impact	Less Than Significant Impact	No Impact
b)	Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☑	☐	☐
c)	Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☑	☐
d)	Substantially increase hazards due to a design feature (e.g. sharp curves or dangerous intersections) or incompatible uses (e.g. farm equipment)?	☐	☐	☑
e)	Result in inadequate emergency access?	☐	☑	☐
f)	Result in inadequate parking capacity?	☐	☑	☐
g)	Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g. bus turnouts, bicycle racks)?	☐	☑	☐

Significance Criteria

Impacts on transportation/traffic will be considered significant if any of the following criteria apply:

- Peak period levels on major arterials are disrupted to a point where level of service (LOS) is reduced to D, E or F for more than one month.
- An intersection's volume to capacity ratio increase by 0.02 (two percent) or more when the LOS is already D, E or F.
- A major roadway is closed to all through traffic, and no alternate route is available.
- There is an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system.
- The demand for parking facilities is substantially increased.
- Water borne, rail car or air traffic is substantially altered.
- Traffic hazards to motor vehicles, bicyclists or pedestrians are substantially increased.
- The need for more than 350 employees
- An increase in heavy-duty transport truck traffic to and/or from the facility by more than 350 truck round trips per day
- Increase customer traffic by more than 700 visits per day.

Discussion

XVII. a) & b) Construction activities resulting from implementing the proposed project may generate a temporary increase in traffic in the areas of each affected facility associated with construction workers, construction equipment, and the delivery of construction materials. Also, the proposed project may exceed, either individually or cumulatively, the current level of service of the areas surrounding the affected facilities. The impacts of the traffic load and capacity of the street system during construction will be analyzed in the Draft EA.

The work force at each affected facility is not expected to significantly increase during operations of the proposed project operations because few, if any, new employees are expected to be needed to operate potential SOx control equipment. As a result, operation-related traffic is expected to be limited more towards supply deliveries, but less than significant. Thus, the operational traffic impacts will not be evaluated further in the Draft EA.

XVII. c) Though some of the facilities that will be affected by the proposed project are located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, actions that would be taken to comply with the proposed project, such as installing SOx control equipment, are not expected to significantly influence or affect air traffic patterns. Further, the size and type of air pollution control devices that would be installed would not be expected to affect navigable air space. Thus, the proposed project would not result in a change in air traffic patterns including an increase in traffic levels or a change in location that results in substantial safety risks.

XVII. d) & e) The siting of each affected facility is consistent with surrounding land uses and traffic/circulation in the surrounding areas of the affected facilities. Thus, the proposed project is not expected to substantially increase traffic hazards or create incompatible uses at or adjacent to the affected facilities. Aside from the temporary effects due to a slight increase in truck traffic for those facilities that will undergo construction activities during installation of air pollution control equipment, the proposed project is not expected to alter the existing long-term circulation patterns. Further, the proposed project is not expected to require a modification to circulation, thus, no long-term impacts on the traffic circulation system are expected to occur. The proposed project is not expected to involve the construction of any roadways, so there would be no increase in roadway design feature that could increase traffic hazards. Emergency access at each affected facility is not expected to be impacted by the proposed project. Further, each affected facility is expected to continue to maintain their existing emergency access gates.

XVII. f) Each affected facility will be required to provide parking for the construction workers, as applicable, either on or within close proximity to each facility. No additional parking will be needed after completion of the construction phase because the work force at each facility is not expected to significantly increase as a result of implementing the proposed project.

XVII. g) Construction and operation activities resulting from implementing the proposed project are not expected to conflict with policies supporting alternative transportation since the proposed project does not involve or affect alternative transportation modes (e.g. bicycles or buses) because the construction and operation activities related to the proposed project will occur solely in existing industrial areas.

Based upon these considerations, significant transportation/traffic impacts are not expected from the implementation of the proposed project and will not be further evaluated in the Draft EA.

	Potentially Significant Impact	Less Than Significant Impact	No Impact
XVIII. MANDATORY FINDINGS OF SIGNIFICANCE.			
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☑
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)	☑	☐	☐
c) Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	☑	☐	☐

Discussion

XVIII. a) The proposed project is not expected to reduce or eliminate any plant or animal species or destroy prehistoric records of the past. As indicated in the biological resources discussion, each site affected by the proposed project is part of an existing facility, which has been previously graded, such that the proposed project is not expected to extend into environmentally sensitive areas.

XVIII. b) The Environmental Checklist indicates that the proposed project has potentially significant adverse impacts on aesthetics, air quality, energy, hydrology and water quality, hazards and hazardous materials, and transportation/traffic. The potential for cumulative impacts on these resources will be evaluated in the Draft EA.

XVIII. c) Even though the objective of the proposed project is to reduce SOx emissions from the top emitters in the RECLAIM program, the proposed project may result in secondary effects, emissions of regulated air pollutants, toxic air contaminants, GHGs and may also increase the hazards at some of the affected facilities. The potential for these impacts to have adverse impacts on human beings, either directly or indirectly, will be evaluated in the Draft EA.

A P P E N D I X A (of the Initial Study)

P R O P O S E D A M E N D E D R E G U L A T I O N X X:

Proposed Amended Rule 2002

In order to save space and avoid repetition, please refer to the latest version of proposed amended Rule 2002 located elsewhere in Appendix A of the Draft EA. The June 9, 2009 version of the proposed amended rule was circulated with the Notice of Preparation/Initial Study (NOP/IS) that was released on June 19, 2009 for a 30-day public review and comment period ending July 21, 2009.

Original hard copies of the NOP/IS, which include the version of the proposed amended rule listed above, can be obtained through the SCAQMD Public Information Center at the Diamond Bar headquarters or by calling (909) 396-2039.

APPENDIX D

COMMENT LETTERS ON THE NOP/INITIAL STUDY

AND RESPONSES TO COMMENTS

Comment Letter #1

Chris Manzanares
Air Regulatory Specialist

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July 21, 2009

Barbara Radlein
Air Quality Specialist
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765-4182

Dear Ms. Radlein,

Chevron is pleased to have the opportunity to review and comment on the *Initial Study for Proposed Amended Regulation XX.* Chevron believes that the potential cumulative impact of the recommended SOx control measures is so great that the project should be reviewed in detail. Chevron recommends that the environmental review place significant emphasis on the issues listed below. 1-1

AESTHETICS:

1. The Environmental Assessment (EA) should address to aesthetic impact of multiple moisture plumes rising all over the south bay. Additionally the EA should recognize that there plumes will appear dark at night and cloudy days giving the appearance of massive amounts of emissions being emitted at night. 1-2
2. The EA should analyze cumulative aesthetic impacts from all potential projects resulting from the amendment of Regulation XX. 1-3

AIR QUALITY (AQ)

1. In order to employ some of the recommended technologies, it may be necessary to reheat certain exhaust to properly operate the SOx control equipment. This reheating will resulting additional construction activities and additional green house emissions as a result of fuel combustion for this reheating. These related AQ impacts should also be considered in the EA. 1-4
2. Consistent with point 2 above; all potential projects resulting from the adoption of this regulation should be analyzed together to determine individual and cumulative impacts of all pollutants. 1-5
3. All alternatives to stationary source reductions and mitigation measures must be analyzed for increases in other pollutants as a result of RECLAIM SOX shave. 1-6
4. Due to the above mentioned contributing issues and the complex and over lapping nature of this project, we recommend that the EA include the full PM2.5 and RECLAIM programs in order to capture all potential future projects. 1-7
5. Solid waste transportation from these proposed recommendations will create an ongoing source of vehicle emissions from trucks, including NOx, CO, VOC, TAC, PM and SOx. 1-8

Barbara Radlein
South Coast Air Quality Management District

ENERGY.

1. The implementation of the recommended emission reduction technologies will impact all regulated facilities and may require significant electrical, natural gas and other infrastructure improvements to accommodate the energy demands of the new equipment. There appears to be a serious deficiency in the analysis of the full energy impacts of these technology recommendations in Part II of the draft Staff Report. 1-9
2. The energy requirements for these recommendations may require the facilities to install new transformer stations to supply the required power, adding to the construction activities. 1-10

HAZARDS AND HAZARDOUS MATERIAL

1. Installation of the proposed measures would result in an increase of hazardous material transported to and stored at the facility, as well as, hazardous waste stored at and transported from the facilities. 1-11
2. The increased transportation of hazardous materials and hazardous wastes greatly increases the risk accidental spills and releases at the facility and on public roadways. 1-12

HYDROLOGY AND WATER QUALITY

1. The third-party consultant reports which the SCAQMD staff has established as the primary resource for technology recommendations and establishing BARCT levels, outlines the tremendous potential water use impacts associated with employment of "gas scrubbing" technologies. It should be noted that these water consumption impacts are associated with all three scrubber technologies, not just the wet-gas scrubbers. 1-13
2. A review of the recommendations of wet gas scrubbers for the FCCUs and SRUs indicates a potential for excessive water usage, with fresh water demand estimated as high as 90 million gallons per year for each scrubber. 1-14
3. Due to the large size of scrubbers involved, it appears that they would represent the top end of the stated ranges – and this is almost certainly true for NWGSs on FCCUs. Thus, the total impact would be a potential new demand for fresh water as high as one billion gallons per year (90 million gallons and 12 installations) 1-15
4. Waste water is estimated at up to 40 million gallons per year for each installation, This increased wastewater load on Publicly Owned Treatment Plants (POTWs) could be as high as 440 million gallons per year (40 million gallons and an assumed eleven systems that would discharge to a POTW). This could result in substantial cost for upgrades at some POTWs. 1-16
5. The EA must consider that one facility would be required to re-open an existing NPDES permit to request an increase in discharge of wastewater flow to the Santa Monica bay, this revision is almost certain to be rejected. 1-17
6. It is expected that this project will increase the levels of sulfite, sulfate, COD, total suspended solids, pH, and DEA at the facility's wastewater treatment plant. Additionally the potential for wastewater to require pre-treatment prior to discharge, may require hazardous treatment permitting and additional construction and spill/contaminations potential due to these activities. 1-18
7. These are dramatic resource consumption and waste figures and these considerations have clearly not been adequately addressed in the District's BARCT recommendations. We strongly suggest 1-19

that the EA conduct a thorough and multi-faceted analysis of all potential multi-media impacts associated with the current technologies employment. 1-19 Cont'd

MANDATORY FINDINGS OF SIGNIFICANCE

1. Overall, implementation of the proposed measures will have significant impact to water and energy demands at the affected facilities. The increased level of hazardous materials being transported over local roads and through neighborhood may greatly increase the risk of accidental release and exposure. 1-20
2. The increased discharge of industrial wastewater may affect a POTW's ability to handle the additional flows and properly treat the water prior to release. 1-21
3. The aesthetic impact of multiple plumes arising from a facility will negatively impact the views and skyline in the adjoining areas. It should be noted that the refineries have multiple sulfur recovery trains that may each require a separate wet gas scrubber resulting in additional plumes. 1-22

Chevron appreciates this opportunity to provide you our perspective and we look forward to developing a comprehensive Environmental Assessment considering all the relevant issues. Should you have any questions please feel free to contact either myself, or Mr. Robert Orinion at (310) 615-4147.

Sincerely,

Chris Manzanares

bcc: Robert Orinion
Jason Donchin
Rod Spackman
Jeff Wilson
John Doyle

Responses to Comment Letter #1
(Chevron, July 21, 2009)

1-1 The CEQA analysis in the PEA will focus on the following environmental topics: aesthetics, air quality, energy, hazards and hazardous materials, hydrology and water quality, and transportation. For any topic that is shown to have significant adverse impacts, a cumulative impacts analysis will also be included in the PEA.

1-2 The Aesthetics discussion in Chapter 4 of the PEA contains an analysis for the installation and operation of 11 wet gas scrubbers (WGSs) with 11 corresponding steam plumes. While it is true that the appearance of the steam plumes from WGSs may vary, depending on atmospheric conditions such as temperature, pressure and humidity as well as time of day, the steam plume is primarily steam (water vapor), not emissions. See also the response to Comment 1-22.

1-3 Because the project-specific aesthetic impacts were shown to not exceed any applicable significance thresholds, they are not considered to be cumulatively considerable pursuant to CEQA Guidelines §15064 (h)(1) and therefore, do not generate significant adverse cumulative aesthetics impacts..

1-4 The commenter did not specify a particular technology that would require inlet gas to be reheated, but for refinery operations, WGSs, as the primary SOx control equipment under consideration for the proposed project, typically do not need a high temperature inlet gas stream. Thus, contrary to the comment, reheating would not be necessary and there will be no construction activities or GHG emissions associated with reheating activities.

1-5 The PEA contains a comprehensive analysis of the individual effects of the entire project and the cumulative effects for topics that are shown to have significant adverse impacts, both on a facility-by-facility basis, as well as on a source-category basis, for each of the following environmental topics: aesthetics, air quality, energy, hazards and hazardous materials, hydrology and water quality, and transportation.

1-6 An alternatives analysis for the proposed project has been prepared and can be found in Chapter 5 of the PEA.

1-7 Impacts from all criteria pollutants, including PM 2.5, and GHGs have been analyzed in the PEA for all affected facilities. Regarding the commenter's suggestion that all potential future projects be analyzed, the PEA takes into account the potential effects of the proposed project spanning to 2019 at which time all projects required to implement the rule are expected to be completed. To consider potential future projects beyond that timeframe would be considered too speculative to evaluate pursuant to CEQA Guidelines §15145.

1-8 The proposed project is expected to have air quality impacts from transportation activities associated with supply deliveries and disposal activities from increased truck trips. In addition, the proposed project is expected to have transportation impacts due to the increased number of trucks on the road to accommodate the additional delivery and disposal trips. Both of these circumstances have been analyzed; the commenter is referred to the Air Quality and Transportation/Traffic discussions in Chapter 4 of the PEA.

1-9 Chapter 4 of the PEA contains a comprehensive energy analysis of the effects of the entire project on an individual facility basis as well as on a source category basis. Contrary to the unsubstantiated assumption that the proposed project would require energy infrastructure improvements, the energy analysis shows that the proposed project will have less than significant impacts for energy, including the use of natural gas, electricity, and fuel (gasoline and diesel.) The energy analysis in both the PEA and the Draft Staff Report are based on data taken from the consultants' reports.

1-10 The consultant's report did not indicate a need to install new transformer stations to supply the required power to operate the new SOx controls. Further, in the energy discussion in Chapter 4 of the PEA, the analysis shows an overall modest, less than significant increase in electricity demand of approximately 204 MWh/day under Option 1 and 101 MWh/day under Option 2, with the highest demand of 48 MWh/day occurring at Facility B under Option 1 and 23 MWh/day occurring at Facility K under Option 2. Refer to Tables 4-19 to 4-22 for the summaries of the energy demand on a facility-by-facility and source category basis.

1-11 The hazards/hazardous materials discussion in Chapter 4 of the PEA analyzes the potential increase in transportation, storage and use of hazardous substances that may be needed as well as the generation, storage and transport of hazardous waste that may result from operating SOx control technologies.

1-12 Regarding transportation of hazardous materials and hazardous wastes, see the response to Comment 1-11.

1-13 Projected total water demand impacts were provided by the consultants for multiple technologies, not just wet gas scrubbers. While most of the total water demand impacts come from the WGSs, other technologies also contributed to the overall water demand impacts analysis in the Hydrology/Water Quality discussion in Chapter 4 of the Draft PEA.

1-14 Contrary to the comment, the total water demand was estimated to be 241,096 gallons per day (or 88 million gallons per year) for four WGSs installed at four FCCUs and 354,247 gallons per day (or 129 million gallons per year) for three WGSs installed at three SRUs, not 90 million gallons per year for <u>each</u> WGS. Because WGS technology does not require fresh or potable water for its operations, recycled or reclaimed water can be utilized to satisfy the total water demand. Further, facilities that currently obtain recycled or industrial-use water for their industrial processes will be required to continue to do so in accordance with the California Water Code if there is a need to increase water use as part of the proposed project. Based on this understanding, the analysis shows that 147,945 gallons per day (or 54 million gallons per year) can currently be supplied by recycled water for the FCCUS. Similarly, all 354,247 gallons per day (or 129 million gallons per year) for three WGSs installed at three SRUs can also be supplied by recycled water. Lastly, the remaining 93,151 gallons per day (34 million gallons per year) of recycled water may also be supplied to the WGSs for the FCCUs after completion of the LADWP's HRRWPP project in Summer 2013. Since construction of the proposed project is not expected to begin sooner than 2012, most of the recycled water is expected to be available and could be utilized for all four WGSs and for most if not all of the FCCUs. In other words, 100

percent of the water demand for WGSs for both FCCUs and SRUs could be supplied by recycled, not potable (fresh), water.

1-15 Contrary to the comment, only four WGSs are projected to be installed on four FCCUs, not 12. Regarding the water demand estimates for WGSs for FCCUs, see the response to Comment 1-14.

For the entire project (which includes the FCCUs), 11 WGSs and two DGSs are projected to be installed for multiple source categories. Contrary to the comment, the worst-case total water demand and potable water demand would occur under Option 1 of the proposed project and would be would be approximately 883,368 gallons per day (322 million gallons per year), not one billion gallons per year. Of this amount, only 201,587 gallons per day or 74 million gallons per year under Option 1 (23 percent) is expected to be supplied by potable (fresh) water with the remainder being supplied by recycled water (63 percent) and industrial-use groundwater (14 percent).

1-16 Contrary to the comment, the wastewater estimates for the proposed project is approximately 270,532 gallons per day or 99 million gallons per year under Option 1 and 158,203 gallons per day or 58 million gallons per year under Option 1), not 40 million gallons per year for each installation (or 480 million gallons per year for the entire project based on the commenter's assumption of 12 installations). Further, the analysis shows that on a facility-by-facility basis, the proposed wastewater increases will not trigger a revision to any facility's wastewater permit. Lastly, SCAQMD staff has shared this data with the various sanitation districts and their staff has indicated that their facilities are expected to be able to handle the proposed increase in wastewater discharge.

1-17 Regarding the comment about the necessity of re-opening of an existing wastewater discharge permit for one facility, see the response to Comment 1-16.

1-18 If a WGS is installed as a result of implementing the proposed project, a liquid discharge containing captured pollutants will be generated. To process this discharge, the wet gas scrubber is designed with a purge treatment system that typically consists of a clarifier, an oxidation tank, and a wet fines tank to handle the wastewater from the scrubber before being sent to the facility's wastewater treatment plant. The purge treatment has two effluents, a liquid composed of water and sodium sulfate, and earth moist solids comprised of catalyst fines that have been captured from the flue gas. A clarifier utilizes a coagulant to separate and thicken the solids in the discharge; the thickened solids stream is collected, sent to a wet fines tank, and, if necessary, further dewatered in a roll-off bin. The concentrated solids slurry collected in both the wet fines tank and the roll-off bin are then transported by truck for disposal or recycling. The liquid that flows out of the clarifier is sent to an oxidation tank where the clarified liquid is oxidized for pH control and for reduction of the chemical oxygen demand (COD). The treated clear liquid is then passed to the existing refinery wastewater treatment system where it is treated before being discharged to a local sewage treatment plant. After the purge treatment is complete, the discharged scrubber water should contain total suspended solids of 200 ppm or less and the chemical oxygen demand from sulfites should be reduced to below 100 ppm. None of the byproducts in the discharged scrubber water or collected solids contain hazardous materials. In fact, the wet sulfate salts that are collected

from the scrubber water can be dried and sold as a commodity. Lastly, wet gas scrubbers for FCCUs at refineries use caustic such as NaOH for the process and not DEA, an amine scrubbing agent, as was implied by the comment.

1-19 Recognizing that WGS technology is a resource-intensive technology, SCAQMD staff has prepared this PEA to fully disclose the potential impacts associated with the proposed project. In particular, after conducting an extensive analysis in the PEA for hydrology and water quality, the analysis and data demonstrate that the commenter's water demand and wastewater assertions are exaggerated by over 300 percent for WGS technology.

1-20 Contrary to the comment, the analysis in the PEA for water quality, energy demand, and for hazards/hazardous materials demonstrates that the potential adverse impacts for these topics will be less than significant for the proposed project. However, the analysis in the PEA for water demand shows that the impacts will be potentially significant for potential potable water demand.

1-21 With regard to a POTW's ability to handle additional wastewater discharge, see the response to Comment 1-16.

1-22 The aesthetics analysis in the PEA considers steam plumes emanating from 11 WGSs and takes into account having multiple plumes from multiple WGSs installed at one facility. Contrary to the comment, if any WGS is installed as part of the proposed project at any of the affected facilities, the steam plume, though visible, is not expected to significantly adversely affect the visual continuity of the surrounding area of each affected facility because no scenic highways or corridors exist within the areas of the refineries, the coke calciner, the sulfuric acid plants and the glass melting plant. Further, the visual continuity of the surrounding area is not expected to be adversely impacted because each WGS, if constructed, will be built within the confines of industrial areas and would be visually consistent with the profiles of the existing affected facilities. Thus, even if each WGS could be visible, depending on the location within each property boundary, the aesthetic significance criteria would not be exceeded.

Comment Letter #2

Western States Petroleum Association
Credible Solutions • Responsive Service • Since 1907

Jodie Muller
Manager, External Affairs and South Coast Region

July 21, 2009

Barbara Radlein
Air Quality Specialist
South Coast Air Quality Management District
21865 East Copley Drive
Diamond Bar, CA. 91765-4182

Dear Ms Radlein:

PRELIMINARY WSPA COMMENTS ON THE PROPOSED AMENDED REGULATION XX: REGIONAL CLEAN AIR INCENTIVES MARKET (RECLAIM) NOTICE OF PREPARATION/INITIAL STUDY

Thank you for the opportunity to comment on the Notice of Preparation and the Initial Study ("NOP/IS") for Proposed Amended Regulation XX. The Western States Petroleum Association ("WSPA") is a trade association that represents nearly thirty companies that conduct a substantial portion of the petroleum-related operations in California and the surrounding states. WSPA member companies own and operate facilities such as refineries in the South Coast Air Basin. As currently proposed, the amendments to Regulation XX rely heavily on the control of several refinery processes, and thus will have a substantial impact on WSPA member companies. WSPA offers the following comments for your consideration. WSPA will also prepare detailed comments to the draft environmental assessment when it is completed and available.

SCOPE OF THE ENIRONMENTAL ASSESSMENT

WSPA believes this major rule amendment will have widespread impacts to the residents, businesses, infrastructure and resources of the South Coast Air Basin. The NOP/IS identifies the topics of aesthetics, air quality, energy, hydrology and water quality, hazards and hazardous materials, and transportation/traffic as areas that may be adversely affected by the proposed project and will be further analyzed in the EA. WSPA concurs that these impacts should be further analyzed, and also agrees that the cumulative impacts on these environmental areas must be studied.

2-1

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However, the District attempts to limit the scope of the EA by focusing merely on the examination of a few control options. In Chapter 2, ENVIRONMENTAL CHECKLIST AND DISCUSSION, the District states that "controlling emissions from equipment not operating at BARCT will be the most cost effective approach", and that therefore it will limit its analysis in the EA to those BARCT controls that it thinks are most likely to be implemented. WSPA contends that this assumption is flawed in nature and premature at best. At this point, the District is assuming a wide range of emission reductions, 3 to 8 tons of oxides of sulfur ("SO_x"), may be ultimately proposed in Regulation XX and has not determined over what time period the shave will be implemented. The amount of reductions targeted and the amount of time in which SO_x RECLAIM participants have to achieve the reductions will influence heavily the control options that will be implemented by industry to comply with the shave. Additionally, this assumption that a very few controls will be implemented ignores the fundamental premise of RECLAIM, that ultimately the market will determine the most cost-effective approaches to control. Instead, WSPA believes that the basis for determining which control options to analyze for purposes of an EA, should be those control options, or combinations thereof, that will have the greatest impact on the environment. The District should analyze the adverse impacts of all BARCT control options, as well as all other possible controls that may be implemented by SO_x RECLAIM participants to reduce SO_x emissions. The District should re-examine its NOP/IS to ensure that all adverse impacts have been identified for all possible control options. 2-2

Also, the impact of the current permit moratorium and the availability of emission offset credits for non-RECLAIM pollutants should be considered in determining cost-effectiveness, project start date and the overall environmental benefits the rule will achieve. The EA should analyze multimedia pollution impacts, project constraints imposed by existing environmental laws and regulations, and project impacts on new laws that will become effective in 2010 and beyond. The EA should also consider all alternatives to stationary source reductions and mitigation measures for increases in other pollutants as a result of RECLAIM SO_x shave. 2-3

WSPA recommends that a full Program Environmental Assessment be completed in order to capture all potential future projects that must be implemented as a result of this rule amendment. While a more simplified project EA may be desired, WSPA believes that, due to the complex and over lapping nature of these RECLAIM amendments, the full impacts of the amendments cannot be determined unless all future projects are examined. 2-4

WSPA offers these additional topic specific comments to be consideration in the EA:

AESTHETICS

WSPA concurs that the stacks that must be installed for the wet scrubber technology and the resultant plumes, both steam and SO_3, have the potential to create significant aesthetic impacts. WSPA believes that the District should conduct plume visibility analysis/modeling to adequately 2-5

address these impacts. "It should be noted that each refinery has multiple SRU trains that may each require separate wet gas scrubbers and stacks, resulting in multiple plumes for each facility." As previously stated, the District should insure that a thorough cumulative analysis should be conducted for this environmental area.

2-5 Cont'd

AIR QUALITY ("AQ")

WSPA believes that in order to employ some of the recommended technologies, it will be necessary to install additional NO_x emitting equipment to provide the heat and steam necessary for the operation of the SO_x control equipment. As such, the consideration of NO_x related AQ impacts should also be considered in the EA.

2-6

The EA should analyze whether the additional NO_x, PM_{10}, $PM_{2.5}$, CO, and GHG sources that must be installed for the purpose of implementing this project is consistent with the Basin's air quality goals. This project is heavily energy intensive and will result in large amounts of additional GHG emissions, possibly exceeding the District's significance threshold for industrial sources and conflicting with the goals of AB 32. Thus, this project may result in the diminishment of an existing air quality rule or future compliance requirement.

2-7

Additionally, in some instances the designated control equipment and the associated blowers can be maintenance intensive which could result in more shutdowns and start-ups at the facilities for the additional maintenance, resulting in additional flaring. This impact should be properly analyzed in the EA.

2-8

The Initial Study indicates that sensitive receptors may be exposed to substantial pollutant concentrations. WSPA encourages the District to conduct a Health Risk Assessment in order to adequately analyze these impacts.

2-9

HYDROLOGY AND WATER QUALITY

The third-party consultant reports upon which District staff primarily relies for technology recommendations and establishing BARCT levels outline the tremendous potential water use impacts associated with employment of "gas scrubbing" technologies. It should be noted that these water consumption impacts are associated with all three scrubber technologies, not just the wet-gas scrubbers.

2-10

Water Impacts Analysis

Table EX-3, module 3a includes the following water demand assumptions for wet/dry scrubbing technology for refinery fluid catalytic cracking units ("FCCUs"), refinery boilers/heaters, and refinery sulfur recovery units ("SRUs") and tail gas treatment processes :

> Fresh water – Between 1 and 90 million gallons per year for each scrubber.
> Waste water – Between 1 and 40 million gallons per year for each scrubber.

WSPA recommends that, due to the large size of scrubbers involved, the District should assume demand will be at the top end of the stated ranges. This is almost certainly true for NWGSs on FCCUs. Utilizing this assumption, the total impact would be a potential new demand for fresh water as high as one billion gallons per year (90 million gallons at 12 installations). Further, the Metropolitan Water District has implemented a Water Supply Allocation Plan which initiated mandatory conservation throughout Southern California, effective July 1, 2009. Thus, the District needs to carefully analyze whether enough raw water exists to meet these control equipment demands. 2-11

The increase in water usage can also result in an increased wastewater load on Publicly Owned Treatment Plants ("POTWs") as high as 440 million gallons per year (40 million gallons per each of an assumed eleven systems that would discharge to a POTW). Also, the implementation of this project may require additional paving at existing facilities thus creating more impervious surfaces, which can in turn result in additional storm water runoff that will require additional treatment. The potential for individual facility expansion or necessitated improvements to manage the significant increase in wastewater generation from the new emission reduction equipment may have a significant impact on local water treatment facilities that may not have the capacity to handle the additional demand. Additional wastewater capacity may need to be added as a result of this rule amendment. Also, the refineries currently have permitted discharge limits which may not be increased, unless and until treatment capacity is sufficient to handle wastewater demands. This should be closely analyzed in the EA. 2-12

These are dramatic resource consumption and waste figures and these considerations have clearly not been adequately addressed in the District's BARCT recommendations. WSPA strongly suggests that the EA conduct a thorough and multi-faceted analysis of all potential multi-media impacts associated with the current technologies employment. 2-13

Considering the water-intensive nature of some recommended technologies, WSPA suggests that great care be taken in conducting the environmental analysis and associated impacts to all recommended emission reduction technologies. 2-14

HAZARDS AND HAZARDOUS WASTE MATERIALS

The Initial Study identifies that there are potentially significant impacts in the area of hazards and hazardous waste materials. WSPA concurs and encourages the District to conduct a risk of upset analysis in order to adequately analyze the impacts in this environmental area.

2-15

ENERGY

The implementation of the recommended emission reduction technologies will impact all WSPA members and may require significant electrical and natural gas infrastructure improvements to accommodate the energy demands of the new equipment. WSPA has contended that a serious deficiency in the analysis of the full associated costs to employ these technology options exists in the consultant reports and now in the SCAQMD's staff reports. This should be corrected and fully analyzed in the EA.

2-16

TRANSPORTATION/TRAFFIC

While this resource area is identified as having potentially significant impacts, the Initial Study indicates that operation-related traffic is expected to be less than significant. WSPA believes that the District has not adequately assessed the number of supply delivery and waste disposal related truck trips that will occur as a result of this project. The EA should also consider a potential for significant cumulative impacts of construction projects at all SOx RECLAIM facilities and other projects. Construction activities may occur during the same time period as SOx RECLAIM facilities are facing the same compliance deadline. Total length of construction period may span over several years as several SOx sources within each facility are identified for reductions. Such long construction period may have some impact on aesthetics in the community. Given that much of this traffic increase will occur in the already heavily impacted port areas, WSPA believes the District should re-assess this area of potential environmental impact.

2-17

AREAS NOT IDENTIFIED AS SIGNIFICANT

The District has identified three additional environmental areas in which it has determined impacts will not reach significance: noise, land use and planning and solid/hazardous waste. WSPA believes that the potential exists for impacts in these areas to be significant and that the District needs to conduct a more robust analysis before making a determination of non-significance.

2-18

Noise

While the project will be introduced into industrialized areas that may already have high background levels, the District should more carefully examine the additional noise that will be

2-19

generated by the large blowers and other rotating equipment that are necessary to implement the control technologies identified.

2-19 Cont'd

Land Use and Planning

The equipment necessary to meet the proposed reductions will have to be installed in facilities that are already space constrained. The implementation of this rule may require refineries that don't have sufficient footprints to acquire additional property on a permanent or temporary basis, to accommodate the control equipment or to utilize as lay-down areas. The District should consider the additional permitting approvals, or land use decisions that may have to be undertaken to install this equipment.

2-20

Solid/Hazardous Waste

The installation of control equipment may require the demolition and removal of existing buildings or old equipment at the refineries in order to have sufficient room to accommodate the controls. Additionally, spent catalyst or scrubber cake will need to be disposed of appropriately. The Initial Study cites the District's own AQMP in determining landfill capacity, and fails to identify the current demand on landfill capacity and projected growth as baseline, nor does it estimate available landfill capacity. The statements are conclusionary and not based on any analysis. WSPA believes that the District should obtain the necessary data and assess the impacts on this resource quantitatively in order to determine whether any significant impact will result from the implementation of this project. Lastly, the EA should consider a potential for an increase in the fire hazard due to the use of chemicals in the SOx control process and the use of NH4 to control NOx.

2-21

ALTERNATIVES

Given the economic impacts that can result from this action, a complete alternatives analysis should be conducted. This analysis must address at least the following elements:

1)Examine as one of its project alternatives the implementation of Control Measure #2007CMB-02 as written in the 2007 AQMP, thus obtaining SO_x reductions of 2.9 tons per day by compliance year 2014.

2) Prepare incremental cost-effectiveness evaluations for alternative emission control levels of 5ppmv, 10ppmv, 25ppmv and 50ppmv BARCT levels for Sulfur Recovery Units/Tail gas Units.

3)For FCCUs, prepare incremental cost-effectiveness evaluations for alternative emission control levels of 10, 20, and 25 ppmv.

2-22

CONCLUSION

The situation in California and the South Coast Air Basin has changed greatly from when this initial analysis was started early last year. The economic health of the entire state of California has rapidly deteriorated over the last year, along with a continuing regional drought which has recently prompted the implementation of mandatory water management and conservation plans for the basin.

More now than ever a thorough and complete environmental analysis of projects within the basin with potential to have significant impacts to resources needs be conducted.

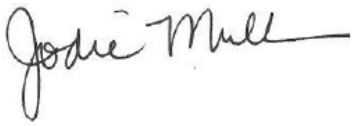
2-23

WSPA recommends that the District prepare an environmental document in the manner that will cover the worst case environmental analysis for all potential future projects resulting from this rule amendment. A Program EA should be prepared by the AQMD rather than a project EA. If the Program EA addresses the program's effects as specifically and as comprehensively as possible, many subsequent projects undertaken by refineries to comply with the rule could be found to be within the Program EA scope and additional environmental documents may not be required, or be required to a lesser degree (i.e. negative declaration vs. full EIR).

WSPA appreciates the District's consideration of these comments on the NOP/IS for Proposed Amended Regulation XX. Please feel free to call me or Steve Schuyler at (310) 408-2146 with any questions regarding these comments.

2-24

Sincerely,



Jodie Muller

Manager, External Affairs and South Coast Region

Western States Petroleum Association

Responses to Comment Letter #2
(Western States Petroleum Association, July 21, 2009)

2-1 The CEQA analysis in the PEA will focus on the following environmental topics: aesthetics, air quality, energy, hazards and hazardous materials, hydrology and water quality, and transportation. A cumulative impacts analysis for these environmental topics has also been included in the PEA.

2-2 The proposed project focuses on multiple source categories with varying SOx emission limits. The consultants prepared facility-specific reports to show all potential BARCT control options. As part of the rule development process, if a control option for a particular equipment/process at a facility was shown to exceed $50,000 per ton cost-effectiveness threshold, both costs and emission reductions anticipated by the installation of the control equipment was excluded from the analysis. For consistency with the proposed rule amendment and the BARCT analysis, the CEQA analysis in this PEA also excludes that equipment from the analysis. It is important to keep in mind, however, that the PEA not only analyzes the proposed project, but also analyzes alternatives. In any case, multiple control technologies are considered and evaluated and are not limited. Further, the control technologies with the worst-case environmental effects are included in the analysis.

2-3 Contrary to the comment, the permit moratorium[8] and availability of emission offset credits for non-RECLAIM pollutants have nothing to do with determining BARCT for sources covered under the proposed project, and overall environmental benefits and impacts of the proposed project. Only factors relevant to the proposed rule amendment should be included in the proposed project. As a reminder, Health and Safety Code §40406 defines BARCT as an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy and economic impacts by each class or category of source. The determination or establishment of BARCT does not need to take into account whether a not a permit can be issued pursuant to the permit moratorium. Lastly, because the proposed project calls for a reduction in SOx, a RECLAIM pollutant, emission offset credits for non-RECLAIM pollutants and their availability are not part of the proposed project and therefore, have not been included.

The PEA contains an elaborate analysis of all foreseeable environmental impacts that may result from implementing the proposed project and alternatives considered, but it is unclear what the commenter means by requesting the CEQA document to contain an analysis of "project constraints imposed by existing environmental laws and regulations, and project impacts on new laws that will become effective in 2010 and beyond." In accordance with CEQA Guidelines §15144 which requires an agency to use its best efforts to find out and disclose all that it reasonably can, if there is an existing environmental law or regulation that is germane to the proposed project, then a discussion is included in the PEA. However, to suggest that the PEA contain an analysis about how the proposed project will affect new laws that have not been promulgated yet is too speculative to evaluate since foreseeing the unforeseeable is not possible. Contrary to the comment, CEQA Guidelines §15145 allows an agency to terminate the discussion of an impact if the particular impact is determined to be too speculative for evaluation.

[8] Governor Schwarzenegger has signed Senate Bill 827 (Wright) which authorized the SCAQMD to begin issuing more than 1,200 air pollution permits frozen by a state court decision in November, 2008 (e.g., the permit moratorium) beginning January 1, 2010.

2-4 Pursuant to the SCAQMD's Certified Regulatory Program, an equivalent document called an Environmental Assessment is prepared in lieu of an EIR for rule projects. The Program EA (PEA) prepared for this proposed project is an amalgam of both a Project and Program EIR because the environmental effects of the project as a whole and on a detailed facility-specific basis are analyzed. Further, the PEA prepared for this proposed project can be relied upon for tiering purposes if future projects contain more detailed or varying facility-specific information when compared to the PEA prepared for this project.

2-5 SCAQMD staff disagrees with the commenter's suggestion that the District should conduct plume visibility analysis/modeling to address the aesthetics impacts from multiple WGS steam plumes because it is unnecessary. The available models for plume visibility analysis are applied when the composition of the plume is unknown. However, WGS technology has already been installed on one FCCU in the District and the unit produces a continuous plume that is made up of water vapor, and not SO3. An aesthetics analysis in the PEA has been prepared and it takes into account the potential installation of multiple scrubbers (and multiple plumes) at one facility. Refer to Chapter 4 of the PEA for this analysis.

2-6 The commenter does not elaborate as to what additional NOx emitting equipment would need to be installed or why it would be installed in order to provide heat and steam for operating SOx controls. However, the consultant reports take into account each individual facility's circumstances and have factored in the amount of energy and water (or steam), as well as other supplies such as caustic and catalyst, that may be necessary for operating each of the proposed SOx controls. This data was considered in the Air Quality analysis of the PEA.

2-7 The PEA takes into account the potential increases in criteria pollutants and GHGs that may result from implementing the proposed project and these increases are considered with the SCAQMD's air quality commitments in the AQMP.

While the proposed project may be perceived as energy intensive, as the commenter suggests, the analysis shows that the potential increased energy use does not exceed the CEQA significance thresholds for energy. Therefore, less than significant energy impacts are expected from the proposed project.

A GHG analysis was also conducted for the proposed project. On a facility-by-facility basis, the CEQA significance threshold of 10,000 MT per year for GHG emissions is not exceeded. However, when the GHG emissions from the entire project are considered together, the significance threshold is exceeded. However, the overall project will reduce SOx, a criteria air pollutant and a major precursor to PM10 and PM2.5, also criteria air pollutants. The residents of the South Coast Air Basin experience the worst PM2.5 exposure levels in the nation. As such, SCAQMD policy prioritizes the reduction in criteria pollutants in order to achieve the National and State Ambient Air Quality Standards.

The increase in GHG emissions that may result from installing SOx controls does not necessarily mean that there is a conflict with the goals of AB 32, because each affected facility will be required to reduce GHG emissions facility-wide in accordance with AB 32, regardless of whether or not the proposed project gets implemented. For facilities to

accomplish the goals of AB 32, older, less efficient equipment will likely need to be targeted in order to reduce their GHG emissions to 1990 levels.

2-8 The commenter's claim that flaring will increase if SOx control equipment will be installed because equipment such blowers are maintenance intensive is unsubstantiated. As a matter of conducting maintenance on support equipment such as blowers and pumps, engineering design typically builds in some redundancies (e.g., one main unit and one as a back-up) to maximize the time between turnarounds. In addition, turnarounds are a necessity of all equipment, not just control equipment. Further, paragraph (c)(3) of SCAQMD Rule 1118 – Control of Emissions From Refinery Flares, requires facility operators to submit to the Executive Officer an evaluation of options to reduce flaring during planned shutdowns, startups and turnarounds. Thus, for any SOx controls that are installed at any affected facility, this evaluation would need to be revised by each facility operator to accommodate the new equipment.

2-9 Chapter 4 of the PEA contains a health risk screening for NaOH. The analysis has demonstrated that the screening level of NaOH exposure to sensitive receptors will not be exceeded if WGSs using NaOH caustic are installed.

2-10 The water consumption estimates provided by the consultants, on which the PEA relies, show very conservative water demand estimates for various types of both wet and dry scrubbers.

2-11 Contrary to the suggestion, using the general ranges would grossly misrepresent the water demand and wastewater impacts, especially since a WGS has already been installed for a FCCU and the water use is far below the general ranges suggested. Instead, the consultants' reports identified the type of scrubber technologies that would be appropriate for each source at each facility and the reports include the corresponding, conservative water demand and wastewater generation estimates. These specific values, instead of the commenter's stated ranges, were relied upon to conduct the hydrology and water demand analysis in the PEA.

The PEA contains an extensive hydrology and water demand analysis as required by CEQA; it also takes into account the fact that California is in a State of Emergency for Drought and that water supply agencies, including the MWD, need to implement multi-layered potable water conservation efforts. A key factor as to whether there is enough water to supply the potential water demand for the proposed project is based on the type of water that would be needed. The commenter incorrectly implies that only raw (i.e., potable) water would be utilized to satisfy the potential total water demand of the proposed project, when, in actuality, WGS technology does not require potable water, and instead can function with recycled water or industrial use groundwater. Thus, the question that is addressed in the PEA is not only if there is enough total water for the proposed project, but what types of water can be supplied (i.e., such as the availability of recycled water to the affected facilities). SCAQMD staff has been working closely with staff from multiple water supply agencies to determine if there is sufficient total water supply (e.g., potable, recycled, and groundwater) available for the proposed project. All of the agencies contacted indicated that there will be enough water available to supply the potential water demand to all of the affected facilities, with the majority of the water supplied being recycled water, by the time the new WGSs come online. Only three facilities (Facilities G,

H and I) are expected to utilize potable water to implement the proposed project and one facility (Facility K) is expected to utilize industrial-use (non-potable) groundwater. For the full analysis, the commenter is referred to the Hydrology and Water Quality discussion in Chapter 4 of the PEA. See also the response to Comment 1-14.

2-12 As mentioned in Response to Comment 2-11, using the general wastewater ranges would grossly misrepresent the wastewater impacts. Instead, the consultants' reports identified the type of scrubber technologies that would be appropriate for each source at each facility and the reports include the corresponding, conservative wastewater generation estimates. These specific values, instead of the commenter's stated ranges, were relied upon to conduct the wastewater analysis in the PEA. Tables 4-41 and 4-42 in Chapter 4 of the Draft PEA summarize the potential wastewater impacts, and the estimated discharges for the entire proposed project is 270,532 gallons per day or 99 million gallons per year under Option 1 and 158,203 gallons per day or 58 million gallons per year under Option 2, not 440 million gallons per year as suggested by the commenter. Further, on a facility-by facility basis, the proposed increase in wastewater generation is not expected to exceed the wastewater CEQA significance threshold (a 25 percent increase in discharge from permitted levels) that would need to occur in order to trigger a wastewater permit revision. Therefore, because each facility has been shown to have the additional capacity to accommodate the proposed project, contrary to the comment, individual facility expansion or improvement of their existing wastewater treatment systems is not expected.

Regarding paving and stormwater runoff, contrary to the comment, typically most of the areas likely to be affected by the proposed project are currently paved and are expected to remain paved. Any new units constructed will be curbed and the existing units will remain curbed to contain any runoff. Any runoff occurring will continue to be handled by each affected facility's wastewater system and sent to an on-site wastewater treatment system prior to discharge. The surface water runoff is expected to be handled with each facility's current wastewater collection or treatment system. Storm water runoff will be collected and discharged in accordance with each facility's discharge permit terms and conditions.

2-13 The consultants and SCAQMD staff followed the BARCT selection process outlined in Part III of the Staff Report. The BARCT selection process includes five steps: 1) identify technology that can achieve maximum degree of reduction, 2) evaluate control effectiveness, 3) conduct a top-down cost analysis, 4) conduct an impact analysis for environment, energy and economic, and 5) select BARCT. Vendor guarantees are important information for Step 2. In evaluating the consultants' recommendation for BARCT and arriving at the SCAQMD's proposal for BARCT, in addition to vendor guarantees, SCAQMD staff relied on source test data, CEMS data, permitting data, and engineering evaluation. SCAQMD staff believes that adequate information has been provided to substantiate the proposed BARCT for all source categories. Recognizing that the proposed project involves resource-intensive control technologies, SCAQMD staff has prepared this PEA (as part of Step 4) to fully disclose the potential resource consumption and waste impacts associated with the proposed project.

2-14 See the response to Comment 1-19.

2-15 The hazards and hazardous materials analysis shows that there is only one substance that will have an increased in use and is considered a hazardous material subject to CalARP,

NaOH, as part of the proposed project. However, because NaOH has such a low vapor pressure (6.33 mm Hg at 40 ^{o}C or 104 ^{o}F) when compared to water (55.3 mm Hg at 40 ^{o}C 104 ^{o}F) at the same temperature, any spill of NaOH would not be expected to evaporate faster than water. Thus any spill of NaOH would be expected to stay in liquid form and would not likely exceed the ERPG-2 vapor concentration of five milligrams per cubic meter for NaOH. Further, operators at each affected facility who construct a new NaOH storage tank will need to build a containment berm large enough to hold 110 percent of the tank capacity in the event of an accidental release due to tank rupture. Thus, any spill of NaOH would not be expected to migrate beyond the boundaries of the berm on-site. Thus, any spill of NaOH is not expected to present a potential offsite public and sensitive receptor exposure. Lastly, since NaOH is not a flammable compound, other types of heat-related hazard impacts such as fires, explosions, boiling liquid – expanding vapor explosion (BLEVE) are not expected to occur. Thus, the hazards and hazardous materials impacts due to the use, tank rupture and the accidental release of NaOH will be less than significant for the proposed project.

2-16 Regarding the alleged necessity for infrastructure improvements, see the response to Comment 1-9. With regard to the alleged cost deficiencies, the commenter did not elaborate. Nonetheless, the consultants' reports contain an extensive facility- and unit-specific cost analysis. A contingency factor has been added to cover miscellaneous costs. This procedure is common to all cost estimates. Whether or not there is a dispute about the cost analysis in the consultant reports or staff report, the CEQA analysis in the PEA is not based on cost but instead is based on the consultants' energy demand estimates for electricity and natural gas, as well as the construction scenario estimates for gasoline and diesel fuel use. Refer to Appendix B of the PEA for the energy assumptions and calculations for both construction and operation activities.

2-17 In order to conduct the air quality analysis and estimate the amount of air emissions that would be generated from supply deliveries and waste disposal trips, supplies delivery and waste disposal data during operations was taken from the consultants' reports and applied to estimate not only the number of truck trips for the transportation analysis but the amount of diesel fuel needed for the energy analysis. The analysis in the PEA re-affirms the less-than-significant determination in the NOP/IS for operational-related traffic. Thus, there is no need to re-assess this portion of the PEA. Refer to Appendix B of the PEA for the assumptions and calculations.

As for cumulative impacts, the PEA considers the impacts of construction activities at all of the affected SOx RECLAIM facilities. The analysis takes into account overlapping construction activities at multiple facilities (the overlapping of four WGS installations) over a seven-year period and a lengthy (18-month) construction period per WGS installed. The PEA, does not, however, include the cumulative effects of other future construction projects outside of the SOx RECLAIM project because the construction of future projects is unknown at this time and inclusion in the PEA would be speculative at best.

With regard to construction activities and aesthetics impacts, Chapter 4 of the PEA includes an aesthetics analysis for both construction and operation of the SOx control technologies.

2-18 The analysis in the PEA confirms that there will be less than significant impacts for noise, land use and planning, and solid/hazardous waste. Detailed responses to this comment can

be found in the following responses: 1) response to Comment 2-19 addresses noise impacts; 2) response to Comment 2-20 addresses land use and planning impacts; and, 3) response to Comment 2-21 addresses solid/hazardous waste impacts.

2-19 The proposed project is expected to involve the installation of large, industrial equipment with the potential to generate noise. Nonetheless, the construction and operation activities associated with the proposed project will take place at existing facilities that are located in industrial, heavy manufacturing settings with an existing noise environment dominated by noise from existing equipment onsite, vehicular traffic around the facilities, and trucks entering and exiting each facility premises. Because of the existing noise setting, any additional noise from the proposed project is not expected to produce noise in excess of current operations at each of the existing facilities at the property line. So, if SOx control equipment is installed, the operations phase of the proposed project may add new permanent sources of noise to each affected facility. However, it is expected that each facility affected will comply with all existing noise control laws or ordinances. Further, OSHA and Cal/OSHA have established noise standards to protect worker health. These potential noise increases are expected within the allowable noise levels established by the local noise ordinances for industrial areas, and thus are expected to be less than significant.

2-20 Plot space concerns were addressed in the consultants' report, section H:

"Wet gas scrubber equipment footprints and space requirements for the FCCUs and the SRU/TGTUs are shown in the confidential appendices for each refinery where measures have been selected. These specifications have been compared with the plot plans provided by the respective refineries, and where applicable, are presented in the costing workbooks."

Further, Tables 4-36 and 4-37 in the Draft PEA contains a summary of these plot space estimates on a facility-by-facility basis. If all affected facilities conduct site preparation activities, the total amount of disturbed area for all of the facilities combined is estimated to be 48,126 square feet or 1.1 acre under Option 1 and 40,976 square feet or 0.94 acre under Option 2. The consultants' reports did not indicate a need for any facility to acquire additional property to accommodate the proposed project. Thus, there is no need to consider additional permitting approvals or land use decisions relative to plot space in the PEA.

2-21 The construction portion of the air quality analysis in the PEA accounts for the potential to demolish existing buildings and foundations and dismantle existing equipment and the construction equipment that would be used for these activities as part of site preparation for installing SOx control equipment. While the NOP/IS acknowledges that there may be demolition wastes associated with these site preparation activities, any metals that are part of demolished equipment, piping or wiring, would be considered a commodity and thus would be sold as scrap for reuse or recycling. The remainder of demolition waste that cannot be recycled would be disposed of in a landfill. Estimating the scope of demolition waste that could be generated and sent to a landfill can be qualitatively determined relative to plot space needed to install the new SOx controls. As mentioned in the response to Comment 2-20, the amount of plot place that would be needed to construct the new SOx control equipment (i.e., the amount of space that would have demolition activities occur) is relatively small on a facility-by-facility basis, and is approximately one acre for the total

project. This implies that whatever existing buildings or equipment that is on the each facility's plot space falls is also relatively small, when compared to the total landfill capacity as discussed in the NOP/IS.

With regard to solid waste generation such as spent catalyst or scrubber cake, the commenter implies that these byproducts require disposal. On the contrary, each facility was surveyed about how their current catalyst fines or other solid waste fines (e.g., ESP fines) are handled and because these byproducts are a commodity, the majority is recycled. Specifically, of the 11 facilities, nine facilities have their catalyst fines picked up by a transport company that in turn trucks the spent catalysts to a local cement manufacturer for recycling, two facilities (Facility B and Facility I) either truck their fines to a landfill or to a cement plant for recycling (depending on the silica, iron and other metals content in the spent catalyst), and one facility (Facility J) does not use catalyst or generate fines as part of its operations and is not expected to use any as part of implementing the proposed project. Based on the survey responses, even with a potential increase in solid waste of 11.75 tons per day that may result from the proposed project, the same facilities that currently recycle will be expected to continue to do so. For the two facilities that do not consistently recycle their catalyst fines (Facility B and Facility I), a maximum of 2.52 tons per day of solid waste may end up in a landfill from two of the 11 facilities provided that the composition is unsuitable for cement manufacturing. This amount is a conservative worst-case because the operator at Facility B has indicated that their catalyst fines are now being recycled because the composition has altered to be more suitable for cement manufacturing. If the composition of the spent catalyst from Facility B after implementing the proposed project remains suitable for cement manufacturing, then the additional 2.47 tons per day will also be recycled and only 0.05 tons per day or 100 pounds per day from Facility I would need to be trucked to a landfill as a result of the proposed project. For these reasons, the solid/hazardous waste generated from the proposed project are not are expected to exceed total landfill capacity.

For the hazards/hazardous materials analysis, a fire hazard analysis of the different materials being used (e.g. catalyst, caustic, et cetera) is included in Chapter 4 of the PEA. However, the fire hazard associated with the use of ammonium (NH4) to control NOx is not germane to the proposed project and as such, is not analyzed in the PEA.

2-22 As required by CEQA, the PEA includes an alternatives analysis and one of the alternatives (referred to herein as Alternative B) is the AQMP alternative, as suggested by the commenter. However, contrary to the comment, CEQA does not require an evaluation of cost-effectiveness. Thus, a cost-effectiveness analysis for varying BARCT levels for SRU/TGUs and FCCUs will not be included in the PEA. However, for the proposed project, facilities for which the cost-effectiveness of a particular control technology exceeded $50,000 per ton reduced were assumed not to use that control technology. Instead, the PEA contains alternatives that analyze varying compliance levels for the affected source categories. This analysis can be found in Chapter 5 of the PEA.

2-23 The purpose of CEQA is to: 1) inform governmental decision-makers and the public about potential environmental effects of a project; 2) identify ways to reduce adverse impacts; 3) offer alternatives to the project; and, 4) disclose to the public why a project was approved. In compliance with CEQA, this PEA has been prepared to thoroughly analyze the environmental effects (benefits and impacts) of the proposed project. As part of this

analysis, the PEA takes into account California's State of Emergency for Drought in the Hydrology and Water Quality existing setting discussion in Chapter 3 and analysis in Chapter 4.

The PEA does not consider the economic health of California, as that issue not part of the project. Further, by the time this project is implemented, the economic health of California could substantially change, making the point moot. The cost of the proposed project will be considered in the socioeconomic analysis. While CEQA Guidelines §15131 (a) allows, but does not require, the economic effects of a project to be included in the CEQA document, the economic effects shall not be treated as significant effects on the environment and the focus of the analysis shall be on the physical changes. This PEA shows that the proposed project contains significant adverse impacts as well as benefits and focuses on the physical effects of the proposed project.

2-24 See the response to Comment 2-4.

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July 21, 2009

Trade Secret and/or Confidential Business Information

Via U.S. Mail and E-Mail

Ms. Barbara Radlein
Air Quality Specialist
South Coast Air Quality Management District
Planning, Rule Development and Area Sources
21865 East Copley Drive
Diamond Bar, CA 91765-4178

Re: Comments on Notice of Preparation of a Draft Environmental Assessment and Initial Study for Proposed Amended Regulation XX

Dear Ms. Radlein:

Rhodia Inc. appreciates the opportunity to provide comments on the South Coast Air Quality Management District's Notice of Preparation of a Draft Environmental Assessment and Initial Study for Proposed Amended Regulation XX (NOP/IS). Because these comments contain confidential business information, we request that the District treat the entirety of these comments as business confidential and protect them from public disclosure. These comments should be distributed only to those District personnel with a need to know this information in the context of the review and revision of the NOP/IS. 3-1

Rhodia previously has provided comments to the District on the proposed amendments to Regulation XX, most recently relating to the draft Staff Report for those proposed amendments. Rhodia incorporates those previous comments by reference here. 3-2

As you know, the District's proposed amendments to the SOx RECLAIM rules (Regulation XX) rely on a reassessment of the Best Available Retrofit Control Technology (BARCT) level for major SOx RECLAIM sources, as proposed in Control Measure CMB-02 in the District's 2007 Air Quality Management Plan (AQMP). Though Control Measure CMB-02 is a SOx control measure, the District has communicated that it seeks these additional SOx reductions as a strategy for meeting the National Ambient Air Quality Standards (NAAQS) for fine particulate matter (PM2.5) by 2015. 3-3

Both the California Environmental Quality Act (CEQA) and District Rule 110 require, among other things, that the District to identify all potential adverse environmental 3-4

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impacts of the proposed rule amendments, and to identify and implement alternatives or mitigation measures to those amendments. In preparing the draft Environmental Assessment (EA) for the proposed rule amendments, District staff should ensure that it considers a number of impacts and alternatives: 3-4 Cont'd

- State law prohibits the District from setting BARCT levels without considering the relative environmental and economic impacts on each affected source category. To date, the District's proposed regulations (which the District estimates would cost all stakeholders over $1 billion to meet) do not reflect a full and fair consideration of lower cost SOx control alternatives that would still allow the District to accomplish its objectives of reducing PM10 and PM2.5 to meet the NAAQS. In preparing the EA, District Staff must consider and evaluate (1) the relative environmental and economic impacts of requiring the proposed SOx controls for sulfuric acid manufacturing instead of requiring greater reductions from different industrial sectors, and/or from direct sources of PM2.5 and/or PM10 throughout the Basin; (2) the relative environmental and economic impacts of obtaining SOx reductions through alternative, less expensive control measures (such as use of cesium catalyst) within the sulfuric acid manufacturing industry; (3) the prospect that the proposed regulations will result in crippling spikes in SOx RECLAIM credit prices and/or a general scarcity in credits, and the relative environmental and economic impacts likely to be associated with such a crippling of the SOx RECLAIM market. 3-5

- District Staff also must consider and evaluate the amount emissions produced from energy used to produce caustic required for wet scrubbers to be used in the sulfuric acid manufacturing industry, and the emissions from transporting caustic to the facility. 3-6

- Staff currently is using 2005 emissions inventories as the baseline against which to measure anticipated emissions reductions from the proposed amendments. Staff must take into account any SOx emissions reductions and control measures that have been put into place since that time, and discount the District's estimated emissions savings figures appropriately to determine the true cost-per-ton cost effectiveness of the proposed amendments and any feasible alternatives. 3-7

- Both the District and stakeholders have acknowledged that the proposed regulations would involve significant compliance costs for the refining industry, and could result in increases in the price of gasoline in Southern California. Staff must consider the full range of potential impacts Basinwide that could result from such higher gasoline prices. 3-8

- Despite optimistic estimates from District Staff to date, stakeholders have explained that installing actual emissions controls likely will take longer that the District anticipates. Emissions reductions from new control equipment may not be available to assist in PM2.5 attainment in the District until 2012 or later, 3-9

depending on when the District approves the BARCT revision. Accordingly, District Staff must consider and evaluate the impacts of requiring SO2 emissions reductions that would not yield PM2.5 reductions until 2012 or later, and whether less-costly alternatives may be available to achieve PM.5 and/or SOx reductions on a faster schedule.

3-9 Cont'd

These are only some of the additional factors District Staff should consider in preparing the draft EA. The proposed amendments would result in unprecedented compliance costs across a host of industries, during the most severe economic downturn the nation has seen in over 75 years, and during a time when the availability of capital funding is extremely limited. The District's EA must take into account all of the environmental and economic impacts that are likely to flow from the adoption of the proposed regulations during this unique confluence of events.

3-10

As always, please feel free to contact us if you have any questions

Very truly yours,

Michael S. McDonough

Responses to Comment Letter #3
(Bingham McCutchen LLP, July 21, 2009)

3-1 Contrary to the original comment, Bingham representative Michael S. McDonough has consented to have the comments and responses to their letter included in the Draft PEA per the following email:

-----Original Message-----
From: McDonough, Michael
Sent: Monday, August 10, 2009 10:17 AM
To: Ruby Fernandez
Cc: Barbara Radlein
Subject: Comments on Notice of Preparation of Environmental Assessment and Initial Study for SOx RECLAIM Amendments

Ms. Fernandez -

Thanks for your voice mail last week. This e-mail is to confirm that, notwithstanding the confidentiality label on Rhodia's July 21, 2009 comments on the SCAQMD's Notice of Preparation of Environmental Assessment and Initial Study for the proposed SOx RECLAIM amendments, we consent to have the comments and the SCAQMD response(s) published in the CEQA document appendix for the proposed amendments. If you have any questions, please feel free to call me. Thank you.

Mike

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3-2 Two comment letters from Rhodia regarding the proposed amendments and staff report were received on April 29, 2008 and November 25, 2008. As none of the comments in these letters pertain to CEQA or the CEQA analysis for the proposed project, they are not repeated here. Instead, responses to these comments can be found in Part 1 of the SOx RECLAIM Draft Staff Report – BARCT Assessment & RTC Reductions Analysis, Chapter 14, December 2009.

3-3 In the *Clean Air Fine Particle Implementation Rule*, the USEPA specifically requires the non-attainment areas (which includes the SCAQMD) to evaluate all control measures to reduce direct PM2.5 emissions, as well as PM2.5 precursors, especially SOx. It should be noted that the 17 million residents of the South Coast Air Basin experience the worst PM2.5 exposure in the nation. While the 2007 AQMP lays out a multi-pollutant control strategy to demonstrate attainment with the federal PM2.5 standards, it identifies NOx and SOx reductions by far as the two most effective tools in reaching attainment with the PM2.5 standards. Because sulfur dioxide (SO2) is a PM2.5 precursor, SO2 reductions that may occur as a result of the proposed project will have the effect of indirectly reducing PM2.5 and contribute to the federal PM2.5 attainment demonstration.

3-4 The CEQA analysis in the PEA will focus on the following environmental topics: aesthetics, air quality, energy, hazards and hazardous materials, hydrology and water quality, and transportation. For any topics that have been shown to have significant impacts, a cumulative impacts analysis for these environmental topics and an alternatives analysis will also be included in the PEA.

3-5 As mentioned in the response to Comment 3-4, the PEA will contain an alternatives analysis and each alternative may have varying economic impacts. The alternatives analysis in the PEA will explore various configurations of SOx control options and each alternative's environmental impacts. As for cost, the cost-effectiveness of the rule and the alternatives can be found in can be found in Part 1 of the SOx RECLAIM Draft Staff Report – BARCT Assessment & RTC Reductions Analysis, Chapter 14, December 2009. In addition, the socioeconomic impacts of the rule and the alternatives will be analyzed in a separate report from the PEA.

3-6 As part of installing a WGS on a sulfuric acid plant, the consultants' reports show that sodium hydroxide (NaOH) caustic will be needed to operate the WGS. NaOH will also be needed to operate WGSs for other equipment source categories. The air quality discussion and the energy discussion in Chapter 4 of the PEA take into account the air emissions that may be generated and the fuel needed for multiple truck deliveries of the caustic solution to all of the affected facilities, including the sulfuric acid plant. With regard to the comment about the increased electricity needed to produce caustic, the PEA assumes that because caustic is produced locally, it is locally available for transport and it is likely that the existing local caustic manufacturers can handle the proposed increase in caustic for the entire project. The energy analysis in Chapter 4 of the PEA takes into account the additional energy that would be needed for local caustic manufacturers to make enough extra caustic to satisfy the total caustic demand of the proposed project (i.e., 13.24 tons per day under Option 1 and 8.79 tons per day under Option 2).

3-7 Very little SOx emission reductions were projected in the 2003 AQMP. The most substantial amount of SOx reductions resulted from the November 2005 amendments to SCAQMD Rule 1118 – Control of Emissions From Refinery Flares, which implemented stationary source control measure CMB-07: Emission Reductions from Petroleum Refinery Flares (2003 AQMP), to reduce SOx emissions by 2.1 tons per day. Subsequent to amending Rule 1118, the 2007 AQMP was adopted and it calls for significant reductions of SOx from both stationary and mobile sources by 2014. Regional modeling in the 2007 AQMP indicates that an overall emission reduction of 24 tons per day of SOx is needed to meet the particulate standard in 2014. Of the 24 tons per day reduction, mobile source control measures from CARB and the District can potentially reduce 21 tons per day. The remaining three tons per day of SOx reductions can come from the stationary source control measure for RECLAIM facilities. However, it should be noted that additional reductions of SOx and NOx emissions will be needed to meet the 24-hour federal PM2.5 standard. A BARCT reassessment for SOx is therefore essential to identify the potential sources that can generate three tons per day of SOx reductions required for 2014.

3-8 SCAQMD staff is in the process of conducting a socioeconomic analysis for the proposed amendments to the SOx RECLAIM program. This analysis will include annual costs of

compliance and the resulting macroeconomic impacts on the Basin's economy. The analysis will also include potential impacts on gasoline prices in the Basin.

3-9 Given the amount of lead time needed for engineering design, planning and financing, the anticipated construction date assumed in the PEA is 2012 at the earliest, spanning over a seven-year period, and with construction completed and units operational by January 1, 2019.

3-10 With regard to compliance costs, refer to the response to Comment 3-8. SCAQMD staff will also assess funding availability to the affected facilities regarding their compliance with the proposed amendments.