Permit to Construct

COMPANY NAME
TESORO REFINING AND MARKETING CO
P.O. BOX 817, WILMINGTON, CA 90748-0817

EQUIPMENT LOCATION
2101 E. PACIFIC COAST HIGHWAY
WILMINGTON, CA 90744
Facility ID#: 800436
Facility Type: NOx & SOx RECLAIM (Cycle 1), Title V
Note: A Title V application has been submitted, but the permit has not been issued.

1. EQUIPMENT DESCRIPTION:

Equipment	ID No.	Connected To	RECLAIM/ Source Type/ Monitoring Unit	Emissions and Requirements	Conditions
Process 18: STEAM GENERATION					
BOILER BO-11, REFINERY FUEL GAS/NATURAL GAS, RENTECH, 352 MMBTU/HR, FGR, WITH A/N 484366	D1629	C1631	NOX: MAJOR SOURCE**; SOX: MAJOR SOURCE**	**CO:** 2000 PPMV (5) [**RULE 407, 4-2-1982];** **CO:** 50 PPMV (4) [**RULE 1703(a)(2)-PSD BACT, 10-7-1988]**] **NOX** (COMMIS)**:** 74.2 LBS/MM SCF (1A)**[RULE 2012, 5-6-2005];** NOX: 5 PPMV NATURAL GAS (4) **[RULE 2005,5-6-2005] ;** **NOX:** 9 PPMV (4) [**Rule 2005 BACT, 4-20-2001]; NOX:** 7 PPMV(Monthly) (4) [**Rule 2005 BACT, 4-20-2001];** ; **NOX:** 0.2 LBS/MMBTU (8) **[40CFR 60 Subpart Db,1-28-2009]** **NOX:** 0.035 LBS/MMBTU (1) **[RULE 2012, 5-6-2005];** **PM:** 0.01 GRAINS/SCF (5) [**RULE 476, 10-8-1976**] **PM:** 11 LBS/HR (5A) [**RULE**	A63.9, A99.11, A99.12, A99.13, A99.14, A99.15, A99.16, A195.12, A195.13, A195.14, A195.15, A195.16 A327.2, B59.7, B61.8, B61.10 C1.52, D29.12, D29.13, D82.5, D82.6, D90.20, D90.21, I296.3, K40.3, K67.14

BURNER REFINERY GAS/NATURAL GAS, COEN - TODD, Variflame, WITH LOW NOX BURNER 352 MMBTU/HR A/N 484366	B1630			**476, 10-8-1976**] PM: 0.051LBS/MMBTU (8) **[40CFR 60 Subpart Db,1-28-2009**] **PM:** 0.1 GRAIN/SCF (5) [**RULE 409, 8-7-1981]; PM** (9) **[RULE 404, 2-7-1986],** **SOX:** 34 LBS/MMSCF (1) **[RULE 2011, 5-6-2005]** **SOX** (COMMIS)**:** 6.65LBS/MMSCF (1) **[RULE 2011, 5-6-2005]**	
SELECTIVE CATALYTIC REDUCTION, SERVING BOILER BO-11, WITH 608 CUBIC FEET CATALYST VOLUME, CORMETECH OR EQUIVALENT, WITH A/N 484364 AMMONIA INJECTION	C1631 B1633	D1629		NH3: 5 PPMV (4) [**RULE 1303 (a)(1)-BACT, 5-10-1996**; RULE 1303(a)(1)-BACT, 12-6-2002]	D12.10, D12.11, D12.12, D29.10, E73.5, E179.3, E179.4
BOILER BO-12, REFINERY FUEL GAS/NATURAL GAS, RENTECH, 352 MMBTU/HR, FGR, WITH A/N 484362	D1634	C1636	NOX: MAJOR SOURCE**; SOX: MAJOR SOURCE**	**CO:** 2000 PPMV (5) [**RULE 407, 4-2-1982];** **CO:** 50 PPMV (4) [**RULE 1703(a)(2)-PSD BACT, 10-7-1988**]] **NOX** (COMMIS)**:** 74.2 LBS/MM SCF (1A)**[RULE 2012, 5-6-2005];** NOX: 5 PPMV NATURAL GAS (4) **[RULE 2005,5-6-2005] ;** **NOX:** 9 PPMV (4) [**Rule 2005 BACT, 4-20-2001]; NOX:** 7 PPMV(Monthly) (4) [**Rule 2005 BACT, 4-20-2001];** ; **NOX:** 0.2 LBS/MMBTU (8) **[40CFR 60 Subpart Db,1-28-2009]** **NOX:** 0.035 LBS/MMBTU (1) **[RULE 2012, 5-6-2005];** **PM:** 0.01 GRAINS/SCF (5) [**RULE 476, 10-8-1976**]	A63.9, A99.11, A99.12, A99.13, A99.14, A99.15, A99.16, A195.12, A195.13, A195.14, A195.15, A195.16 A327.2, B59.7, B61.8,B61.10, C1.52, D29.12, D29.13, D82.5, D82.6, D90.20, D90.21, I296.3, K40.3, K67.14

BURNER REFINERY GAS/NATURAL GAS, COEN- TODD, Variflame, WITH LOW NOX BURNER 352 MMBTU/HR A/N 484362	B1635			**PM:** 11 LBS/HR (5A) [**RULE 476, 10-8-1976**] PM: 0.051LBS/MMBTU (8) **[40CFR 60 Subpart Db,1-28-2009**] **PM:** 0.1 GRAIN/SCF (5) [**RULE 409, 8-7-1981]; PM** (9) **[RULE 404, 2-7-1986],** **SOX:** 34 LBS/MMSCF (1) **[RULE 2011, 5-6-2005] SOX** (COMMIS)**:** 6.65LBS/MMSCF (1) **[RULE 2011, 5-6-2005]**	
SELECTIVE CATALYTIC REDUCTION, SERVING BOILER BO-12, WITH 608 CUBIC FEET CATALYST VOLUME, CORMETECH OR EQUIVALENT, WITH A/N 484365 AMMONIA INJECTION	C1636 B1637	D1634		NH3: 5 PPMV (4) [**RULE 1303 (a)(1)-BACT, 5-10-1996**; RULE 1303(a)(1)-BACT, 12-6-2002]	D12.10, D12.11, D12.12, D29.10, E73.5,E179.3, E179.4
Process 15: STORAGE TANKS					
System 6: STORAGE TANKS, OTHERS					
STORAGE TANK, PRESSURIZED, AQUEOUS AMMONIA, 19.9% SOLUTION OR LESS, 12000 GALS, WITH A VAPOR BALANCE SYSTEM, WITH A/N 484367	D1628				C157.1,E144.1

* (1) Denotes RECLAIM emission factor (2) Denotes RECLAIM emission rate
(3) Denotes RECLAIM concentration limit (4) Denotes BACT emission limit
(5)(5A)(5B) Denotes command and control emission limit (6) Denotes air toxic control rule limit
(7) Denotes NSR applicability limit (8)(8A)(8B) Denotes 40 CFR limit(e.g. NSPS, NESHAPS,etc.)
(9) See App B for Emission Limits (10) See Section J for NESHAP/MACT requirements

** Refer to Section F and G of this permit to determine the monitoring, recordkeeping and reporting requirements for this device.

2. BACKGROUND

Tesoro Refining and Marketing Company (TSO) purchased this refinery from EQUILON on May 11, 2007. TSO is proposing this project to reduce RECLAIM NO_X emissions and minimize future RECLAIM Trading Credits (RTC) purchase
. Currently, TSO NO_X RTC holdings for 2009 and 2011 are 533 and 498 tons, respectively. These levels are significantly below the refinery 2007 NO_X emissions of 821 tons. Of this amount, RECLAIM major NO_X sources emitted 777.5 tons. NOx Emissions from the existing four boilers BO-6, BO-7, BO-8, BO-9 and BO-10 with total combined heat input of 734 MMBTU/HR(the existing boilers do not have air pollution control systems), for compliance year 2008 were 241,811 pounds which was 15.55 percent of all NOX emissions from Major RECLAIM sources. SOx Emissions from the four boilers (compliance year 2008) were 64,338 pounds which was 8.85 percent of all SOX emissions from Major RECLAIM sources.
Currently, the refinery complies with NO_X allocation by purchasing RTCs from the RECLAIM market. This project will allow TSO to reduce emissions at the facility rather than purchasing NO_X RTCs. Two new boilers with total combined heat input of 704 MMBTU/HR will replace the four existing steam boilers with total combined heat input of 734 MMBTU/HR. The existing boilers do not have air pollution control systems.

The two new boilers BO-11 and BO-12 will replace the existing boilers BO-7, BO-8, BO-9 and BO-10 installed in 1944. At that time, the air pollution control regulation did not require permits to install and operate these boilers. Subsequent changes in air quality regulations and permitting requirement resulted in the air pollution control district issuing permits to operate these boilers in 1964. Subsequent permit history include new permits to operate new burners in all four boilers in 1968 and permits allowing combustion of waste gases from the fume scrubbers and the Alkylation Feed Treatment Unit in BO-8, BO-9, and BO-10 (Applications 105344, 10754, and 10755) in 1983. In June 1998, permits to construct/operate were issued to BO-7, BO-8, BO-9, and BO-10 (Application numbers 254766, 136774, 136775, and 136776) to limit the total steam production to 276,000 lbs/hr, however, the maximum steam production rates were 75,000 lb/hr for BO-6 and 110,000 lb/hr for each of the boilers BO-7, BO-8, BO-9 and BO-10. Vent gas currently vented to the existing boilers will be managed as follows: vent gas from the caustic fume scrubbers (Process 21/System 9) will be vented to the refinery vapor recovery system (separate applications will be submitted). Vent gas from the Alkylation Feed Treatment Unit (Process 9/System 3) will be sent to the refinery fuel gas system.

The two new boilers, each rated at 352 MMBTU/HR (HHV), will be equipped with SCR to reduce NO_X emissions.

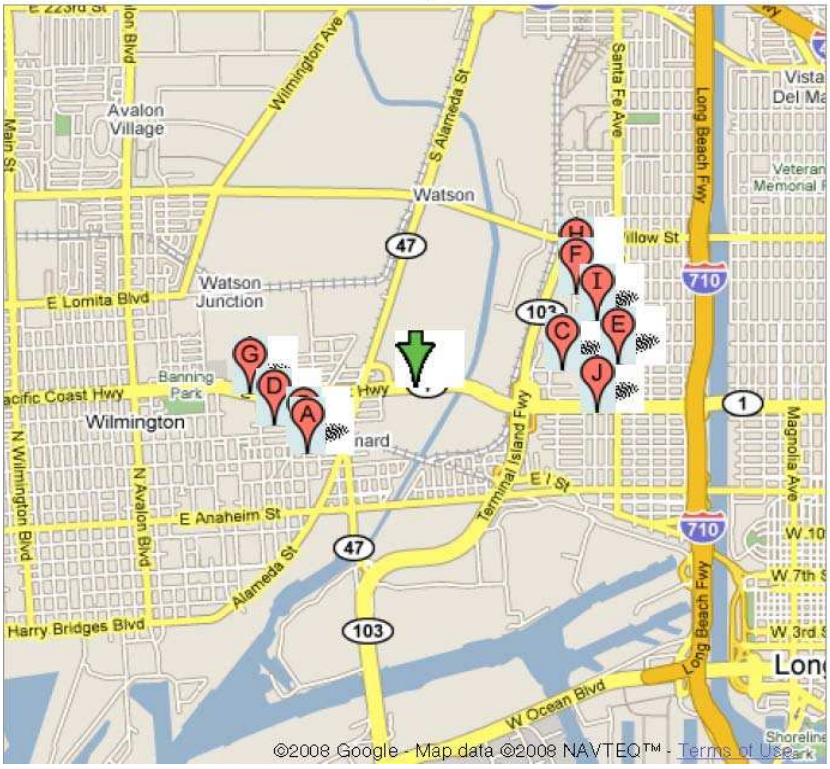
Table 1 – Applications for Permit to Construct Submitted to AQMD

Application Number	Equipment Description
484366	Boiler BO-11
484364	SCR for Boiler BO-11
484362	Boiler BO-12
484365	SCR for Boiler BO-12
484367	Aqueous Ammonia Storage Tank
484540	RECLAIM Administrative Application

Table 2 – Summary of Permit Processing Fees

A/N	Submittal Date	Deemed Complete	Equipment	Schedule	Processing Fee	XPP Fee	Total Fee
484366	6/27/08		Boiler BO-11	E	$4,680.85	$2,340.43	$7,021.28
484364	6/27/08		SCR for Boiler BO-11	C	$2,949.92	$1,474.96	$4,424.88
484362	6/27/08		Boiler BO-12	E	$2,340.43	$1,170.21	$3,510.64
484365	6/27/08		SCR for Boiler BO-12	C	$1,474.96	$737.48	$2,212.44
484367	6/27/08		Aqueous Ammonia Storage Tank	C	$2,949.92	$1,474.96	$4,424.88
484540	6/27/08		RECLAIM Administrative A/N	Rule 301 (k)(5)	$1,534.21		$1,534.21
						Total Permit Processing Fee	**$23,128.33**

Nearby Schools: There is no school within 1000 feet of the refinery. The nearest school is 0.7 miles from the refinery. The closest 20 public and private schools and related educational facilities are listed on this page and the following page.



A. Wilmington Park Elementary
1419 E Young St, Wilmington, CA
(310) 518-3207 -0.7 mi SW

B. Wilmington Park Erly Edu Center
1140 Mahar Ave, Wilmington, CA
(310) 830-8404 -0.7 mi SW

C. American Indian Changing
2120 W Williams St # 1, Long Beach, CA
(562) 388-8118 -0.8 mi E

D. Holy Family School
1122 E Robidoux St, Wilmington, CA
(310) 518-1440 -0.8 mi W

E. Cabrillo (Juan Rodriguez) High School
2001 Santa Fe Ave, Long Beach, CA
(562) 951-7797 -1.2 mi E

F. Hudson
2335 Webster Ave., Long Beach, CA
(562) 595-4120 -1.1 mi NE

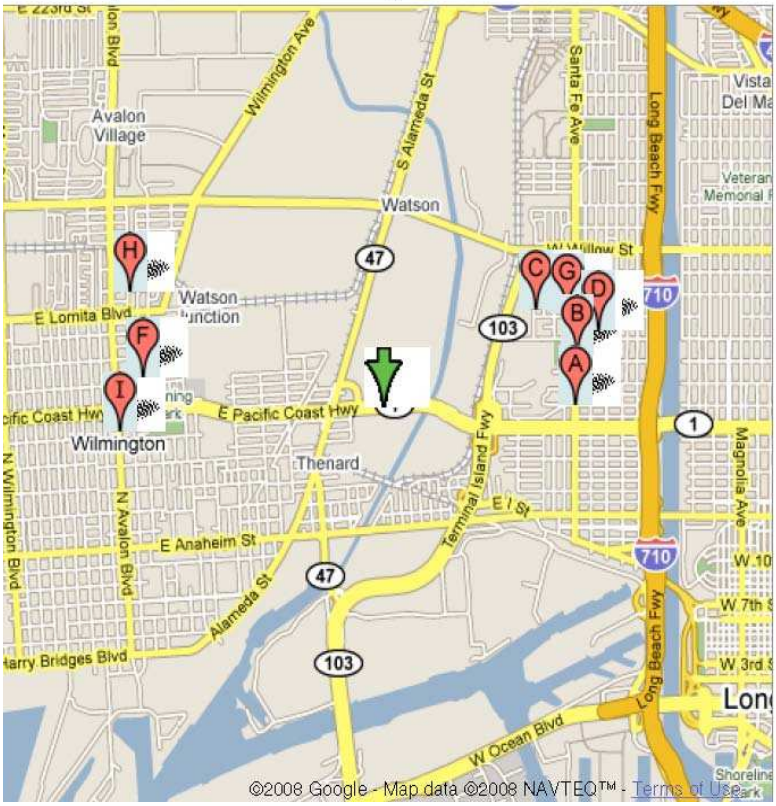
G. Harbor Trucking School
920 E Pacific Coast Hwy, Wilmington, CA
(310) 830-6201 -1 review -0.9 mi W

H. Long Beach Unified School District
2425 Webster Ave, Long Beach, CA
(562) 997-7550 -1.1 mi NE

I. Long Beach Child Development
2209 Seabright Ave, Long Beach, CA
(562) 595-5366 -1.1 mi E

J. Long Beach Japanese School Inc
1766 Seabright Ave, Long Beach, CA
(562) 435-0438 -1.0 mi E

Map of Schools Near Refinery (continue)



A. Long Beach Job Corps
1903 Santa Fe Ave, Long Beach, CA
(562) 983-1777 -1.2 mi E

B. West Child Development Center 2125
Santa Fe Ave, Long Beach, CA
(562) 436-5166 -1.2 mi E

C. Hudson Child Development Center
2335 Webster Ave, Long Beach, CA
(562) 424-1386 -1.1 mi NE

D. James A Garfield Elem School
2240 Baltic Ave, Long Beach, CA
(562) 424-8167 -1.4 mi E

E. Dynamic Educational
1903 Santa Fe Ave, Long Beach, CA
(562) 495-0124 -1.2 mi E

F. Phineas Banning Senior High School
1527 Lakme Ave, Wilmington, CA
(310) 830-5515 -1.5 mi W

G. St. Lucy School
2320 Cota Ave, Long Beach, CA
(562) 424-9062 -1.2 mi NE

H. Broad Avenue Elementary School
24815 Broad Ave, Wilmington, CA
(310) 835-6012 -1.7 mi NW

I. Aegis Medical Systems Inc
1322 N Avalon Blvd, Wilmington, CA
(310) 513-1300 -1.6 mi W

J. Garfield Head Start
2240 Baltic Ave, Long Beach,
CA (562) 492-9259 -1.4 mi E

Compliance History

COMPLIANCE RECORD REVIEW

A review of the AQMD Compliance Database showed 14 Notices of Violation (NOV) and Notices to Comply (NC) issued to Tesoro in the past two years (08/01/2007-10/23/2009). All notices are either closed or in compliance status. A summary of the NOV and NC is provided in Attachment 1.
The refinery is currently in compliance.

3. PROCESS DESCRIPTION

Boilers BO-11 (A/N 484366) and BO-12 (A/N 484362)
The two boilers are identical and they are custom design and manufacture by Rentech to meet operation needs at Tesoro Los Angeles Refinery (LAR). Each boiler will be equipped with a Coen Todd low NO_X burner, rated at 352 MMBtu/hr HHV with flue gas recirculation. Steam generated by these boilers will be used to support various refining processes at LAR. Each boiler will be equipped with an SCR to reduce NO_X emissions to meet BACT requirement. Specifications for each boiler are listed in Table 3.

Table 3 - Boiler Specification (Each Boiler)

Manufacture	Rentech *
Model	Custom Design
Fuel Type	Refinery Gas/Natural Gas
Fuel Operating Temperature	70 °F
Heat Input HHV	352 MMBTU/hr, HHV
Exhaust Flow	1632 ACFS @ 301 °F

* See Attachment 2 for Manufacturer Guarantees

Air Pollution Control (APC) Equipment for Boilers (A/N 484364 – APC-BO-11 AND A/N 484365 –APC-BO-12)
Each boiler is equipped with a Coen-Todd, Variflame Low NO_X burner with flue gas recirculation. Selective Catalytic Reduction (SCR) will be added at the boiler exhaust to reduce NO_X emissions. SCR will use ammonia injection in the presence of the catalyst to reduce NO_X. Catalyst will be located downstream of the convection bank and upstream of the economizer where the flue gas temperature is estimated to be in the range of 580-750 °F during normal operation. Catalyst material is a homogeneous honeycomb type coated with Titanium, Vanadium and Tungsten. The maximum pressure drop across the catalyst is 10" H_2O. The catalyst life is 26,100 fired hours. Specifications for boiler SCR are listed in Table 4 below.

Table 4 - SCR Catalyst for Boiler (Each System)

Manufacturer	Cormetech or Equivalent
Catalyst Description	Homogenous Honeycomb with Ti-V-W
Catalyst Dimension	4 modules, each 8.79 ft wide x 5.84 ft high
Catalyst Thickness	4 modules, each 1.31 feet
Catalyst Volume	4 modules, each 152 cubic feet
Space Velocity	28,700 hr^{-1}
Maximum Pressure Drop	10 inch H_2O
Maximum Ammonia Injection Rate	72 lb/hr
Maximum Ammonia Slip	5 ppmv @ 15%O_2 (1-hr average)
Maximum Outlet NO_X	9 ppmv @ 15%O_2 (1-hr average) 7 ppmv @ 15%O_2 (monthly average)
Minimum Operating Temperature	546 °F
Maximum Operating Temperature	780 °F

Ammonia Transfer and Storage Equipment Aqueous ammonia (less than 20% solution) will be stored in a 12,000 gallon tank. The carbon steel tank will be equipped with a pressure relief valve set to open at not less than 50 psig. A vapor return line will be used to control emissions during storage tank loading operations. This tank will be used to store ammonia for use by both the new gas turbine, which will be permitted in the near future, and the two new boilers. The estimated ammonia usage will be approximately 450,000 gallons/year for controlling NO_X emissions from the new gas turbine and the two new steam boilers.

Ammonia Vaporization System An ammonia vaporization system will be used to vaporize the aqueous ammonia solution as it is being transferred to the ammonia injection grid. A carbon steel ammonia distribution header will be used to receive the hot ammonia/air mixture from the ammonia vaporization skid and deliver it evenly to the ammonia injection grid piping. Typically, the injection grid supply piping is equipped with manual butterfly valves and flow instrumentation used for adequate balancing of ammonia flow.

4. EMISSIONS

Operation Scenarios

There are four possible modes of operation for the boilers. Emissions from the four operating modes are potentially different and hence are evaluated independently. Table 5 provides more detail on the four operating modes for the boilers.

Table 5 – Operating Modes for Boilers

Operating Mode	Description
Commissioning	The process of fine-tuning the boilers. Facility follows a systematic approach to optimize performance of the boilers, and associated control equipment. Emissions are expected to be greater during commissioning than during normal operation for some pollutants. This mode effects only the initial months and year of operation
Start Up	Up to a maximum of two hours per day per unit could include a start up sequence for the boilers. Start-ups NOx emissions are high because catalyst bed has not reached optimal temperature to begin the chemical reactions needed to reduce emissions. Depending on the duration, start-ups are subdivided in to cold, warm and hot. A cold start-up comes after the plant has been shutdown for at least 48 hours. The start-up considers hot if the shutdown came within 8 hours of previous. All start-ups that fall between 8 and 48 hours are considered warm.
Shutdown	Up to a maximum of one hour per day per unit could include in a shutdown sequence for the boilers. Shutdown occurs at the initiation of the boiler shutdown sequence and ends with the cessation of fuel flow and firing. Typically the shutdown process will emit lesser amount of pollutants than during the startup process, but may emit slightly greater NO_X than during normal operation ammonia injection into SCR ceases during part of this operation.
Normal Operation	Normal operation occurs after the control equipment work optimally at their designated levels. Emissions may vary due to ambient conditions.

Boilers BO-11 and BO-12 Emissions
Each Boiler – Both boilers are identical
Boiler Manufacturer: RENTECH
Burner Manufacturer: Coen - TODD
Maximum Heat Input: 352 MMBTU/ HR
Stack Height: 120 feet

Boiler Emission Data:
The following formula and assumptions are used to calculate the energy-based emission factors:

$$EF\ (lb/MMBTU) = PPMVD \times MW \times (1/SMV) \frac{(20.9\% O_2 - 0\% O_2)}{(20.9\% O_2 - 3\% O_2)} \times F_D \times 10^{-6}$$

Where,

EF = emission factor
PPMVD = pollutant concentration at concentration corrected to 3 % O_2
SMV = molar volume at 68 °F = 385.3 DSCF/lb-mol
MW = molecular weight of pollutant
F_D = Oxygen Based Dry fuel Factor specific for TSO LAR refinery gas tested in accordance with RECLAIM Rule 2012 Protocol = 8552 DSCF combustion products/MMBTU

Boiler Emission Rate:
Uncontrolled Emission Rate = Uncontrolled EF (lb/MMBTU) x Heat Input HHV (MMBTU/hr)
Controlled Emission Rate = Controlled EF (lb/MMBTU) X Heat Input HHV (MMBTU/hr)

CO = 50 PPMV @ 3% O2 average 1 hr (Manufacturer Guarantee)
NOX = Uncontrolled 70 PPMV @ 3% O2 average 1 hr
9 PPMV @ 3% O2 average 1 hr, 7 PPMV @ 3% O2 annual average (Manufacturer Guarantee)
PM10 = .01 lb/MMBTU Fuel Gas (Manufacturer Guarantee)
VOC = .004 lb/MMBTU Fuel Gas (Manufacturer Guarantee)
SOX = 40 PPMV S as H2S in Fuel Gas average over a 24 hour period. Assume 1 mole of H2S (34 lb/lb-mole) is converted to 1 mole SO2 (64 lb/lb-mole)
Exhaust Flow Rate = 3,471,071 ACF/HR @ 301 F (manufacturer data)

Assumptions:
Refinery Fuel Gas Heat Content = Varies from 1200 – 1500 BTU/SCF. Use 1200 BTU/SCF to allow for the highest emissions estimate (most conservative bias high)
Maximum Operation = 24 hours/day, 365 day/yr.
Assume < 8 % SO2 to SO3 Conversion and PM10 as ammonium sulfate:

$$\frac{40 \text{ lb-mole Total S as H2S}}{10^6 \text{ lb-mole FG}} \times \frac{\text{lb-mole SO2}}{\text{lb-mole H2S}} \times \frac{64 \text{ lb SO2}}{\text{lb-mole SO2}} \times \frac{\text{lb-mole FG}}{385.3 \text{ SCF FG}} \times \frac{\text{scf FG}}{1200 \text{ BTU}} \times \frac{352 \text{ MMBTU}}{\text{HR}} \times \frac{0.08 \text{ lb SO3}}{\text{lb SO2}} = \frac{0.16 \text{ lb}}{\text{hr}}$$

$$= \frac{0.16 \text{ lb SO3}}{\text{Hr}} \times \frac{\text{lb-mole SO3}}{80 \text{ lb SO3}} \times \frac{\text{lb-mole } (NH4)_2 SO4}{\text{lb-mole SO3}} \times \frac{132 \text{ lb } (NH4)_2 SO4}{\text{lb-mole (NH4)2 SO4}} = 0.347 \text{lb/hr} \times 24 \text{ hr/day} = 8.32 \text{ lb/day} =$$

= 0..90 lb/MMSCF

Table 6 – Boiler Emissions (Each Boiler) – Normal Operation at 100% Load

Pollutant	Un-controlled Emission Factor	Controlled Emission Factor **	Un-controlled Emissions (lb/hr)	Controlled Emissions (lb/hr)
CO	50 PPMV	50 PPMV	12.6	12.6
NOx	.083 lb/ MMBTU	.011 lb/ MMBTU	29.22	3.87
PM10 SO2 Conversion	.01 lb/ MMBTU 0.00056 lb/ MMBTU fuel	.01 lb/ MMBTU 0.00056lb/ MMBTU fuel	3.72	3.72
VOC	.004lb/MM BTU	.004lb/MM BTU	1.41	1.41
SOX	40 PPMV Total S as H2S in Fuel	40 PPMV Total S as H2S in Fuel	1.947	1.947
NH3	5 PPMV	5 PPMV	0.77	0.77

** Emission factors are based on manufacturer's guarantee. SOx is based on 40 ppm total sulfur in fuel gas (average over a 24 hour period) calculated as H2S.

Start-Up Emissions – Each Boiler

Each boiler will start up only under cold start-up mode. Total start-up period will be approximately 5 hours with approximately 10% firing rate.

Data (For Each Boiler)
Maximum number of start-up per day = 2
Maximum number of start-up per month = 4
Maximum number of start-up per year = 48
Start-up duration = 4 hours cold @ 10% of maximum load (35 MMBTU/HR HHV)
NOx = 70 PPMVD @ 3%O2 (0.083 lb/MMBTU)
CO = 1000 PPMVD @ 3%O2 (0.75 lb/MMBTU)
VOC = 0.004 lb/MMBTU
SOX = 6.67 lb/MMSCF (with 40 ppm S as H2S average over a 24 hour period)
PM10 = .01056 lb/MMBTU

Table 7– Boiler Start-Up Emission (Each Boiler)

Pollutant	Maximum Heat Input (MMBTU) During Start-UP	Un-controlled Emission Factor	Un-controlled Emissions (lb/hr)	Total Start-Up Emissions (lb/event)	Monthly Emissions (lb/month) 4 events/ month	Yearly Emissions (lb/year) 48 events/ year
CO	176 MMBTU (approx. 10% of full load) for 5 hours in duration	.75 lb/ MMBTU	26.4	132	528	6336
NOx		.083 lb/ MMBTU	14.6*	14.6	46.5	3504*
PM10 SO2 Conversion		.01 lb/ MMBTU fuel 0.00056 lb/ MMBTU fuel	0.37	1.86	7.43	89.2
VOC		.004 lb/ MMBTU	0.14	0.7	2.82	33.8
SOX		6.67 lb/ MMSCF	0.196	0.98	3.9	46.95

* Worse case Scenario for calculating the NOx emissions per event will be based on 1 hour instead of 5 hours

Shutdown Emissions – Each Boiler

Shutdown period for each boiler will be relatively short in duration, not to exceed 30 minutes. The boilers are anticipated to be operating in compliance during the shutdown period as air pollution control equipment will remain in operation.

Table 8- Boiler Shutdown Emissions (Each Boiler)

Pollutant	Maximum Heat Input (MMBTU)During shutdown	Un-controlled Emission Factor	Un-controlled Emissions (lb/hr)	Total Shutdown Emissions (lb/event)	Monthly Emissions (lb/month) 4 events/ month	Yearly Emissions (lb/year) 48 events/ year
CO	88 MMBTU (Reduce from full load to zero load in 30 min.)	.75 lb/ MMBTU	132	66	264	3168
NOx		.083 lb/ MMBTU	14.61	7.3	29	350
PM10 SO2 Conversion		.01 lb/ MMBTU fuel 0.00056 lb/ MMBTU fuel	1.86	0.93	3.72	44.6
VOC		.004 lb/ MMBTU	0.70	0.35	1.40	16.8
SOX		6.67 lb/ MMSCF	0.97	0.49	1.946	23.3

Emission Rates – Boiler Initial Commissioning Period (Each Boiler)

Initial commissioning period for each boiler expects to last no more than 498 hours for the duration of no more than 100 days. During the initial part of the commissioning period, there will be relatively frequent start-ups and shutdowns with boiler operating with no NO_X control. Estimated maximum emissions during the commissioning period for each boiler is estimated as shown in Appendix C (Table C2) and summarized in Table 9 below.

Table 9– Initial Commissioning Period Emissions – Each Boiler

Pollutant	Total Emissions lbs
NO_X	8,970
SO_X	806
VOC	595
PM10	2,538
CO	19,509

Table 10-Emissions from Fugitive Components Associated with Each Boiler

Sources	No.	Emission Factor (lb/yr)	Emissions (lb/yr)	Emissions (lb/month)
Valves				
Sealed bellows	56	0	0	0
AQMD Approved I&M gas/vapor	44	23	1012	84.33
Others –Light Liquid	0	19	0	0
Heavy Liquid	102	0	0	0
(144 bellow seal gas valves common to cogeneration and boilers, apportion 48 to each permit unit; 204 Heavy Liquid valves common to turbine and boilers, apportion 68 to each permit unit; 8 bellow seal valves, 44 non-bellow seal valves, and 34 heavy liquid valves are dedicated to the cogeneration unit)				
Pumps				
Double or Tandem Mechanical Seal – LL	0	104	0	0
HL	6	80	480	40.00
(2 dedicated pumps per boiler, 12 HL are common to both boilers and Cogen "C." For the purpose of calculation, 4 common pumps are apportion to each permit unit)				
Flanges (Fittings) - 238 are dedicated to each boiler and 1103 flanges (fittings) are common to turbine and boilers (apportion 369 to turbine, 367 to each boiler)	605	1.5	908	75.67
Total VOC Emissions from new fugitive components	N/A	N/A	2400	200.00

Aqueous Ammonia Storage Tank

The above ground ammonia storage tank will be equipped with a pressure relief valve set to open at not less than 50 psig. At this pressure setting, there will not be any breathing losses from the storage tank. A vapor return line will be used to control the ammonia emissions during storage tank filling operations. The emissions during filling operations are as follows:

Working Loss Calculation:
Lw = 0.001 (Mv)(P)(Kn)(Kp)(Q)
Where:
Mv = molecular weight of product vapor (lb/lb-mole) = 17 lbs/lb-mole
P = true vapor pressure psia (assume 70 F daily average liquid surface temp) = 4.28 psia
Q = volume of liquid pumped into tank = 450,000 gallons/year = 10,715 barrels/year
N = tank turnovers = 450,000 gallons/year / 12,000 gallons = 38
Kn = turnover factor =1
Kp = product factor =1
Lw = working loss = .001 * Mv * P * Kn * Kp *Q
= .001 * 17 * 4.28 * 1 * 1 * 10715 = 780 lbs/year
Maximum Yearly Uncontrolled Emissions = 780 lbs/year
Assume control Efficiency of vapor return line = 95%
Maximum Yearly Controlled Emissions = 520 lbs/year * 0.05 = 39 lbs/year
30- Day Average Emissions = 39 lbs/year * (1/12 months/yr) * (1/30) = .11 lb/day

RULE COMPLIANCE EVALUATION

Rule 212 – Standards for Approving Permits
This project is subject to Rule 212 public notice requirements because the daily maximum CO, NOX, PM10 and VOC emissions from each boiler will exceed the emission thresholds specified in subdivision (g) of this rule.

In accordance with subdivision (d) of this rule, the applicant will be required to distribute the public notice to each address within ¼ mile radius of the project.

Subdivision (g) requires that the public notification and comment process include all applicable provisions of 40 CFR Part 51, Section 51.161(b) and 40 CFR Part 124, Section 124.10. The minimum requirements specified in the above documents are included in paragraphs (g)(1), (g)(2), and (g)(3).
In accordance with paragraph (g)(1) of this rule, the District will make the following information available for public inspection (i.e. public library) during the 30 days comment period: public notice, project information submitted by the applicant, and the District permit to construct evaluation.

In accordance with paragraph (g)(2) of this rule, the public notice will be published in a newspaper that serves the area that will be impacted by the project.

In accordance with paragraph (g)(3) of this rule, the public notice will be mailed to the following persons: the applicant, the Region IX EPA Administrator, the California Air Resources Board, the chief executives of the city and county where the project will be located, the regional land use planning agency, and the state and federal land managers whose lands may be affected by the emissions from the proposed project.

Rule 218 – Continuous Emission Monitoring
The CO CEMS will comply with the requirements of Rule 218.

Rule 401 – Visible Emissions
This rule limits visible emissions from exceeding 20% opacity for an aggregate period of greater than 3 minutes in any one hour. The two boilers, gas turbine and duct burner will be fired with gaseous fuel only. Base on current operation of combustion devices burning refinery gas at LAR, no visible emissions is expected. Therefore, compliance with this rule is expected.

Rule 402 – Nuisance
This rule requires that a person not discharge from any source air contaminants or material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which cause, or have a natural tendency to cause injury or damage to business or property. The new equipment will utilize the best available control technologies to reduce emissions. Therefore, the equipment is not expected to create public nuisance problems.

Rule 403 – Fugitive Dust
This rule requires the use of best available control measures to minimize fugitive dust formation from "active operations" including but not limited to, earth moving, construction, and vehicular movement. The rule prohibits active operations from causing visible emissions that extend beyond the facility's fence line. The applicant will use best available control measures during construction of the proposed permit units.

Rule 404 – Particulate Matter Concentration
This rule does not apply to emissions resulting from combustion of liquid or gaseous fuels in steam generators. The proposed boilers are primarily for the purpose of generating steam for use at the refinery. Therefore both boilers are exempt from this rule. Boiler and steam generators have the same definition in Rule 1146 and 1146.1. Pursuant to these rules, boilers or steam generator means any combustion equipment

fired with liquid and/or gaseous and/or solid fuel and used to produce steam or heat water and that is not use exclusively to produce electricity for sale. Boiler or steam generator does not include any waste heat recovery boiler that is used to recovered sensible heat from the exhaust of a combustion turbine or any unfired waste heat recovery boiler that is used to recover sensible heat from any combustion equipment.

Rule 407 – Liquid and Gaseous Air Contaminants
This rule limits CO emissions to 2000 PPM. SO2 limit is subsumed by the RECLAIM program pursuant to Rule 2001 and is not applicable. CO emissions from the two boilers will be below 2000 PPM. Full compliance with this rule is expected.

Rule 409 – Combustion Contaminants
This rule limits particulate emissions (from combustion process) to 0.1 grain per standard cubic foot (at 12% CO2). Based on the estimated PM-10 emissions from each of the two boilers compliance is expected as shown in the calculation below.

Boiler (each):
Max grain loading = (3.72 lb/hr)(7000 grains/lb)/[56,220 dscf/min)(60 min/hr)]
= .0077 grains/dscf

Rule 431.1 – Sulfur Content of Gaseous Fuels
This rule is not applicable for this facility because it is subject to the SOX RECLAIM program under Regulation XX. The sulfur content requirement is subsumed under the RECLAIM program pursuant to Rule 2001.

Rule 474 – Fuel Burning Equipment – Oxides of Nitrogen
This rule is superseded by NOX RECLAIM.

Rule 476 – Steam Generating Equipment
NOX requirements in this rule are subsumed by Regulation XX-RECLAIM. However, the requirements for combustion air contaminants are still applicable. This rule applies to steam generating equipment with heat input of greater than 50 MMBTU/hr that are installed after May 7, 1976. The rule prohibits discharge of combustion air contaminants (PM) to the atmosphere at the rate greater than both of the following limits: 0.01 grain/DSCF and 11 lb/hr. Either one of the boiler may exceed one of the limits, but not both. The PM emissions are 3.72 lb/hr which is below the Rule limit <11 lb/hr. Based on the estimated PM emissions from each of the two boilers compliance is expected

Rule 1123 – Refinery Process Turnarounds
This rule specifies requirements for displacement of organic materials during turnaround and also requires a turnaround plan to be submitted. This facility operates in compliance with this rule and continued compliance with Rule 1123 is expected.

Rule 1173 – Fugitive Emissions of Volatile Organic Compounds
This rule specifies monitoring and reporting requirements for fugitive components and associated emissions. It also specifies atmospheric PRV monitoring requirements. This facility operates in compliance with this rule and continued compliance is expected. New fugitive components will comply with BACT requirements.

REG IX- Federal Regulations
Regulation IX – Standards of Performance Electric Utility Steam Generating Units for which Construction is commenced after June 19, 1984, NSPS for Electric Utility Steam Generators – 40CFR Part 60 Subpart Da
Subpart Da does not apply to the proposed Boilers because the boilers are not Electric Utility Steam Generators.

Regulation IX – Standards of Performance Industrial-Commercial-Institutional Steam Generating Units for which Construction is commenced after June 19, 1984, NSPS for Steam Generators – 40CFR Part 60 Subpart Db
The boilers are subject to this performance standard because its maximum heat input of 352 MMBtu/hr is greater than 100 MMbtu/hr threshold established by this regulation. The NOx and PM limits specified by this rule under provisions 60.44 for natural gas fueled burners are 0.2 lb/MMBtu and 0.051 lb/MMBtu respectively. The BACT limit of 0.011 lb/MMBtu and 0.01 lb/MMBtu for NOx and PM respectively are more stringent than the specified limits. Thus, compliance is expected. The SOx standards are subject to Subpart Ja

Regulation IX – NSPS Standard for Petroleum Refineries – 40 CFR Part 60 Subpart J
Subpart J applies to existing equipment. The final Subpart Ja published on May 8, 2008, applies to equipment which construction, modification or reconstruction commenced on or after May 14, 2007 is subject to Subpart Ja. Since Subpart J applies only to existing equipment, it is not applicable to the new boilers being proposed for this project.

NSPS Standard for Petroleum Refineries – 40 CFR Part 60 Subpart Ja
This regulation limits SOX emissions from fuel gas combustion devices (and also set NOX emission limits for heaters > 40 MMBTU/hr) Sulfur content standards for Subpart Ja applies to the proposed boilers. Tesoro select to comply with the H_2S limit in fuel gas for all combustion equipment. The H_2S limits in Subpart J are 162 PPM H_2S 3 hours rolling average and 60 ppm H_2S 365 successive days rolling average. The

proposed boilers are expected to use fuel gas in compliance with this requirement. .Condition 90.20 specifies that Tesoro install a continuous monitoring system the H2S concentration in the fuel gas. By continuously monitoring the H2S concentration, compliance is expected.

Regulation XIII, Rule 2005, and Rule 1703 – New Source Review

LAR is a RECLAIM facility. NOX and SOX are subject to RECLAIM new source review under Rule 2005, while VOC, PM10 and NH3 are subject to Regulation XIII - New Source Review. NO_2, SO_2 and CO are attainment air pollutants and any increases above significant threshold are subject to PSD analysis under Regulation XVII. LAR is a PSD facility and the significant emission increase is 40 tons per year or more of NO_2 or SO_2; or 100 tons per year or more of CO.

Rule 1303 (a) and 2005 (c) (1)(A) – BACT/LEAR

These rules state that the Executive Officer shall deny a permit to construct for any new source which results in an emission increase of any non-attainment air contaminant, any ozone depleting compound, or ammonia unless the applicant can demonstrate that BACT is employed for the new source. The proposed boilers are new sources and therefore, must meet BACT requirement.

For Major sources, BACT is determined at the time of permitting and is the Lowest Achievable Emissions Rate(LAER) which has been achieved –in practice. Based on recently issued permits(Ultramar/Valero A/N 416622),(AES Huntington Beach LLC A/N427061), the District has determined BACT requirements for refinery gas boilers are listed below

Boiler

NOX Rule2005(b)	**SOX Rule 2005(c)(1)(A)**	**VOC Rule1303(a)**	**PM10 Rule 1303(a)**	**NH3 Rule1303(a)**	**CO Rule 1703(a)(2)**
9 PPMV @3% O2 1-hr average (Refinery gas) 7 PPMV @3% O2 Monthly average (Refinery gas) 5 PPMV @3% O2 1-hr average (Natural gas)	≤ 30 PPMV 24-hr average total Sulfur expressed as H2S include addition of natural gas or LPG to refinery fuel gas	Best Combustion Practice	≤ 30 PPMV 24-hr average Total Sulfur expressed as H2S include addition of natural gas or LPG to refinery fuel gas	5 ppmv @3% O2 1-hr average	50 PPMV @ 3% O2 1-hr average

Criteria pollutants from the Refinery gas Boilers will be controlled to very low levels, for this type of equipment. The District has worked with the applicant and considers theses standards to be BACT/LAER for refinery gas/ natural gas boilers. These standards are stated below

NOX Rule2005(b)	**SOX Rule 2005(c)(1)(A)**	**VOC Rule1303(a)**	**PM10 Rule 1303(a)**	**NH3 Rule1303(a)**	**CO Rule1703(a)(2)**
9 PPMV @3% O2 1-hr average (Refinery gas) 7 PPMV @3% O2 Monthly average (Refinery gas) 5 PPMV @3% O2 1-hr average (Natural gas)	Use of Refinery Fuel gas with the following limitations for total reduced sulfur concentration, calculated as H2S: 40 ppm(1 hour average) and, Use of Natural gas regulated by the Public Utility Commission(PUC) or combination	0.004 lb/mmbtu	Use of Refinery Fuel gas with the following limitations for total reduced sulfur concentration, calculated as H2S: 40 ppm (1 hour average) and, Use of Natural gas regulated by the Public Utility Commission(PUC) or combination	5 ppmv @3% O2 1-hr average	50 ppmv @ 3% O2 1-hr average

Note(1) For SCONOX and SCOSOX as BACT Determination ,See Attachment 3 for Emera Chem EMx &ESx Evaluation for Boilers

Ammonia Storage Tank

The current BACT requirements for an ammonia storage tank with a storage capacity greater than 250 gallons are as follows: (1) use of a pressure relief valve set at not less than 50 psig to control the standing losses, and (2) use of control equipment, such as a scrubber or vapor return line, to control the working losses. TSO is proposing to control the standing losses with a pressure relief valve set at not less than 50 psig, and a vapor return line will be used to control the working losses. Therefore, compliance is expected.

Rules 1303(b)(1) and 2005(c)(1)(B) – NO2 and PM10 Impacts Modeling

These rules require the applicant to substantiate with modeling that each permit unit will not cause a violation, or make significantly worse an existing violation of any state or national ambient air quality standards at any receptor location in the District.
For this project, **both boilers are exempt from modeling requirements of this rule pursuant to Rule 1304(a)(1) because it is a functionally identical replacement for 4 existing boilers.**

Rule 1303(b)(2) and Rule 2005(c)(2) – Offsets

The propose boilers will emit NOX, SOX, VOC, and PM10 subject to these rules. NOX and SOX are RECLAIM pollutants and are subject to the requirements of Rule

2005(c)(2). VOC and PM10 are non-RECLAIM pollutants and are subject to Rule 1303 (b)(2). Increases in emissions include start ups and shutdowns and are calculated based on maximum rated equipment capacity and maximum operating hours (24 hours/day, 365 days per year) as shown below

PM10 and VOC Emissions

Daily PM10 and VOC emissions increases calculated pursuant to Rule 1306 (b) are shown in Appendix E and are summarized below:

Pollutant	Boiler BO-10 (lb/day)	Boiler BO-11 (lb/day)	Total (lb/day)
PM10	92.25	92.25	184.5
VOC	41.7	41.7	83.4

Since the four existing boilers will removed from service after the two new boilers start operation, increases in emissions from the proposed permit units are eligible for exemption offset requirement pursuant to Rule 1304 (a) (1)– Functionally identical replacement

Rule 1304 (a)(1) – Replacements: Exemption from Modeling and Offsets

Tesoro is proposing to replace existing boilers 7 and 8 with a new boiler BO-11 and existing boilers 9 and 10 with a new boiler BO-12. These replacements qualify for this exemption as follows:

(1) Boiler BO-11 and BO-12 will be used to generate process steam for use at the refinery. BO-11 is a functionally identical replacement for boilers 7 and 8 which currently are used to generate process steam for use at the refinery. BO-12 is a functionally identical replacement for boilers 9 and 10 which currently are used to generate process steam for use at the refinery.

(2) The maximum rated heat input for Boiler BO-11 (352 MMBTU/hr) is less than the total combined maximum rated heat input for Boilers 7 and 8 (367 MMBTU/hr).

(3) The potential for BO-11 to emit air contaminants subject to this regulation is not greater than the potential to emit air contaminants for Boilers 7 and 8 combined determined as if the current BACT were applied to Boilers 7 and 8.

a. VOC - BACT for Boiler is good combustion practice. The new boiler BO-11 utilizes a more current and efficient combustion technology than the existing boilers 7 and 8. Since the fuel consumption for the new boiler BO-11 is less than that of boilers 7 and 8. The potential to emit VOC emission from Boiler BO-11 is expected not to be greater than the combined potential to emit VOC from boilers 7 and 8.

b. PM10 – BACT for PM10 when refinery gas is used is 40 PPM total sulfur calculated as H2S. Since the fuel consumption for the BO-11 is less than that of boilers 7 and 8. The potential to emit PM10 emission from Boiler

BO-11 is expected not to be greater than the combined potential to emit PM10 from boilers 7 and 8 if the current BACT were applied.
c. CO – BACT for CO is 50 ppmv @ 3% O2. Since the fuel consumption for the BO-11 is less than that of boilers 7 and 8. The potential to emit CO emission from Boiler BO-11 is expected not to be greater than the combined potential to emit CO from boilers 7 and 8 if the current BACT were applied
(4) The potential for BO-12 to emit air contaminants subject to this regulation is not greater than the potential to emit air contaminants for Boilers 9 and 10 combined determined as if the current BACT were applied to Boilers 9 and 10.
a. VOC - BACT for Boiler is good combustion practice. The new boiler BO-12 utilizes a more current and efficient combustion technology than the existing boilers 9 and 10. Since the fuel consumption for the new boiler BO-12 is less than that of boilers 9 and 10. The potential to emit VOC emission from Boiler BO-12 is expected not to be greater than the combined potential to emit VOC from boilers 9 and 10.
b. PM10 – BACT for PM10 when refinery gas is used is 40 PPM total sulfur calculated as H2S. Since the fuel consumption for the BO-12 is less than that of boilers 9 and 10. The potential to emit PM10 emission from Boiler BO-12 is expected not to be greater than the combined potential to emit PM10 from boilers 9 and 10 if the current BACT were applied.
c. CO – BACT for CO is 50 ppmv @ 3% O2. Since the fuel consumption for the BO-11 is less than that of boilers 7 and 8. The potential to emit CO emission from Boiler BO-11 is expected not to be greater than the combined potential to emit CO from boilers 7 and 8 if the current BACT were applied.

Constructions of the proposed boilers BO-11 and BO-12 qualify for offset exemptions under functionally identical replacement

To ensure compliance with emission offset requirements, the permit will include a condition limiting the firing rate of the boilers

Rule 1303 (b)(4)– Facility Compliance
This facility complies with or on schedule of compliance with applicable rules and regulations of the District.

Rule 1303 (b)(5)(A) and 2005 (g)(2) – Alternative Analysis
The proposed project has been analyzed by an environmental impact report pursuant to Public Resources Code Section 21002.1 and Title 14 CCR Section 15080 subparagraph (b)(5)(A) and the environmental impact report (EIR) for this project was certified by the District in April 2009.
Therefore, compliance of Rule 1303(b) (5) and 2005 (g) (2) are expected.

Rule 1303 (b)(5)(B) and 2005 (g)(1) – Statewide Compliance

Tesoro Refinery is an existing major polluting facility. However, this project is not a major modification pursuant to Rule 1302 (r). The net emission increase at this existing facility comes only from Ammonia which is not an air contaminant contained in the definition of a major modification.

Rule 1401 – Toxic Air Contaminants

This rule establishes the allowable risks for new or modified permit units that will emit toxic air contaminants (TAC). Rule 1401 significant levels are as follows:

Maximum Individual Cancer Risk = 1 in 1 million
Cancer Burden = 0.5
Maximum Chronic Hazard Index =1
Maximum Acute Hazard Index = 1

Both boilers are exempt from this Rule according Rule 1401(g)(1)(c) because it is a functionally identical replacement.

Regulation XVII – Prevention of Significant Deterioration

This Rule pertains to emissions of pollutants for which attainment with ambient air standards has been achieved in the South Coast Air Basin (NO2, SO2, CO and lead). The project meets BACT requirements and does not result in an increase of 100 to 250 tons of attainment air contaminants, does not result in a significant emissions increase (as defined in Rule 1702) at a major stationary source, nor does it result in a net emissions increase at a major stationary source located within 10 km of a Federal Class I Area. Therefore, the project is not subject to the requirements associated with PSD under Reg XVII.

The table below shows the net emissions at LAR during non-commissioning years due to the addition of the proposed two boilers and the removal of Boilers BO-7, BO-8, BO-9 and BO-10 to be as follows:

Activity	NOX (ton/year)	SOX (ton/year)	CO (ton/year)
New Boilers (2)	40.59	17.053	116.58
Removal of Existing Boilers BO-7, BO-8, BO-9, and BO-10	-120.9	-32.169	-44.05
Net Emissions	-80.31	-15.116	+89.48
PSD Significant Threshold	40	40	100
PSD Analysis	NO	NO	NO

Regulation XX –RECLAIM

Rule 2011: Requirements for Monitoring Reporting and Recordkeeping for Oxides of Sulfur (SOX) Emissions

This rule establishes the monitoring, reporting and recordkeeping requirements (MRR) for SOX emissions under the RECLAIM program. The boilers are classified as a Major SOX sources and stack emissions are measured by a Continuous Emission Monitoring System (CEMS) which is certified.

Rule 2012: Requirements for Monitoring Reporting and Recordkeeping for Oxides of Nitrogen (NOX) Emissions

This rule establishes the monitoring, reporting and recordkeeping requirements (MRR) for NOX emissions under the RECLAIM program. The boilers are classified as Major NOX sources and stack emissions are measured by a Continuous Emission Monitoring System (CEMS) which is certified.

In addition, emission factors for SO_X and NO_X are specified for the initial commissioning period, and for the interim period prior to CEMS certification. Detailed emission factor calculations are included in Appendix G. For compliance with RECLAIM offset under Rule 2005 (c)(2), applicant is required to demonstrate that they hold sufficient RTCs to offset the total NO_X and SO_X emission increase for each pollutant during the first year of operation using a 1-to-1 offset ratio. The total first year (commissioning year) emissions will be as follows:

	NOX (lb/year)	SOX (lb/year)	Start Operation
Boiler BO-11	49,568	17,862	January 1, 2011
Boiler BO-12	49,568	17,862	January 1, 2011

For compliance with RECLAIM offset under Rule 2005 (f)(1), applicant is required to hold sufficient RTCs in the amount shown below at the beginning of each subsequent compliance year. The total subsequent year emissions will be as follows:

	NOX (lb/year)	SOX (lb/year)	Start Operation
Boiler BO-11	40,594	17,053	January 1, 2011
Boiler BO-12	40,594	17,053	January 1, 2011

Emission Factors to Calculate NO_X and SO_X emissions during the Commissioning Period and Interim Period prior to CEMS Certification

Rule 2002 requires the District to specify a RECLAIM NOX and SOX emission factors for the boilers. Interim NOX and SOX emission factors for the new boilers with BACT are specified in Table 1 and 2 of Rule 2002 as 0.035 lb/MMBTU and Reported Value

34 lb/MMSCF, respectively. However, average hourly NOX emissions during commissioning period is higher for NOX due to the intermittent testing of control devices; therefore an emission factor of 74.2 lb/MMSCF is used for the boilers(as calculated in Appendix G).

Regulation XXX- Title V

Tesoro Refinery is currently subject to Title V, and the addition of the two boilers will be considered a significant revision to the existing Title V permit. As a significant revision, the permit is subject to a 30 day public Notice and a 45 day EPA review and comment period.

40CFR Part 64 Compliance Assurance Monitoring

This regulation applies to stationary sources with control equipment, and the purpose of the rule is to ensure equipment has adequate emission monitoring and recording equipment to determine compliance with applicable regulations. Compliance of NOX and SOX emissions limit is subject to monitoring requirement under RECLAIM and therefore, exempt from the requirements of this provision pursuant to §64.2(b)(vi) – Emission Trading Programs. Continuous monitoring device will be installed to monitor compliance with CO limit. Compliance with VOC BACT limit will be determined by periodic source testing. There is no add-on control equipment used to meet the CO and the VOC limit, and CAM would not apply for both pollutants.

CONCLUSION

The proposed permit is expected to comply with all applicable rules and requirements. Issuance of permits to construct is recommended subject to the following conditions

PERMITS CONDITIONS

Boilers (D1629, D1634)

A. Emission Limits

A63.9 The operator shall limit emissions from this equipment as follows:

CONTAMINANT	EMISSIONS LIMIT
PM10	Less than or equal to 2768 LBS IN ANY ONE MONTH
VOC	Less than or equal to 1049 LBS IN ANY ONE MONTH

The operator shall calculate the monthly emissions for PM10 and VOC using either the equation below and the emission factors: VOC= 0.0040 lb/MMBTU and PM10 = 0.01056 lb/MMBTU or the results of the most recent source test whichever is higher.

Monthly Emissions, lb/month = X*(EF); Where X= monthly heat input , MMBTU/month ; and EF = emission factor indicated above

[RULE 1303(b)(2)-Offset, 5-10-1996] [Devices subject to this condition : D1629, D1634]
A99.11 The 6.65 LBS/MMSCF SOX emission limit(s) shall only apply during initial boiler commissioning to report RECLAIM emissions. The commissioning reporting period shall not exceed 498 hours for the duration of no more than 100 days from entry into RECLAIM.

[RULE 2011, 5-6-2005]

[Devices subject to this condition : D1629, D1634]

A99.12 The 34 LBS/MMSCF SOX emission limit(s) shall only apply during the interim reporting period after initial boiler commissioning when the boiler is operating to report RECLAIM emissions. The interim reporting shall not exceed 12 months from entry into RECLAIM.

[RULE 2011, 5-6-2005]

[Devices subject to this condition : D1629, D1634]

A99.13 The 9, 7 and 5 PPM NOX emission limit(s) shall not apply during boiler commissioning, startup, and shutdown periods. The commissioning period shall not exceed 498 operating hours for the duration of no more than 100 days. Cold start shall be restricted to the followings: maximum of 5 hrs per event, maximum of 48 events per year, no more than 14.5 lbs NOx per event. Shutdown periods shall not exceed 30 minutes per event, 24 hours per year.

For the purposes of this condition, start-up and shutdown shall be defined as as the period when the exhaust temperature of entering the SCR catalyst bed is below 546 degree F.

Written records of commissioning, start-ups and shutdowns shall be maintained and made available upon request from the Executive Officer of his designee

[RULE 2005, 4-20-2001; RULE 2005, 5-6-2005]
[Devices subject to this condition : D1629, D1634]

A99.14 The 50 PPM CO emission limit(s) shall not apply during boiler commissioning, start-up, and shutdown periods. Start-up shall not exceed 4 hours for each startup. Shutdown time shall not exceed 30 minutes per shutdown. The commissioning period shall not exceed 498 operating hours. The boiler shall be limited to a maximum of 48 start-ups per year. Written records of commissioning, start-ups and shutdowns shall be maintained and made available upon request from the Executive Officer or his designee.

For the purposes of this condition, start-up and shutdown shall be defined as the period when the exhaust temperature of this equipment is below 546 degree F.

[RULE 1703(a)(2) - PSD-BACT, 10-7-1988]
[Devices subject to this condition : D1629, D1634]

A99.15 The 74.2 LBS/MMSCF NOX emission limit(s) shall only apply during initial boiler commissioning to report RECLAIM emissions. The commissioning period shall not exceed 100 days from entry into RECLAIM. The NOx emission limit shall be defined as NOx emission factor.

[RULE 2012, 5-6-2005]

[Devices subject to this condition : D1629, D1634]

A99.16 The 0.035 LBS/MMSCF NOX emission limit(s) shall only apply during the interim reporting period after initial boiler commissioning to report RECLAIM emissions. The interim reporting shall not exceed 12 months from entry into RECLAIM. The NOx emission limit shall be defined as NOx emission factor.

[RULE 2012, 5-6-2005]

[Devices subject to this condition : D1629, D1634]

A195.12 The 9 PPMV NOX emission limit(s) is averaged over 1 hour at 3 percent O2 dry.

The 9 ppm (1- hour) NOx shall apply when the boiler fires refinery fuel gas or a mixture of refinery fuel gas and natural gas with ≥ 50% of heat input from refinery fuel gas.

This NOx hourly emission limit shall be calculated based on the measured NOx emissions using a certified RECLAIM CEMS and the heat input during all boiler operating hours except during:

Any District required source test performed without ammonia

Periods of the exhaust temperature entering the SCR catalyst is less than 546 degree F, which is the minimum ammonia injection temperature

RATA testing; RECLAIM Missing Data Period; Calibration and maintenance periods; Equipment breakdown periods as defined in Rule 2004; and periods of zero fuel flow.

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 2005, 5-6-2005]

[Devices subject to this condition : D1629, D1634]

A195.13 The 7 PPMV NOX emission limit(s) is averaged over a calendar month and is at dry conditions, corrected to 3 percent oxygen.

The 7 ppm(monthly) NOx shall apply when the boiler fires refinery fuel gas or a mixture of refinery fuel gas and natural gas with ≥ 50% of heat input from refinery fuel gas.

This NOx calendar monthly emission limit shall be calculated based on the measured NOx emissions using a certified RECLAIM CEMS and the heat input during all boiler operating hours for the calendar month except during:

Any District required source test performed without ammonia

Periods of the exhaust temperature entering the SCR catalyst is less than 546 degree F, which is the minimum ammonia injection temperature:.

RATA testing; RECLAIM Missing Data Period; Calibration and maintenance periods; Equipment breakdown periods as defined in Rule 2004; and periods of zero fuel flow.

A data acquisition system(DAS) shall be installed and maintained to record the parameters necessary to determine the calendar monthly NOx concentration. In addition, the DAS shall calculate and display on demand the average monthly NOx PPM.

Any concentration to DAS data and calculation shall be completed within 72 hours after the end of the calendar month. The recorded parameters and the calculated average monthly NOx PPM shall be kept for a period as stated in the section E of this facility permit and shall be readily available to the District personnel upon request.

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 2005, 5-6-2005]

[Devices subject to this condition : D1629, D1634]

A195.14The 50 PPMV CO emission limit(s) is averaged over 1 hour at 3 percent O2 dry.

[RULE 1703(a)(2) - PSD-BACT, 10-7-1988]

[Devices subject to this condition : D1629, D1634]

A195.15The 5 PPMV NH3 emission limit(s) is averaged over 1 hour at 3 percent O2 dry.

The operator shall calculate and continuously record the NH3 slip concentration using the following:NH3(ppmv)=[a-(b*c/1E6)]*1E6/b, where a=NH3 injection rate(lb/hr)/17 (lb/lbmole), b= dry exhaust gas flow rate (scf/hr)/385.3 scf/lbmole, and c= change in measured NOx across the SCR (ppmv at 3 percent O2). The operator shall install and maintain a NOx analyzer to measure the SCR inlet NOx ppm accurate to within plus or minus 5 percent calibrated at least once every 12 months.

The NOx analyzer shall be installed and operated within 90 days of initial start up.

The operator shall use the method described above or another alternative method approved by the Executive Officer.

The ammonia slip calculation procedures described above shall not be used for compliance determination for emission information determination without corroborative data using an approved reference test method for the determination of ammonia.

[RULE 1303(a)(1)-BACT, 5-10-1996]

[Devices subject to this condition : D1629, D1634]

A195.16The 5 PPMV NOX emission limit(s) is averaged over 1 hour at 3 percent O2 dry.

The 5 ppm (1- hour) NOx limit shall apply when the boiler fires natural gas or a mixture of refinery fuel gas and natural gas with <50% of heat input from refinery fuel gas.

This NOx hourly emission limit shall be calculated based on the measured NOx emissions using a certified RECLAIM CEMS and the heat input during all boiler operating hours except during:.

Any District required source test performed without ammonia

Periods of the exhaust temperature entering the SCR catalyst is less than 546 degree F, which is the

minimum ammonia injection temperature

RATA testing; RECLAIM Missing Data Period; Calibration and maintenance periods; Equipment breakdown periods as defined in Rule 2004; and periods of zero fuel flow

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 2005, 5-6-2005]

[Devices subject to this condition : D1629, D1634]

A327.2 For the purpose of determining compliance with District Rule 476, combustion contaminant emissions may exceed the concentration limit or the mass emission limit listed, but not both limits at the same time.

[RULE 476, 10-8-1976]
[Devices subject to this condition : D1629, D1634]

B. Material/Fuel Type Limits

B59.7 The operator shall only use the following material(s) in this device :

Refinery fuel gas meeting sulfur limit specified by condition B61.8, natural gas, or mixture of refinery fuel gas and natural gas

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 1303(a)(1)-BACT, 12-6-2002]
[Devices subject to this condition : D1629, D1634]

B61.8 The operator shall not use fuel gas containing the following specified compounds:

Compound	Header 2	ppm by volume
total sulfur compounds calculated as H2S	greater than	40

The total reduced sulfur concentration limit shall apply to refinery fuel gas and be based on one-hour averaging period and measured before blending with natural gas

[RULE 1303(b)(2)-Offset, 5-10-1996; RULE 1303(b)(2)-Offset, 12-6-2002]

[Devices subject to this condition : D1629, D1634]

B61.10 The operator shall not use fuel gas containing the following specified compounds:

Compound	Header 2	ppm by volume
H2S	greater than	162
H2S	greater than	60

The 162 ppm limit shall be based on a rolling 3-hour averaging period

The 60 ppm limit shall be based on a rolling 365 successive calendar day rolling average

[40CFR 60 Subpart Ja, 6-24-2008] [Devices subject to this condition : D1629, D1634]

C. Throughput or Operating Parameter Limits

C1.52 The operator shall limit the heat input to no more than 352 MM Btu per hour.

The purpose(s) of this condition is to ensure that this equipment qualifies for the offset exemption under the functional identical replacement of the existing boilers

[RULE 1303(b)(2)-Offset, 12-6-2002; RULE 1303(b)(3), 5-10-1996]

[Devices subject to this condition : D1629, D1634]

D. Monitoring/Testing Requirements

D29.12 The operator shall conduct source test(s) for the pollutant(s) identified below.

Pollutant(s) to be tested	Required Test Method(s)	Averaging Time	Test Location
NOX emissions	District method 100.1	1 hour	Outlet of the SCR
CO emissions	District method 100.1	1 hour	Outlet of the SCR
SOX emissions	Approved District Method	District approved averaging time	fuel sample
VOC emissions	Approved District Method	1 hour	Outlet of the SCR
PM10 emissions	Approved District Method	District approved averaging time	Outlet of the SCR

The test shall be conducted after AQMD approval of the source test protocol, but no later than 180 days after initial start-up. The AQMD shall be notified of the date and time of the test at least 10 days prior to the test.

The test shall be conducted to determine the oxygen levels in the exhaust. In addition, the test shall record the fuel flow rate(CFH), the flue gas flowrate.

The test shall be conducted in accordance with AQMD approved source test protocol. The protocol shall be submitted to the AQMD (attention Sawsan Andrawis) no later than 45 days before the proposed test date and shall be approved by the AQMD before test commences. The test protocol shall include the proposed operating conditions of the boiler during the test, the identity of the testing lab, a statement from the testing lab certifying that it meets the criteria of Rule 304, and a description of all sampling and analytical procedures.

The test shall be conducted when this equipment is operating at maximum, average, and minimum load.

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 1303(a)(1)-BACT, 12-6-2002; RULE 1303(b)(2)-Offset, 5-10- 1996; RULE 1303(b)(2)-Offset, 12-6-2002; ; RULE 1703(a)(2) - PSD-BACT, 10-7-1988; RULE 2005, 4-20-2001; RULE 2005, 5-6-2005]

[Devices subject to this condition : D1629,D1634]

D29.13 The operator shall conduct source test(s) for the pollutant(s) identified below.

Pollutant(s) to be tested	Required Test Method(s)	Averaging Time	Test Location
VOC emissions	Approved District Method	1 hour	Outlet of the SCR
PM10 emissions	Approved District Method	District approved averaging time	Outlet of the SCR

The test shall be conducted at least once every three years.

The test shall be conducted and the results submitted to the AQMD within 60 days after the test date.

The AQMD shall be notified of the date and time of the test at least 7 days prior to the test.

The test shall be conducted when this equipment is operating at least at 80 percent of maximum load.

The test shall be conducted to demonstrate compliance with all applicable emission limits.

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 1303(a)(1)-BACT, 12-6-2002; RULE 1303(b)(2)- Offset, 5-10- 1996; RULE 1303(b)(2)-Offset, 12-6-2002]; RULE 3004(a)(4)-Periodic Monitoring,12-12-19]

Devices subject to this condition : D1629, D1634]

D82.5 The operator shall install and maintain a CEMS to measure the following parameters:

CO concentration in ppmv at the outlet of the SCR serving the equipment

Concentrations shall be corrected to 3 percent oxygen on a dry basis.

The CEMS shall be installed and operated no later than 90 days after initial start up of the boiler and in accordance with an approved AQMD Rule 218 CEMS plan application. The operator shall not install the CEMS prior to receiving initial approval. Within two weeks of the boiler start-up, the operator shall provide written notification to the AQMD of the exact date of start-up

RULE 1703(a)(2) - PSD-BACT, 10-7-1988;

[Devices subject to this condition : D1629, D1634]

D82.6 The operator shall install and maintain a CEMS to measure the following parameters:

NOX concentration in ppmv at the outlet of the SCR serving the equipment

Concentrations shall be corrected to 3 percent oxygen on a dry basis.

The CEMS shall be installed and operating no later than 90 days after initial start up of the boiler and shall comply with the requirements of Rule 2012. During the interim period between the initial start-up and the provisional certification date of the CEMS, the operator shall comply with the monitoring requirements of Rule 2012(h)(2) and 2012(h)(3). Within two weeks of boiler start-up date, the operator shall provide written notification to the District of the exact date of start-up

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 1303(b)(2)-Offset, 5-10-1996]

[Devices subject to this condition : D1629, D1634]

D90.20 The operator shall continuously monitor the H2S concentration in the fuel gases before being burned in this device according to the following specifications:

The operator shall use Gas Chromatograph meeting the requirements of 40CFR60 Subpart Ja to monitor the parameter.

The operator shall also install and maintain a device to continuously record the parameter being monitored.

The operator may monitor the H2S concentration at a single location for fuel combustion devices, if monitoring at this location accurately represents the concentration of H2S in the fuel gas being burned in this device.

[40CFR 60 Subpart Ja, 6-24-2008]

[Devices subject to this condition : D1629, D1634]

D90.21 The operator shall continuously monitor the total sulfur compounds calculated as H2S concentration in the fuel gases before being burned in this device and before blending with natural gas according to the following specifications:

The CEMS shall be approved by the District before the initial start-up

The operator shall also install and maintain a device to continuously record the parameter being monitored.

The operator may monitor the total sulfur compounds calculated as H2S concentration at a single location for fuel combustion devices, if monitoring at this location accurately represents the concentration of total sulfur compounds calculated as H2S in the fuel gas being burned in this device.

[RULE 2005, 5-6-2005]

[Devices subject to this condition : D1629, D1634]

I. Administrative

I296.3 This equipment shall not be operated unless the operator demonstrates to the Executive Officer that the facility holds sufficient RTCs to offset the prorated annual emissions increase for the first compliance year of operation. In addition, this equipment shall not be operated unless the operator demonstrates to the Executive Officer that, at the commencement of each compliance year after the first compliance year of operation, the facility holds sufficient RTCs in an amount equal to the annual emissions increase.

To comply with this condition, the operator shall prior to the first compliance year hold a minimum 49,568 lbs/yr of NOx RTCs and 13,393 lbs/yr of SOx RTCs. This condition shall apply to the first year of operation, commencing with the initial operation of the boiler

To comply with this condition, the operator shall, prior to the begining of all years subsequent to the first compliance year, hold a minimum 40,594 lbs/yr of NOx RTCs and 12,789 lbs/yr of SOx RTCs for operation of the boiler. In accordance with Rule 2005(f), unused RTCs may be sold only during the reconciliation period for the fourth quarter of the applicable compliance year inclusive of the first year

For the purpose of this condition, unused RTCs is the difference between (1) the amount of NOx RTCs required to be held at the beginning of a compliance year as specified in this condition and the amount of NOx emissions during each applicable compliance year and (2) the amount of SOx RTCs required to held at the beginning of a compliance year as specified in this condition and amount of SOx emissions during each applicable compliance year

[RULE 2005, 5-6-2005]

[Devices subject to this condition : D1629, D1634]

K. Record Keeping/Reporting

K40.3 The operator shall provide to the District a source test report in accordance with the following specifications:

Source test results shall be submitted to the District no later than 60 days after the source test was conducted.

Emission data shall be expressed in terms of concentration (ppmv), corrected to 3 percent oxygen, dry basis.

Emission data shall be expressed in terms of mass rate (lbs/hr). In addition, solid PM emissions, if required to be tested, shall also be reported in terms of grains per DSCF.

Emission data shall be expressed in terms of lbs/MM standard cubic feet.

All exhaust flow rate shall be expressed in terms of dry standard cubic feet per minute (DSCFM) and dry actual cubic feet per minute (DACFM).

All moisture concentration shall be expressed in terms of percent corrected to 3 percent oxygen.

Source test results shall also include oxygen levels in the exhaust, the fuel flow rate (CFH) for each fuel used by the equipment, the fuel gas temperature and pressure under which the test conducted.

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 1303(a)(1)-BACT, 12-6-2002; RULE 1303(b)(2)-Offset, 5-10- 1996; RULE 1303(b)(2)-Offset, 12-6-2002]

[Devices subject to this condition: D1629, D1634]

K67.14 The operator shall keep records, in a manner approved by the District, for the following parameter(s) or item(s):

Fuel use during the commissioning period

Fuel use after the commissioning period and prior to CEMS certification

Fuel use after CEMS certification

[RULE 2012, 5-6-2005]

[Devices subject to this condition: D1629, D1634]

SCR CATALYST CONDITIONS

D. Monitoring/Testing Requirements

D12.10 The operator shall install and maintain a(n)flow meter to accurately indicate the flow rate of the total hourly throughput recorded of injected ammonia.

The operator shall also install and maintain a device to continuously record the parameter being measured

The measuring device or gauge shall be accurate to within plus or minus 5 percent. It shall be calibrated once every 12 months.

[RULE 1303(a)(1)-BACT, 5-10-1996] [RULE 2012, 5-6-2005]

[Devices subject to this condition : C1631, C1636]

D12.11 The operator shall install and maintain a(n) temperature reading device to accurately indicate the temperature of the exhaust at the inlet to the SCR reactor.

The operator shall also install and maintain a device to continuously record the parameter being measured.

The measuring device or gauge shall be accurate to within plus or minus 5 percent. It shall be calibrated once every 12 months.

[RULE 1303(a)(1)-BACT, 5-10-1996] [RULE 2012, 5-6-2005]

[Devices subject to this condition : C1631, C1636]

D12.12 The operator shall install and maintain a(n) pressure gauge to accurately indicate the differential pressure across the SCR catalyst bed in inches water column.

The operator shall also install and maintain a device to continuously record the parameter being measured.
The measuring device or gauge shall be accurate to within plus or minus 5 percent. It shall be calibrated once every 12 months.

[RULE 1303(a)(1)-BACT, 5-10-1996] [RULE 2012, 5-6-2005]

[Devices subject to this condition : C1631, C1636]

D29.10 The operator shall conduct source test(s) for the pollutant(s) identified below.

Pollutant(s) to be tested	Required Test Method(s)	Averaging Time	Test Location
NH3 emissions	Approved District method	1 hour	Outlet of the SCR

The test shall be conducted no later than 180 days after initial startup and the results submitted to the District within 60 days after the test date. The AQMD shall be notified of the date and time of the test at least 7 days prior to the test.

The test shall be conducted at least quarterly during the first twelve months of operation and at least annually therafter. The NOx concentration, as determined by the certified CEMS is inoperable or not yet certified, a test shall be conducted to determine the NOx emissions using District Method 100.1 measured over 60 minutes averaging time period.

The test shall be conducted to demonstrate compliance with Rule 1303 concentration limit. If the equipment is not operated in any given quarter, the operator may elect to defer the required testing to a quarter in which the equipment is operated.

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 1303(a)(1)-BACT, 12-6-2002]
[Devices subject to this condition : C1631, C1636]

E. Equipment Operation/Construction Requirements

E73.5 Notwithstanding the requirements of Section E conditions, the operator may, at his discretion, choose not to use ammonia injection if any of the following requirement(s) are met:

The inlet exhaust temperature to the SCR reactor is below 546 degrees F

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 1303(a)(1)-BACT, 12-6-2002; RULE 2005, 5-6-2005]

[Devices subject to this condition : C1631]

E179.3 For the purpose of the following condition number(s), continuously record shall be defined as once every hour and shall be calculated upon average of the continuous monitoring for that hour.

Condition Number D 12-10

Condition Number D 12-11

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 2012, 12-5-2003; RULE 2012, 1-7-2005]

[Devices subject to this condition : C1631, C1636]

E179.4 For the purpose of the following condition number(s), continuously record shall be defined as once every month and shall be calculated upon average of the continuous monitoring for that month.

Condition Number D 12-12

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 2012, 12-5-2003; RULE 2012, 1-7-2005]
[Devices subject to this condition : C1631, C1636]

Ammonia Tank

E. Equipment Operation/Construction Requirements

E144.1 The operator shall vent this equipment, during filling, only to the vessel from which it is being filled.

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 1303(a)(1)-BACT, 12-6-2002]

[Devices subject to this condition : D1628]

C. Throughput or Operating Parameter Limits

C157.1 The operator shall install and maintain a pressure relief valve set at 50 psig.

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 1303(a)(1)-BACT, 12-6-2002]

[Devices subject to this condition : D1628

Appendix C – Commissioning Period Emissions

Table C2 – Boiler (each) Commissioning Period Emissions

Commissioning Task	**Total Fuel Consumption MMSCF**	**Total Hours**	**CO** (lb/task)	**NOx** (lb/task)	**PM10** (lb/task)	**VOC** (lb/task)	**SOx** (lb/task)	**CO EF** (lb/MMSCF)	**NOx EF** (lb/MMSCF)	**PM10 EF** (lb/MMSCF)	**VOC EF** (lb/MMSCF)	**SOx EF** (lb/MMSCF)
First Fired/Boil Out (10% load)	1.76	60	1584	176	37	9	11.7	900	100	21	4.92	6.67
Refractory Curing (20% load)	2.35	40	2112	235	49	12	15.7	900	100	21	4.92	6.67
Burner Tuning (0-100% load)	58.67	200	13,200	5,875	1232	289	391	225	100	21	4.92	6.67
Catalyst Loading	0	40										6.67
SCR Tuning (100% load)	49.28	168	2217	2,464	1,035	242	329	45	50	21	4.92	6.67
Steam Blow (100% load)	8.80	30	396	220	185	43	59	45	25	21	4.92	6.67
Totals	120.86	498	19,509	8.970	2,538	595	806					

For each boiler, the boiler commissioning period will take approximately 90 days with a total of 498 hours of operation.

Appendix D –AEIS Emissions Calculation

Data: (Each Boiler)
Normal Operation = 8715 hours/year
Start-up = 5 hours/start, 48 starts/year = 240 hours
Boiler Shutdown = 0.5 hours/event, 48 events/year = 24 hours/year

Table D-3: Boiler Uncontrolled Emission Calculations (Each Boiler)

Operating Condition	Hours per Year	CO (lb/hr)	NO_X (lb/hr)	PM10 (lb/hr)	VOC (lb/hr)	SO_X (lb/hr)	CO (lb/year)	NO_X (lb/year)	PM10 (lb/year)	VOC (lb/year)	SO_X (lb/year)
Start-up	240	26.25	2.975	0.30	0.115	0.11	6,300	714	72	28	26
Shutdown	24	132	14.61	1.86	0.72	0.97	3,168	351	45	17	24
Normal Operation (36 F, DB ON)	8,496	12.6	29.22	3.72	1.41	1.946	107,050	248,253	31,605	12,234	16541
Total Boiler	8,760						116,518	249,318	31,722	12,279	12,448
							lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
Uncontrolled Emissions (lb/hr)							13.30	28.46	3.62	1.41	1.42

Table D-4: Boiler Controlled Emission Calculations (Each Boiler)

Operating Condition	Hours per Year	CO (lb/hr)	NO_X (lb/hr)	PM10 (lb/hr)	VOC (lb/hr)	SO_X (lb/hr)	CO (lb/year)	NO_X (lb/year)	PM10 (lb/year)	VOC (lb/year)	SO_X (lb/year)
Cold Starts	240	26.5	2.975	0.30	0.115	0.11	6,360	714	72	28	26
Shutdown	24	132	14.61	1.86	0.72	0.73	3,168	351	45	17	18
Normal Operation @ Full Load	8,496	12.6	3.87	3.72	1.41	1.46	107,050	32,880	31,605	11,979	12,404
Total	8,760						116,578	33,945	31,722	12,024	12,448
							lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
Controlled Emissions (lb/hr)							13.31	3.88	3.62	1.37	1.42

Appendix E – Emission Offset Calculations (Non-RECLAIM Pollutants)

Boiler Data (Each Boiler):

Boiler operation (each) = 744 hours/month (assume 31 days/month and duct firing for all normal operation for the most conservative emissions estimate)

Assume boiler starts up from cold start for worst case emission calculation. The maximum number of start-ups is 4 starts per month and 48 start-ups /year for each boiler.

Boiler Cold Starts = 5 hours/event @ avg 10% of full load = 20 hours/month. For the purpose of offset calculation below 100% load during the 5 hours are assumed.

Boiler Shutdown = 0.5 hours/event (Boiler load reduces from 100% to 0% in 30 minutes) = 2 hours/month. For the purpose of offset calculation below, 100% load during the 0.5 hours is assume.

Assume 31 days/month, 365 days/yr. **Daily offset calculated from 31 days calendar monthly divided by 30 days (per Rule 1306 (b))**

Table E-2: Boilers Emission Offsets Calculation (Each Boiler)
Data from Tables 15, 16, 17 and 19 of this report

Operating Condition	Hours per Month	PM10 (lb/hr)	VOC (lb/hr)	PM10 (lb/month)	VOC (lb/month)
Start-up	20	3.72*	1.41*	74.40	28.20
Shutdown	2	3.72**	1.41**	7.44	2.80
Normal Operation @Full Load	722	3.72	1.41	2685.84	1018.02
Total Boiler	744			2767.68	1049.02
Fugitive Components	744				200.00
Total Permit Unit	744			2767.68	1249.02
				lb/day	lb/day
30-Day Avg Emissions (lb/day)				92.25	41.70

**Actual start-up emissions in Table 7 for PM10 and VOC are 0.3 lb/hr and 0.11 lb/hr respectively. To be conservative for the purpose of calculating offset, maximum rated capacity is assumed during the entire period of start-up and shutdown by using 3.72 lb/hr for PM10 and 1.41 lb/hr for VOC in Table 6.*

***Actual shutdown emissions in Table 8 for PM10 and VOC are 1.9 lb/hr and 0.72 lb/hr respectively. To be conservative for the purpose of calculating offset, maximum rated capacity is assumed during the entire period of start-up and shutdown by using 3.72 lb/hr for PM10 and 1.41 lb/hr for VOC in Table 6*

Appendix F – NOX RTC Calculations

Table F-1: RECLAIM Pollutants Emissions from Each Boiler – First Year

Operating Condition	Hours per Year	NO_X (lb/hr)	SO_X (lb/hr)	NO_X (lb/year)	SO_X (lb/year)
Commissioning	498	-	-	8,970	806
Start-up	240	29.22	1.946	7013	467
Shutdown	24	29.22	1.946	701	47
Normal Operation @ 100% Load	7998	3.87	1.946	32,880	16,542
Total BO-11	8,760			49,568	17,862
Total BO-12	8,760			49,568	17,862
Total-2 boilers				99,136	35,724

Note: Although NOX and SOX emissions during start-ups are 2.975 lb/hr and 0.146 lb/hr respectively; and NOX and SOX emissions during shutdowns are 14.61 and 0.97 lb/hr respectively, for the purpose of determining NOX and SOX required to be held at the beginning of each year, the most conservative NOX and SOX estimates (lb/hr) are used in this table by assuming maximum firing rate and with no control during start-up, shutdown. Maximum firing rate with control is assumed during normal operation.

Table F-1B: RECLAIM Pollutants Emissions from Each Boiler – Subsequent Years

Operating Condition	Hours per Year	NO_X (lb/hr)	SO_X (lb/hr)	NO_X (lb/year)	SO_X (lb/year)
Start-up	240	29.22	1.946	7013	467
Shutdown	24	29.22	1.946	701	47
Normal Operation @ 100% Load	8,496	3.87	1.946	32,880	16,539
Total BO-11	8,760			40,594	17,053
Total BO-12	8,760			40,594	17,053
Total-2 boilers				81,188	34,106

Note: Although NOX and SOX emissions during start-ups are 2.975 lb/hr and 0.146 lb/hr respectively; and NOX and SOX emissions during shutdowns are 14.61 and 0.97 lb/hr respectively, for the purpose of determining NOX and SOX required to be held at the beginning of each year, the most conservative NOX and SOX estimates (lb/hr) are used in this table by assuming maximum firing rate and with no control during start-up, shutdown. Maximum firing rate with control is assumed during normal operation.

Total BO-11 and BO-12 – First Year	NOx (lb/year)	SOx (lb/year)
	99,136	35,724
Total BO-11 and BO-12 – Each subsequent Year	NOx (lb/year)	SOx (lb/year)
	81,188	34,106

Appendix G– Interim Period RECLAIM Emission Factor Calculations for Boiler

Table G-1: Emission Factors (Base Load , Start Up and Shutdown)

Pollutant	Boiler Table 1 of Rule 2002 Starting allocation Factor (lb/MMSCF)
SOX	34
NOX	.035 lb/MMBTU

Table G-2: Emission Factors (Commissioning Period)

Pollutant	Emissions (lbs)	Fuel Flow Rate (MMSCF)	EF (lb/MMSCF)
Boiler – NOX Commissioning	8,970	120.86	74.2
Boiler – SOX Commissioning	805	120.86	6.65