Holly Refinery: Revised Netting Analysis

March 21, 2013

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HOLLYFRONTIER

HOLLY REFINING & MARKETING COMPANY – WOODS CROSS LLC

1070 West 500 South • West Bountiful, Utah 84087-1442

(801) 299-6600 • Fax (801) 299-6609

March 21, 2013

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MAR 21 2013
DEPARTMENT OF
ENVIRONMENTAL QUALITY

Mr. Bryce Bird, Director
Division of Air Quality
Utah Dept. of Environmental Quality
195 North 1950 West
Salt Lake City, Utah 84114

HAND DELIVERED

RE: **Revised Netting Analysis for the Heavy Crude (Black Wax) Processing Change to the Modernization Project**

Dear Mr. Bird:

On February 7, 2013 representatives from Holly Refining & Marketing Company – Woods Cross LLC ("Holly") met with representatives from the Division of Air Quality ("DAQ") to discuss the status of Holly's request to modify its Approval Order to incorporate changes to the previously permitted Modernization Project. Holly requested the changes to facilitate the use of Utah-produced Black Wax Crude instead of Western Canadian Select Crude to increase plant throughput. At the February 7th meeting, the DAQ representatives asked for four additional categories of information to allow them to continue processing our modification request. First, they asked for a written response to the EPA comment letter submitted during the comment period, which Holly provided on February 12, 2013. The February 12 letter was supplemented with a letter dated March 20, 2013, submitted to EPA, and enclosed herewith. Second, Holly was asked to resubmit a revised netting analysis. Third, DAQ requested additional information regarding the emissions from the propane pit flare. Finally, Holly was asked to provide further economic justification for the determination that a flare gas recovery system was not the Best Available Control Technology ("BACT"). Holly is submitting information today to satisfy the final three requests.

BACKGROUND

In 2006, as part of the Modernization Project, several changes to the refinery were proposed in order to process Western Select Canadian Crude. These changes included the addition of new equipment and process units and modifications to existing equipment. However, once Holly made the decision to switch its crude oil feedstock source from Western Select Canadian Crude to Utah Black Wax Crude, some equipment that was requested and permitted in 2007 was no longer needed. Alternatively, equipment necessary to process the Black Wax Crude was requested in the July 2012 Notice of Intent ("NOI"). For your convenience, provided below is a summary of the 2007 Modernization Project elements presented in the 2006 NOI and an explanation of the current implementation status (or non-implementation) of each item:

- The fluid catalytic cracking unit (FCCU) feed heater (4H1) was derated to 39.0 MMBtu/hr from 68.4 MMBtu/hr in 2008.

- To comply with federal regulations requiring the removal of sulfur from gasoline, a Gas Oil Hydrocracking Unit (GOHC) was installed to remove sulfur in 2009. Air emissions associated with the installation of the GOHC Unit were based on the addition of a 29.8 MMBtu/hr (HHV) reactor charge heater and a 47.1 MMBtu/hr (HHV) fractionator charge heater, both of which were installed in 2009. However, the former heater was installed at 14.9 MMBtu/hr and the latter at 47.0 MMBtu/hr.
- A flue gas wet scrubber was added to treat regenerator gas from the FCCU. This scrubber reduces emissions of NOx as well as SO2 and particulate matter from the FCCU (Unit 4). The wet gas scrubber was installed and became operational in the fall of 2012.
- Burners on the existing crude unit feed heater (8H1) and naphtha HDS feed heater (12H1) were replaced with next generation ultra-low NOx burners (ULNB) burners in 2008.
- The existing crude unit was proposed to be expanded from 26,400 barrels per day (BPD) to 40,000 BPD to accommodate the heavier crude. This expansion has not yet occurred. To accommodate the currently proposed change in feedstock, the addition of a new crude unit with a capacity of 15,000 BPD and the expansion of the existing crude unit to 45,000 BPD is planned.
- A 35.0 MMBtu/hr (HHV) crude unit heater to be installed on the existing crude unit will not be built.
- In 2006, the heavy crude tower bottoms were proposed to be further distilled in a 24,000 BPD vacuum tower equipped with a 15.2 MMBtu/hr HHV vacuum furnace heater. The 15.2 MMBtu/hr vacuum furnace heater will not be built. Currently, a larger vacuum tower equipped with a 130 MMBtu/hr vacuum furnace heater is proposed.
- In 2006, it was proposed that the vacuum tower bottoms will be fed to a solvent deasphalting (SDA) unit with expanded capacity from 6,500 BPD to 14,500 BPD. The SDA would be converted in to a Residual Oil Solvent Extraction "ROSE" Unit which separates the gas oil from the asphalt. The SDA unit expansion and addition of the "ROSE" Unit is in the engineering stages and is planned for construction.
- A previously permitted 99MMBtu/hr (HHV) hot oil heater will be added to the ROSE unit and will be constructed in the future.
- The existing asphalt heater 10H1 will not be converted to a desalter feed heater. Thus, no changes will be made to 10H1.
- A 10,000 BBL asphalt tank to be equipped with two (2) 0.8 MMBtu/hr heaters was proposed in 2006. These new asphalt tank and heaters have yet not been installed but will be in the future.
- The modification to the gas plant to process hydrotreater (DHT) and GOHC off-gas for LPG recovery has not occurred but is still planned in the future. No changes in air emissions are expected.
- The gas plant compressor (Clark 11-2a) was replaced with an electric driven-compressor in 2008.
- The naphtha fractionator will be reconfigured to improve processing and conserve energy in the future. The reconfiguration will have no impact on emissions.
- In 2006, it was proposed that gas from the GOHC be treated in a NaSH unit and sulfur recovery unit (SRU). Gas from the GOHC is currently being treated in the NaSH unit and will be further treated in the SRU in the future once the modifications to the gas plant are made.
- 2 new amine units that were proposed in 2006 will not be required due to the change in proposed crude oil feedstock and will not be built.
- Two (2) new 55 LTD SRU units with TGTU that were proposed in 2006 will not be built.

- Oxygen enhancement will not be added to the existing SRU to enable it to handle the additional sour water.
- A sour water stripper was added in 2009.
- The construction for the proposed 2006 20MMSCF/day hydrogen plant will commence in the future.
- Two (2) 123.2 MMBtu/hr (HHV) hydrogen reformer feed furnaces to be installed at the new hydrogen plant will be constructed in the future.
- Based on the results of a flare study conducted for the Refinery, the decommissioned south flare will be replaced with a new flare (2012 NOI). Currently, all gases are routed to the north flare.
- Selective catalytic reduction (SCR) was added to Boilers #5 and #8 for NOx control in 2008 and 2012, respectively. The CO boiler was decommissioned at the end of 2012.
- Changes to existing tanks and addition of new tanks were proposed in 2006. Some of the proposed tank changes have been completed, several have not.
- One new location for NaSH truck loading and two new rail spots were added for NaSH loading in 2009. One new location for unloading caustic trucks was added at the caustic tanks in 2009. One new rail spot was added for unloading caustic rail cars. In 2006 a proposed new loading arm for loading sulfur trucks at the existing sulfur pit was to be installed. This loading arm will not be added.
- In 2006, forty (40) rail spots were proposed to be added for loading fuel oil. In the 2012 NOI, this number was revised to 16 for fuel oil and 24 for lube oil. Other clarifications pertaining to loading/unloading activities are presented in Section 2.0 of the 2012 NOI.

The remaining Modernization Project elements specific to processing the Utah Black Wax Crude are presented in the July 2012 NOI.

REVISED NETTING ANALYSIS

During the implementation of the Modernization Project, Holly decided to switch its primary feedstock source from Western Canadian Select Crude to Utah Black Wax Crude. Given the differences between these feedstock sources, Holly determined some of the equipment requested in the 2006 NOI would not be necessary but that different equipment would need to be installed to finalize the project. As such, Holly submitted its 2012 NOI to request permission to implement these changes. In reviewing the netting analysis submitted in July, 2012, it became apparent that the analysis did not account for all of the project elements previously permitted in 2006 that were part of the project. Therefore, the revised netting analysis we are submitting today has factored in all contemporaneous changes in the last five years, including what was built, what was permitted but not yet built, and what will be built in the future. Attachment A contains the revised netting analysis.

Several items should be noted in the revised netting analysis.

1. The baseline years used in the attached netting analysis changed from the July 2012 NOI submittal. The revised baseline years are as follows:
   PM10 - No change from July NOI submittal;
   PM2.5 - Consecutive 24-month period from January 2008 - December 2009;

SO2 - Consecutive 24-month period from January 2005 - December 2006;
NOX - Consecutive 24-month period from January 2007 - December 2008;
CO - Consecutive 24-month period from January 2010 - December 2011;
VOC - Consecutive 24-month period from January 2007 - December 2008.

2. PM10 and PM2.5 emission estimates were revised for all (proposed and previously permitted) process heaters based on the emission factors for process heaters in the petroleum industry used by EPA in the preparation of the National Emission Inventories (NEI). Reductions of PM from removal of the gas plant compressor were determined by adjusting the baseline with these emission factors, which resulted in smaller reductions. The EPA emission factors are presented at http://www.epa.gov/ttn/chief/net/2011inventory.html. Holly believes these emission factors more accurately reflect the PM10 and PM2.5 emissions from the refinery.
3. All contemporaneous emissions have been included.
4. As engineering work has progressed in the several months since July 2012 NOI submittal, a previously proposed 14.1 MMBtu/hr hot oil heater (26H1) to be installed on the poly gasoline unit will not be required.

This approach is consistent with the PSD rules contained in 40 C.F.R. 52.21. An actual increase or decrease in emissions will be contemporaneous with the proposed project if the increase or decrease occurs between: "(a) the date five years before construction on the particular change commences; and (b) the date the increase from the particular change occurs". 40 C.F.R. § 52.21(3)(ii). This means that if construction will commence on the equipment requested in the July 2012 NOI sometime in the next 6 months, say July 2013, then the contemporaneous period start date is July, 2008, five years prior to the commencement of construction. The contemporaneous period end date will be the date which the proposed equipment has been built and fully operational, in other words, when the increase from the change "occurs." Any increases or decreases in actual emissions that occurred after July 2008 and before final installation of the requested equipment, will be considered contemporaneous. The increases and decreases in emissions Holly has included in its revised netting analysis were the result of equipment and pollution control installations that were built after July 2008. See Letter from Director, Division of Stationary Source Enforcement, to Merrill S. Hohman, Director, Air & Hazardous Materials Division, Region I (Apr. 1, 1981) ("In order for a decrease in emissions to be considered contemporaneous, the actual decrease itself must take place within five years of the particular physical change or change in method of operation at a stationary source.").

Based on the revised netting analysis, Modernization Project emissions for criteria and hazardous pollutants are estimated to be as follows:

NOx -	+37.7 TPY
SO2 -	-378.5 TPY
VOC -	+5.8 TPY
PM10 -	-22.6 TPY
PM2.5 -	-3.2 TPY
CO -	+500.7 TPY
Lead -	+0.002 TPY
HAPs -	+19.7 (TPY) (with 8.8 tons single pollutant increase for hexane)

Thus, consistent with our prior analysis, this revised analysis shows the only significant increases are for CO and CO2.

PROPANE PIT FLARE

Further clarification regarding the propane pit flare and January 2010 compliance with NSPS subparts A & J was requested by the UDAQ. As you are aware, in 2009 a new propane pit flare was installed at the Woods Cross Refinery. This flare replaced the previous flare, adding air assist (to control smoke production) and pilot monitoring. The replacement flare meets the NSPS Subpart A & J requirements. Emission estimates from the NSPS compliant flare as compared to the flare prior to replacement did not change since the emission factors used were identical and were based on the emission factors found in AP-42 Section 13.5, Industrial Flares. Holly has planned to decommission the frozen earth propane storage facility and so the propane pit flare will no longer be needed and will be removed.

ECONOMIC ANALYSIS OF THE FLARE GAS RECOVERY SYSTEM

An annualized economic benefit analysis associated with the installation and operation of a flare gas recovery system was prepared by Holly engineers and concluded that 1.3 million dollars per year could be recouped by incorporating fuel gas recovery. This cost estimate was based on an average fuel gas recovery of 550 standard cubic feet per minute (scfm) at $5.00 per MMBtu. When factoring in this cost benefit against the other direct and indirect costs to install and operate a flare gas recovery system, the cost effectiveness per pollutant is as follows: $141,082.07 per ton NOX reduction; $25,918.49 per ton CO reduction; $151,494.03 per ton VOC reduction; $84.97 per ton CO2 reduction; and $28,147.04 per ton CH4 reduction. Attachment B contains the cost effectiveness calculations.

If you have any questions or need additional information, please call me at (801) 299-6625.

Sincerely,

Michael S. Astin, P.E.
Environmental Manager

c: C. Harry (Utah DAQ)
M. Wright, Jr.
L. Keddington
File 2.5.1

Attachment A
Revised Netting Analysis

Pollutant	FCC Feed Heater (TPY)	GOHT/C Charge Heater (TPY)	Fractionator Reboiler (TPY)	FCC Scrubber (TPY)	Crude Feed Heater 8H1 (TPY)	Hot Oil Heater 10H2 (TPY)	SRGP Compressor (TPY)	Naphtha Feed Heater (TPY)	Hydrogen Plant (TPY)	Hydrogen Reformer Deaerator Vent (TPY)	Hydrogen fugitives (TPY)	Hydrogen Reformer Furnace #2 (TPY)	Boiler #5 (TPY)	Boiler #8 (TPY)	Asphalt Tank (TPY)	New & Modified Tanks (TPY)	Increased Tank Thruput (TPY)
NOx	-5.18	2.61	8.23	-35.68	3.39	8.67	-36.62	6.83	10.78			10.78	-9.44	-1.77			
SO2	-1.28	0.65	2.04	-266.66		4.31	0.0		5.35			5.35					
VOC	-0.69	0.35	1.11	-0.7		2.34	-2.27		2.91	3.20	0.055	2.91			0.11	0.30	0.84
PM10	-0.07	0.03	0.10	-43.66		0.22	-0.012		0.27			0.27					
PM2.5	-0.05	0.03	0.09	-22.98		0.18	-0.0075		0.23			0.23					
CO	-10.60	5.37	16.95	125.33		35.71	0.0		44.40	2.63		44.40					
lead	-6.31E-05	0.00	0.00			2.13E-04			2.64E-04			2.64E-04					
benzene	-2.65E-04	0.00	0.00			8.93E-04			1.11E-03			1.11E-03				0.27	0.13
formaldehyde	-9.47E-03	0.00	0.02			3.19E-02			3.96E-02			3.96E-02					
hexane	-2.27E-01	0.12	0.36			7.65E-01			9.51E-01			9.51E-01				4.71E-01	1.04E-01
naphthalene	-7.70E-05	0.00	0.00			2.59E-04			3.22E-04			3.22E-04				1.70E-04	1.73E-04
toluene	-4.29E-04	0.00	0.00			1.45E-03			1.80E-03			1.80E-03				2.81E-01	8.45E-02
arsenic	-2.52E-05	0.00	0.00			8.50E-05			1.06E-04			1.06E-04					
beryllium	-1.51E-06	0.00	0.00			5.10E-06			6.34E-06			6.34E-06					
cadmium	-1.39E-04	0.00	0.00			4.68E-04			5.81E-04			5.81E-04					
chromium	-1.77E-04	0.00	0.00			5.95E-04			7.40E-04			7.40E-04					
cobalt	-1.06E-05	0.00	0.00			3.57E-05			4.44E-05			4.44E-05					
manganese	-4.80E-05	0.00	0.00			1.62E-04			2.01E-04			2.01E-04					
mercury	-3.28E-05	0.00	0.00			1.11E-04			1.37E-04			1.37E-04					
nickel	-2.65E-04	0.00	0.00			8.93E-04			1.11E-03			1.11E-03					
selenium	-3.03E-06	0.00	0.00			1.02E-05			1.27E-05			1.27E-05					
Xylene																1.01E-01	4.50E-02
Ethylbenzene																1.08E-02	2.38E-03
Cyclohexane																2.00E-01	6.51E-02
Trimethylbenzene																5.15E-03	1.13E-03
Isooctane																2.40E-01	5.29E-02
Chlorine																	
Acetaldehyde																	
Acrolein																	
Propylene																	
2,2,4-Trimethylpentane																	
Undesignated HAPS																	
Total HAPS																	

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Pollutant	2012 NOI Crude Furnace #3 24H1 (TPY)	2012 NOI FCC #2 Feed Heater 25H1 (TPY)	2012 NOI FCC #2 Scrubber (TPY)	2012 NOI Reactor Charge Furnace (27H1) (TPY)	2012 NOI Reactor Charge Heater (20H3) (TPY)	2012 NOI Boiler #11 (TPY)	2012 NOI Cooling Tower #10 (TPY)	2012 NOI Cooling Tower #11 (TPY)	2012 NOI Cooling Towers #4-#8 (TPY)	2012 NOI Vacuum Furnace Heater (33H1) (TPY)	2012 NOI Emer. Equip. (TPY)	2012 NOI Other Emergency Equipment (TPY)	2012 NOI New & Modified Tanks (TPY)	Tanks 71 & 72 Conversion (TPY)
NOx	10.51	7.88	19.91	8.67	7.38	7.82				11.39	0.11	0.84		
SO2	2.61	1.96	17.70	4.31	1.83	3.88				5.65	0.03	0.06		
VOC	1.42	1.06	0.00	2.34	1.00	1.56	1.56	2.39	-39.28	3.07	8.91E-04	6.78E-02	3.64	-0.58
PM10	0.13	0.10	8.15	0.22	0.09	3.91	0.10	0.14		0.29	7.43E-04	5.94E-02		
PM2.5	0.11	0.08	8.15	0.18	0.08	3.91	0.00	0.00		0.24	7.43E-05	5.94E-02		
CO	21.02	15.77	154.85	34.69	14.75	14.47				45.55	7.72E-03	1.80E-01		
lead	1.29E-04	9.66E-05		2.13E-04	9.04E-05	1.92E-04				2.79E-04				
benzene	5.41E-04	4.06E-04		8.93E-04	3.80E-04	8.05E-04	0.25	0.39		1.17E-03	3.20E-05	4.60E-05	4.16E-03	
formaldehyde	1.93E-02	1.45E-02		3.19E-02	1.36E-02	2.88E-02				4.19E-02	4.04E-05	5.81E-05		
hexane	4.64E-01	3.48E-01		7.65E-01	3.25E-01	6.90E-01	0.31	0.47		1.00E+00			8.76E-03	
naphthalene	1.57E-04	1.18E-04		2.59E-04	1.10E-04	2.34E-04	4.00E-04	6.00E-04		3.41E-04	2.90E-06	4.18E-06		
toluene	8.76E-04	6.57E-04		1.45E-03	6.15E-04	1.30E-03	0.21	0.32		1.90E-03	1.40E-05	2.01E-05	5.99E-03	
arsenic	5.15E-05	3.86E-05		8.50E-05	3.62E-05	7.67E-05				1.12E-04				
beryllium	3.09E-06	2.32E-06		5.10E-06	2.17E-06	4.60E-06				6.70E-06				
cadmium	2.83E-04	2.13E-04		4.68E-04	1.99E-04	4.22E-04				6.14E-04				
chromium	3.61E-04	2.71E-04		5.95E-04	2.53E-04	5.37E-04				7.82E-04				
cobalt	2.16E-05	1.62E-05		3.57E-05	1.52E-05	3.22E-05				4.69E-05				
manganese	9.79E-05	7.34E-05		1.62E-04	6.87E-05	1.46E-04				2.12E-04				
mercury	6.70E-05	5.02E-05		1.11E-04	4.70E-05	9.97E-05				1.45E-04				
nickel	5.41E-04	4.06E-04		8.93E-04	3.80E-04	8.05E-04				1.17E-03				
selenium	6.18E-06	4.64E-06		1.02E-05	4.34E-06	9.20E-06				1.34E-05				
Xylene							0.14	0.21			9.76E-06	1.40E-05	2.76E-03	
Ethylbenzene							9.00E-03	1.41E-02					3.75E-04	
Cyclohexane														
Trimethylbenzene							0.21	0.33						
Isooctane														
Chlorine							0.94	1.44						
Acetaldehyde											2.63E-04	3.78E-04		
Acrolein											3.17E-06	4.56E-06		
Propylene														
2,2,4-Trimethylpentane														
Undesignated HAPS														
Total HAPS														

Pollutant	Fugitives (TPY)	2012 NOI Fugitives (TPY)	2012 NOI South Flare (TPY)	2012 NOI Propane Flare (TPY)	2012 NOI Existing SRU (TPY)	2012 NOI Tank Heaters (TPY)	Stab-in Heaters (TPY)	45H1 Asphalt Heater (TPY)	Other Permitted Emissions (TPY)	Step 1 2012 NOI Emission Increase Total (TPY)	2012 NOI Emission Decrease Total (TPY)	Contemp. Emissions Increases (TPY)	Contemp. Emission Decreases (TPY)	Net Total (TPY)	PSD/NNSR Trigger Levels (TPY)	PSD/NNSR Triggered
NOx			4.00	-19.57	-0.85	2.06	0.69	-2.69	16.95	80.57	-19.57	68.9	-92.2	37.7	40	No
SO2			-4.32	0.00	-184.64	0.21	0.07	-0.67	23.09	38.23	-188.96	40.9	-268.6	-378.5	40	No
VOC	3.88	15.25	-3.87	-1.55	-0.05	0.11	0.04	-0.36	3.64	33.49	-44.70	21.7	-4.6	5.8	25	No
PM10				-0.93	-0.06	0.01	0.00	-0.50	8.53	13.20	-0.93	9.4	-44.3	-22.6	15	No
PM2.5				-2.19	-0.07	0.01	0.00	-0.03	8.53	12.82	-2.19	9.3	-23.1	-3.2	10	No
CO			31.68	-129.27	-0.76	1.68	0.56	-5.36	36.63	334.66	-129.27	312.0	-16.7	500.7	100	Yes
lead						1.03E-05	3.44E-06	-3.29E-05		0.001		8.78E-04	-9.60E-05	1.8E-03		
benzene		0.80	0.01			4.33E-05	1.44E-05	-1.38E-04		1.461		4.08E-01	-4.03E-04	1.9E+00		
formaldehyde			8.70E-02			1.55E-03	5.15E-04	-4.93E-03		0.239		1.32E-01	-1.44E-02	3.6E-01		
hexane		0.98	2.16E-03			3.71E-02	1.24E-02	-1.18E-01		5.407		3.73E+00	-3.46E-01	8.8E+00		
naphthalene		0.00	8.19E-04			1.26E-05	4.19E-06	-4.01E-05		4.38E-03		1.41E-03	-1.17E-04	5.7E-03		
toluene		0.66	4.32E-03			7.01E-05	2.34E-05	-2.23E-04		1.21E+00		3.72E-01	-6.53E-04	1.6E+00		
arsenic						4.12E-06	1.37E-06	-1.31E-05		4.04E-04		3.51E-04	-3.84E-05	7.2E-04		
beryllium						2.47E-07	8.24E-08	-7.88E-07		2.42E-05		2.11E-05	-2.30E-06	4.3E-05		
cadmium						2.27E-05	7.56E-06	-7.23E-05		2.22E-03		1.93E-03	-2.11E-04	3.9E-03		
chromium						2.89E-05	9.62E-06	-9.20E-05		2.83E-03		2.46E-03	-2.69E-04	5.0E-03		
cobalt						1.73E-06	5.77E-07	-5.52E-06		1.70E-04		1.47E-04	-1.61E-05	3.0E-04		
manganese						7.83E-06	2.61E-06	-2.50E-05		7.67E-04		6.67E-04	-7.29E-05	1.4E-03		
mercury						5.36E-06	1.79E-06	-1.71E-05		5.25E-04		4.56E-04	-4.99E-05	9.3E-04		
nickel						4.33E-05	1.44E-05	-1.38E-04		4.24E-03		3.69E-03	-4.03E-04	7.5E-03		
selenium						4.95E-07	1.65E-07	-1.58E-06		4.85E-05		4.21E-05	-4.61E-06	8.6E-05		
Xylene		0.44	2.16E-03							0.799		1.46E-01		9.4E-01		
Ethylbenzene		0.03	0.11							0.160		1.32E-02		1.7E-01		
Cyclohexane										0.000		2.65E-01		2.6E-01		
Trimethylbenzene										0.539		6.28E-03		5.4E-01		
Isooctane										0.000		2.93E-01		2.9E-01		
Chlorine										2.384				2.4E+00		
Acetaldehyde			3.20E-03							0.004				3.8E-03		
Acrolein			7.45E-04							0.001				7.5E-04		
Propylene			1.82E-01							0.182				1.8E-01		
2,2,4-Trimethylpentane		0.68								0.676				6.8E-01		
Undesignated HAPS									1.65			1.65E+00		1.7E+00		
Total HAPS														19.74		

Fluid Catalytic Cracking Feed Heater - Modified

Pollutant	Equipment Rating (MMBtu/hr)	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	68.4 MMBtu/hr Emission (lb/yr)	68.4 MMBtu/hr Emission (tn/yr)	39.0 MMBtu/hr Emission (lb/yr)	39.0 MMBtu/hr Emission (tn/yr)	Difference (tn/yr)
NOx	68.4	39	41		1020	24084.8	12.04	13732.59	6.87	-5.18
SO2	68.4	39			1020	5950.0	2.97	3392.54	1.70	-1.28
VOC	68.4	39	5.5		1020	3230.9	1.62	1842.18	0.92	-0.69
PM10	68.4	39		0.00051		305.6	0.15	174.24	0.09	-0.07
PM2.5	68.4	39		0.00042		251.7	0.13	143.49	0.07	-0.05
CO	68.4	39	84		1020	49344.6	24.67	28135.06	14.07	-10.60
lead	68.4	39	0.0005		1020	0.3	0.00	0.17	8.37E-05	-0.0001
benzene	68.4	39	2.10E-03		1020	1.2	0.00	0.70	3.52E-04	-0.0003
formaldehyde	68.4	39	7.50E-02		1020	44.1	0.02	25.12	1.26E-02	-0.01
hexane	68.4	39	1.8		1020	1057.4	0.53	602.89	3.01E-01	-0.23
naphthalene	68.4	39	6.10E-04		1020	0.36	0.00	0.20	1.02E-04	-7.70E-05
toluene	68.4	39	3.40E-03		1020	2.00	0.00	1.14	5.69E-04	-4.29E-04
arsenic	68.4	39	2.00E-04		1020	0.12	0.00	0.07	3.35E-05	-2.52E-05
beryllium	68.4	39	1.20E-05		1020	0.01	0.00	0.00	2.01E-06	-1.51E-06
cadmium	68.4	39	1.10E-03		1020	0.65	0.00	0.37	1.84E-04	-1.39E-04
chromium	68.4	39	1.40E-03		1020	0.82	0.00	0.47	2.34E-04	-1.77E-04
cobalt	68.4	39	8.40E-05		1020	0.05	0.00	0.03	1.41E-05	-1.06E-05
manganese	68.4	39	3.80E-04		1020	0.22	0.00	0.13	6.36E-05	-4.80E-05
mercury	68.4	39	2.60E-04		1020	0.15	0.00	0.09	4.35E-05	-3.28E-05
nickel	68.4	39	2.10E-03		1020	1.23	0.00	0.70	3.52E-04	-2.65E-04
selenium	68.4	39	2.40E-05		1020	0.01	0.00	0.01	4.02E-06	-3.03E-06
Total HAPS										

Assumptions:

Historical usage around 30mmBTU/hr. Derate furnace from 68.4 mmBTU/hr to 39 mmBTU/hr through physical means or permit limit.

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Small Boilers - Low Nox burners

Source ID 4H1

SO_2 emissions based on H_2S content of 60 ppmv

PM10 and PM2.5 emissions based on EPA PM emission factors for gas-fired boilers (NEI Inventory)

GOHT/C Charge Heater - New

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emission (lb/yr)	Emission (tn/yr)
NOx	14.9		0.04		5220.96	2.61
SO2	14.9			1020	1296.13	0.65
VOC	14.9	5.5		1020	703.81	0.35
PM10	14.9		0.00051		66.57	0.03
PM2.5	14.9		0.00042		54.82	0.03
CO	14.9	84		1020	10749.04	5.37
lead	14.9	0.0005		1020	0.06	3.20E-05
benzene	14.9	2.10E-03		1020	2.69E-01	1.34E-04
formaldehyde	14.9	7.50E-02		1020	9.60E+00	4.80E-03
hexane	14.9	1.8		1020	2.30E+02	1.15E-01
naphthalene	14.9	6.10E-04		1020	7.81E-02	3.90E-05
toluene	14.9	3.40E-03		1020	4.35E-01	2.18E-04
arsenic	14.9	2.00E-04		1020	2.56E-02	1.28E-05
beryllium	14.9	1.20E-05		1020	1.54E-03	7.68E-07
cadmium	14.9	1.10E-03		1020	1.41E-01	7.04E-05
chromium	14.9	1.40E-03		1020	1.79E-01	8.96E-05
cobalt	14.9	8.40E-05		1020	1.07E-02	5.37E-06
manganese	14.9	3.80E-04		1020	4.86E-02	2.43E-05
mercury	14.9	2.60E-04		1020	3.33E-02	1.66E-05
nickel	14.9	2.10E-03		1020	2.69E-01	1.34E-04
selenium	14.9	2.40E-05		1020	3.07E-03	1.54E-06
Total HAPS						1.21E-01

Assumptions

Ultra low NO_x burners

20 mmBTU/hr absorbed, 85% efficient, 15% more for maximum, up 10% for HHV, may reduce emissions based on limited operation (only during startup?)

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Small Boilers - Low Nox burners

SO_2 emissions based on H_2S content of 60 ppmv

Was installed in December 2008 at 14.9 million

PM10 and PM2.5 emissions based on EPA PM emission factors for gas-fired boilers (NEI Inventory)

FCCU Scrubber
Holly Marketing & Refining Company

Equations Used:

$PM_{10}/PM_{2.5}$ = 6200 lb coke burn/hr /1000 * Consent Decree FCCU PM limit*operating hours per year

SO_2 = Maximum daily FCC flue gas flow rate * Consent Decree FCCU SOx limit *(1/379.5 scf*MW SOx)*Operating hours per year

NO_x = Maximum daily FCC flue gas flow rate * Consent Decree FCCU NOx limit *(1/379.5 scf*MW NOx)*Operating hours per year

CO = Maximum daily FCC flue gas flow rate * Consent Decree FCCU CO limit *(1/379.5 scf*MW CO)*Operating hours per year

		Emissions		CO Boiler	Net	
Pollutant	**lb/hr**	**(lb/yr)**	**(tn/yr)**	**(tn/yr)**	**(tn/yr)**	
NO_x	4.545	39818.18	19.91	-55.59	-35.68	2007-2008 Baseline
SO2	4.040	35393.94	17.70	-284.36	-266.66	2005-2006 Baseline
VOC	Neg.	Neg.	Neg.	-0.700	-0.700	2007-2008 Baseline
PM_{10}	3.1	27156	13.58	-57.240	-43.662	2005-2006 Baseline
$PM_{2.5}$	3.1	27156	13.58	-36.560	-22.982	2008-2009 Baseline
CO	35.354	309697	154.85	-29.520	125.328	2010-2011 Baseline

Assumptions:

Emissions controlled through wet gas scrubber

NOx from CD controlled fluid catalytic cracking units:	40	Holly Consent Decree FCCU NOx final limits (ppmvd 0% O2 365 day average)
SO2 from CD controlled fluid catalytic cracking units:	25	Holly Consent Decree FCCU SOx final limits (ppmvd 0% O2 365 day average)
PM10 from CD controlled fluid catalytic cracking units:	0.5	J
PM2.5 from CD controlled fluid catalytic cracking units:	0.5	All PM10 assumed to be PM2.5 (lb/1000 lb coke burn)
CO Emission Limit for FCCU:	500	ppm (1 hr average 0% O2)
VOC from controlled fluid catalytic cracking units:	Neg	AP-42 Emission Factors from Table 5.1-1 (lb/10^3 bbl fresh feed) [TOC]
Plant Wide Annual Operating Time:	8760	hr
Conversion from scf to lb mol:	379.5	scf -> lb mol
Maximum daily FCC flue gas flow rate:	23	mmscfd (Engineering Calculation)
Maximum hourly FCC regenerator coke burn rate:	6200	lbs coke burn / hr (Engineering Calculation)
Molecular Weight of CO:	28	lb/lb-mol
Molecular Weight of NOx:	45	lb/lb-mol
Molecular Weight of SOx:	64	lb/lb-mol

Fractionator Reboiler

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emission (lb/yr)	Emission (tn/yr)
NOx	47.0		0.04		16468.80	8.23
SO2	47.0			1020	4088.45	2.04
VOC	47.0	5.5		1020	2220.06	1.11
PM10	47.0		0.00051		209.98	0.10
PM2.5	47.0		0.00042		172.92	0.09
CO	47.0	84		1020	33906.35	16.95
lead	47.0	0.0005		1020	2.02E-01	1.01E-04
benzene	47.0	2.10E-03		1020	8.48E-01	4.24E-04
formaldehyde	47.0	7.50E-02		1020	3.03E+01	1.51E-02
hexane	47.0	1.8		1020	7.27E+02	3.63E-01
naphthalene	47.0	6.10E-04		1020	2.46E-01	1.23E-04
toluene	47.0	3.40E-03		1020	1.37E+00	6.86E-04
arsenic	47.0	2.00E-04		1020	8.07E-02	4.04E-05
beryllium	47.0	1.20E-05		1020	4.84E-03	2.42E-06
cadmium	47.0	1.10E-03		1020	4.44E-01	2.22E-04
chromium	47.0	1.40E-03		1020	5.65E-01	2.83E-04
cobalt	47.0	8.40E-05		1020	3.39E-02	1.70E-05
manganese	47.0	3.80E-04		1020	1.53E-01	7.67E-05
mercury	47.0	2.60E-04		1020	1.05E-01	5.25E-05
nickel	47.0	2.10E-03		1020	8.48E-01	4.24E-04
selenium	47.0	2.40E-05		1020	9.69E-03	4.84E-06
Total HAPS						3.81E-01

Assumptions

Ultra low NO_x burners

31.68 mmBTU/hr absorbed, 85% efficient, 15% more for maximum, up 10% for HHV.

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Small Boilers - Low Nox burners

SO_2 emissions based on H_2S content of 60 ppmv

Installed at 47.0 MMBtu/hr (HHV) in December 2008

PM10 and PM2.5 emissions based on EPA PM emission factors for gas-fired boilers (NEI Inventory)

Crude Feed Heaters - Existing

Pollutant	Equipment Rating (mmBtu/hr)	Emission Factor (lb/mmBTU)	Emission (lb/hr)	Emission (tn/yr)	Net Emission (tn/yr)	(tn/yr)	
NOx	99	0.08	7.92	34.69	3.39	31.3	NOx 2007-2008 Baseline

Assumptions:
Burners replaced with next generation ultra low NOX boilers resulting in higher emissions
Source ID: 8H1
Emissions at 0.08 lb/MMBtu based on stack test
No increase in emissions based on addition of preflash tower.
Existing crude unit able to accommodate additional throughput.

Straight Run Gas Plant Compressor Driver - To Be Removed

Source	Pollutant	Emissions (tn/yr)	Comment
Clark	PM10	-0.012	Baseline emissions based on 2005 and 2006 (EI adjusted using updated emission factors)
	PM2.5	-0.0075	Baseline emissions based on 2008 and 2009 (EI adjusted using updated emission factors)
	SOx	0	Baseline emissions based on 2005 and 2006
	NOx	-36.62	Baseline emissions based on 2007 and 2008
	VOC	-2.27	Baseline emissions based on 2007 and 2008
	CO	0	Baseline emissions based on 2010 and 2011

Assumptions:
Source ID: Clark - 11-2a

Naphtha HDS Feed Heater - Existing

Pollutant	Equipment Rating (mmBtu/hr)	Emission Factor (lb/mmBTU)	Emission (lb/hr)	Emission (tn/yr)	Net Emission (tn/yr)	(tn/yr)	
NOx	50.2	0.08	4.02	17.59	6.83	10.76	Baseline 2007/2008

Assumptions:
Burners replaced with next generation ultra low NOX boilers resulting in higher emissions
Source ID: 12H1
Emissions at 0.08 lb/MMBtu based on stack test

10 H2 Hot Oil Heater

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emission (lb/yr)	Emission (tn/yr)
NOx	99		0.02		17344.80	8.67
SO2	99			1020	8611.84	4.31
VOC	99	5.5		1020	4676.29	2.34
PM10	99		0.00051		442.29	0.22
PM2.5	99		0.00042		364.24	0.18
CO	99	84		1020	71419.76	35.71
lead	99	0.0005		1020	0.43	2.13E-04
benzene	99	2.10E-03		1020	1.79E+00	8.93E-04
formaldehyde	99	7.50E-02		1020	6.38E+01	3.19E-02
hexane	99	1.8		1020	1.53E+03	7.65E-01
naphthalene	99	6.10E-04		1020	5.19E-01	2.59E-04
toluene	99	3.40E-03		1020	2.89E+00	1.45E-03
arsenic	99	2.00E-04		1020	1.70E-01	8.50E-05
beryllium	99	1.20E-05		1020	1.02E-02	5.10E-06
cadmium	99	1.10E-03		1020	9.35E-01	4.68E-04
chromium	99	1.40E-03		1020	1.19E+00	5.95E-04
cobalt	99	8.40E-05		1020	7.14E-02	3.57E-05
manganese	99	3.80E-04		1020	3.23E-01	1.62E-04
mercury	99	2.60E-04		1020	2.21E-01	1.11E-04
nickel	99	2.10E-03		1020	1.79E+00	8.93E-04
selenium	99	2.40E-05		1020	2.04E-02	1.02E-05
Total HAPS						8.02E-01

Assumptions

70.8 mmBTU/hr absorbed, 85% efficient, 8% more for maximum, up 10% for HHV

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Small Boilers - Low Nox burners

SO_2 emissions based on H_2S content of 60 ppmv

Proposed change - 10H2 will be equipped with LNB and SCR.

SCR added to control NOx emission.

Proposed emissions based on approximately 21 lb/MMscf or 0.02 lb/MMBtu

Natural gas/refinery fuel gas combusted

PM10 and PM2.5 emissions based on EPA PM emission factors for gas-fired boilers (NEI Inventory)

Sour Water Stripp. Unit

No air emissions are expected from this unit

Assumptions:
Unit built

Hydrogen Reformer Furnace #1

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emission (lb/yr)	Emission (tn/yr)
NOx	123.1		0.02		21567.12	10.78
SO2	123.1			1020	10708.26	5.35
VOC	123.1	5.5		1020	5814.66	2.91
PM10	123.1		0.00051		549.96	0.27
PM2.5	123.1		0.00042		452.91	0.23
CO	123.1	84		1020	88805.79	44.40
lead	123.1	0.0005		1020	0.53	2.64E-04
benzene	123.1	2.10E-03		1020	2.22E+00	1.11E-03
formaldehyde	123.1	7.50E-02		1020	7.93E+01	3.96E-02
hexane	123.1	1.8		1020	1.90E+03	9.51E-01
naphthalene	123.1	6.10E-04		1020	6.45E-01	3.22E-04
toluene	123.1	3.40E-03		1020	3.59E+00	1.80E-03
arsenic	123.1	2.00E-04		1020	2.11E-01	1.06E-04
beryllium	123.1	1.20E-05		1020	1.27E-02	6.34E-06
cadmium	123.1	1.10E-03		1020	1.16E+00	5.81E-04
chromium	123.1	1.40E-03		1020	1.48E+00	7.40E-04
cobalt	123.1	8.40E-05		1020	8.88E-02	4.44E-05
manganese	123.1	3.80E-04		1020	4.02E-01	2.01E-04
mercury	123.1	2.60E-04		1020	2.75E-01	1.37E-04
nickel	123.1	2.10E-03		1020	2.22E+00	1.11E-03
selenium	123.1	2.40E-05		1020	2.54E-02	1.27E-05
Total HAPS						9.97E-01

Assumptions:
Low NOx burners and SCR
Scaled from Artesia at 10 mmscfd with 2 reformer feed furnaces @ 61.55 mmbtu/hr HHV released, 4 burners each.
Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Large Boilers - Low Nox burners
SO_2 emissions based on H_2S content of 60 ppmv
Unit not built but still planning on being built
PM10 and PM2.5 emissions based on EPA PM emission factors for gas-fired boilers (NEI Inventory)

Hydrogen Unit Fugitives

Pollutant	Emission Rate (tn/yr) [1)]	Ratio	Emissions (lb/yr)	Emissions (tn/yr)
VOC	0.38	0.1460	110.95	0.055

Assumptions:
1) Emission rate based on 2004 testing from gas values (0.38 tons for 1370 values)
Ratio based on 200 valves

Hydrogen Reformer Deaerator Vent

	Artesia (tn/yr)	Artesia (lb/hr)	Ratio to Artesia Unit	(tn/yr)
VOC	1.6		2	3.20
CO		0.3	2	2.63

Assumptions:
CO scaled from Holly's Artesia NM facility permit application at 10 mmscfd and 0.3 lbs/hr.
VOC - emission rate obtained from Holly's Artesia NM facility engineering
Vent to be installed

Boiler Modifications

Boiler #5

Pollutant	Equipment Rating (mmBtu/hr)	Emission Factor (lb/mmBTU)	Emission (lb/hr)	Emission (tn/yr)	Net Emission (tn/yr)	(tn/yr)	
NOx	70	0.02	1.40	6.13	-9.44	15.57	2007/2008 baseline

Assumptions:
0.02 based on LNB & SCR
#5 got SCR - concent decree - 2009/2010

Hydrogen Reformer Furnace #2

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emission (lb/yr)	Emission (tn/yr)
NOx	123.1		0.02		21567.12	10.78
SO2	123.1			1020	10708.26	5.35
VOC	123.1	5.5		1020	5814.66	2.91
PM10	123.1		0.00051		549.96	0.27
PM2.5	123.1		0.00042		452.91	0.23
CO	123.1	84		1020	88805.79	44.40
lead	123.1	0.0005		1020	0.53	2.64E-04
benzene	123.1	2.10E-03		1020	2.22E+00	1.11E-03
formaldehyde	123.1	7.50E-02		1020	7.93E+01	3.96E-02
hexane	123.1	1.8		1020	1.90E+03	9.51E-01
naphthalene	123.1	6.10E-04		1020	6.45E-01	3.22E-04
toluene	123.1	3.40E-03		1020	3.59E+00	1.80E-03
arsenic	123.1	2.00E-04		1020	2.11E-01	1.06E-04
beryllium	123.1	1.20E-05		1020	1.27E-02	6.34E-06
cadmium	123.1	1.10E-03		1020	1.16E+00	5.81E-04
chromium	123.1	1.40E-03		1020	1.48E+00	7.40E-04
cobalt	123.1	8.40E-05		1020	8.88E-02	4.44E-05
manganese	123.1	3.80E-04		1020	4.02E-01	2.01E-04
mercury	123.1	2.60E-04		1020	2.75E-01	1.37E-04
nickel	123.1	2.10E-03		1020	2.22E+00	1.11E-03
selenium	123.1	2.40E-05		1020	2.54E-02	1.27E-05
Total HAPS						9.97E-01

Assumptions:

Low NOx burners and SCR

Scaled from Artesia at 10 mmscfd with 2 reformer feed furnaces @ 61.55 mmbtu/hr HHV released, 4 burners each.

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Large Boilers - Low Nox burners

SO_2 emissions based on H_2S content of 60 ppmv

Unit not built but still planning on being built

PM10 and PM2.5 emissions based on EPA PM emission factors for gas-fired boilers (NEI Inventory)

Boiler #8

Pollutant	Equipment Rating (mmBtu/hr)	Emission Factor (lb/mmBTU)	Emission (lb/hr)	Emission (tn/yr)	Net Emission (tn/yr)	Net Emission (tn/yr)	
NOx	92.7	0.02	1.85	8.12	-1.77	9.89	2007/2008 Baseline

Assumptions:
LNB and SCR
#8 got SCR - concent decree-2012

Asphalt Tank Emissions

VOC = 0.025 lb/hr
VOC = 219 lb/yr
VOC = 0.11 tn/yr

Assumptions:
Emissions from small amount of residual solvent

2006 Tank Modifications

Total Emissions	New VOC Emissions lbs	Existing VOC Emissions lbs	Net Emissions lbs	Net Emissions tns
#6 Fuel Oil Tank 1	11.32		11.32	0.0057
#6 Fuel Oil Tank 2	11.32		11.32	0.0057
New Cutter Tank	576.51		576.51	0.2883
Tank 28	0.00	69.8	-69.8	-0.0349
Tank 59	110.62	39.4	71.22	0.0356
Total Emissions				0.3003

2006 Increased Tank Throughput

Tank	Type	Contents	Increase	VOC Emissions (tons/yr)			HAPS Emissions (lb/year)								
				Standing	Withdrawal	Total	Benzene	Xylene	Toluene	Ethylbenzene	Naphthalene	Hexane	Cyclohexane	Trimethylbenzene	Isooctane
12	IFR	Reformer Charge	0.44	0	0.00	0.00	3.190	0.026	5.764	0.000	0.000	0.000	0.000	0.000	0.000
323	IFR	Reformer Charge	0.44	0	0.00	0.00	2.935	0.022	5.236	0.000	0.000	0.000	0.000	0.000	0.000
71	IFR	NHDS Charge	0.11	0	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
106	EFR	Gasoline	0.11	0	0.00	0.00	1.476	0.532	1.969	0.095	0.000	3.482	0.766	0.046	0.000
107	EFR	Gasoline	0.11	0	0.00	0.00	1.458	2.017	6.760	0.306	0.000	5.899	0.151	0.141	14.325
108	EFR	Gasoline	0.11	0	0.01	0.01	3.056	1.707	4.700	0.288	0.000	8.580	1.584	0.207	0.000
132	EFR	Gasoline	0.11	0	0.00	0.00	1.570	1.263	3.732	0.194	0.000	5.122	0.613	0.136	4.752
145	EFR	Gasoline	0.11	0	0.00	0.00	14.202	3.422	17.150	0.646	0.000	41.495	7.382	0.132	0.000
146	EFR	Gasoline	0.11	0	0.00	0.00	1.305	1.357	5.613	0.215	0.000	5.346	0.135	0.062	12.406
72	IFR	Cat Gas/Gasoline	0.11	0	0.00	0.00	0.428	0.231	0.523	0.019	0.000	1.106	0.162	0.028	0.000
101	EFR	Cat Gasoline	0.11	0	0.00	0.00	1.180	1.532	1.300	0.000	0.000	3.527	0.000	0.287	0.000
138	IFR	Cat Gas/Isomerate	0.11	0	0.00	0.00	1.263	0.108	0.097	0.000	0.000	5.446	3.728	0.019	0.000
104	EFR	Isomerate	0.11	0	0.00	0.00	1.283	0.000	0.000	0.000	0.000	5.777	4.125	0.000	0.000
105	EFR	Reform./Isom	0.11	0	0.00	0.00	5.598	0.642	2.866	0.127	0.000	16.482	13.688	0.006	0.000
100	EFR	Reformate	0.11	0	0.00	0.00	6.069	2.562	9.970	0.491	0.000	0.000	5.745	0.029	0.000
102	EFR	Crude Oil	0.51	0	0.05	0.05	45.201	0.000	7.732	0.000	0.041	0.000	14.071	0.000	0.000
121	EFR	Crude Oil	0.51	0	0.08	0.08	24.577	14.020	5.574	0.000	0.061	0.000	7.604	0.000	0.000
126	EFR	Crude Oil	0.51	0	0.09	0.09	17.355	15.152	5.013	0.000	0.071	0.000	5.335	0.000	0.000
135	EFR	Cat Gas/Alky	0.11	0	0.00	0.00	0.471	0.450	0.482	0.000	0.000	1.433	0.000	0.042	5.237
109	EFR	Alkylate	0.11	0	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.030	0.000	0.000	16.155
103	EFR	Gas Oil/Crude	0.38	0	0.00	0.00									
35	VFR	Gas Oil	0.38	0	0.01	0.01	132.615	45.045	84.481	2.378	0.173	103.725	65.088	1.133	52.875
59	VFR	Gas Oil/Fuel Oil	0.38	0	0.00	0.00									
11	VFR	Fuel Oil	8.75	0	0.00	0.00									
15	VFR	Fuel Oil	8.75	0	0.09	0.09									
31	VFR	Fuel Oil	8.75	0	0.00	0.00									
37	VFR	Fuel Oil	8.75	0	0.00	0.00									
49	VFR	Fuel Oil	8.75	0	0.00	0.00									
52	VFR	Fuel Oil	8.75	0	0.09	0.09									
53	VFR	Fuel Oil	8.75	0	0.00	0.00									
54	VFR	Fuel Oil	8.75	0	0.00	0.00									
55	VFR	Fuel Oil	8.75	0	0.00	0.00									
56	VFR	Fuel Oil	8.75	0	0.00	0.00									
57	VFR	Fuel Oil	8.75	0	0.00	0.00									
58	VFR	Fuel Oil	8.75	0	0.00	0.00									
139	VFR	Fuel Oil/SDA Charge	2.33	0	0.00	0.00									
140	VFR	SDA Charge	2.33	0	0.00	0.00									
143	VFR	Diesel	0.92	0	0.00	0.00									
23	VFR	Diesel	0.92	0	0.15	0.15									
24	VFR	Diesel	0.92	0	0.15	0.15									
4	VFR	Diesel	0.92	0	0.00	0.00									
47	VFR	Diesel	0.92	0	0.13	0.13									
28	VFR	Diesel/Light Cycle Oil	-1	-0.03	-0.01	-0.04									
48	VFR	Light Cycle Oil	0.11	0	0.00	0.00									
14	VFR	Kerosene	0	0	0.00	0.00									
20	VFR	Jet Kerosene	0	0	0.00	0.00									
128	EFR	Jet Fuel	0	0	0.00	0.00									
63	VFR	Jet Fuel/Naphtha	0	0	0.00	0.00									
129	EFR	Naphtha	0.44	0	0.00	0.00									
127	VFR	Naphtha	0.44	0	0.02	0.02									
70	VFR	Gas Oil/Fuel Oil	0.38	0	0.00	0.00									
77	VFR	Naphtha/Jet Kerosene	0	0	0.00	0.00									
78	VFR	Naphtha/Jet Kerosene	0	0	0.00	0.00									
19	VFR	Stove Oil	0	0	0.00	0.00									
131	VFR	Stove Oil	0	0	0.00	0.00									
50	HFR	Stove Oil	0	0	0.00	0.00									
51	HFR	Stove Oil	0	0	0.00	0.00									
137	VFR	Propane		0	0.00	0.00									
122	HFR	Propane		0	0.00	0.00									
123	HFR	Propane		0	0.00	0.00									
136	HFR	Propane		0	0.00	0.00									
147	HFR	Propane		0	0.00	0.00									
148	HFR	Propane		0	0.00	0.00									
124	HFR	Butane		0	0.00	0.00									
125	HFR	Butane		0	0.00	0.00									
149	HFR	Butane		0	0.00	0.00									
150	HFR	Butane		0	0.00	0.00									
151	HFR	Butane		0	0.00	0.00									
133	HFR	Isobutane		0	0.00	0.00									
134	HFR	Isobutane		0	0.00	0.00									
152	HFR	Isobutane		0	0.00	0.00									
153	HFR	Isobutane		0	0.00	0.00									
141	HFR	Solvent		0	0.00	0.00									
159	HFR	NGL		0	0.00	0.00									
						0.84	265.230	90.090	168.962	4.756	0.347	207.449	130.177	2.266	105.750
							0.13	0.05	0.08	0.00	0.00	0.10	0.07	0.00	0.05

Tank	Type	Contents	Movement		VOC Emissions (tons/yr)			HAPS Emissions (lb/year)								
			Turnovers	1000 gallons	Standing	Withdrawal	Total	Ber	lene	Toluene	Ethylbenzene	Naphthalene	Hexane	Cyclohexane	Trimethylbenzene	Isooctane
12	IFR	Reformer Charge	0.15	61	0.23	0	0.23		0.06	13.1	0	0	0	0	0	0
323	IFR	Reformer Charge	0.09	56	0.24	0	0.24	6.67	0.05	11.9	0	0	0	0	0	0
71	IFR	NHDS Charge	0.38	1280	0	0	0	0	0	0	0	0	0	0	0	0
106	EFR	Gasoline	6.91	7112	1.04	0.01	1.05	13.42	4.84	17.9	0.86	0	31.65	6.96	0.42	0
107	EFR	Gasoline	16.16	16628	3.23	0.03	3.26	13.25	18.34	61.45	2.78	0	53.63	1.37	1.28	130.23
108	EFR	Gasoline	38.43	39469	2.04	0.07	2.11	27.78	15.52	42.73	2.62	0	78	14.4	1.88	0
132	EFR	Gasoline	9.34	9632	1.78	0.02	1.8	14.27	11.48	33.93	1.76	0	46.56	5.57	1.24	43.2
145	EFR	Gasoline	0.66	110	10.46	0	10.46	129.11	31.11	155.91	5.87	0	377.23	67.11	1.2	0
146	EFR	Gasoline	11.82	1974	2.98	0.01	2.99	11.86	12.34	51.03	1.95	0	48.6	1.23	0.56	112.78
72	IFR	Cat Gas/Gasoline	1	5249	0.53	0	0.53	3.89	2.1	4.75	0.17	0	10.05	1.47	0.25	0
101	EFR	Cat Gasoline	10.38	23359	2.67	0.03	2.7	10.73	13.93	11.82	0	0	32.06	0	2.61	0
138	IFR	Cat Gas/Isomerate	1.39	2585	0.59	0	0.59	11.48	0.98	0.88	0	0	49.51	33.89	0.17	0
104	EFR	Isomerate	3.44	3530	0.44	0.02	0.46	11.66	0	0	0	0	52.52	37.5	0	0
105	EFR	Reform./Isom	10.65	10961	1.57	0.02	1.59	50.89	5.84	26.05	1.15	0	149.84	124.44	0.05	0
100	EFR	Reformate	13.71	30722	1.24	0.03	1.27	55.17	23.29	90.64	4.46	0	0	52.23	0.26	0
102	EFR	Crude Oil	10.35	23038	0.63	0.1	0.73	88.63	0	15.16	0	0.08	0	27.59	0	0
121	EFR	Crude Oil	10.68	44915	2.28	0.15	2.43	48.19	27.49	10.93	0	0.12	0	14.91	0	0
126	EFR	Crude Oil	15.12	41054	0.47	0.18	0.65	34.03	29.71	9.83	0	0.14	0	10.46	0	0
135	EFR	Cat Gas/Alky	0.66	1231	1.45	0	1.45	4.28	4.09	4.38	0	0	13.03	0	0.38	47.61
109	EFR	Alkylate	20.81	21417	1.03	0.04	1.07	0	0	0	0	0	0.27	0	0	146.86
103	EFR	Gas Oil/Crude	2.35	2428	0.03	0	0.03									
35	VFR	Gas Oil	4.78	12252	0.04	0.03	0.07									
59	VFR	Gas Oil/Fuel Oil	0.2	234	0.02	0	0.02									
11	VFR	Fuel Oil	0	0	0.01	0	0.01									
15	VFR	Fuel Oil	12.83	2528	0.01	0.01	0.02									
31	VFR	Fuel Oil	7.26	7251	0	0	0									
37	VFR	Fuel Oil	23.84	3442	0	0	0									
49	VFR	Fuel Oil	1.16	2615	0	0	0									
52	VFR	Fuel Oil	44.74	1680	0	0.01	0.01									
53	VFR	Fuel Oil	41.94	1575	0	0	0									
54	VFR	Fuel Oil	35.15	1320	0	0	0									
55	VFR	Fuel Oil	36.22	1360	0	0	0									
56	VFR	Fuel Oil	38.96	1463	0	0	0									
57	VFR	Fuel Oil	39.62	1487	0	0	0									
58	VFR	Fuel Oil	15.83	9072	0	0	0									
139	VFR	Fuel Oil/SDA Charge	1.75	1102	0.02	0	0.02									
140	VFR	SDA Charge	3.49	2201	0	0	0									
143	VFR	Diesel	0.51	80	0.01	0	0.01									
23	VFR	Diesel	114.64	43645	0.02	0.16	0.18									
24	VFR	Diesel	31.31	18195	0.05	0.16	0.21									
4	VFR	Diesel	0	0	0	0	0									
47	VFR	Diesel	12.71	16068	0.12	0.14	0.26									
28	VFR	Diesel/Light Cycle Oil	1.51	1803	0.03	0.01	0.04									
48	VFR	Light Cycle Oil	5.02	5730	0.03	0.02	0.05									
14	VFR	Kerosene	2.27	222	0	0	0									
20	VFR	Jet Kerosene	20.34	5955	0.04	0.06	0.1									
128	EFR	Jet Fuel	12.87	5459	0.03	0.01	0.04									
63	VFR	Jet Fuel/Naphtha	7.41	7400	0.11	0.07	0.18									
129	EFR	Naphtha	1.92	4447	0	0	0	0	0	0	0	0	0	0	0	0
127	VFR	Naphtha	7.34	9448	0.06	0.04	0.1									
70	VFR	Gas Oil/Fuel Oil	2.37	7093	0.07	0.01	0.08									
77	VFR	Naphtha/Jet Kerosene	4.99	1041	0.01	0.01	0.02									
78	VFR	Naphtha/Jet Kerosene	3.09	645	0.01	0	0.01									
19	VFR	Stove Oil	7.5	2202	0	0	0									
131	VFR	Stove Oil	5.78	15669	0	0	0									
50	HFR	Stove Oil			0	0	0									
51	HFR	Stove Oil			0	0	0									
137	VFR	Propane			0	0	0									
122	HFR	Propane			0	0	0									
123	HFR	Propane			0	0	0									
136	HFR	Propane			0	0	0									
147	HFR	Propane			0	0	0									
148	HFR	Propane			0	0	0									
124	HFR	Butane			0	0	0									
125	HFR	Butane			0	0	0									
149	HFR	Butane			0	0	0									
150	HFR	Butane			0	0	0									
151	HFR	Butane			0	0	0									
133	HFR	Isobutane			0	0	0									
134	HFR	Isobutane			0	0	0									
152	HFR	Isobutane			0	0	0									
153	HFR	Isobutane			0	0	0									
141	HFR	Solvent			0	0	0									
159	HFR	NGL			0	0	0									
								542.56	201.2	562.39	21.62	0.34	942.95	399.13	10.3	480.68
								0.27128	0.101	0.2812	0.01081	0.00017	0.4715	0.199565	0.00515	0.24034

Crude Furnace #3 (24H1) - New
Holly Marketing & Refining Company
Reference: AP-42, Section 1.4 Natural Gas Combustion, Small Boilers

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	(lb/hr)	Emissions (lb/yr)	(tn/yr)
NOx	60		0.04		2.400	21024.00	10.51
SO2	60			1020	0.596	5219.30	2.61
VOC	60		0.005		0.324	2838.24	1.42
PM_{10}	60		0.00051		0.031	268.06	0.13
$PM_{2.5}$	60		0.00042		0.025	220.75	0.11
CO	60		0.08		4.800	42048.00	21.02
lead	60	0.0005		1020	2.94E-05	0.26	1.29E-04
benzene	60	2.10E-03		1020	1.24E-04	1.08E+00	5.41E-04
formaldehyde	60	7.50E-02		1020	4.41E-03	3.86E+01	1.93E-02
hexane	60	1.8		1020	1.06E-01	9.28E+02	4.64E-01
naphthalene	60	6.10E-04		1020	3.59E-05	3.14E-01	1.57E-04
toluene	60	3.40E-03		1020	2.00E-04	1.75E+00	8.76E-04
arsenic	60	2.00E-04		1020	1.18E-05	1.03E-01	5.15E-05
beryllium	60	1.20E-05		1020	7.06E-07	6.18E-03	3.09E-06
cadmium	60	1.10E-03		1020	6.47E-05	5.67E-01	2.83E-04
chromium	60	1.40E-03		1020	8.24E-05	7.21E-01	3.61E-04
cobalt	60	8.40E-05		1020	4.94E-06	4.33E-02	2.16E-05
manganese	60	3.80E-04		1020	2.24E-05	1.96E-01	9.79E-05
mercury	60	2.60E-04		1020	1.53E-05	1.34E-01	6.70E-05
nickel	60	2.10E-03		1020	1.24E-04	1.08E+00	5.41E-04
selenium	60	2.40E-05		1020	1.41E-06	1.24E-02	6.18E-06
Total HAPS							0.49

Assumptions:
New heater to be installed on second crude unit
Ultra Low NO_x burners
SO_2 emissions based on H_2S content of 60 ppmv
PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

FCC #2 Feed Heater (25H1) - New
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (tn/yr)
NOx	45		0.04		1.800	15768.00	7.88
SO2	45	10.1281		1020	0.447	3914.47	1.96
VOC	45		0.005		0.243	2128.68	1.06
PM_{10}	45		0.00051		0.023	201.04	0.10
$PM_{2.5}$	45		0.00042		0.019	165.56	0.08
CO	45		0.08		3.600	31536.00	15.77
lead	45	0.0005		1020	2.21E-05	0.19	9.66E-05
benzene	45	2.10E-03		1020	9.26E-05	8.12E-01	4.06E-04
formaldehyde	45	7.50E-02		1020	3.31E-03	2.90E+01	1.45E-02
hexane	45	1.8		1020	7.94E-02	6.96E+02	3.48E-01
naphthalene	45	6.10E-04		1020	2.69E-05	2.36E-01	1.18E-04
toluene	45	3.40E-03		1020	1.50E-04	1.31E+00	6.57E-04
arsenic	45	2.00E-04		1020	8.82E-06	7.73E-02	3.86E-05
beryllium	45	1.20E-05		1020	5.29E-07	4.64E-03	2.32E-06
cadmium	45	1.10E-03		1020	4.85E-05	4.25E-01	2.13E-04
chromium	45	1.40E-03		1020	6.18E-05	5.41E-01	2.71E-04
cobalt	45	8.40E-05		1020	3.71E-06	3.25E-02	1.62E-05
manganese	45	3.80E-04		1020	1.68E-05	1.47E-01	7.34E-05
mercury	45	2.60E-04		1020	1.15E-05	1.00E-01	5.02E-05
nickel	45	2.10E-03		1020	9.26E-05	8.12E-01	4.06E-04
selenium	45	2.40E-05		1020	1.06E-06	9.28E-03	4.64E-06
Total HAPS							0.36

Assumptions

Ultra Low NO_x burners

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion

SO_2 emissions based on H_2S content of 60 ppmv

PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

FCCU #2 Scrubber - New
Holly Marketing & Refining Company

Equations Used:

$PM_{10}/PM_{2.5}$ = 6200 lb coke burn/hr /1000 * Consent Decree FCCU PM limit*operating hours per year

SO_2 = Maximum daily FCC flue gas flow rate * Consent Decree FCCU SOx limit *(1/379.5 scf*MW SOx)*Operating hours per year

NO_x = Maximum daily FCC flue gas flow rate * Consent Decree FCCU NOx limit *(1/379.5 scf*MW NOx)*Operating hours per year

CO = Maximum daily FCC flue gas flow rate * Consent Decree FCCU CO limit *(1/379.5 scf*MW CO)*Operating hours per year

		Emissions	
Pollutant	**lb/hr**	**(lb/yr)**	**(tn/yr)**
NO_x	4.545	39818.18	19.91
SO2	4.040	35393.94	17.70
VOC	Neg.	Neg.	Neg.
PM_{10}	1.9	16293.6	8.15
$PM_{2.5}$	1.86	16293.6	8.15
CO	35.354	309697	154.85

Assumptions:

Emissions controlled through wet gas scrubber

NOx from CD controlled fluid catalytic cracking units:	40	Holly Consent Decree FCCU NOx final limits (ppmvd 0% O2 365 day average)
SO2 from CD controlled fluid catalytic cracking units:	25	Holly Consent Decree FCCU SOx final limits (ppmvd 0% O2 365 day average)
PM10 from CD controlled fluid catalytic cracking units:	0.3	Ja
PM2.5 from CD controlled fluid catalytic cracking units:	0.3	All PM10 assumed to be PM2.5 (lb/1000 lb coke burn)
CO Emission Limit for FCCU:	500	ppm (1 hr average 0% O2)
VOC from controlled fluid catalytic cracking units:	Neg	AP-42 Emission Factors from Table 5.1-1 (lb/10^3 bbl fresh feed) [TOC]
Plant Wide Annual Operating Time:	8760	hr
Conversion from scf to lb mol:	379.5	scf -> lb mol
Maximum daily FCC flue gas flow rate:	23	mmscfd (Engineering Calculation)
Maximum hourly FCC regenerator coke burn rate:	6200	lbs coke burn / hr (Engineering Calculation)
Molecular Weight of CO:	28	lb/lb-mol
Molecular Weight of NOx:	45	lb/lb-mol
Molecular Weight of SOx:	64	lb/lb-mol

Reactor Charge Heater (27H1) - New
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (tn/yr)
NOx	99		0.02		1.98	17344.80	8.67
SO2	99	10.13		1020	0.98	8611.84	4.31
VOC	99		0.005		0.53	4683.10	2.34
PM_{10}	99		0.00051		0.05	442.29	0.22
$PM_{2.5}$	99		0.00042		0.04	364.24	0.18
CO	99		0.08		7.92	69379.20	34.69
lead	99	0.0005		1020	4.85E-05	0.43	2.13E-04
benzene	99	2.10E-03		1020	2.04E-04	1.79E+00	8.93E-04
formaldehyde	99	7.50E-02		1020	7.28E-03	6.38E+01	3.19E-02
hexane	99	1.8		1020	1.75E-01	1.53E+03	7.65E-01
naphthalene	99	6.10E-04		1020	5.92E-05	5.19E-01	2.59E-04
toluene	99	3.40E-03		1020	3.30E-04	2.89E+00	1.45E-03
arsenic	99	2.00E-04		1020	1.94E-05	1.70E-01	8.50E-05
beryllium	99	1.20E-05		1020	1.16E-06	1.02E-02	5.10E-06
cadmium	99	1.10E-03		1020	1.07E-04	9.35E-01	4.68E-04
chromium	99	1.40E-03		1020	1.36E-04	1.19E+00	5.95E-04
cobalt	99	8.40E-05		1020	8.15E-06	7.14E-02	3.57E-05
manganese	99	3.80E-04		1020	3.69E-05	3.23E-01	1.62E-04
mercury	99	2.60E-04		1020	2.52E-05	2.21E-01	1.11E-04
nickel	99	2.10E-03		1020	2.04E-04	1.79E+00	8.93E-04
selenium	99	2.40E-05		1020	2.33E-06	2.04E-02	1.02E-05
Total HAPS							0.80

Assumptions

Low NO_x burners and Selective Catalytic Reduction

NOx emissions based on 20 lb/mmscf (estimated)

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion

SO_2 emissions based on H_2S content of 60 ppmv

PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

Reactor Charge Heater (20H3) - New
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (tn/yr)
NOx	42.1		0.04		1.68	14751.84	7.38
SO2	42.1	10.1281		1020	0.42	3662.21	1.83
VOC	42.1		0.005		0.23	1991.50	1.00
PM_{10}	42.1		0.00051		0.02	188.09	0.09
$PM_{2.5}$	42.1		0.00042		0.02	154.89	0.08
CO	42.1		0.08		3.37	29503.68	14.75
lead	42.1	0.0005		1020	2.06E-05	0.18	9.04E-05
benzene	42.1	2.10E-03		1020	8.67E-05	7.59E-01	3.80E-04
formaldehyde	42.1	7.50E-02		1020	3.10E-03	2.71E+01	1.36E-02
hexane	42.1	1.8		1020	7.43E-02	6.51E+02	3.25E-01
naphthalene	42.1	6.10E-04		1020	2.52E-05	2.21E-01	1.10E-04
toluene	42.1	3.40E-03		1020	1.40E-04	1.23E+00	6.15E-04
arsenic	42.1	2.00E-04		1020	8.25E-06	7.23E-02	3.62E-05
beryllium	42.1	1.20E-05		1020	4.95E-07	4.34E-03	2.17E-06
cadmium	42.1	1.10E-03		1020	4.54E-05	3.98E-01	1.99E-04
chromium	42.1	1.40E-03		1020	5.78E-05	5.06E-01	2.53E-04
cobalt	42.1	8.40E-05		1020	3.47E-06	3.04E-02	1.52E-05
manganese	42.1	3.80E-04		1020	1.57E-05	1.37E-01	6.87E-05
mercury	42.1	2.60E-04		1020	1.07E-05	9.40E-02	4.70E-05
nickel	42.1	2.10E-03		1020	8.67E-05	7.59E-01	3.80E-04
selenium	42.1	2.40E-05		1020	9.91E-07	8.68E-03	4.34E-06
Total HAPS							0.34

Assumptions

Ultra Low NO_x burners

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion

SO_2 emissions based on H_2S content of 60 ppmv

PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

Sour Water Stripper
Holly Marketing & Refining Company

No air emissions expected from this unit.

Assumptions:
Emissions controlled through existing sour water stripper/ammonia stripping unit prior to treatment in existing SRU.

Cooling Tower #4-#8 Emissions
Holly Marketing & Refining Company

Reference: South Coast Air Quality Management District, Guidelines for Calculating Emissions from Cooling Towers, June 2006
E = Cooling tower circulating water rate (gal/min) * TDS/10^6 * Drift loss * density of water * 60 * operating hours

$E_{(VOC)}$ =	9749.88	lb/yr			Net Emiss.
$E_{(VOC)}$ =	4.87	tn/yr	-44.15 tons	VOC Baseline 2007-2008	-39.28
$E_{(VOC)}$ =	1.11	lb/hr			

Where:

Water Circulating Rate (gal/min)	26,500
Concentration of Total Dissolved Solids (ppm by weight)	2964.9
Drift Loss of Circulating Water	0.000
Density of Water (lbs/gal)	8.34
Conversion of Minutes to Hours	60
Annual Operating Hours (hr/yr)	8760

Assumptions:
TDS was based on the average TDS of the existing cooling towers
HAP emissions estimated by Holly based on storage tank HAPs emissions determined using the TANKS software, averaging the last 8 years, and multiplying by 2 standard deviations.
VOC emission factor from AP-42 Section 5.1-2 controlled
Circulation rate for cooling towers 4-8

Boiler #11 - New
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (MMBtu/hr)	Conversion lb/mmscf to lb/MMBtu	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (tn/yr)
NOx	89.3		0.02		1.786	15645.36	7.82
SO2	89.3	10.1281		1020	0.886	7768.05	3.88
VOC	89.3		0.004		0.357	3129.07	1.56
PM_{10}	89.3		0.01		0.893	7822.68	3.91
$PM_{2.5}$	89.3		0.01		0.893	7822.68	3.91
CO	89.3		0.037		3.304	28943.92	14.47
lead	89.3	0.0005		1020	4.38E-05	0.38	1.92E-04
benzene	89.3	2.10E-03		1020	1.84E-04	1.61E+00	8.05E-04
formaldehyde	89.3	7.50E-02		1020	6.57E-03	5.75E+01	2.88E-02
hexane	89.3	1.8		1020	1.58E-01	1.38E+03	6.90E-01
naphthalene	89.3	6.10E-04		1020	5.34E-05	4.68E-01	2.34E-04
toluene	89.3	3.40E-03		1020	2.98E-04	2.61E+00	1.30E-03
arsenic	89.3	2.00E-04		1020	1.75E-05	1.53E-01	7.67E-05
beryllium	89.3	1.20E-05		1020	1.05E-06	9.20E-03	4.60E-06
cadmium	89.3	1.10E-03		1020	9.63E-05	8.44E-01	4.22E-04
chromium	89.3	1.40E-03		1020	1.23E-04	1.07E+00	5.37E-04
cobalt	89.3	8.40E-05		1020	7.35E-06	6.44E-02	3.22E-05
manganese	89.3	3.80E-04		1020	3.33E-05	2.91E-01	1.46E-04
mercury	89.3	2.60E-04		1020	2.28E-05	1.99E-01	9.97E-05
nickel	89.3	2.10E-03		1020	1.84E-04	1.61E+00	8.05E-04
selenium	89.3	2.40E-05		1020	2.10E-06	1.84E-02	9.20E-06
Total HAPS							0.72

Assumptions

Selective Catalytic Reduction for emissions control

HAPs Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion

SO_2 emissions based on H_2S content of 60 ppmv

CO emissions based on manufacturer supplied emission rate of 0.037 lb/MMbtu

PM10/PM2.5 emissions based on manufacturer supplied emission rate of 0.01 lb/MMBtu

NOx emissions based on 0.02 lb/MMBtu

VOC emissions based on manufacturer supplied emissions rate of 0.004 lb/MMBtu

Cooling Tower #10 Emissions
Holly Marketing & Refining Company

Reference: South Coast Air Quality Management District, Guidelines for Calculating Emissions from Cooling Towers, June 2006
E = Cooling tower circulating water rate (gal/min) * TDS/10^6 * Drift loss * density of water * 60 * operating hours

$E_{(PM)}$ =	662.83	lb/yr
$E_{(PM)}$ =	0.33	tn/yr
$E_{(PM)}$ =	0.0757	lb/hr
$E_{(PM10)}$ =	190.65	lb/yr
$E_{(PM10)}$ =	0.095	tn/yr
$E_{(PM10)}$ =	0.0218	lb/hr
$E_{(PM2.5)}$ =	1.20	lb/yr
$E_{(PM2.5)}$ =	0.001	tn/yr
$E_{(PM2.5)}$ =	0.0001	lb/hr
$E_{(VOC)}$ =	3127.32	lb/yr
$E_{(VOC)}$ =	1.56	tn/yr
$E_{(VOC)}$ =	0.36	lb/hr

HAPS	Benzene	0.25	tn/yr
	Hexane	0.31	tn/yr
	Naphthalene	0.00	tn/yr
	Toluene	0.21	tn/yr
	Xylenes	0.14	tn/yr
	Ethylbenzene	0.01	tn/yr
	2,2,4 Trimethylpentane	0.21	tn/yr
	Chlorine	0.94	tn/yr

Where:

Water Circulating Rate (gal/min)	8,500
Concentration of Total Dissolved Solids (ppm by weight)	2964.9
Drift Loss of Circulating Water	0.000
Density of Water (lbs/gal)	8.34
Conversion of Minutes to Hours	60
Annual Operating Hours (hr/yr)	8760

Assumptions:

Reference: Calculating Realistic PM_{10} Emissions from Cooling Towers, Joel Reisman and Gordon Frisbie, Abstract No. 216
TDS was based on the average TDS of the existing cooling towers
HAP emissions estimated by Holly based on storage tank HAPs emissions determined using the TANKS software, averaging the last 8 years, and multiplying by 2 standard deviations.
New cooling tower
VOC emission factor from AP-42 Section 5.1-2 controlled

Cooling Tower #11 Emissions
Holly Marketing & Refining Company

Reference: South Coast Air Quality Management District, Guidelines for Calculating Emissions from Cooling Towers, June 2006
E = Cooling tower circulating water rate (gal/min) * TDS/10^6 * Drift loss (%)/100 * density of water * 60 * operating hours

	$E_{(PM)}$ =	936.35	lb/yr
	$E_{(PM)}$ =	0.47	tn/yr - for two cells
	$E_{(PM)}$ =	0.1069	lb/hr
	$E_{(PM10)}$ =	275.68	lb/yr
	$E_{(PM10)}$ =	0.138	tn/yr - for two cells
	$E_{(PM10)}$ =	0.0315	lb/hr
	$E_{(PM2.5)}$ =	1.72	lb/yr
	$E_{(PM2.5)}$ =	0.001	tn/yr - for two cells
	$E_{(PM2.5)}$ =	0.0002	lb/hr
	$E_{(VOC)}$ =	4782.96	lb/yr
	$E_{(VOC)}$ =	2.39	tn/yr
	$E_{(VOC)}$ =	0.55	lb/hr
HAPS	Benzene	0.39	tn/yr
	Hexane	0.47	tn/yr
	Naphthalene	0.00	tn/yr
	Toluene	0.32	tn/yr
	Xylenes	0.21	tn/yr
	Ethylbenzene	0.01	tn/yr
	2,2,4 Trimethylpentane	0.33	tn/yr
	Chlorine	1.44	tn/yr

Water Circulating Rate (gal/min)	13,000 for two cells
Concentration of Total Dissolved Solids (ppm by weight)	2738.56
Drift Loss of Circulating Water (%)	0.000
Density of Water (lbs/gal)	8.34
Conversion of Minutes to Hours	60
Annual Operating Hours (hr/yr)	8760

Assumptions:

Reference: Calculating Realistic PM_{10} Emissions from Cooling Towers, Joel Reisman and Gordon Frisbie, Abstract No. 216
TDS based on average TDS for cooling tower 11
HAP emissions estimated by Holly based on storage tank HAPs emissions determined using the TANKS software, averaging the last 8 years, and multiplying by 2 standard deviations.
Existing cooling tower expanded by adding a cell
VOC emission factor from AP-42 Section 5.1-2 controlled

Average Daily Crude Feed (barrels)

Year	Crude Feed	Average	SD	Average + 3SD	Daily
2009	9600949				
2010	9952070	9890265	263898.5	10681960.57	29265.6454
2011	10117776				

Ratio of HAPS to VOC for Tanks (lbs/ton)

	VOC (tons)	HAPS (lbs)						
	VOC	Benzene	Xylene	Toluene	Ethylbenzene	Napthalene	Hexane	2,2,4- Trimethylpentane
2001	29.14	755.960	389.360	606.790	27.290	1.110	668.310	
Ratio		25.942	13.362	20.823	0.937	0.038	22.934	
2002	28.7	545.990	359.670	518.540	21.650	1.040	586.020	
Ratio		19.024	12.532	18.068	0.754	0.036	20.419	
2003	30.76	444.550	187.170	431.350	16.310	0.260	619.660	
Ratio		14.452	6.085	14.023	0.530	0.008	20.145	
2006	30.76	539.450	181.640	566.960	22.610	0.270	909.150	410.720
Ratio		17.537	5.905	18.432	0.735	0.009	29.556	13.352
2007	37.12	2710.410	235.580	660.110	26.740	0.360	1029.990	288.830
Ratio		73.018	6.346	17.783	0.720	0.010	27.748	7.781
2008	38.21	570.660	204.050	578.430	23.210	0.300	922.810	200.340
Ratio		14.935	5.340	15.138	0.607	0.008	24.151	5.243
2009	38.21	503.300	214.970	588.120	24.920	0.270	942.410	335.110
Ratio		13.172	5.626	15.392	0.652	0.007	24.664	8.770
2010	38.21	544.720	208.720	623.270	26.170	0.200	1058.060	390.710
Ratio		14.256	5.462	16.312	0.685	0.005	27.691	10.225
Average Ratios		17.046	7.582	16.996	0.703	0.015	24.663	9.074
Standard Deviation		4.421	3.334	2.198	0.120	0.014	3.470	6.360
Final Average Ratio		25.89	14.25	21.39	0.9421	0.0425	31.60	21.79

note: 2004 and 2005 data not available, 2007 benzene was an extreme outlier so it was left out of the average

Old Fractions of Cooling Tower Feed

4	0.165
6	0.137
7	0.148
8	0.340
11	0.210

New Fractions of Cooling Tower Feed

4	0.125000
6	0.104167
7	0.104167
8	0.218750
10	0.177083
11	0.270833

PM = Water Circulation Rate * Drift Rate * TDS

Year	Circulation Rate	Design Recirculation Rates	
	Millions Gallons per year		GPM
2001	15150	CT 4	6000
2002	14451	CT 6	5000
2003	14023	CT 7	5000
2004	15279	CT 8	10500
2005	15279	CT 10	8500
2006	14495	CT 11 Before	6500
2007	231.94	CT 11 After	13000
2008	13550		
2009	15379	Total Before	33000
2010	15864	Total After	48000

Assumptions: Additions to Cooling Tower 11 have no effect on TDS, Cooling Tower 10 will have the same average TDS as the rest of the Cooling Towers

			Total PM PTE				
Cooling Tower	Drift Rate	TDS	Total PM (lbs/year)	2.5 Mass %	10 Mass %	PM 2.5	PM 10
CT 4	0.002	2860.95	150491.93	0.18	29.08	274.48	43755.75
CT 6	0.002	3233.89	141757.59	0.18	27.96	253.27	39630.23
CT 7	0.002	2962.36	129855.33	0.18	28.77	235.53	37360.56
CT 8	0.002	3028.73	278805.88	0.18	28.57	503.84	79659.85
CT 10	0.000006	2964.90	662.83	0.18	28.76	1.20	190.65
CT 11 Before	0.000006	2738.56	468.18	0.18	29.44	0.86	137.84
CT 11 After	0.000006	2738.56	936.35	0.18	29.44	1.72	275.68

Total for old Equipment	1267.97	200544.22
Total With Expansion	1270.03	200872.72

From the NALCO Handbook, evaporation is considered to be 1% of the recirculation rate
for every 10 degree drop. 3% for 30 degrees
(This analysis assumes that chlorine in water evaporates at the same rate as the w
Drift Rate = Used .002 without drift eliminators and .000006 with drift eliminators

Avg. Cl (ppm)	lb H2O/gallon	lb Cl/gallon
1.63	8.331	1.36E-05

For PTE on Chlorine New Equipment

Tower	Evaporation		Drift	
	(gpm)	(gallons/year)	(gpm)	(gallons/year)
4	180	9.46E+07	12	6.31E+06
6	150	7.88E+07	10	5.26E+06
7	150	7.88E+07	10	5.26E+06
8	315	1.66E+08	21	1.10E+07
10	255	1.34E+08	0.051	2.68E+04
11	390	2.05E+08	0.078	4.10E+04
Totals	1440	7.57E+08	53.129	2.79E+07
Cl lost (lb/yr)		10267		379

For PTE on Chlorine Old Equipment

Tower	Evaporation		Drift	
	(gpm)	(gallons/year)	(gpm)	(gallons/year)
4	180	9.46E+07	12	6.31E+06
6	150	7.88E+07	10	5.26E+06
7	150	7.88E+07	10	5.26E+06
8	315	1.66E+08	21	1.10E+07
11	195	1.02E+08	0.039	2.05E+04
Totals	990	4.18E+08	53.039	2.79E+07
Cl lost (lb/yr)		5668		378

6046

Interrpolation of PM_{10} and $PM_{2.5}$ Percentages - Cooling Towers

Reference: Calculating Realistic PM_{10} Emissions from Cooling Towers - Joel Reisman and Gordon Frisbie

$y2 = y_o+(y_1-y_o)/(x_1-x_o)*(x_2-x_o)$ - linear interrpolation formula

(TDS = 7700 ppmw) Solid Part. Dia. (µm)	EPRI % Mass Smaller	(TDS = 11000 ppmw) Solid Part. Dia. (µm)	EPRI % Mass Smaller
1.518	0	1.71	0
2.5	0.127	2.5	0.091
3.037	0.196	3.42	0.196
4.555	0.226	5.13	0.226
6.073	0.514	6.84	0.514
7.591	1.816	8.55	1.816
9.11	5.702	10	5.111
10	14.875	10.26	5.702
10.628	21.348		

For 2010 PM 2.5 and PM 10 DATA

	CT 4	CT 6	CT 7	CT 8	CT 11
Average TDS	2346	2179	2232	2232	2064
Throughput	4978.47	4148.72	4459.88	10268.09	6326.80
Drift Fraction	0.00	0.00	0.00	0.00	0.00
Total PM	102414.22	79257.23	87283.20	200952.59	343.41
2.5 Mass %	0.19	0.19	0.19	0.19	0.19
10 Mass Perce	30.62	31.12	30.96	30.96	31.47
PM 2.5	195.06	146.97	164.68	379.15	0.65
PM 10	31357.82	24665.46	27023.79	62217.13	108.06

Totals lbs/year
886.52
145372.26

Assumptions:
Used Table 2 data from reference

	4 Basin		6 Basin		7 Basin		8 Basin		11 Basin	
Date	Conductivity	TDS	Conductivity	TDS	ctivity	TDS	Conductivity	TDS	Conductivity	TDS
4/14/2010	3276	2293	3967	2777	3479	2435	3438	2407	2702	1891
4/29/2010	3143	2200	3652	2556	3764	2635	3015	2111	2869	2008
5/4/2010	3073	2151	2968	2078	3048	2134	3371	2360	3011	2108
5/11/2010	3310	2317	3544	2481	2715	1901	3010	2107	2250	1575
5/18/2010	3051	2136	3053	2137	2329	1630	3400	2380	3198	2239
5/26/2010	4234	2964	2274	1592	2816	1971	3008	2106	3281	2297
6/1/2010	3459	2421	4682	3277	3382	2367	3299	2309	3028	2120
6/7/2010	3427	2399	3350	2345	3335	2335	3449	2414	2851	1996
6/25/2010	3432	2402	4345	3042	3410	2387	3139	2197	2056	1439
6/30/2010	2837	1986	3032	2122	2096	1467	2069	1448	2750	1925
7/8/2010	3560	2492	2879	2015	3036	2125	3311	2318	3347	2343
7/16/2010	3270	2289	3615	2531	3376	2363	3421	2395	3355	2349
7/22/2010	3249	2274	2902	2031	3401	2381	3861	2703	3010	2107
7/28/2010	3189	2232	4320	3024	3223	2256	3438	2407	2800	1960
8/5/2010	2917	2042	1980	1386	3336	2335	3013	2109	3195	2237
8/10/2010	3146	2202	2803	1962	3553	2487	3289	2302	3271	2290
8/27/2010	3443	2410	3904	2733	3314	2320	3478	2435	3213	2249
9/2/2010	3656	2559	2626	1838	2699	1889	3144	2201	2927	2049
9/9/2010	3504	2453	3267	2287	3409	2386	2855	1999	2951	2066
9/15/2010	4106	2874	3660	2562	3422	2395	2502	1751	3150	2205
9/23/2010	3384	2369	3528	2470	3906	2734	2845	1992	2241	1569
9/30/2010	3524	2467	3341	2339	3405	2384	2970	2079	2425	1698
10/5/2010	3543	2480	3156	2209	2772	1940	2700	1890	1987	1391
10/11/2010	3488	2442	4144	2901	3730	2611	3733	2613	2790	1953
10/19/2010	3529	2470	2468	1728	3500	2450	3168	2218	3162	2213
10/28/2010	3408	2386	3663	2564	3427	2399	3157	2210	2781	1947
11/4/2010	3485	2440		#VALUE!	3527	2469	2390	1673	3609	2526
11/8/2010	3452	2416		#VALUE!	3095	2167	2204	1543	3932	2752
11/10/2010		0	1392	974	1510	1057		0		0
11/15/2010	3500	2450	2032	1422	2910	2037	3454	2418	3087	2161
11/22/2010	3000	2100	3800	2660	2685	1880	3684	2579	3451	2416
12/2/2010	3431	2402	2635	1845	3002	2101	3750	2625	2394	1676
12/9/2010	2313	1619	3041	2129	3407	2385	3900	2730	3002	2101
12/15/2010	2751	1926	2171	1520	3630	2541	3600	2520	3041	2129
12/21/2010	3683	2578	1642	1149	3903	2732	3190	2233	3024	2117
12/29/2010	3550	2485	2005	1404	3253	2277	3360	2352	3045	2132
1/7/2011	3524	2467	2286	1600	3308	2316	3434	2404	2671	1870
1/12/2011	3576	2503	1822	1275	2949	2064	3127	2189	2401	1681
1/18/2011	1970	1379	2384	1669	2931	2052	4377	3064	3668	2568
1/24/2011	1857	1300	2226	1558	2982	2087	3418	2393	3261	2283
2/1/2011	1870	1309	1545	1082	3279	2295	2971	2080	2948	2064
2/7/2011	1991	1394	1660	1162	3500	2450	2072	1450	3281	2297
2/14/2011	2445	1712	1574	1102	3748	2624	2264	1585	3406	2384
2/23/2011	2942	2059	1607	1125	3500	2450	2360	1652	3425	2398
2/28/2011	2958	2071	1685	1180	3447	2413	2315	1621	3359	2351
3/7/2011	3170	2219	1952	1366	3903	2732	2635	1845	3304	2313
3/15/2011	3363	2354	2392	1674	3202	2241	3180	2226	3352	2346
3/21/2011	3005	2104	2429	1700	3440	2408	3056	2139	3419	2393
3/31/2011	2664	1865	3962	2773	3360	2352	3580	2506	3380	2366
4/4/2011	2947	2063	3514	2460	4582	3207	3432	2402	3534	2474
4/8/2011		0	1345	942	1623	1136		0		0
4/11/2011	3037	2126	2010	1407	1936	1355	2997	2098	3305	2314
4/18/2011	3220	2254	2135	1495	2910	2037	3265	2286	3423	2396
4/27/2011	2733	1913	2750	1925	3535	2475	3471	2430	3155	2209
5/3/2011	2702	1891	4529	3170	3742	2619	3133	2193	3480	2436
5/10/2011	3075	2153	1469	1028	3116	2181	3056	2139	3087	2161
5/17/2011	3000	2100	3400	2380	3115	2181	3275	2293	3369	2358
5/25/2011	3220	2254	3500	2450	3262	2283	3590	2513	3037	2126
6/2/2011	3199	2239	2348	1644	3180	2226	3530	2471	3352	2346
6/8/2011	3393	2375	3060	2142	3223	2256	3687	2581	3075	2153
6/15/2011	3360	2352	3384	2369	3117	2182	3200	2240	3219	2253
6/21/2011	3308	2316	2810	1967	3195	2237	3620	2534	3707	2595
6/28/2011	3215	2251	3729	2610	3328	2330	4242	2969	3353	2347
7/7/2011	3320	2324	3083	2158	3800	2660	4167	2917	3164	2215
7/14/2011	3419	2393	4008	2806	3425	2398	4830	3381	3815	2671
7/19/2011	2850	1995	2781	1947	3495	2447	4015	2811	3345	2342
7/26/2011	3402	2381	3870	2709	2838	1987	3675	2573	3615	2531
8/3/2011	3089	2162	3126	2188	3178	2225	2432	1702	3316	2321
Average		2218		2017		2254		2270		2179
Standard Deviation		321.363075		608.2225		354.2127		379.4075		279.9763
Final Average TDS		2860.95191		3233.887		2962.364		3028.735		2738.565

Holly Refining & Marketing Company - Woods Cross LLC Refinery, 1070 West 500 South, West Bountiful, UT 84087-1442, Phone (801) 299-6600, Fax (801) 299-6609

Vacuum Furnace Heater (33H1) - New
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (tn/yr)
NOx	130		0.02		2.600	22776.00	11.39
SO2	130	10.13		1020	1.291	11308.48	5.65
VOC	130		0.005		0.702	6149.52	3.07
PM_{10}	130		0.00051		0.066	580.79	0.29
$PM_{2.5}$	130		0.00042		0.055	478.30	0.24
CO	130		0.08		10.400	91104.00	45.55
lead	130	0.0005		1020	6.37E-05	0.56	2.79E-04
benzene	130	2.10E-03		1020	2.68E-04	2.34E+00	0.00117
formaldehyde	130	7.50E-02		1020	9.56E-03	8.37E+01	4.19E-02
hexane	130	1.8		1020	2.29E-01	2.01E+03	1.00E+00
naphthalene	130	6.10E-04		1020	7.77E-05	6.81E-01	3.41E-04
toluene	130	3.40E-03		1020	4.33E-04	3.80E+00	1.90E-03
arsenic	130	2.00E-04		1020	2.55E-05	2.23E-01	1.12E-04
beryllium	130	1.20E-05		1020	1.53E-06	1.34E-02	6.70E-06
cadmium	130	1.10E-03		1020	1.40E-04	1.23E+00	6.14E-04
chromium	130	1.40E-03		1020	1.78E-04	1.56E+00	7.82E-04
cobalt	130	8.40E-05		1020	1.07E-05	9.38E-02	4.69E-05
manganese	130	3.80E-04		1020	4.84E-05	4.24E-01	2.12E-04
mercury	130	2.60E-04		1020	3.31E-05	2.90E-01	1.45E-04
nickel	130	2.10E-03		1020	2.68E-04	2.34E+00	1.17E-03
selenium	130	2.40E-05		1020	3.06E-06	2.68E-02	1.34E-05
Total HAPS							1.05

Assumptions
Selective Catalytic Reduction
Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion
PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

Emissions Calculations for Diesel Emergency Generator
Holly Marketing & Refining Company

EPA Reference: EPA Standards and AP-42, Section 3.3 Gasoline and Diesel Engines

Pollutant	Emission Factors			Rating				Operating Hours	Emissions	Emissions
	(g/HP-hr)	(lb/MMBtu)	(lb/HP-hr)	(HP)	(MMBtu/hr)	(g/hr)	(lb/hr)	(hr/yr)	(lb/yr)	(tns/yr)
PM	0.025			540	1.37	13.5	0.030	50	1.49	0.00074
PM_{10}	0.025			540	1.37	13.5	0.030	50	1.49	0.00074
$PM_{2.5}$	0.0025			540	1.37	1.4	0.003	50	0.15	0.00007
SO_2			2.05E-03	540	1.37		1.107	50	55.35	0.0277
NO_x	3.7			540	1.37	1998.0	4.396	50	219.78	0.1099
CO	0.26			540	1.37	140.4	0.309	50	15.44	0.0077
HC	0.03			540	1.37	16.2	0.036	50	1.78	0.0009
Benzene		9.33E-04		540	1.37		1.28E-03	50	0.06	3.20E-05
Toluene		4.09E-04		540	1.37		5.60E-04	50	0.03	1.40E-05
Xylenes		2.85E-04		540	1.37		3.90E-04	50	0.02	9.76E-06
Formaldehyde		1.18E-03		540	1.37		1.62E-03	50	0.08	4.04E-05
Acetaldehyde		7.67E-03		540	1.37		1.05E-02	50	0.53	2.63E-04
Acrolein		9.25E-05		540	1.37		1.27E-04	50	0.01	3.17E-06
Naphthalene		8.48E-05		540	1.37		1.16E-04	50	0.01	2.90E-06
Total HAP										3.65E-04

Assumptions:
540 HP Caterpillar Diesel Generator Set
Sulfur content not to exceed 15 ppm
HP = 2545.46 BTU/hr; therefore, 540 HP = 1374548.4 BTU/hr or 1.37 mmBTU/hr
HAPs emissions based on AP-42, Section 3.3 Gasoline and Diesel Engines
HC, NOx, CO, PM emissions from manufacturer provided emissions rates
10% of PM_{10} emissions assumed to be $PM_{2.5}$. References: EPA 2001, Procedures Document for National Emissions Inventory, Criteria Pollutants and EPA 2006, Documentation for the Final 2002 Nonpoint Section National Emissions Inventory for Criteria and Hazardous Air Pollutants.

Increased hours for E.. ..ency Equipment
Holly Refining & Marketing Company

EPA Reference: EPA Standards and AP-42, Section 3.3 Gasoline and Diesel Engines

Pollutant	Water Well #3 Rating		Fire Pump No.1 Rating		Fire Pump No.2 Rating		Fire Pump Rating		Diesel Compressors (3) Rating		Cummings Gen. Rating		Control Room Gen. Rating		Emission Factor		Operating Hours	Water Well 3 Emissions	FP NO. 1 Emissions	FP NO. 2 Emissions	FP Emissions	DC (3) Emissions	Cum. Gen Emissions	Con. Room Gen Emissions	Total Emissions
	(HP)	(MMBtu/hr)	(HP)	(MMBtu/hr)	(HP)	(MMBtu/hr)	(HP)	(MMBtu/hr)	(HP)	(MMBtu/hr)	(HP)	(MMBtu/hr)	(HP)	(MMBtu/hr)	(lb/MMBtu)	(lb/HP-hr)	(hr/yr)	(tns/yr)	(tns/yr)	(tns/yr)	(tns/yr)	(tns/yr)	(tns/yr)	(tns/yr)	(tns/yr)
PM_{10}	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10		2.20E-03	20	4.93E-03	0.0086	0.0086	0.0040	0.0145	0.0103	0.0084	0.0594
$PM_{2.5}$	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10		2.20E-03	20	4.93E-03	0.0086	0.0086	0.0040	0.0145	0.0103	0.0084	0.0594
SO_2	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10		2.05E-03	20	4.59E-03	0.0081	0.0081	0.0037	0.0135	0.0096	0.0078	0.0554
NO_x	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10		3.10E-02	20	6.94E-02	0.1218	0.1218	0.0558	0.2046	0.1457	0.1178	0.8370
CO	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10		6.68E-03	20	1.50E-02	0.0263	0.0263	0.0120	0.0441	0.0314	0.0254	0.1804
VOC	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10		2.51E-03	20	5.62E-03	0.0099	0.0099	0.0045	0.0166	0.0118	0.0095	0.0678
Benzene	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10	9.33E-04		20	5.32E-06	9.33E-06	9.33E-06	4.27E-06	1.57E-05	1.12E-06	9.02E-07	4.60E-05
Toluene	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10	4.09E-04		20	2.33E-06	4.09E-06	4.09E-06	1.87E-06	6.87E-06	4.89E-07	3.96E-07	2.01E-05
Xylenes	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10	2.85E-04		20	1.63E-06	2.85E-06	2.85E-06	1.31E-06	4.79E-06	3.41E-07	2.76E-07	1.40E-05
Formaldehyde	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10	1.18E-03		20	6.73E-06	1.18E-05	1.18E-05	5.41E-06	1.98E-05	1.41E-06	1.14E-06	5.81E-05
Acetaldehyde	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10	7.67E-03		20	4.37E-05	7.67E-05	7.67E-05	3.51E-05	1.29E-04	9.18E-06	7.42E-06	3.78E-04
Acrolein	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10	9.25E-05		20	5.27E-07	9.25E-07	9.25E-07	4.24E-07	1.55E-06	1.11E-07	8.95E-08	4.56E-06
Naphthalene	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10	8.48E-05		20	4.84E-07	8.48E-07	8.48E-07	3.89E-07	1.42E-06	1.01E-07	8.20E-08	4.18E-06
Total HAP																	20	6.07E-05	1.07E-04	1.07E-04	4.88E-05	1.79E-04	1.27E-05	1.03E-05	5.25E-04

Assumptions:
Sulfur content not to exceed 15 ppm.
HP = 2545.46 BTU/hr
20 additional operating hours requested

Storage Tanks - Converted
Holly Refining & Marketing

Source	Pollutant	PTE Emissions (lb/yr)	PTE Emissions (tn/yr)	Baseline Emissions (tn/yr)	Net Emissions (tn/yr)	Comment
Tank 71	VOC	447.79	0.224	-0.471	-0.25	Baseline 2007-2008
Tank 72	VOC	722.06	0.361	-0.69	-0.33	Baseline 2007-2008
					-0.58	Total

Storage Tanks - New and Modified
Holly Refining & Marketing

SERVICE	Tank No.	Product	Heated	Size (BBLS)	Volume (Gallons)	Height (ft)	Diameter (ft)	Type	Net Throughput (gallons/year)	Total VOC Emissions (lb)	Benzene (lb)	Ethylbenzene (lb)	Hexane (lb)	Toluene (lb)	Xylene (lb)
Black Wax Crude Oil	70	Black wax crude	No	80,306	2,471,782	35	126	Cone	15,427,595	395.69	1.98	0.0	0.0	0.0	0.0
Black Wax Crude Oil	71	Black wax crude	No	67,155	3,217,980	36	126	Cone	20,084,980	447.79	2.24	0.0	0.0	0.0	0.0
Black Wax Crude Oil	72	Black wax crude	No	106,811	5,188,982	36	160	Cone	32,386,965	722.06	3.61	0.0	0.0	0.0	0.0
Poly Gasoline Unit Product	85	Poly Gas	No	19,600	832,200	NA	60	Pontoon	15,811,800	1703.46	0.0	0.0	0.21	0.0	0.0
Gas Oil Storage	86	Gas Oil	No	109,660	4,286,555	31	160	Cone	26,754,450	518.75	0.0	0.0	0.0	0.0	0.0
Gas Oil Storage	87	Gas Oil	No	109,660	4,286,555	31	160	Cone	26,754,450	518.75	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	88	Lubes feed	Yes	26,730	1,137,150	40	70	Cone	10,545,745	62.95	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	89	Lubes feed	Yes	26,730	1,137,150	40	70	Cone	10,545,745	62.95	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	90	Lubes feed	Yes	13,600	580,180	40	50	Cone	10,545,745	56.44	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	91	Lubes feed	Yes	13,600	580,180	40	50	Cone	10,545,745	56.44	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	92	Lubes feed	Yes	13,600	580,180	40	50	Cone	10,545,745	56.44	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	93	Lubes feed	Yes	13,600	580,180	40	50	Cone	10,545,745	56.44	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	94	Lubes feed	Yes	13,600	580,180	40	50	Cone	10,545,745	56.44	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	95	Lubes feed	Yes	13,600	580,180	40	50	Cone	10,545,745	56.44	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	96	Lubes feed	Yes	13,600	580,180	40	50	Cone	10,545,745	56.44	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	97	Lubes feed	Yes	13,600	580,180	40	50	Cone	10,545,745	56.44	0.0	0.0	0.0	0.0	0.0
Gasoline	98	Gasoline	No	19,600	845,970		60	IFR	12,689,550	1268.7	0.5	0.8	17.3	12.0	5.5
ULSD #2	99	ULS Diesel	No	66,000	2,950,235	40	110	Cone	25,054,220	566.33	0.0	0.0	0.0	0.0	0.0
Storm and waste water storage	158	Waste Water	No	64,315	2,701,230	40	110.0	FR	NA	NA	0.0	0.0	0.0	0.0	0.0
Sour Water Feed	168	Sour Water	No	30,952	1,299,984	40	80.0	FR	NA	NA	0.0	0.0	0.0	0.0	0.0
ULSD #2	170	ULS Diesel	No	66,000	2,950,235	40	110	Cone	25,054,220	566.33	0.0	0.0	0.0	0.0	0.0
Propane	171-174	Propane	No	1,600				Hor. Elliptical		NA					
Totals (tn/yr)										3.64	4.16E-03	3.75E-04	8.76E-03	5.99E-03	2.76E-03

Assumptions:
VFR - Vertical fixed roof tank
IFR - Internal floating roof tank
EFR - External floating roof tank
No HAP emissions expected from gas oil storage
0.05% benzene in liquid for black wax crude - MSDS Silver Eagle Refining
0.1 K factor

2006 Modernization Project Fugitive Component Count
New

2% Leak Rate	Total Count	Emission Factor (kg/hr/source)	2% Leaking	Emissions (lb/day)	Emissions (tons/yr)
Gas valves:	354.85	0.0268	7.09707317	10.07	1.84
Light liquid valves:	630	0.0109	12.6	7.27	1.33
Heavy liquid valves:	630	0.00023	12.6	0.15	0.03
Light liquid pump seals:	1	0.114	0.02	0.12	0.02
Heavy liquid pump seals:	1	0.021	0.02	0.02	0.00
Compressor seals:	1	0.636	0.02	0.67	0.12
Pressure relief valves:	12.37	0.16	0.24731707	2.09	0.38
Connectors:	3229.71	0.00025	64.5941463	0.85	0.16
Open-ended lines	0	0.0023	0	0.00	0.00
Sampling connections:	0	0.015	0	0.00	0.00
					3.88

Unit	Component	Count
20	Gas valves:	55
	Light liquid valves:	630
	Heavy liquid valves:	630
	Light liquid pump seals:	1
	Heavy liquid pump seals:	1
	Compressor seals:	1
	PSVs:	8
	Connectors:	2630
	Open-ended lines	0
	Sampling connections:	0
21	Gas valves:	124
	Light liquid valves:	0
	Heavy liquid valves:	0
	Light liquid pump seals:	0
	Heavy liquid pump seals:	0
	Compressor seals:	0
	PSVs:	3
	Connectors:	248
	Open-ended lines	0
	Sampling connections:	0
30	Gas valves:	0
	Light liquid valves:	0
	Heavy liquid valves:	0
	Light liquid pump seals:	0
	Heavy liquid pump seals:	0
	Compressor seals:	0
	Connectors:	0
	Open-ended lines	0
	Sampling connections:	0
33	Gas valves:	175.85
	Light liquid valves:	0
	Heavy liquid valves:	0
	Light liquid pump seals:	0
	Heavy liquid pump seals:	0
	Compressor seals:	0
	PSVS	1.37
	Connectors:	351.71
	Open-ended lines	0
	Sampling connections:	0

El Dorado	41	MMSCF/Day
WX	14	MMSCF/Day
	0.34146341	
El Dorado	WX	
515	175.85	
0	0	
0	0	
0	0	
0	0	
0	0	
4	1.37	
104	351.71	
0	0	
0	0	

based on El Dorado Refinery's Hydrogen Plant

New Unit	Valve Count From
GHC (GOHC)	Current unit count
NaHS	Current unit count
Vacuum	Negligible
Hydrogen	

Fugitives from Leaks - New Equipment
Holly Marketing & Refining Company

Total Count		Emission Factor (kg/hr/source)	2% Leaking	Emissions (lb/day)	Emissions (tons/yr)
	1553.088316	0.0268	31.06176632	44.05	8.04
	2272.808666	0.0109	45.45617332	26.22	4.79
	2272.808666	0.00023	45.45617332	0.55	0.10
	44.38783386	0.114	0.887756677	5.36	0.98
	44.38783386	0.021	0.887756677	0.99	0.18
	2.909254268	0.636	0.058185085	1.96	0.36
	7	0.16	0.14	1.19	0.22
	12197.4113	0.00025	243.9482259	3.23	0.59
	0	0.0023	0	0.00	0.00
	0	0.015	0	0.00	0.00
					15.25

Component	Count			Count
Gas valves:		766.5655885	- modeled after Unit 4	803
Light liquid va		420.0359389		440
Heavy liquid v		420.0359389		440
Light liquid pu		17.18328841		18
Heavy liquid p		17.18328841		18
Compressor s		1.909254268		2
Connectors:		3213.274933		3366
Open-ended li		0		0
Sampling con		0		0
Gas valves:		135.7954545	- modeled after Unit 8	239
Light liquid va		280.6818182		494
Heavy liquid v		280.6818182		494
Light liquid pu		5.113636364		9
Heavy liquid p		5.113636364		9
Compressor s		0		0
Connectors:		1394.318182		2454
Open-ended li		0		0
Sampling con		0		0
Gas valves:		202.7272727	- modeled after Unit 7	223
Light liquid va		649.0909091		714
Heavy liquid v		649.0909091		714
Light liquid pu		9.090909091		10
Heavy liquid p		9.090909091		10
Compressor s		0		0
Connectors:		3001.818182		3302
Open-ended li		0		0
Sampling con		0		0
Gas valves:		55	- modeled after Unit 9	55
Light liquid va		630		630
Heavy liquid v		630		630
Light liquid pu		1		1
Heavy liquid p		1		1
Compressor s		1		1
Connectors:		2630		2630
Open-ended li		0		0
Sampling con		0		0
Gas valves:		228	- left same, add boiler #11, delete boiler #6	
Light liquid va		15		
Heavy liquid v		15		
Light liquid pu		0		
Heavy liquid p		0		
Compressor s		0		
Connectors:		516		
Open-ended li		0		
Sampling con		0		
Gas valves:		51	-same as north flare	
Light liquid va		50		
Heavy liquid v		50		
Light liquid pu		4		
Heavy liquid p		4		
Compressor s		0		
Connectors:		302		
Open-ended li		0		
Sampling con		0		
Gas valves:		45	-left same	
Light liquid va		166		
Heavy liquid v		166		
Light liquid pu		6		
Heavy liquid p		6		
Compressor s		0		
Connectors:		754		
Open-ended li		0		
Sampling con		0		
Gas valves:		69	- modeled after Unit 8 Crude Tower	
Light liquid va		62		30
Heavy liquid v		62		10
Light liquid pu		2		7
Heavy liquid p		2		14
Compressor s		0		32
Connectors:		386		4
Open-ended li		0		5
Sampling con		0		15
PSV		2		5

New Unit
FCCU
Crude
Poly Gas
Hydro Isom
Boiler #11
South Flare
Additional Unloading

New Units
Max Thru
FCCU
Crude
Poly Gas
Hydro Isom
Crude Flash Twr

HAP Fugitives from Leaks - New Equipment
Holly Marketing & Refining Company

		TPY		TONS per year						
				Benzene	Xylene	Toluene	Ethylbenzene	Naphthalene	Hexane	2,2,4-Trimethylpentane
Fugitives	Valves and Fittings	40.4		0.522	0.288	0.432	0.019	0.001	0.638	0.440
Fugitives	Pumps	3.5		0.045	0.025	0.037	0.002	0.000	0.055	0.038
Fugitives	Compressors	1.6		0.021	0.011	0.017	0.001	0.000	0.025	0.017
Fugitives	Pressure Relief Valves	0.2		0.002	0.001	0.002	0.000	0.000	0.002	0.002
Fugitives	Connectors	1.8		0.024	0.013	0.020	0.001	0.000	0.029	0.020
Fugitives	Valves and Fittings	12.4		0.161	0.089	0.133	0.006	0.000	0.197	0.136
Fugitives	Pumps	1.1		0.014	0.008	0.012	0.001	0.000	0.017	0.012
Fugitives	Compressors	0.4		0.005	0.003	0.004	0.000	0.000	0.006	0.004
Fugitives	Pressure Relief Valves	0.2		0.002	0.001	0.002	0.000	0.000	0.002	0.002
Fugitives	Connectors	0.6		0.007	0.004	0.006	0.000	0.000	0.009	0.006
			Total	0.803	0.442	0.664	0.029	0.001	0.981	0.676

Calculations found in Cooling Tower PTE
Based off averages from 2001 - 2010

Pounds per Ton VOC emitted						
Benzene	Xylene	Toluene	Ethylbenzene	Napthalene	Hexane	2,2,4- Trimethylpentane
25.89	14.25	21.39	0.9421	0.0425	31.60	21.79

Flare Emissions (South Flare)
Holly Marketing & Refining Company

References: AP-42 Section 13.5 Industrial Flares
California Air Resources Board
EPA's Technology Transfer Network
API Compendium of Greenhouse Gas Emission Methodologies for the Oil and Gas Industry

$E_{(lb/hr)}$ = flare gas vol (scf/hr) * HHV (Btu/scf) * (1 MMBtu/1000000 Btu) * EF (lb/MMBtu)

flare gas vol	17,000.0	scf/hr
HHV	1150	Btu/scf
$EF_{(CO)}$ =	0.37	lb/MMBtu
$EF_{(NOx)}$ =	0.068	lb/MMBtu
$EF_{(VOC)}$ =	5.6	lb/MMcf
$EF_{(benzene)}$ =	0.159	lb/MMcf
$EF_{(formaldehyde)}$ =	1.169	lb/MMcf
$EF_{(naphthalene)}$ =	0.011	lb/MMcf
$EF_{(acetaldehyde)}$ =	0.043	lb/MMcf
$EF_{(acrolein)}$ =	0.01	lb/MMcf
$EF_{(propylene)}$ =	2.44	lb/MMcf
$EF_{(toluene)}$ =	0.058	lb/MMcf
$EF_{(xylenes)}$ =	0.029	lb/MMcf
$EF_{(ethylbenzene)}$ =	1.44	lb/MMcf
$EF_{(hexane)}$ =	0.029	lb/MMcf
$EF_{(SO2)}$ =	0.024	lb/hr

Pollutant	Emissions (lb/hr)	Emissions (TPY)	Baseline (TPY)	Net Emissions (TPY)	
CO	7.2335	31.68	0.00	31.68	Baseline 2010-2011
NOx	1.3294	5.82	-1.820	4.00	Baseline 2007-2008
VOC	9.52E-02	0.42	-4.29	-3.87	Baseline 2007-2008
Benzene	2.70E-03	1.18E-02			
Formaldehyde	1.99E-02	8.70E-02			
Naphthalene	1.87E-04	8.19E-04			
Acetaldehyde	7.31E-04	3.20E-03			
Acrolein	1.70E-04	7.45E-04			
Propylene	4.15E-02	1.82E-01			
Toluene	9.86E-04	4.32E-03			
Xylene	4.93E-04	2.16E-03			
Ethylbenzene	2.45E-02	1.07E-01			
Hexane	4.93E-04	2.16E-03			
Total HAPS		4.01E-01			
SO_2	0.024	0.1042	-4.42	-4.32	Baseline 2005-2006

Assumptions:
Flare efficiency - 98%
Average methane concentration of total HC is 55% per AP-42
Questar - 1 grain S/100 scf
HAPS speciation from CARB
VOC emission factor from webfire database

Truck Unloading
Holly Refining and Marketing Company

Black and yellow wax becomes a solid at ambient temperatures. No emissions are expected.

Assumptions:
Addition of 12 bays

Propane Pit Flare - To Be Removed
Holly Marketing & Refining Company

Source	Pollutant	Emissions (tn/yr)	Comment
Propane Pit Flare	NOx	-19.57	Baseline 2007-2008
	SO2	0	Baseline 2005-2006
	VOC	-1.55	Baseline 2007-2008
	PM_{10}	-0.93	Baseline 2005-2006
	$PM_{2.5}$	-2.19	Baseline 2008-2009
	CO	-129.27	Baseline 2010-2011

Existing Sulfur Recovery Unit Incinerator

SO_2 ER (tn/yr) = [20 LTPD * 0.002 (99.8% efficiency)*2240 tons/2000LT * 1.988 lb/SO2/lbS * 365 days/yr]

SO_2 =	32.5	TPY
SO_2 =	-217.15	SO2 baseline 2005-2006
SO_2 =	-184.6	Net decrease in emissions

NOx =	-0.852	2007/2008 Baseline
VOC =	-0.047	2007/2008 Baseline
PM_{10} =	-0.062	2005/2006 Baseline
$PM_{2.5}$ =	-0.070	2008/2009 Baseline
CO =	-0.76	2010/2011 Baseline

Assumptions:
Emissions from existing sulfur recovery incinerator routed to wet scrubber

Tank Stab-in Asphalt Tank Heaters
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	(lb/hr)	Emissions per Heater (lb/yr)	(tn/yr)	2012 6 heaters (tn/yr)	2006 2 heaters (tn/yr)
NOx	0.8	100		1020	0.0784	687.06	0.34	2.06	0.69
SO2	0.8	10.13		1020	0.0079	69.59	0.03	0.21	0.07
VOC	0.8		0.005		0.0043	37.84	0.02	0.11	0.04
PM_{10}	0.8		0.00051		0.0004	3.57	1.79E-03	0.01	0.00
$PM_{2.5}$	0.8		0.00042		0.0003	2.94	1.47E-03	0.01	0.00
CO	0.8		0.08		0.0640	560.64	0.28	1.68	0.56
lead	0.8	0.0005		1020	3.92E-07	0.00	1.72E-06	1.03E-05	3.44E-06
benzene	0.8	2.10E-03		1020	1.65E-06	1.44E-02	7.21E-06	4.33E-05	1.44E-05
formaldehyde	0.8	7.50E-02		1020	5.88E-05	5.15E-01	2.58E-04	1.55E-03	5.15E-04
hexane	0.8	1.8		1020	1.41E-03	1.24E+01	6.18E-03	3.71E-02	1.24E-02
naphthalene	0.8	6.10E-04		1020	4.78E-07	4.19E-03	2.10E-06	1.26E-05	4.19E-06
toluene	0.8	3.40E-03		1020	2.67E-06	2.34E-02	1.17E-05	7.01E-05	2.34E-05
arsenic	0.8	2.00E-04		1020	1.57E-07	1.37E-03	6.87E-07	4.12E-06	1.37E-06
beryllium	0.8	1.20E-05		1020	9.41E-09	8.24E-05	4.12E-08	2.47E-07	8.24E-08
cadmium	0.8	1.10E-03		1020	8.63E-07	7.56E-03	3.78E-06	2.27E-05	7.56E-06
chromium	0.8	1.40E-03		1020	1.10E-06	9.62E-03	4.81E-06	2.89E-05	9.62E-06
cobalt	0.8	8.40E-05		1020	6.59E-08	5.77E-04	2.89E-07	1.73E-06	5.77E-07
manganese	0.8	3.80E-04		1020	2.98E-07	2.61E-03	1.31E-06	7.83E-06	2.61E-06
mercury	0.8	2.60E-04		1020	2.04E-07	1.79E-03	8.93E-07	5.36E-06	1.79E-06
nickel	0.8	2.10E-03		1020	1.65E-06	1.44E-02	7.21E-06	4.33E-05	1.44E-05
selenium	0.8	2.40E-05		1020	1.88E-08	1.65E-04	8.24E-08	4.95E-07	1.65E-07
Total HAPS							0.01	0.04	0.01

Assumptions

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Small Boilers (<100), uncontrolled burners

SO_2 emissions based on H_2S content of 60 ppmv

8 total stab-in heaters

PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

Asphalt Mix and Storage Furnace
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (tn/yr)	Removed from Service (tn/yr)
NOx	15.3	41		1020	0.6150	5387.40	2.69	-2.69
SO2	15.3	10.13		1020	0.1519	1330.92	0.67	-0.67
VOC	15.3		0.005		0.0826	723.75	0.36	-0.36
PM_{10}	15.3	7.6		1020	0.1519	998.64	0.50	-0.50
$PM_{2.5}$	15.3		0.00042		0.0064	56.29	0.03	-0.03
CO	15.3		0.08		1.2240	10722.24	5.36	-5.36
lead	15.3	0.0005		1020	7.50E-06	0.07	3.29E-05	-3.29E-05
benzene	15.3	2.10E-03		1020	3.15E-05	2.76E-01	1.38E-04	-1.38E-04
formaldehyde	15.3	7.50E-02		1020	1.13E-03	9.86E+00	4.93E-03	-4.93E-03
hexane	15.3	1.8		1020	2.70E-02	2.37E+02	1.18E-01	-1.18E-01
naphthalene	15.3	6.10E-04		1020	9.15E-06	8.02E-02	4.01E-05	-4.01E-05
toluene	15.3	3.40E-03		1020	5.10E-05	4.47E-01	2.23E-04	-2.23E-04
arsenic	15.3	2.00E-04		1020	3.00E-06	2.63E-02	1.31E-05	-1.31E-05
beryllium	15.3	1.20E-05		1020	1.80E-07	1.58E-03	7.88E-07	-7.88E-07
cadmium	15.3	1.10E-03		1020	1.65E-05	1.45E-01	7.23E-05	-7.23E-05
chromium	15.3	1.40E-03		1020	2.10E-05	1.84E-01	9.20E-05	-9.20E-05
cobalt	15.3	8.40E-05		1020	1.26E-06	1.10E-02	5.52E-06	-5.52E-06
manganese	15.3	3.80E-04		1020	5.70E-06	4.99E-02	2.50E-05	-2.50E-05
mercury	15.3	2.60E-04		1020	3.90E-06	3.42E-02	1.71E-05	-1.71E-05
nickel	15.3	2.10E-03		1020	3.15E-05	2.76E-01	1.38E-04	-1.38E-04
selenium	15.3	2.40E-05		1020	3.60E-07	3.15E-03	1.58E-06	-1.58E-06
Total HAPS							0.12	

Other Permitted Contemporaneous Emissions

Project	PM10 (TPY)	PM2.5 (TPY)	NOx (TPY)	CO (TPY)	SO2 (TPY)	VOC (TPY)	HAPS (TPY)	Note
Install 250 gpm charge pump	–	–	–	–	–	0.03	–	DAQE-AN101230040-11 - VOC emission increase of 0.03 TPY (PTE)
Install 3 dedicated ethanol unloading areas	–	–	–	–	–	0.05	–	DAQE-101230039-11 - VOC emission increase of 0.05 TPY (PTE)
Incorporation of FCCU NOx and SO2 limits from CD	–	–	–	–	–	–	–	DAQE-AN101230038-10. 7 day rolling NOx limit 180 ppm; 160 ppm for SOx.
	–	–	–	–	–	–	–	365-day rolling average limit is 110 ppm NOx; 50 ppm SOx
Install Benzene Sat Unit #23 (23H1)	0.69	0.69	0.64	7.57	2.4	0.5	0.2	NOI Dated April 29, 2010; AO DAQE-0101230036-10
Boiler #5 NOx Limit	–	–	–	–	–	–	–	Incorporation of CD Limit using SCR - NOx - 0.03 lb/Mmbtu 3-hr avg. From 12.26 to 9.2 TPY
Incorporate NSPS Subpart A & J for CO Emissions to FCCU	–	–	–	–	–	–	–	DAQE-AN101230032-10 - 500 ppm limit
Addition of Boilers #9 and #10	7.82	7.82	15.65	28.94	20.69	3.13	1.45	NOI dated October 14, 2009; AO DAQE-AN0101230031-10
Incorporate CD Limits for SRU, heaters/boilers, flare, benzene waste, LDAR	–	–	–	–	–	–	–	DAQE-AN101230027-09
Addition of 135 KW John Deere Portable Diesel Generator	0.02	0.02	0.66	0.12	0.001	0.01	–	
Totals	8.53	8.53	16.95	36.63	23.091	3.64	1.65	

Attachment B
Flare Gas System Recovery Cost Effectiveness Calculations

Cost Analysis for Flare Recovery System		
Flare Recovery System		**Basis for Cost and Factor**
Capacity (kw)	400	flare gas compressor
Annual Capacity Factor	100%	
Capital Cost /Total Installed Cost		
Direct Costs		
Puchased Equipment		
Primary and Auxiliary Equipment (PE)	$3,750,000	
Instrumentation and Controls	$375,000	10% of PE
Sales Tax	$112,500	3% of PE
Freight	$187,500	5% of PE
Total Purchased Equipment Cost (PEC)	**$4,425,000**	
Direct Installation		
Foundations	$531,000	12% of PEC
Handling and Erection	$1,770,000	40% of PEC
Electrical	$44,250	1% of PEC
Piping	$88,500	2% of PEC
Insulation and Ductwork	$44,250	1% of PEC
Painting	$44,250	1% of PEC
Total Direct Installation (DI)	**$2,522,250**	
Total Direct Cost (DC)	**$6,947,250**	
Indirect Installation Costs		
Engineering and Project Management	$442,500	10% of PEC
Construction and Field Expenses	$442,500	10% of PEC
Contractor Fees	$0	0% of PEC
Startup Expenses	$44,250	1% of PEC
Performance Tests	$44,250	1% of PEC
Contingencies	$132,750	3% of PEC
Total Indirect Cost	**$1,106,250**	
Total Installed Cost (TIC)	**$8,053,500**	
Annual Costs (Direct + Indirect)		
Direct Costs		
Operating Labor	$161,070	2% of capital cost
Raw materials	$0	
Replacement Parts	$161,070	2% of capital cost
Utilities – Power	$245,280	$0.07/KW, 400 KW flare gas compressor
Total Direct Costs, $/year	**$567,420**	
Indirect Costs		
Overhead	$128,856	80% of labor costs
Taxes, Insurance, and Administration	$322,140	4% of total installed cost - EPA[1]

Cost Analysis for Flare Recovery System		
Capital Recovery	$1,094,471	6%, 10 years, CRF-.1359
Total Indirect Costs, $/year	**$1,545,467**	
Total Annual Cost	**$2,112,887**	
Fuel Gas Recovery Benefit	**$1,300,000**	Average 550 scfm @ $5/MMBtu
NO_X Reduction Cost Effectiveness		
Emissions Before Control, lb/MMBtu	0.068	
Emissions Before Control, ton/yr	5.82	
Emissions After Control, lb/MMBtu	6.73268	
Control Efficiency (%)	99	
Emissions After Control, ton/yr	0.0582	
Emission Reduction, ton/yr	5.7618	
Cost Effectiveness, $ per ton NO_X reduction	**$141,082.07**	
CO Reduction Cost Effectiveness		
Emissions Before Control, lb/MMBtu	0.37	
Emissions Before Control, tn/yr	31.68	
Emissions After Control, lb/MMBtu	0.0037	
Control Efficiency (%)	99	
Emissions After Control, tn/yr	0.3168	
Emission Reduction, tn/yr	31.3632	
Cost Effectiveness, $ per ton CO reduction	**$25,918.49**	
VOC Reduction Cost Effectiveness		
Emissions Before Control, lb/MMBtu	3.614	
Emissions Before Control, tn/yr	5.42	
Emissions After Control, lb/MMBtu	0.03614	
Control Efficiency (%)	99	
Emissions After Control, tn/yr	0.0542	
Emission Reduction, tn/yr	5.3658	
Cost Effectiveness, $ per ton VOC reduction	**$151,494.03**	
CO_2 Reduction Cost Effectiveness		
Emissions Before Control, lb/MMBtu	132.3	
Emissions Before Control, Mtn/yr	10069.97	
Emissions After Control, lb/MMBtu	6.615	
Control Efficiency (%)	95	
Emissions After Control, Mtn/yr	503.4985	
Emission Reduction, Mtn/yr	9566.4715	
Cost Effectiveness, $ per ton CO_2 reduction	**$84.97**	
CH_4 Reduction Cost Effectiveness		
Emissions Before Control, lb/MMBtu	0.0066	
Emissions Before Control, Mtn/yr	30.4	
Emissions After Control, lb/MMBtu	0.00033	
Control Efficiency (%)	95	
Emissions After Control, Mtn/yr	1.52	

Cost Analysis for Flare Recovery System		
Emission Reduction, Mtn/yr	28.88	
Cost Effectiveness, $ per ton CH_4 reduction	**$28,147.04**	

1 - EPA Air Pollution Control Cost Manual, Sixth Edition, Section 4, EPA/452/B-002-001, Jan. 2002. Table A.2

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WASHINGTON

THEODORE L. GARRETT
1201 PENNSYLVANIA AVENUE, NW
WASHINGTON, DC 20004-2401
T 202.662.5398
F 202.778.5398
tgarrett@cov.com

March 20, 2013

VIA E-MAIL AND U.S. MAIL

Phillip Brooks
Director, Air Enforcement Division
USEPA Headquarters
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Re: Holly Refining & Marketing Company – Woods Cross, LLC ("Holly" or "Woods Cross") Heavy Crude Processing Project

Dear Mr. Brooks:

This letter is a follow-up to our meeting at your offices on Thursday, March 14, 2013 to discuss possible resolution of a dispute under the dispute resolution provisions of Part XV of the consent decree.[1] It is important to resolve this matter promptly. The Utah Division of Air Quality (DAQ) permit modification process has been stalled as a result of EPA's January 18, 2013 letter. Delays in the permit process will delay and impair the benefits of the Woods Cross project to the community and the nation.

The issues concern a netting analysis submitted by Holly accompanying Holly's July 2012 Notice of Intent (NOI) for the project. EPA's letter argues that the netting analysis is improper because, for three sources, it included emission reductions from projects or controls used to comply with the consent decree.

Holly disagrees with EPA's position and submits that the consent decree permits the use of emissions reductions from those three sources, for two independent reasons. First, as explained in our letter to DAQ on February 12, 2013, ¶ 143(c) of the consent decree expressly allows Holly to use consent decree emission reductions for a project permitted in these circumstances.

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[1] United States v. Holly Refining & Marketing Company-Woods Cross, US District Court, D. Utah No. 1:08cv00041.

Second, as explained below, two of the three emission reductions addressed in EPA's letter (the CO boiler and propane pit flare) resulted from decisions made by Holly to discontinue operation of the sources for business reasons, and to install a wet gas scrubber to treat gases from the FCCU pursuant to the 2007 DAQ approval order, and thus the reductions did not result from projects or controls "utilized to comply with this Consent Decree" within the scope of ¶ 142 of the consent decree. The third source (boiler #8) is subject to more stringent emission limitations than required by the consent decree and thus, in the alternative, would be covered by the exception in ¶ 143(a) of the consent decree. Enclosed with this letter is a declaration from Michael S. Astin, the environmental manager for Holly's Woods Cross Refinery, which provides additional factual information relevant to these sources and the modernization project. ("Astin Decl.").

I. The Background Of This Matter

The Heavy Crude Processing Project

In 2006 Holly embarked on a project to modernize the Woods Cross refinery and expand processing capacity. In 2007, the state Division of Air Quality (DAQ) issued an approval order for the changes proposed by Holly to implement this project. Work on this project ensued and has been ongoing.

Due to market conditions, in May 2012 Holly submitted a NOI to modify the prior state permit. Central to those changes in the project was a replacement of the planned nature of the crude oil feed to the refinery, from heavier crude with a higher sulfur content to local crude from eastern Utah with a lower sulfur content. The 2012 NOI included installation of new equipment and decommissioning or replacement of and/or modifications to existing equipment. Holly subsequently submitted a revised NOI in July 2012.

Holly has been working for years to develop a sound project that will benefit the community economically and meet all of the standards and regulations required to have it permitted. Holly has spent more than $225 million on equipment to reduce emissions from the refinery and from the fuels that it produces. The enclosed PowerPoint slides provide additional background concerning this project.

On July 10, 2012, in a show of support for Governor Gary Herbert's U-CAIR initiative to improve air quality, Holly announced that it plans to add pollution control equipment that reduces sulfur dioxide emissions by 150 tons per year.

The Current Dispute

As part of the July 2012 NOI, Holly submitted a netting analysis of whether a major modification had taken place under EPA's regulations. The NOI concluded, under step one, that there was a significant increase in emissions of certain pollutants, without considering any emission reductions. The NOI went on to conduct a netting analysis under step two,

which included the reduction in emissions from the shutting down of the CO boiler and other reductions in the determination of whether there was a significant net increase in emissions. This analysis was entirely proper under EPA's regulations.

On January 18, by way of its letter to DAQ, EPA notified Holly of its position that the emissions reductions from the CO Boiler and Boiler #8 may not be considered in Holly's netting calculation including under 143(c) of the decree, and questioned whether the Propane Pit Flare reductions were properly included in the netting calculation. On February 12, 2013, I submitted comments to Bryce Bird, DAQ Director, responding to EPA's comments and concluding that ¶ 143(c) of the consent decree clearly allows the use of the reductions in question in the permit's netting analysis.

EPA and Holly are currently engaged in informal negotiations, as provided for by ¶ 229 of the consent decree, regarding that position. To that end, Holly submitted its February 12 letter to DAQ and EPA, and Holly subsequently contacted EPA Region 8 in an effort to resolve this dispute. On February 26, 2013, Holly met with Michael Owens, Sara Laumann and other representatives of EPA Region 8 and DAQ. Holly was subsequently advised by Region 8 that EPA headquarters would be reviewing this matter and suggested that Holly contact you for further discussions. We then met with you on March 14.

At our March 14 meeting, you suggested that EPA was planning to respond to our February 12, 2013 letter, but before taking a final position EPA would welcome additional factual information relating to whether the consent decree permitted the use of certain emissions reductions in Holly's netting analysis.[2] We are writing to provide such additional information, focusing on the emission reductions addressed in EPA's January 18, 2013 letter, namely for the CO Boiler, Boiler #8, and the Propane Pit Flare. We hope this additional information will resolve the concerns you have raised. Holly understands that EPA's written response will constitute EPA's "written summary of its position regarding the dispute" under ¶ 230 of the consent decree.

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[2] Our letter dated February 12, 2013 explained why ¶ 143(c) of the consent decree allows Holly to use the reduction in emissions resulting from the installation of controls under the consent decree in connection with Holly's modernization project. You have reviewed our February 12 letter, but for completeness we have enclosed a copy. The facts presented in this letter provide additional, independent reasons why the emission reductions addressed in the EPA Region 8 letter dated January 18, 2013 were properly included in Holly's netting analysis.

II. The Key Provisions Of The Consent Decree Support The Reductions Used By Holly In the Netting Analysis

Paragraphs 141 through 143 of the consent decree contain provisions as to when emissions reductions may be used. Paragraph 141 makes clear that these provisions govern not only when emissions reductions resulting from the installation of controls required by the consent decree cannot be used for the purpose of netting reductions, "but also . . . describe the circumstances which are not prohibited." Consent Decree ¶ 141. Paragraph 143 provides a number of exceptions permitting the use of emissions reductions for netting purposes, including in subparagraph (c), which provides:

> Outside the Scope of the Prohibition. Nothing in this Part VI is intended to prohibit Holly from seeking to: . . . utilize emissions reductions from the installation of controls required by this Consent Decree in determining whether a project that includes both the installation of controls under this Consent Decree and other construction that occurs at the same time and is permitted as a single project triggers major New Source Review requirements.

For the reasons discussed in our February 12, 2013 letter, the language of this paragraph permits the reduction in emissions from the three sources addressed in EPA's letter to be used in determining whether a major modification has taken place.

Moreover, the consent decree does not contain a blanket prohibition on the use of emissions reductions for netting purposes. Instead, the consent decree contains a limited prohibition on the use of emissions reductions, which states: "Holly shall not generate or use any . . . emissions reductions that result from any projects conducted or controls utilized to comply with this Consent Decree as netting reductions or emission offset credits." Consent Decree ¶ 142 (emphasis added). This language is limited in its scope: only "emissions reductions that result from projects conducted or controls utilized to comply with this Consent Decree" may not be used for netting purposes. Likewise, ¶ 141 states that "[t]he intent of this Part generally is to prohibit Holly from using emissions reductions . . . that will result from the installation and operation of the controls required by this Consent Decree for the purpose of netting reductions or emission offset credits." Consent Decree ¶ 141 (emphasis added).

As explained below, two of the three emission reductions addressed in EPA's letter (the CO boiler and propane pit flare) resulted from decisions made by Holly to discontinue operation of the sources for business reasons, and to install a wet gas scrubber to treat gases from the FCCU pursuant to the 2007 DAQ approval order, and thus the reductions did not result from projects or controls "utilized to comply with this Consent Decree" within the scope of ¶ 142 of the consent decree.

Finally, ¶ 143(a) of the consent decree specifically allows the use of netting reductions in situations where refinery units are subject to more stringent emission limitations than provided in the consent decree. As discussed below, Holly has agreed to such more stringent controls for Boiler #8, and thus, in the alternative, netting reductions would be allowed under ¶ 143(a) of the consent decree.

III. The Reduction In Emissions From The Shutdown Of The CO Boiler Was Properly Included In Holly's Netting Analysis.

The July 2012 NOI properly included a reduction in emissions from the shutdown of the CO Boiler in its netting analysis. The emissions reductions from the CO Boiler did not "result from any projects conducted or controls utilized to comply with" the consent decree. Instead, those reductions stemmed from two other sources: (1) the 2007 DAQ permit's requirement that Holly install a wet gas scrubber to treat gases produced by the Fluid Catalytic Cracking Unit (FCCU), and (2) a business decision to replace the CO Boiler and other boilers with newer, more efficient boilers. Astin Decl. ¶¶ 10, 12, 16.

The July 2012 NOI includes in its netting analysis the reduction in emissions from the decommissioning of the CO Boiler. This figure reflects two sources of emissions reductions: the decommissioning of the CO Boiler, and the installation of the wet gas scrubber to treat gasses from the FCCU. Astin Decl. ¶ 16. Previously, the FCCU flue gas discharged to the CO Boiler for emission control. In the fall of 2012, the FCCU flue gas was rerouted away from the CO Boiler and to the new wet gas scrubber. Astin Decl. ¶ 16. Shortly thereafter in late 2012, Holly shut down the CO Boiler. Astin Decl. ¶ 16.

Installation of the Wet Gas Scrubber.

In October 2006, Holly submitted a NOI to DAQ for Holly's proposed modernization project, which was approved in June 2007. At the time of the approval order, the CO Boiler received gasses from the FCCU. The NOI, as approved, required Holly to install a gas scrubber, which would treat the gas from the FCCU. Astin Decl. ¶ 10; October 2006 NOI at 2-2, 3-4. The consent decree did not impose a more stringent limitation. Rather, it reiterated the same requirement: that Holly install a wet gas scrubber. Consent Decree ¶¶ 25, 33.

The requirements contained in the 2007 permit issued by DAQ were legally binding on Holly. See Utah Admin Code r.307-401-5(1) (requiring proposed new or modified sources to "submit a notice of intent to the director and receive an approval order prior to initiation of construction, modification or relocation"); Utah Admin Code r.307-130-2 (providing for penalties for violations of approval orders); see also 42 U.S.C. § 7475(a)(1) (requiring a permit to be issued which satisfies the PSD requirements before construction may commence). Further, those requirements bound Holly when the approval order was issued in June 2007, well before the entry of the consent decree in July 2008.

Accordingly, the portion of emissions reductions due to the installation of the wet gas scrubber was the result of the 2007 permit, not the result of any controls utilized to comply with the consent decree. Therefore, these emissions reductions do not "result from" the consent decree and do not fall within the scope of ¶ 142.

Decommissioning the CO Boiler.

The shutdown of the CO Boiler was likewise not the result of any controls utilized to comply with the consent decree. By 2009, it had become clear that the available boilers were not able to produce sufficient steam for certain units which had been constructed to comply with federal requirements regarding the removal of sulfur. Astin Decl. ¶ 12. In September 2009, Holly submitted an NOI to DAQ, proposing construction of Boilers #9 and #10. The NOI further proposed the installation of Selective Catalytic Reduction (SCR) technology on these boilers, a highly effective means of reducing NO_x emissions. This NOI was approved in January 2010. Astin Decl. ¶ 13.

Holly designed Boilers #9 and #10 to have sufficient capacity to replace the CO Boiler entirely. In addition, the increased capacity from the new boilers would enable Boilers #4 and #5 to be placed on standby, only needing to be operated if Boiler #9 or #10 were shut down for maintenance. This decision was made for business reasons: Holly was able to replace old, outdated, and inefficient boilers with new, more efficient boilers equipped with state of the art emissions reduction technology. Astin Decl. ¶¶ 12-14, 16. The emissions from new Boilers #9 and #10, which were equipped with SCR, were included in Holly's July 2012 netting analysis. July 2012 NOI at 3-14.

Accordingly, the emissions reduction from the shutdown of the CO Boiler does not fall within the scope of the consent decree. The shutdown did not result from controls utilized to comply with the consent decree, but rather from a business decision to replace an outdated piece of equipment with more efficient technology. As a result, the prohibition contained in ¶ 142 of the consent decree does not apply. Holly should be entitled to use the entirety of the reduction in emissions from the shutdown of the CO Boiler.

IV. The Reduction In Emissions From The Shutdown Of The Propane Pit Flare Was Properly Included In Holly's Netting Analysis.

The emissions reduction resulting from the shutdown of the Propane Pit Flare was properly included in Holly's netting analysis, for three reasons.

First, the shutdown of the Propane Pit Flare was not a result of requirements in the consent decree, but rather due to Holly's business decision to dismantle the propane pit. Holly installed the new Propane Pit Flare in late 2009, to assist in the operation of the propane pit. However, Holly ultimately decided to remove the propane pit in its entirety for several reasons: market considerations led to liquid propane being less commercially attractive, the propane pit's technology had become outdated, and the property on which the

propane pit was operating was more valuable to Holly for other purposes. Astin Decl. ¶ 22. As a result, Holly decided to shut down the propane pit and remove the Propane Pit Flare for business reasons. Accordingly, the reductions did not fall within the scope of the prohibition of ¶ 142 of the consent decree and were properly included in the netting analysis.

Second, the emission reduction from the removal of the Propane Pit Flare was properly considered under ¶¶ 142, 143(a), and 143(b) of the consent decree. The only portion of the consent decree containing requirements relating to the Propane Pit Flare are ¶¶ 56 and 57, which require Holly to meet the New Source Performance Standards (NSPS) for flaring devices, using one or a combination of methods. Consent Decree ¶¶ 56(a), 57. The consent decree neither established an emission limitation nor required the installation of any control technology on the Propane Pit Flare.

Accordingly, the emissions reduction from the shutdown of the Propane Pit Flare do not fall within the scope of ¶ 142, because the shutdown of the Propane Pit Flare was not a "control utilized to comply with this Consent Decree." Consent Decree ¶ 142. Similarly, the emission reduction falls within ¶ 143(b), which permits the use of emissions reductions "for refinery units that are not subject to an emission limitation pursuant to this Consent Decree." Consent Decree ¶ 143(b). While the Propane Pit Flare was subject to NSPS requirements, it was not subject to an "emission limitation" under the consent decree.

Third, the reduction from the shutdown of the Propane Pit Flare was properly included in the netting analysis under ¶ 143(a), as a more stringent limitation. EPA agrees that the emissions reduction from the shutdown of the new Propane Pit Flare falls within the scope of ¶ 143(a), so long as the NSPS requirements for the Propane Pit Flare were met prior to its shutdown. The Region 8 letter states that "if the new Propane Pit Flare was operating in compliance with ¶ 56.a. of the Decree, Holly would be permitted under ¶ 143.a. of the decree to take credit for emission reductions below the post-control baseline that will result from the shutdown of the new Propane Pit Flare." Letter from Carly Daly, EPA Region 8, to Bryce Bird, Utah DAQ, at 4 (Jan. 18, 2013).

Holly's operation of the Propane Pit Flare was in compliance with NSPS prior to its shutdown. The NSPS regulations require major stationary sources to conduct performance tests for new or modified sources subject to NSPS, 40 C.F.R. § 60.8, and to report the results of such tests to EPA, 40 C.F.R. § 60.11(e)(2).

Holly conducted such tests and reported the results, which demonstrated that Holly was in compliance with the NSPS requirements as well as ¶ 56(a) of the consent decree. As documented in Holly's July 29, 2010, semiannual progress report to EPA,[3] Holly successfully conducted the performance pit flare test on March 25, 2010. Astin Decl. ¶ 21;

[3] This progress report is enclosed.

July 2010 Semiannual Progress Report, at Discussion of Consent Decree ¶ 56; see also Holly Propane Flare Sample Report at 4 (Mar. 25, 2010) (finding that the propane pit flare satisfied the applicable requirements of 40 C.F.R. § 60.18).[4]

In summary, the shutdown of the Propane Pit Flare was not a result of the consent decree, but rather due to Holly's business decision to dismantle the propane pit. Moreover, the consent decree neither established an emission limitation nor required the installation of any control technology on the Propane Pit Flare. Finally, the Propane Pit Flare was in compliance with the consent decree, so the reduction in emissions from Holly's shutdown of that pit flare may be used for netting purposes under ¶ 143(a) of the consent decree, as is conceded in EPA's January 18, 2013 letter.

V. Holly May Use A Reduction In Emissions From Boiler #8 In Its Netting Analysis.

The consent decree required installation of NGULNB control technology on Boiler #8. Consent Decree ¶ 46(a), App'x B. Holly instead decided to install more stringent SCR technology on Boiler #8. Astin Decl. ¶ 19. Accordingly, Holly is entitled to the portion of emissions reduction representing the difference in emission levels between operation of the boiler with NGULNB and operation of the boiler with SCR, pursuant to ¶ 143(a) of the consent decree.

Paragraph 143(a) permits Holly to "utilize or generate netting reductions or emission offset credits from refinery units that are covered by this Consent Decree to the extent that the proposed netting reductions or emission offset credits represent the difference between the emissions limitations set forth in this Consent Decree for these refinery units and the more stringent emissions limitations that Holly may elect to accept for these refinery units in a permitting process." Consent Decree ¶ 143(a).

SCR is a more advanced technology, resulting in lower emissions than NGULNB technology. EPA's January 18 letter mistakenly states the consent decree contemplated a NO_x limit set below .020 lb NO_x/mm/Btu if NGULNB technology was installed, but that is not correct. The consent decree defined NGULNB technology as burners "that are designed to achieve a NO_x emission rate of less than or equal to 0.020 lb NO_x/mm BTU" under certain conditions. Consent Decree ¶ 10(dd) (emphasis added). But the fact that a control technology is "designed" to achieve a certain emissions limitation does not mean it actually will achieve such an emissions limitation when operating on actual equipment in the field.

In recognition of this fact, the consent decree specifies a process for determining the appropriate NO_x emissions limit: Holly is to conduct an initial performance test, and then

[4] The March 25, 2010 report is enclosed.

submit a permit application to DAQ requesting an emissions limitation not based on the design specification, but instead "based on actual performance as demonstrated by [continuous emissions monitoring system] and performance tests." Consent Decree ¶ 46(c).

Holly submits that installation of NGULNB on Boiler #8 would have resulted in a higher emissions limitation under this provision than the limitation that resulted from the installation of SCR. Accordingly, Holly is entitled to use the difference in emissions limitations between the two technologies under ¶ 143(a) of the consent decree.[5]

Conclusion

Holly submits that the netting analysis was proper for the reasons stated in its February 12, 2013 letter and in this letter. As explained in its February 12, 2013 letter, ¶ 143(c) of the consent decree expressly allows Holly to use consent decree emission reductions in connection with the Woods Cross modernization project. Moreover, as explained above, two of the three emission reductions addressed in EPA's letter (the CO boiler and propane pit flare) resulted from decisions made by Holly to discontinue operation of the sources for business reasons, and to install a wet gas scrubber to treat gases from the FCCU pursuant to the 2007 DAQ approval order, and thus the reductions did not result from projects or controls "utilized to comply with this Consent Decree" within the scope of ¶ 142 of the consent decree.

Holly accordingly requests that EPA reconsider the position stated in EPA's January 18, 2013 letter to DAQ and withdraw its objections to the use of the emission reductions in question.

It is important to resolve this matter promptly. The DAQ permit process has been stalled as a result of EPA's January 18, 2013 letter objecting to Holly's netting analysis. Holly employs hundreds of people performing quality, high-paying jobs. Holly also contributes to the community by paying taxes, royalties, refining of essential fuels, and the continuous efforts of Holly employees to operate a facility that is safe and compliant with Federal and State environmental requirements. Delays in the permit process will delay and impair the benefits of this project to the community and the nation.

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[5] EPA's January 18 letter also appears to take the position that the installation of SCR could never be considered a more stringent control technology unless NGULNB technology was also installed, because the installation of SCR would be a control installed to comply with the decree. EPA is mistaken: nothing in the consent decree states that a particular control cannot be both a means of compliance with the consent decree and also a "more stringent" limitation within the meaning of ¶ 143(a).

We appreciate your efforts to try to resolve this dispute informally. Let us know if an additional meeting would be useful.

Sincerely yours,

COVINGTON & BURLING LLP

By:
Theodore L. Garrett
Thomas Brugato

PARR BROWN GEE & LOVELESS

Steven J. Christiansen
Megan J. Houdeshel

cc: Gregory Fried (EPA HQ)
Pat Foley (EPA HQ)
Virginia Sorrell (EPA HQ)
Dana Stotsky (EPA Region 8)
Bryce Bird (DAQ)
Christian Stephens (UAG)

Declaration of Michael S. Astin

I, Michael S. Astin, under penalty of perjury, hereby declare as follows:

1. I am the environmental manager for Holly Refining & Marketing Company – Woods Cross LLC ("Holly"). I have held this position since August 2007.

2. My duties on behalf of Holly include oversight of compliance with Holly's environmental obligations, including under the Clean Air Act, at Holly's Woods Cross Refinery (the "Refinery"). The Refinery is located in Davis County, Utah.

3. This declaration is provided to address certain statements in the letter from EPA Region 8 dated January 18, 2013, which questioned Holly's use of certain emission reductions in the netting analysis accompanying Holly's pre-construction permit application, namely reductions from the CO Boiler, Boiler #8 and the Propane Pit Flare.

4. This Declaration is based on my personal knowledge and belief.

Holly's Woods Cross Modernization Project

5. In October 2006, Holly submitted a Notice of Intent (NOI) to the Utah Division of Air Quality (DAQ), requesting approval of a number of proposed modifications to the Refinery, designed to implement Holly's modernization plan. Holly's proposed modernization plan would enable Holly to expand the Refinery's processing capacity, to enable the Refinery to process heavier crude feed containing higher sulfur content, and to modernize a number of pieces of equipment at the Refinery. The 2006 NOI is attached hereto as Exhibit A.

6. The October 2006 NOI was approved by an Approval Order (AO) issued by DAQ in June 2007. The AO was numbered DAQE-AN0101230023-07. The 2007 AO is attached hereto as Exhibit B.

7. In 2008, Holly entered into a Consent Decree with the United States and the State of Utah, requiring Holly to, *inter alia*, install certain controls on equipment at the Refinery.

8. In July 2012, Holly submitted a NOI to DAQ, requesting a modification of DAQ's 2007 AO. Holly sought a modification primarily due to a revision in the planned nature of the crude oil feed to the Refinery. Rather than use heavier crude with a higher sulfur content, Holly would use lighter black wax and yellow wax crude, produced primarily in eastern Utah.

9. In its July 2012 NOI, Holly presented a netting analysis for the Refinery modernization project showing increases and decreases in emissions from various sources. The netting analysis included reductions in emissions from the CO Boiler, Boiler #8, and the Propane Pit Flare.

The CO Boiler

10. The 2006 NOI, as approved by the 2007 AO, required installation of a wet gas scrubber, to treat regenerator gas from the Fluid Catalytic Cracking United (FCCU) after such gasses left CO Boiler #6. At the time of the 2007 AO, the FCCU was connected to CO Boiler #6.

11. The 2008 Consent Decree reiterated the 2007 AO's prior requirement that a wet gas scrubber be installed to treat gasses from the FCCU.

12. By 2009, it had become clear that the existing Refinery boilers were inefficient and were not able to produce sufficient steam for Holly's modernization project, including certain units that had been installed to comply with federal requirements for the removal of sulfur from fuels. Holly therefore made a business decision that additional steam production would be required for the modernization project. In particular, as explained below, Holly

decided to install two new boilers (Nos. 9 and 10), to place two existing boilers (Nos. 4 and 5) on standby, and to decommission one boiler (No. 6) .

13. In September 2009, Holly submitted a second NOI to DAQ, requesting permission to install two new boilers – Boiler #9 and Boiler #10. The NOI proposed installation of Selective Catalytic Reduction (SCR) technology on each boiler. SCR is a highly effective control technology for reducing Nitrogen Oxide (No_x) emissions, typically providing greater emissions reductions than those provided by Next-Generation Ultra-Low No_x Burners (Next Generation ULNB). An AO for this NOI was issued by the State in January 2010.

14. In addition to providing additional steam, Boilers #9 and #10 would be able to replace older, less efficient units. Boilers #9 and #10 were designed to have sufficient capacity to replace the CO Boiler (No. 6) entirely and to allow the older Boilers #4 and #5 to be placed on standby. Placement of Boilers #4 and #5 on standby meant they would need to be operated only if Boiler #9 or Boiler #10 were shut down for maintenance.

15. The installation of Boiler #9 was complete by October 2010. The installation of Boiler #10 was complete by January 2013.

16. The installation of the new, more efficient Boiler #9 and Boiler #10 obviated the need for continued operation of the CO boiler. Accordingly, in late 2012, shortly after flue gas from the FCCU was routed to the new wet gas scrubber, the CO boiler, which had been disconnected from the FCCU, was decommissioned.[1] The CO boiler was decommissioned for the foregoing business reasons and not for the purpose of complying with the Consent Decree.

Boiler #8

[1] The July 2012 NOI's netting reduction regarding the CO Boiler incorporates the reduction in emissions resulting from both the installation of the wet gas scrubber and the decommissioning of the CO Boiler.

17. The 2007 NOI and AO required Holly to install ULNB technology on Boiler #8.

18. The 2008 Consent Decree required Holly to install Next Generation ULNB technology, or Alternative NO_x Control Technology, on Boiler #8.

19. Rather than install Next Generation ULNB on Boiler #8, Holly decided to install SCR. The SCR technology typically provides greater emission reductions than provided by Next Generation ULNB. The installation of SCR on Boiler #8 was completed by late 2012.

The Propane Pit Flare

20. The Consent Decree did not require any reduction in emissions from the Propane Pit Flare. Instead, the Consent Decree required compliance with the applicable New Source Performance Standards (NSPS).

21. Holly installed a new Propane Pit Flare in November 2009. Holly conducted its performance test for the new Propane Pit Flare in March 2010. The test was successful and Holly satisfied the relevant NSPS requirements. The relevant portion of the test results are attached hereto as Exhibit C. Holly reported the results to EPA in its July 2010 semiannual progress report, the relevant portion of which is attached hereto as Exhibit D.

22. As a result of several changes in the marketplace, Holly made a business decision to remove the propane pit, which accordingly made the new Propane Pit Flare superfluous, given the absence of a propane pit. Holly plans to remove the propane pit for several business reasons. First, variations in the seasonal price of propane made continued operation of the propane pit less attractive. Second, the technology of the propane pit was becoming outdated and inefficient. Third, the land occupied by the propane pit could be used for other purposes in support of the Refinery's other operations. As a result of these business considerations, Holly decided to shut down the propane pit. Removal of the Propane Pit Flare is planned for this year. The Propane

Pit Flare is being removed for the foregoing business reasons and not for the purpose of complying with the Consent Decree.

I verify under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Michael S. Astin

Dated this 20th Day of March, 2013.

Holly Refinery: Requested Revisions to Heavy Crude Processing Change to the Modernization Project

April 1, 2013

HOLLYFRONTIER

HOLLY REFINING & MARKETING COMPANY – WOODS CROSS LLC

1070 West 500 South • West Bountiful, Utah 84087-1442
(801) 299-6600 • Fax (801) 299-6609

April 1, 2013

UTAH DEPARTMENT OF
ENVIRONMENTAL QUALITY

APR 0 1 2013

DIVISION OF AIR QUALITY

HAND DELIVERED

Mr. Bryce Bird, Director
Division of Air Quality
Utah Dept. of Environmental Quality
195 North 1950 West
Salt Lake City, Utah 84114

RE: **Requested Revisions to Heavy Crude (Black Wax) Processing Change to the Modernization Project**

Dear Mr. Bird:

On March 25th, 2013 representatives from Holly Refining & Marketing Company – Woods Cross LLC ("Holly") met with representatives from the Division of Air Quality ("DAQ") to discuss the status of Holly's request to modify its Approval Order to incorporate changes to the previously permitted Modernization Project. It was made clear to Holly at that meeting that even if the DAQ agreed to the requested permit modification on the basis of the netting analysis that was submitted by Holly on March 21st, the final Approval Order would not be issued until there was a resolution, whether by EPA concurrence or by litigation, on the alleged inclusion of Consent Decree reductions in that netting analysis, and that the expected delay in obtaining such resolution would likely result in further delay in issuance of the permit. Accordingly, Holly has identified additional measures that it will voluntarily undertake to reduce emissions from existing equipment, and has modified the netting analysis to remove the disputed Consent Decree reductions and still demonstrate minimal emission increases. While these additional voluntary emission reductions will address the comments and should alleviate concerns about Holly's alleged use of the reductions from Consent Decree requirements in the netting analysis, they are also consistent with Holly's values to minimize our emissions and lessen our impact on the environment.

The additional emissions reductions will be obtained by replacing the gas-driven engines on 4 compressors with electric motors. The 4 compressors are the FCC KVG East and West gas compressors 4-4a and 4-4b (DAQ IDs 5499 and 5502) and the Reformer SVG East and West gas compressors 6-4a and 6-4b (DAQ IDs 5503 and 5504).

4K1A
4K1B
6K1
6K2

We have revised the netting analysis, removing the previous contributions to the netting analysis that included the emissions reductions that were referenced in our Consent Decree. The revised analysis now includes the increases associated with the new equipment that we are requesting, adds the equipment that was previously permitted and that we still plan to construct, adds other contemporaneous increases in emissions resulting from minor changes we have permitted but were otherwise unrelated to the Modernization Project, and then incorporates the other reductions in emissions that we have proposed or recently achieved.

A revised netting analysis was conducted in accordance with the suggested procedures for determining net emissions changes at a source as found in EPA's New Source Review Workshop Manual, Prevention of Significant Deterioration and Nonattainment Area Permitting. These procedures are as follows:

1. Determine the emissions increases (but not any decreases) from the proposed project. If increases are significant, proceed; if not, the source is not subject to review.
2. Determine the beginning and ending dates of the contemporaneous period as it relates to the proposed modification.
3. Determine which emissions units at the source experienced (or will experience, including any proposed decreases resulting from the proposed project) a creditable increase or decrease in emissions during the contemporaneous period.
4. Determine which emissions changes are creditable.
5. Determine, on a pollutant-by-pollutant basis, the amount of each contemporaneous and creditable emissions increase and decrease.
6. Sum all contemporaneous and creditable increases and decreases with the increase from the proposed modification to determine if a significant net emissions increase will occur.

Davis County is attainment for the following pollutants: NOx, SOx, VOC, CO, and GHG. In accordance with Step 1, the emissions increases from the proposed project were determined and are presented as revised NOI Table 3-3 (found in Attachment 1). Startup and shutdown emissions from the proposed project sources were also included in the Step 1 project totals. VOC emissions include 15.25 tpy of fugitive emissions. Significance for criteria pollutants is defined in R307-101-2 and for GHGs in R307-405-3.The project estimated emissions including startup and shutdown emissions are as follows:

NO_X + 81.47 tpy + 1.92 tpy = 83.39 tpy > 40 tpy significance
SO_2 + 38.23 tpy + 0.04 tpy = 38.27 tpy < 40 tpy significance
VOC + 32.29 tpy + 0.11 tpy = 32.40 tpy < 40 tpy significance
CO + 334.66 tpy + 10.48 tpy = 345.14 tpy > 100 tpy significance
GHG + 262,389 metric tpy CO2e > 75,000 tpy CO2e

The project emissions increases from NO_X, CO, and GHG are significant; therefore, a netting analysis was prepared for NO_X, and CO emissions looking back five (5) years at contemporaneous emission increases and decreases.

In Step 2, the contemporaneous period is defined. For this project, the contemporaneous period is defined as beginning five years prior to the start of construction on the proposed project and ending when the project begins operation. This means that if construction will commence on the equipment requested in the July 2012 NOI sometime in the next 6 months, say July 2013, then the contemporaneous period start date is July, 2008, five years prior to the commencement of construction. The contemporaneous period end date will be the date on which the proposed equipment has been built and is fully operational, in other words, when the increase from the change "occurs." Any increases or decreases in actual emissions that occurred after July 2008 and before final installation of the requested equipment, will be considered contemporaneous. Site work for construction is scheduled to begin as soon as approval to

proceed is obtained. Startup of the earliest portions of this project is anticipated to begin in April 2014. Completion of the entire project is projected by December 2016.

Baseline actual emissions for project affected sources were calculated in accordance with 40 CFR 52.21 and are presented below. These emissions are based on a consecutive 24-month period in the past 10 years as reported in the Holly Refinery annual emission inventories. A revised NOI Table 3-2 is presented in Attachment 1.

looks like 2004-2005 was used?

NO_X: January 2007- December 2008
CO: January 2010 - December 2011

In Steps 3-5, any other increases and decreases in actual emissions at Holly that were contemporaneous with the particular change and were creditable were evaluated. Baseline actual emissions for calculating increases and decreases were determined in accordance with 40 CFR Part 52.21 (b)(48). An increase or decrease in actual emission is creditable only if actual emission increases or decreases have not been relied on when issuing a permit. In addition, an increase in actual emissions is creditable only to the extent that the new level of actual emissions exceeds the old level. A decrease in actual emissions is creditable only to the extent that: (a) the old level of actual emissions exceeds the new level of actual emissions; (b) it is enforceable as a practical matter at and after the time that actual construction on the particular change begins; and (c) it has approximately the same qualitative significance for public health and welfare as that attributed to the increase from the particular change.

For this revised netting analysis, as mentioned previously, Holly only considered those creditable emissions that were ***not*** subject to Consent Decree requirements and ***not*** relied on for previously issued permits. Tables 2 and 3 present summaries of the contemporaneous creditable emission increases and decreases. Increases associated with new equipment that was permitted in the 2007 Approval Order but began operation in the contemporaneous period have been included as contemporaneous emissions.

The netting analysis does not include any change in emissions from heaters 8H1 and 12H1 because there were no significant changes in actual emissions from those heaters. Emissions before replacing the burners were determined using AP-42 emission factors of 100 lb/scf of NO_X (or at 1020 Btu/scf, 0.098 lbs/MMBtu of NO_X). Results from performance tests conducted after the installation of next-generation ultra-low NO_X burners in 2008 showed actual emissions between .072 and .085 lb/MMBtu of NO_X for the two heaters, a slight reduction that we have treated as inconsequential for these purposes. Because the actual performance of the new burners did not result in the reductions anticipated in the 2007 Approval Order, the permitted emissions were later readjusted back up in a subsequent modification in 2009.

The netting analysis does include a reduction in emissions from the planned shutdown of Frozen Earth Propane Storage Facility (Propane Pit), and the historical flaring from that facility. Baseline emissions for the flare at the propane pit were calculated based on the AP-42 emission factors for flares. The pit flare was replaced in November 2009 to comply with New Source Performance Standards (NSPS). Compliance with NSPS affects neither the AP-42 emission factor calculation, which is based on the

amount of propane used, nor the baseline calculation, because the NSPS standards do not include emission controls or other modifications that would result in a decrease in emissions. See 40 C.F.R. § 60.18(b)-(f). Accordingly, the post-control baseline emissions and pre-control baseline emissions are identical. EPA's January 18, 2013 letter agrees that the consent decree allows use of the reductions from the shutdown of the propane pit flare so long as the new pit flare is in compliance with NSPS at the time it is shut down, which was demonstrated in Holly's April 2010 performance test report and July 29, 2010 semi-annual progress report.

A summary of the contemporaneous increases/decreases in emissions for NO_X and CO are presented below and in revised NOI Table 3-4 presented in Attachment 1. Please note that emissions within parenthesis are negative values.

NO_X: + 58.7 tpy (contemporaneous) - 104.9 tpy (this project) = (46.2) tpy
CO: + 186.7 tpy (contemporaneous) - 198.4 tpy (this project) = (11.7) tpy

In Step 6, all contemporaneous and creditable increases and decreases with the increase from the proposed modification were summed to determine if a significant net emissions increase will occur. The net emission increases for NO_X and CO are as follows:

NO_X: 83.39 tpy - 46.2 tpy = 37.19 tpy increase < 40 tpy significance
CO: 345.14 tpy – 11.72 tpy = 333.42 tpy increase > 100 tpy significance

Thus, PSD review is triggered for CO and GHG emissions. The analysis, considering contemporaneous emissions, netted Holly Refinery out of PSD review for NO_X. GHG emissions were revised from the 2012 NOI submittal to reflect the removal of 26H1 hot oil furnace and replacement of 4 compressor drivers with electric motors. Table 3-6 of the 2012 NOI has been revised and included in Attachment 1. It shows an increase of GHG emission of 5,364,708 metric tpy CO2e, including products.

Existing GHG emissions were estimated at 656,530 metric tpy CO_2e, which includes previously permitted equipment. A CO_2e emission limitation of 910,186 would be based on the existing GHG emissions (656,530 metric tpy CO_2e) plus the proposed increase in GHG emissions (262,389 metric tpy CO_2e minus 8,733 metric tpy CO_2e in proposed reductions). This total does not include the estimated product GHG emission increase (5,102,319 metric tpy CO_2e). 910,186 metric tons

Davis County is nonattainment for PM2.5 and Holly Refinery has been defined as a contributing source to the Salt Lake County PM10 non-attainment area. The project estimated emissions for PM10 and PM2.5 are presented below and in revised Table 3-3.

PM10: +9.56 tpy < 15 tpy
PM2.5: +9.21 tpy < 10 tpy

The project emissions of PM10 and PM2.5 are below significance levels.

Based on the revised netting analysis, overall emissions (including all increases and decreases) for criteria and hazardous pollutants are estimated to be as follows:

NOx -	+37.2 TPY
SO2 -	-109.8 TPY
VOC -	+4.26TPY
PM10 -	+10.02 TPY
PM2.5 -	+8.36 TPY
CO -	+333.42 TPY
Lead -	+0.002 TPY
HAPs -	+20.11 (TPY) (with 9.14 tons single pollutant increase for hexane)

We believe that this will address the remaining concerns presented in comments to the proposed Approval Order. If you have any questions or need additional information, please call me at (801) 299-6625.

Sincerely,

Michael S. Astin, P.E.
Environmental Manager

Attachment

c: C. Harry (Utah DAQ)
M. Wright, Jr.
File 2.5.1

Attachment 1
Revised NOI Tables

Table 3-2

Baseline Actual 24-Month Period

Pollutant	Consecutive 24-month Period
PM_{10}	January 2005 - December 2006
$PM_{2.5}$	January 2008- December 2009
SO_2	January 2005 - December 2006
NO_x	January 2007 – December 2008
CO	January 2010 – December 2011
VOC	January 2007- December 2008

Table 3-3

Proposed PTE Increased Emissions from Heavy Crude Processing Project New and Modified Equipment Only

Emission Unit	PM_{10} (TPY)	$PM_{2.5}$ (TPY)	SO_2 (TPY)	NO_x (TPY)	VOC (TPY)	CO (TPY)	Total HAPS (TPY)
24H1 Crude Furnace #3 (new)	0.13	0.11	2.61	10.51	1.42	21.02	0.49
25H1 FCC#2 Feed Heater (new)	0.10	0.08	1.96	7.88	1.06	15.77	0.36
FCCU #2 Wet Scrubber (new)	8.15	8.15	17.70	19.91	--	154.85	--
27H1 Reactor Charge Heater (new)	0.22	0.18	4.31	8.67	2.34	34.69	0.80
20H3 Reactor Charge Heater (new)	0.09	0.08	1.83	7.38	1.00	14.75	0.34
Boiler #11 (new)	0.20	0.16	3.88	7.82	1.56	14.47	0.72
Sour Water Stripper	--	--	--	--	--	--	--
Cooling Tower #10 (new)	0.10	0.0006	--	--	1.56	--	2.07
Cooling Tower #11 (modified)	0.07	0.0004	--	--	1.19	--	2.07
33H1 Vacuum Furnace Heater (new)	0.29	0.24	5.65	11.39	3.07	45.6	1.05
540 HP Diesel Generator (new)	0.0007	0.00007	0.03	0.11	0.0009	0.008	0.0004
Other Emergency Equipment	0.06	0.06	0.06	0.84	0.0009	0.18	0.00
Stab-in Asphalt Tank Heaters (new)	0.01	0.01	0.21	2.06	0.11	1.68	0.04
New and Modified Tanks (See Table 2-1)	--	--	--	--	3.64	--	0.02
Fugitives from leaks (new)	--	--	--	--	15.3	--	0.85
South Flare (modified)	--	--	--	4.9	--	31.7	0.40
12 Additional Truck Bays for Black Wax Crude	--	--	--	--	--	--	--
Startup and Shutdown Emissions	0.14	0.14	0.04	1.92	0.11	10.48	--
Project Total	9.56	9.21	38.27	83.39	32.40	345.14	9.2
NSR/Significant Emissions Rate	15	10	40	40	40	100	NA
Significant	No	No[1]	No	Yes	No[1]	Yes	--

[1] Davis County is non-attainment for $PM_{2.5}$ and maintenance for ozone; thus, $PM_{2.5}$ and VOC emissions are subject to NNSR permitting requirements provisions.

Contemporaneous Project Emission Increases/Decreases

Project	Emission Changes			Source
	NO_2 (TPY)	CO (TPY)	CO_2e (metric TPY)	
Install GOHT charge heater, fractionator reboiler, 10H2 hot oil heater, hydrogen plant furnace #1, hydrogen plant deaerator vent, hydrogen fugitives, hydrogen plant furnace #2, asphalt tank, 2 stab-in heaters, new and modified tanks, increased tank thruput, fugitives	41.8	150.0	171,622	DAQE-AN0101230023-07 (includes previously permitted equipment)
Install 250 gpm charge pump	--	--	--	DAQE-AN101230040-11
Install 3 dedicated ethanol unload areas	--	--	--	DAQE-101230039-11
Incorporation of FCCU NO_x and SO_2 Limits from CD	--	--	--	DAQE-AN101230038-10
Install Benzene Sat Unit #23 and boiler #5 NOx limit	0.64 ✓	7.57 ✓	--	NOI Dated April 29, 2010 DAQE-AN0123[illegible]-10
Incorporate NSPS Subpart A & J for CO Emissions to FCCU	--	--	--	DAQE-AN101230032-10
Addition of Boilers #9 and #10	15.65 ✓	28.94 ✓	74,998	NOI dated October 14, 2009; AO DAQE-AN0101230031-10, PM adjusted for new factors.
Incorporate CD Requirements & Add 135 KW diesel generator	0.66[1]	0.12	--	DAQE-AN101230027-09
Propane Pit Flare	-5.36	-129.27	-360	2012 NOI
Existing SRU	-0.85	-0.76	-1025	2012 NOI
4a KVG West	-34.7	-9.28	-2630	Proposed removal March 2013
4b KVG East	-36.7	-12.9	-2630	Proposed removal March 2013
6a SVG West	-12.9	-22.4	-1044	Proposed removal March 2013
6b SVG East	-14.5	-23.8	-1044	Proposed removal March 2013
Total Increases	58.7	186.7	246,620	
Total Decreases	-104.9	-198.4	-8,733	

CD - July 2008 Consent Decree

[1] The NO_2 emissions do not include the increase of 39.3 tons of NO_2 emissions listed in DAQE-AN101230027-09 abstract for heaters 8H1 and 12H1. This emission increase was based on October 8, 2009 performance test results, and reflect adjustment of the permitted emissions related to the NGULNB performance being only nominally better than the replaced burners. These tests were conducted in compliance with the CD after the replacement of the original heater burners with NGULNB or equivalent.

Table 3-6

PTE Greenhouse Gas Emission Estimates for Proposed Heavy Crude Processing Project at Holly Refining & Marketing Company Woods Cross Refinery

Equipment	CO_2 (MTPY)	CH_4 (MTPY)	N_2O (MTPY)
20H3 Reactor Charge Heater	17,660.6	0.35	0.03
24H1 Crude Furnace #3	25,169.6	0.49	0.05
25H1 FCC#2 Feed Heater	18,877.2	0.37	0.04
FCC	53,846.7	1.58	0.32
27H1 Reactor Charge Heater	41,529.8	0.82	0.08
33 H1 Vacuum Furnace Heater	54,534.0	1.07	0.11
#11 Boiler	37,460.7	0.74	0.07
Process Flare (South)	10,070.0	30.40	0.101
Asphalt Heaters (6 total)	2,013.5	0.06	0.004
Tanks	NA	1.00	NA
Fugitives (Leaks)	NA	9.60	NA
Product Combustion	5,102,319	NA	NA
Total w/o Product	261,162	46.48	0.81
Total	5,363,481	46.48	0.81
Total CO_2e (w/o product)			**262,389**
Total CO_2e			**5,364,708**

Note: Table does not include proposed reductions.

- 8,733 = 253,656

DAQ Revised Modernization Project from Holly Refinery's April 1, 2013 Submittal
Holly Woods Cross Refinery

Pollutant	Chloride Furnace #1 (TPY)	FCCU #2 Feed Furnace (TPY)	Isom #2 Reactor Furnace (TPY)	Isom #2 Stabilizer Reboiler (TPY)	Reformer Charge Heater (TPY)	Reformer Stabilizer Reboiler (TPY)	Boiler #1 (TPY)	Boiler #2 (TPY)	Boiler #3 (TPY)	Boiler #4 (TPY)	Boiler #5 (TPY)	Boiler #6 (TPY)	Boiler #7 (TPY)	Cooling Tower (TPY)	Flare (TPY)	Fugitives (TPY)	Total (TPY)	PSD/NNSR Trigger Levels (TPY)	PSD/NNSR Triggered In Step 1
NOx	10.51	7.88	19.91	8.67	7.38	7.82			11.39	0.11	0.84			2.06	4.90	1.92	83.39	40	Yes
SO2	2.61	1.96	17.70	4.31	1.83	3.88			5.65	0.03	0.06			0.21		0.04	38.27	40	No
VOC	1.42	1.06	0.00	2.34	1.00	1.56	1.56	1.20	3.07	8.91E-04	6.78E-02	3.64	15.25	0.11		0.11	32.40	25	Yes
PM10	0.13	0.10	8.15	0.22	0.09	0.20	0.10	0.07	0.29	7.43E-04	5.94E-02			0.01		0.14	9.56	15	No
PM2.5	0.11	0.08	8.15	0.18	0.08	0.16	0.00	0.00	0.24	7.43E-05	5.94E-02			0.01		0.14	9.21	10	No
CO	21.02	15.77	154.85	34.69	14.75	14.47			45.55	7.72E-03	1.80E-01			1.68	31.68	10.48	345.14	100	Yes
lead	1.29E-04	9.66E-05		2.13E-04	9.04E-05	1.92E-04			2.79E-04					1.03E-05			0.001		No trigger
benzene	5.41E-04	4.06E-04		8.93E-04	3.80E-04	8.05E-04	0.25	0.39	1.17E-03	3.20E-05	4.60E-05	4.16E-03	0.80	4.33E-05	0.01		1.461		No trigger
formaldehyde	1.93E-02	1.45E-02		3.19E-02	1.36E-02	2.88E-02			4.19E-02	4.04E-05	5.81E-05			1.55E-03	8.70E-02		0.239		No trigger
hexane	4.64E-01	3.48E-01		7.65E-01	3.25E-01	6.90E-01	0.31	0.47	1.00E+00			8.76E-03	0.98	3.71E-02	2.16E-03		5.407		No trigger
naphthalene	1.57E-04	1.18E-04		2.59E-04	1.10E-04	2.34E-04	4.00E-04	6.00E-04	3.41E-04	2.90E-06	4.18E-06		0.00	1.26E-05	8.19E-04		4.38E-03		No trigger
toluene	8.76E-04	6.57E-04		1.45E-03	6.15E-04	1.30E-03	0.21	0.32	1.90E-03	1.40E-05	2.01E-05	5.99E-03	0.66	7.01E-05	4.32E-03		1.21E+00		No trigger
arsenic	5.15E-05	3.86E-05		8.50E-05	3.62E-05	7.67E-05			1.12E-04					4.12E-06			4.04E-04		No trigger
beryllium	3.09E-06	2.32E-06		5.10E-06	2.17E-06	4.60E-06			6.70E-06					2.47E-07			2.42E-05		No trigger
cadmium	2.83E-04	2.13E-04		4.68E-04	1.99E-04	4.22E-04			6.14E-04					2.27E-05			2.22E-03		No trigger
chromium	3.61E-04	2.71E-04		5.95E-04	2.53E-04	5.37E-04			7.82E-04					2.89E-05			2.83E-03		No trigger
cobalt	2.16E-05	1.62E-05		3.57E-05	1.52E-05	3.22E-05			4.69E-05					1.73E-06			1.70E-04		No trigger
manganese	9.79E-05	7.34E-05		1.62E-04	6.87E-05	1.46E-04			2.12E-04					7.83E-06			7.67E-04		No trigger
mercury	6.70E-05	5.02E-05		1.11E-04	4.70E-05	9.97E-05			1.45E-04					5.36E-06			5.25E-04		No trigger
nickel	5.41E-04	4.06E-04		8.93E-04	3.80E-04	8.05E-04			1.17E-03					4.33E-05			4.24E-03		No trigger
selenium	6.18E-06	4.64E-06		1.02E-05	4.34E-06	9.20E-06			1.34E-05					4.95E-07			4.85E-05		No trigger
Xylene							0.14	0.21		9.76E-06	1.40E-05	2.76E-03	0.44		2.16E-03		0.799		No trigger
Ethylbenzene							9.00E-03	1.41E-02				3.75E-04	0.03		0.11		0.160		No trigger
Cyclohexane																	0.000		No trigger
Trimethylbenzene							0.21	0.33									0.539		No trigger
Isooctane																	0.000		No trigger
Chlorine							0.94	1.44									2.384		No trigger
Acetaldehyde										2.63E-04	3.78E-04				3.20E-03		0.004		No trigger
Acrolein										3.17E-06	4.56E-06				7.45E-04		0.001		No trigger
Propylene															1.82E-01		0.182		No trigger
2,2,4-Trimethylpentane													0.68				0.676		No trigger
Undesignated HAPS																			No trigger
Total HAPS	0.49	0.36	0.00	0.80	0.34	0.72	2.07	3.17	1.05	0.00	0.00	0.02	3.60	0.04	0.40	0.00	13.08		

Pollutant	Trigger Levels (TPY)	PSD/NNSR Triggered In Step 1
NOx	40	Yes
SO2	40	No
VOC	25	Yes
PM10	15	No
PM2.5	10	No
CO	100	Yes
lead		No trigger
benzene		No trigger
formaldehyde		No trigger
hexane		No trigger
naphthalene		No trigger
toluene		No trigger
arsenic		No trigger
beryllium		No trigger
cadmium		No trigger
chromium		No trigger
cobalt		No trigger
manganese		No trigger
mercury		No trigger
nickel		No trigger
selenium		No trigger
Xylene		No trigger
Ethylbenzene		No trigger
Cyclohexane		No trigger
Trimethylbenzene		No trigger
Isooctane		No trigger
Chlorine		No trigger
Acetaldehyde		No trigger
Acrolein		No trigger
Propylene		No trigger
2,2,4-Trimethylpentane		No trigger
Undesignated HAPS		No trigger
Total HAPS		

[1] DAQE-AN0101230023-07

[2] DAQE-AN101230027-09, DAQE-AN101230032-10, DAQE-AN101230038-10, DAQE-101230039-11, DAQE-AN101230040-11

[2] See other contem. permitted emiss. workbook spreadsheet for complete details.

Pollutant	Project Emissions Increase (TPY)	Contemporaneous (Project) Reductions									Contemp. Emission Decrease Total (TPY)	Project Net Total (TPY)
		South Flare Decrease (TPY)	Tanks 71 & 72 Conversion (TPY)	Cooling Towers #4-#8 (TPY)	Propane Flare (TPY)	Existing SRU (TPY)	4a KVG W (TPY)	4b KVG E (TPY)	5a SVG W (TPY)	5b SVG E (TPY)		
NOx	83.39				-5.36	-0.85	-34.69	-36.70	-12.88	-14.45	-104.92	-21.53
SO2	38.27	-4.32			0.00	-184.64	0.00	0.00	0.00	0.00	-188.96	-150.69
VOC	32.40	-3.87	-0.58	-39.28	-1.55	-0.05	-2.06	-2.04	-0.19	-0.22	-49.82	-17.42
PM10	9.56				-0.93	-0.06	-0.08	-0.09	-0.06	-0.04	-1.25	8.31
PM2.5	9.21				-2.19	-0.07	0.00	0.00	-0.07	-0.07	-2.39	6.82
CO	345.14				-129.27	-0.76	-9.28	-12.92	-22.36	-23.79	-198.38	146.76
lead	0.00										0.00	0.00
benzene	1.46										0.00	1.46
formaldehy	0.24										0.00	0.24
hexane	5.41										0.00	5.41
naphthalen	0.00										0.00	0.00
toluene	1.21										0.00	1.21
arsenic	0.00										0.00	0.00
beryllium	0.00										0.00	0.00
cadmium	0.00										0.00	0.00
chromium	0.00										0.00	0.00
cobalt	0.00										0.00	0.00
manganes	0.00										0.00	0.00
mercury	0.00										0.00	0.00
nickel	0.00										0.00	0.00
selenium	0.00										0.00	0.00
Xylene	0.80										0.00	0.80
Ethylbenze	0.16										0.00	0.16
Cyclohexa	0.00										0.00	0.00
Trimethylb	0.54										0.00	0.54
Isooctane	0.00										0.00	0.00
Chlorine	2.38										0.00	2.38
Acetaldehy	0.00										0.00	0.00
Acrolein	0.00										0.00	0.00
Propylene	0.18										0.00	0.18
2,2,4-Trim	0.68										0.00	0.68
Undesignated HAPS											0.00	0.00
Total HAPs	13.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	13.08

Pollutant	Previously Permitted and Contemporaneous Emissions													Contemp. Emissions Increase Total (TPY)	Contemp. Emission Decrease Total (TPY)	Net Total (TPY)
	GOHT/C Charge Heater[1] (TPY)	ractionato Reboiler[1] (TPY)	Hot Oil Heater 10H2[1] (TPY)	H2 Plant Furnace #1[1] (TPY)	H2 Plant Deaerator Vent[1] (TPY)	Hydrogen fugitives[1] (TPY)	H2 Plant Furnace #2[1] (TPY)	Asphalt Tank[1] (TPY)	Stab-in Heaters[1] (TPY)	New & Modified Tanks[1] (TPY)	Increased Tank Thruput[1] (TPY)	Fugitives[1] (TPY)	her Conter (TPY)			
NOx	2.61	8.23	8.67	10.78			10.78		0.69				16.95	58.72	83.39	-104.92	37.2
SO2	0.65	2.04	4.31	5.35			5.35		0.07				23.09	40.87	38.27	-188.96	-109.8
VOC	0.35	1.11	2.34	2.91	3.20	0.055	2.91	0.11	0.04	0.30	0.84	3.88	3.64	21.68	32.40	-49.82	4.3
PM10	0.03	0.10	0.22	0.27			0.27		0.00				0.80	1.71	9.56	-1.25	10.0
PM2.5	0.03	0.09	0.18	0.23			0.23		0.00				0.79	1.54	9.21	-2.39	8.36
CO	5.37	16.95	35.71	44.40	2.63		44.40		0.56				36.63	186.66	345.14	-198.38	333.4
lead	3.20E-05	1.01E-04	2.13E-04	2.64E-04			2.64E-04		3.44E-06					N/A	0.00	0.00	N/A
benzene	1.34E-04	4.24E-04	8.93E-04	1.11E-03			1.11E-03		1.44E-05	0.27	0.13			N/A	1.46	0.00	N/A
formaldehy	4.80E-03	1.51E-02	3.19E-02	3.96E-02			3.96E-02		5.15E-04					N/A	0.24	0.00	N/A
hexane	1.15E-01	3.63E-01	7.65E-01	9.51E-01			9.51E-01		1.24E-02	4.71E-01	1.04E-01			N/A	5.41	0.00	N/A
naphthalen	3.90E-05	1.23E-04	2.59E-04	3.22E-04			3.22E-04		4.19E-06	1.70E-04	1.73E-04			N/A	0.00	0.00	N/A
toluene	2.18E-04	6.86E-04	1.45E-03	1.80E-03			1.80E-03		2.34E-05	2.81E-01	8.45E-02			N/A	1.21	0.00	N/A
arsenic	1.28E-05	4.04E-05	8.50E-05	1.06E-04			1.06E-04		1.37E-06					N/A	0.00	0.00	N/A
beryllium	7.68E-07	2.42E-06	5.10E-06	6.34E-06			6.34E-06		8.24E-08					N/A	0.00	0.00	N/A
cadmium	7.04E-05	2.22E-04	4.68E-04	5.81E-04			5.81E-04		7.56E-06					N/A	0.00	0.00	N/A
chromium	8.96E-05	2.83E-04	5.95E-04	7.40E-04			7.40E-04		9.62E-06					N/A	0.00	0.00	N/A
cobalt	5.37E-06	1.70E-05	3.57E-05	4.44E-05			4.44E-05		5.77E-07					N/A	0.00	0.00	N/A
manganes	2.43E-05	7.67E-05	1.62E-04	2.01E-04			2.01E-04		2.61E-06					N/A	0.00	0.00	N/A
mercury	1.66E-05	5.25E-05	1.11E-04	1.37E-04			1.37E-04		1.79E-06					N/A	0.00	0.00	N/A
nickel	1.34E-04	4.24E-04	8.93E-04	1.11E-03			1.11E-03		1.44E-05					N/A	0.00	0.00	N/A
selenium	1.54E-06	4.84E-06	1.02E-05	1.27E-05			1.27E-05		1.65E-07					N/A	0.00	0.00	N/A
Xylene										1.01E-01	4.50E-02			N/A	0.80	0.00	N/A
Ethylbenzene										1.08E-02	2.38E-03			N/A	0.16	0.00	N/A
Cyclohexane					0					2.00E-01	6.51E-02			N/A	0.00	0.00	N/A
Trimethylbenzene										5.15E-03	1.13E-03			N/A	0.54	0.00	N/A
Isooctane										2.40E-01	5.29E-02			N/A	0.00	0.00	N/A
Chlorine														N/A	2.38	0.00	N/A
Acetaldehyde														N/A	0.00	0.00	N/A
Acrolein														N/A	0.00	0.00	N/A
Propylene														N/A	0.18	0.00	N/A
2,2,4-Trimethylpentane														N/A	0.68	0.00	N/A
Undesignated HAPS													1.65	N/A		0.00	N/A
Total HAPs	0.12	0.38	0.80	1.00	0.00	0.00	1.00	0.00	0.01	1.58	0.49	0.00	1.65	N/A	13.08	0.00	N/A

	PM10	0.00051	lb/MMscf			
	PM2.5	0.00042	lb/MMscf			
	NOx	**SOx**	**VOC**	**PM10**	**PM2.5**	**CO**
Project Emissions	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)
Heavy Crude Project increases	83.39	38.27	32.40	9.56	9.21	345.14
Subtotal	83.39	38.27	32.40	9.56	9.21	345.14
Major Modification Significance	40	40	40	15	10	100
Trigger's Major Modification Significance?	Yes	No	No	No	No	Yes
Program	PSD	PSD	PSD	NNSR	NNSR	PSD
Netting Analysis						
Contemporaneous Increases						
Project decreases	-104.92	-188.96	-49.82	-1.25	-2.39	-198.38
Contemporaneous increases/decreases	58.72	40.87	21.68	1.71	1.54	186.66
Subtotal	-46.20	-148.09	-28.14	0.46	-0.85	-11.72
Net Increase/Decrease	37.19	-109.82	4.26	10.02	8.36	333.42
Major Modification Significance	40	40	40	15	10	100
Trigger's Major Modification Significance?	No	No	No	No	No	Yes
Program	PSD	PSD	PSD	NNSR	NNSR	PSD
Offsetting Analysis	**NOx**	**SOx**	**VOC**	**PM10**	**PM2.5**	**CO**
PM10	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)
Project Increases	83.39	38.27		9.56		
Project Decreases	-104.92	-188.96		-1.25		
Total Increases/Decreases	**-21.53**	**-150.69**		**8.31**		
PM10+NOx+SOx	-163.91	tpy				
PM10 Offset Requirement	0.00	tpy				
Ozone						
Net Emission Increase/Decrease	37.19		4.26			
Significance	**40.00**		**25.00**			
Offset Required	**no**		**no**			
Ozone Offset Requirement	0.00	tpy	0.00	tpy		
PM2.5						
Net Emission Increase/Decrease		-109.82			8.36	
Significance		40			10	
Offset Required		**no**			**no**	
Ozone Offset Requirement		**0.00**	tpy		**0.00**	tpy

GOHT/C Charge Heater - New

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emission (lb/yr)	Emission (tn/yr)
NOx	14.9		0.04		5220.96	2.61
SO2	14.9			1020	1296.13	0.65
VOC	14.9	5.5		1020	703.81	0.35
PM10	14.9		0.00051		66.57	0.03
PM2.5	14.9		0.00042		54.82	0.03
CO	14.9	84		1020	10749.04	5.37
lead	14.9	0.0005		1020	0.06	3.20E-05
benzene	14.9	2.10E-03		1020	2.69E-01	1.34E-04
formaldehyde	14.9	7.50E-02		1020	9.60E+00	4.80E-03
hexane	14.9	1.8		1020	2.30E+02	1.15E-01
naphthalene	14.9	6.10E-04		1020	7.81E-02	3.90E-05
toluene	14.9	3.40E-03		1020	4.35E-01	2.18E-04
arsenic	14.9	2.00E-04		1020	2.56E-02	1.28E-05
beryllium	14.9	1.20E-05		1020	1.54E-03	7.68E-07
cadmium	14.9	1.10E-03		1020	1.41E-01	7.04E-05
chromium	14.9	1.40E-03		1020	1.79E-01	8.96E-05
cobalt	14.9	8.40E-05		1020	1.07E-02	5.37E-06
manganese	14.9	3.80E-04		1020	4.86E-02	2.43E-05
mercury	14.9	2.60E-04		1020	3.33E-02	1.66E-05
nickel	14.9	2.10E-03		1020	2.69E-01	1.34E-04
selenium	14.9	2.40E-05		1020	3.07E-03	1.54E-06
Total HAPS						1.21E-01

Assumptions

Ultra low NO_x burners

20 mmBTU/hr absorbed, 85% efficient, 15% more for maximum, up 10% for HHV, may reduce emissions based on limited operation (only during startup?)

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Small Boilers - Low Nox burners

SO_2 emissions based on H_2S content of 60 ppmv

Was installed in December 2008 at 14.9 million

PM10 and PM2.5 emissions based on EPA PM emission factors for gas-fired boilers (NEI Inventory)

Fractionator Reboiler

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emission (lb/yr)	Emission (tn/yr)
NOx	47.0		0.04		16468.80	8.23
SO2	47.0			1020	4088.45	2.04
VOC	47.0	5.5		1020	2220.06	1.11
PM10	47.0		0.00051		209.98	0.10
PM2.5	47.0		0.00042		172.92	0.09
CO	47.0	84		1020	33906.35	16.95
lead	47.0	0.0005		1020	2.02E-01	1.01E-04
benzene	47.0	2.10E-03		1020	8.48E-01	4.24E-04
formaldehyde	47.0	7.50E-02		1020	3.03E+01	1.51E-02
hexane	47.0	1.8		1020	7.27E+02	3.63E-01
naphthalene	47.0	6.10E-04		1020	2.46E-01	1.23E-04
toluene	47.0	3.40E-03		1020	1.37E+00	6.86E-04
arsenic	47.0	2.00E-04		1020	8.07E-02	4.04E-05
beryllium	47.0	1.20E-05		1020	4.84E-03	2.42E-06
cadmium	47.0	1.10E-03		1020	4.44E-01	2.22E-04
chromium	47.0	1.40E-03		1020	5.65E-01	2.83E-04
cobalt	47.0	8.40E-05		1020	3.39E-02	1.70E-05
manganese	47.0	3.80E-04		1020	1.53E-01	7.67E-05
mercury	47.0	2.60E-04		1020	1.05E-01	5.25E-05
nickel	47.0	2.10E-03		1020	8.48E-01	4.24E-04
selenium	47.0	2.40E-05		1020	9.69E-03	4.84E-06
Total HAPS						3.81E-01

Assumptions

Ultra low NO_x burners

31.68 mmBTU/hr absorbed, 85% efficient, 15% more for maximum, up 10% for HHV.

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Small Boilers - Low Nox burners

SO_2 emissions based on H_2S content of 60 ppmv

Installed at 47.0 MMBtu/hr (HHV) in December 2008

PM10 and PM2.5 emissions based on EPA PM emission factors for gas-fired boilers (NEI Inventory)

Sour Water Stripper Unit

No air emissions are expected from this unit.

Assumptions:
Unit built

10 H2 Hot Oil Heater

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emission (lb/yr)	Emission (tn/yr)
NOx	99		0.02		17344.80	8.67
SO2	99			1020	8611.84	4.31
VOC	99	5.5		1020	4676.29	2.34
PM10	99		0.00051		442.29	0.22
PM2.5	99		0.00042		364.24	0.18
CO	99	84		1020	71419.76	35.71
lead	99	0.0005		1020	0.43	2.13E-04
benzene	99	2.10E-03		1020	1.79E+00	8.93E-04
formaldehyde	99	7.50E-02		1020	6.38E+01	3.19E-02
hexane	99	1.8		1020	1.53E+03	7.65E-01
naphthalene	99	6.10E-04		1020	5.19E-01	2.59E-04
toluene	99	3.40E-03		1020	2.89E+00	1.45E-03
arsenic	99	2.00E-04		1020	1.70E-01	8.50E-05
beryllium	99	1.20E-05		1020	1.02E-02	5.10E-06
cadmium	99	1.10E-03		1020	9.35E-01	4.68E-04
chromium	99	1.40E-03		1020	1.19E+00	5.95E-04
cobalt	99	8.40E-05		1020	7.14E-02	3.57E-05
manganese	99	3.80E-04		1020	3.23E-01	1.62E-04
mercury	99	2.60E-04		1020	2.21E-01	1.11E-04
nickel	99	2.10E-03		1020	1.79E+00	8.93E-04
selenium	99	2.40E-05		1020	2.04E-02	1.02E-05
Total HAPS						8.02E-01

Assumptions

70.8 mmBTU/hr absorbed, 85% efficient, 8% more for maximum, up 10% for HHV

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Small Boilers - Low Nox burners

SO_2 emissions based on H_2S content of 60 ppmv

Proposed change - 10H2 will be equipped with LNB and SCR.

SCR added to control NOx emission.

Proposed emissions based on approximately 21 lb/MMscf or 0.02 lb/MMBtu

Natural gas/refinery fuel gas combusted

PM10 and PM2.5 emissions based on EPA PM emission factors for gas-fired boilers (NEI Inventory)

Hydrogen Reformer Furnace #1

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emission (lb/yr)	Emission (tn/yr)
NOx	123.1		0.02		21567.12	10.78
SO2	123.1			1020	10708.26	5.35
VOC	123.1	5.5		1020	5814.66	2.91
PM10	123.1		0.00051		549.96	0.27
PM2.5	123.1		0.00042		452.91	0.23
CO	123.1	84		1020	88805.79	44.40
lead	123.1	0.0005		1020	0.53	2.64E-04
benzene	123.1	2.10E-03		1020	2.22E+00	1.11E-03
formaldehyde	123.1	7.50E-02		1020	7.93E+01	3.96E-02
hexane	123.1	1.8		1020	1.90E+03	9.51E-01
naphthalene	123.1	6.10E-04		1020	6.45E-01	3.22E-04
toluene	123.1	3.40E-03		1020	3.59E+00	1.80E-03
arsenic	123.1	2.00E-04		1020	2.11E-01	1.06E-04
beryllium	123.1	1.20E-05		1020	1.27E-02	6.34E-06
cadmium	123.1	1.10E-03		1020	1.16E+00	5.81E-04
chromium	123.1	1.40E-03		1020	1.48E+00	7.40E-04
cobalt	123.1	8.40E-05		1020	8.88E-02	4.44E-05
manganese	123.1	3.80E-04		1020	4.02E-01	2.01E-04
mercury	123.1	2.60E-04		1020	2.75E-01	1.37E-04
nickel	123.1	2.10E-03		1020	2.22E+00	1.11E-03
selenium	123.1	2.40E-05		1020	2.54E-02	1.27E-05
Total HAPS						9.97E-01

Assumptions:

Low NOx burners and SCR

Scaled from Artesia at 10 mmscfd with 2 reformer feed furnaces @ 61.55 mmbtu/hr HHV released, 4 burners each.

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Large Boilers - Low Nox burners

SO_2 emissions based on H_2S content of 60 ppmv

Unit not built but still planning on being built

PM10 and PM2.5 emissions based on EPA PM emission factors for gas-fired boilers (NEI Inventory)

Hydrogen Reformer Deaerator Vent

	Artesia (tn/yr)	Artesia (lb/hr)	Ratio to Artesia Unit	(tn/yr)
VOC	1.6		2	3.20
CO		0.3	2	2.63

Assumptions:

CO scaled from Holly's Artesia NM facility permit application at 10 mmscfd and 0.3 lbs/hr.
VOC - emission rate obtained from Holly's Artesia NM facility engineering
Vent to be installed

Hydrogen Unit Fugitives

Pollutant	Emission Rate (tn/yr) [1]	Ratio	Emissions (lb/yr)	Emissions (tn/yr)
VOC	0.38	0.1460	110.95	0.055

Assumptions:

1) Emission rate based on 2004 testing from gas values (0.38 tons for 1370 values)
Ratio based on 200 valves

Hydrogen Reformer Furnace #2

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emission (lb/yr)	Emission (tn/yr)
NOx	123.1		0.02		21567.12	10.78
SO2	123.1			1020	10708.26	5.35
VOC	123.1	5.5		1020	5814.66	2.91
PM10	123.1		0.00051		549.96	0.27
PM2.5	123.1		0.00042		452.91	0.23
CO	123.1	84		1020	88805.79	44.40
lead	123.1	0.0005		1020	0.53	2.64E-04
benzene	123.1	2.10E-03		1020	2.22E+00	1.11E-03
formaldehyde	123.1	7.50E-02		1020	7.93E+01	3.96E-02
hexane	123.1	1.8		1020	1.90E+03	9.51E-01
naphthalene	123.1	6.10E-04		1020	6.45E-01	3.22E-04
toluene	123.1	3.40E-03		1020	3.59E+00	1.80E-03
arsenic	123.1	2.00E-04		1020	2.11E-01	1.06E-04
beryllium	123.1	1.20E-05		1020	1.27E-02	6.34E-06
cadmium	123.1	1.10E-03		1020	1.16E+00	5.81E-04
chromium	123.1	1.40E-03		1020	1.48E+00	7.40E-04
cobalt	123.1	8.40E-05		1020	8.88E-02	4.44E-05
manganese	123.1	3.80E-04		1020	4.02E-01	2.01E-04
mercury	123.1	2.60E-04		1020	2.75E-01	1.37E-04
nickel	123.1	2.10E-03		1020	2.22E+00	1.11E-03
selenium	123.1	2.40E-05		1020	2.54E-02	1.27E-05
Total HAPS						9.97E-01

Assumptions:

Low NOx burners and SCR

Scaled from Artesia at 10 mmscfd with 2 reformer feed furnaces @ 61.55 mmbtu/hr HHV released, 4 burners each.

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Large Boilers - Low Nox burners

SO_2 emissions based on H_2S content of 60 ppmv

Unit not built but still planning on being built

PM10 and PM2.5 emissions based on EPA PM emission factors for gas-fired boilers (NEI Inventory)

Asphalt Tank Emissions

VOC =	0.025	lb/hr
VOC =	219	lb/yr
VOC =	0.11	tn/yr

Assumptions:
Emissions from small amount of residual solvent

2006 Tank Modifications

Total Emissions	New VOC Emissions lbs	Existing VOC Emissions lbs	Net Emissions lbs	Net Emissions tns
#6 Fuel Oil Tank 1	11.32		11.32	0.0057
#6 Fuel Oil Tank 2	11.32		11.32	0.0057
New Cutter Tank	576.51		576.51	0.2883
Tank 28	0.00	69.8	-69.8	-0.0349
Tank 59	110.62	39.4	71.22	0.0356
Total Emissions				0.3003

Crude Furnace #3 (24H1) - New
Holly Marketing & Refining Company
Reference: AP-42, Section 1.4 Natural Gas Combustion, Small Boilers

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	(lb/hr)	Emissions (lb/yr)	(tn/yr)
NOx	60		0.04		2.400	21024.00	10.51
SO2	60			1020	0.596	5219.30	2.61
VOC	60		0.005		0.324	2838.24	1.42
PM_{10}	60		0.00051		0.031	268.06	0.13
$PM_{2.5}$	60		0.00042		0.025	220.75	0.11
CO	60		0.08		4.800	42048.00	21.02
lead	60	0.0005		1020	2.94E-05	0.26	1.29E-04
benzene	60	2.10E-03		1020	1.24E-04	1.08E+00	5.41E-04
formaldehyde	60	7.50E-02		1020	4.41E-03	3.86E+01	1.93E-02
hexane	60	1.8		1020	1.06E-01	9.28E+02	4.64E-01
naphthalene	60	6.10E-04		1020	3.59E-05	3.14E-01	1.57E-04
toluene	60	3.40E-03		1020	2.00E-04	1.75E+00	8.76E-04
arsenic	60	2.00E-04		1020	1.18E-05	1.03E-01	5.15E-05
beryllium	60	1.20E-05		1020	7.06E-07	6.18E-03	3.09E-06
cadmium	60	1.10E-03		1020	6.47E-05	5.67E-01	2.83E-04
chromium	60	1.40E-03		1020	8.24E-05	7.21E-01	3.61E-04
cobalt	60	8.40E-05		1020	4.94E-06	4.33E-02	2.16E-05
manganese	60	3.80E-04		1020	2.24E-05	1.96E-01	9.79E-05
mercury	60	2.60E-04		1020	1.53E-05	1.34E-01	6.70E-05
nickel	60	2.10E-03		1020	1.24E-04	1.08E+00	5.41E-04
selenium	60	2.40E-05		1020	1.41E-06	1.24E-02	6.18E-06
Total HAPS							0.49

Assumptions:
New heater to be installed on second crude unit
Ultra Low NO_x burners
SO_2 emissions based on H_2S content of 60 ppmv
PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

FCC #2 Feed Heater (25H1) - New
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	(lb/hr)	Emissions (lb/yr)	(tn/yr)
NOx	45		0.04		1.800	15768.00	7.88
SO2	45	10.1281		1020	0.447	3914.47	1.96
VOC	45		0.005		0.243	2128.68	1.06
PM_{10}	45		0.00051		0.023	201.04	0.10
$PM_{2.5}$	45		0.00042		0.019	165.56	0.08
CO	45		0.08		3.600	31536.00	15.77
lead	45	0.0005		1020	2.21E-05	0.19	9.66E-05
benzene	45	2.10E-03		1020	9.26E-05	8.12E-01	4.06E-04
formaldehyde	45	7.50E-02		1020	3.31E-03	2.90E+01	1.45E-02
hexane	45	1.8		1020	7.94E-02	6.96E+02	3.48E-01
naphthalene	45	6.10E-04		1020	2.69E-05	2.36E-01	1.18E-04
toluene	45	3.40E-03		1020	1.50E-04	1.31E+00	6.57E-04
arsenic	45	2.00E-04		1020	8.82E-06	7.73E-02	3.86E-05
beryllium	45	1.20E-05		1020	5.29E-07	4.64E-03	2.32E-06
cadmium	45	1.10E-03		1020	4.85E-05	4.25E-01	2.13E-04
chromium	45	1.40E-03		1020	6.18E-05	5.41E-01	2.71E-04
cobalt	45	8.40E-05		1020	3.71E-06	3.25E-02	1.62E-05
manganese	45	3.80E-04		1020	1.68E-05	1.47E-01	7.34E-05
mercury	45	2.60E-04		1020	1.15E-05	1.00E-01	5.02E-05
nickel	45	2.10E-03		1020	9.26E-05	8.12E-01	4.06E-04
selenium	45	2.40E-05		1020	1.06E-06	9.28E-03	4.64E-06
Total HAPS							0.36

Assumptions

Ultra Low NO_x burners

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion

SO_2 emissions based on H_2S content of 60 ppmv

PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

FCCU #2 Scrubber - New
Holly Marketing & Refining Company

Equations Used:

$PM_{10}/PM_{2.5}$ = 6200 lb coke burn/hr /1000 * Consent Decree FCCU PM limit*operating hours per year

SO_2 = Maximum daily FCC flue gas flow rate * Consent Decree FCCU SOx limit *(1/379.5 scf*MW SOx)*Operating hours per year

NO_x = Maximum daily FCC flue gas flow rate * Consent Decree FCCU NOx limit *(1/379.5 scf*MW NOx)*Operating hours per year

CO = Maximum daily FCC flue gas flow rate * Consent Decree FCCU CO limit *(1/379.5 scf*MW CO)*Operating hours per year

		Emissions	
Pollutant	**lb/hr**	**(lb/yr)**	**(tn/yr)**
NO_x	4.545	39818.18	19.91
SO2	4.040	35393.94	17.70
VOC	Neg.	Neg.	Neg.
PM_{10}	1.9	16293.6	8.15
$PM_{2.5}$	1.86	16293.6	8.15
CO	35.354	309697	154.85

Assumptions:

Emissions controlled through wet gas scrubber		
NOx from CD controlled fluid catalytic cracking units:	40	Holly Consent Decree FCCU NOx final limits (ppmvd 0% O2 365 day average)
SO2 from CD controlled fluid catalytic cracking units:	25	Holly Consent Decree FCCU SOx final limits (ppmvd 0% O2 365 day average)
PM10 from CD controlled fluid catalytic cracking units:	0.3	Ja
PM2.5 from CD controlled fluid catalytic cracking units:	0.3	All PM10 assumed to be PM2.5 (lb/1000 lb coke burn)
CO Emission Limit for FCCU:	500	ppm (1 hr average 0% O2)
VOC from controlled fluid catalytic cracking units:	Neg	AP-42 Emission Factors from Table 5.1-1 (lb/10^3 bbl fresh feed) [TOC]
Plant Wide Annual Operating Time:	8760	hr
Conversion from scf to lb mol:	379.5	scf -> lb mol
Maximum daily FCC flue gas flow rate:	23	mmscfd (Engineering Calculation)
Maximum hourly FCC regenerator coke burn rate:	6200	lbs coke burn / hr (Engineering Calculation)
Molecular Weight of CO:	28	lb/lb-mol
Molecular Weight of NOx:	45	lb/lb-mol
Molecular Weight of SOx:	64	lb/lb-mol

Reactor Charge Heater (27H1) - New
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (tn/yr)
NOx	99		0.02		1.98	17344.80	8.67
SO2	99	10.13		1020	0.98	8611.84	4.31
VOC	99		0.005		0.53	4683.10	2.34
PM_{10}	99		0.00051		0.05	442.29	0.22
$PM_{2.5}$	99		0.00042		0.04	364.24	0.18
CO	99		0.08		7.92	69379.20	34.69
lead	99	0.0005		1020	4.85E-05	0.43	2.13E-04
benzene	99	2.10E-03		1020	2.04E-04	1.79E+00	8.93E-04
formaldehyde	99	7.50E-02		1020	7.28E-03	6.38E+01	3.19E-02
hexane	99	1.8		1020	1.75E-01	1.53E+03	7.65E-01
naphthalene	99	6.10E-04		1020	5.92E-05	5.19E-01	2.59E-04
toluene	99	3.40E-03		1020	3.30E-04	2.89E+00	1.45E-03
arsenic	99	2.00E-04		1020	1.94E-05	1.70E-01	8.50E-05
beryllium	99	1.20E-05		1020	1.16E-06	1.02E-02	5.10E-06
cadmium	99	1.10E-03		1020	1.07E-04	9.35E-01	4.68E-04
chromium	99	1.40E-03		1020	1.36E-04	1.19E+00	5.95E-04
cobalt	99	8.40E-05		1020	8.15E-06	7.14E-02	3.57E-05
manganese	99	3.80E-04		1020	3.69E-05	3.23E-01	1.62E-04
mercury	99	2.60E-04		1020	2.52E-05	2.21E-01	1.11E-04
nickel	99	2.10E-03		1020	2.04E-04	1.79E+00	8.93E-04
selenium	99	2.40E-05		1020	2.33E-06	2.04E-02	1.02E-05
Total HAPS							0.80

Assumptions

Low NO_x burners and Selective Catalytic Reduction

NOx emissions based on 20 lb/mmscf (estimated)

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion

SO_2 emissions based on H_2S content of 60 ppmv

PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

Reactor Charge Heater (20H3) - New
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (tn/yr)
NOx	42.1		0.04		1.68	14751.84	7.38
SO2	42.1	10.1281		1020	0.42	3662.21	1.83
VOC	42.1		0.005		0.23	1991.50	1.00
PM_{10}	42.1		0.00051		0.02	188.09	0.09
$PM_{2.5}$	42.1		0.00042		0.02	154.89	0.08
CO	42.1		0.08		3.37	29503.68	14.75
lead	42.1	0.0005		1020	2.06E-05	0.18	9.04E-05
benzene	42.1	2.10E-03		1020	8.67E-05	7.59E-01	3.80E-04
formaldehyde	42.1	7.50E-02		1020	3.10E-03	2.71E+01	1.36E-02
hexane	42.1	1.8		1020	7.43E-02	6.51E+02	3.25E-01
naphthalene	42.1	6.10E-04		1020	2.52E-05	2.21E-01	1.10E-04
toluene	42.1	3.40E-03		1020	1.40E-04	1.23E+00	6.15E-04
arsenic	42.1	2.00E-04		1020	8.25E-06	7.23E-02	3.62E-05
beryllium	42.1	1.20E-05		1020	4.95E-07	4.34E-03	2.17E-06
cadmium	42.1	1.10E-03		1020	4.54E-05	3.98E-01	1.99E-04
chromium	42.1	1.40E-03		1020	5.78E-05	5.06E-01	2.53E-04
cobalt	42.1	8.40E-05		1020	3.47E-06	3.04E-02	1.52E-05
manganese	42.1	3.80E-04		1020	1.57E-05	1.37E-01	6.87E-05
mercury	42.1	2.60E-04		1020	1.07E-05	9.40E-02	4.70E-05
nickel	42.1	2.10E-03		1020	8.67E-05	7.59E-01	3.80E-04
selenium	42.1	2.40E-05		1020	9.91E-07	8.68E-03	4.34E-06
Total HAPS							0.34

Assumptions

Ultra Low NO_x burners

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion

SO_2 emissions based on H_2S content of 60 ppmv

PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

Sour Water Stripper
Holly Marketing & Refining Company

No air emissions expected from this unit.

Assumptions:
Emissions controlled through existing sour water stripper/ammonia stripping unit prior to treatment in existing SRU.

Boiler #11 - New
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (MMBtu/hr)	Conversion lb/mmscf to lb/MMBtu	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (tn/yr)
NOx	89.3		0.02		1.786	15645.36	7.82
SO2	89.3	10.1281		1020	0.886	7768.05	3.88
VOC	89.3		0.004		0.357	3129.07	1.56
PM_{10}	89.3		0.00051		0.046	398.96	0.20
$PM_{2.5}$	89.3		0.00042		0.038	328.55	0.16
CO	89.3		0.037		3.304	28943.92	14.47
lead	89.3	0.0005		1020	4.38E-05	0.38	1.92E-04
benzene	89.3	2.10E-03		1020	1.84E-04	1.61E+00	8.05E-04
formaldehyde	89.3	7.50E-02		1020	6.57E-03	5.75E+01	2.88E-02
hexane	89.3	1.8		1020	1.58E-01	1.38E+03	6.90E-01
naphthalene	89.3	6.10E-04		1020	5.34E-05	4.68E-01	2.34E-04
toluene	89.3	3.40E-03		1020	2.98E-04	2.61E+00	1.30E-03
arsenic	89.3	2.00E-04		1020	1.75E-05	1.53E-01	7.67E-05
beryllium	89.3	1.20E-05		1020	1.05E-06	9.20E-03	4.60E-06
cadmium	89.3	1.10E-03		1020	9.63E-05	8.44E-01	4.22E-04
chromium	89.3	1.40E-03		1020	1.23E-04	1.07E+00	5.37E-04
cobalt	89.3	8.40E-05		1020	7.35E-06	6.44E-02	3.22E-05
manganese	89.3	3.80E-04		1020	3.33E-05	2.91E-01	1.46E-04
mercury	89.3	2.60E-04		1020	2.28E-05	1.99E-01	9.97E-05
nickel	89.3	2.10E-03		1020	1.84E-04	1.61E+00	8.05E-04
selenium	89.3	2.40E-05		1020	2.10E-06	1.84E-02	9.20E-06
Total HAPS							0.72

Assumptions

Selective Catalytic Reduction for emissions control
HAPs Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion
SO_2 emissions based on H_2S content of 60 ppmv
CO emissions based on manufacturer supplied emission rate of 0.037 lb/MMbtu
PM10/PM2.5 emissions based on manufacturer supplied emission rate of 0.01 lb/MMBtu
NOx emissions based on 0.02 lb/MMBtu
VOC emissions based on manufacturer supplied emissions rate of 0.004 lb/MMBtu

Cooling Tower #10 Emissions
Holly Marketing & Refining Company

Reference: South Coast Air Quality Management District, Guidelines for Calculating Emissions from Cooling Towers, June 2006
E = Cooling tower circulating water rate (gal/min) * TDS/10^6 * Drift loss * density of water * 60 * operating hours

$E_{(PM)}$ =	662.83	lb/yr
$E_{(PM)}$ =	0.33	tn/yr
$E_{(PM)}$ =	0.0757	lb/hr
$E_{(PM10)}$ =	190.65	lb/yr
$E_{(PM10)}$ =	0.095	tn/yr
$E_{(PM10)}$ =	0.0218	lb/hr
$E_{(PM2.5)}$ =	1.20	lb/yr
$E_{(PM2.5)}$ =	0.001	tn/yr
$E_{(PM2.5)}$ =	0.0001	lb/hr
$E_{(VOC)}$ =	3127.32	lb/yr
$E_{(VOC)}$ =	1.56	tn/yr
$E_{(VOC)}$ =	0.36	lb/hr

HAPS	Benzene	0.25	tn/yr
	Hexane	0.31	tn/yr
	Naphthalene	0.00	tn/yr
	Toluene	0.21	tn/yr
	Xylenes	0.14	tn/yr
	Ethylbenzene	0.01	tn/yr
	2,2,4 Trimethylpentane	0.21	tn/yr
	Chlorine	0.94	tn/yr

Where:

Water Circulating Rate (gal/min)	8,500
Concentration of Total Dissolved Solids (ppm by weight)	2964.9
Drift Loss of Circulating Water	0.000
Density of Water (lbs/gal)	8.34
Conversion of Minutes to Hours	60
Annual Operating Hours (hr/yr)	8760

Assumptions:

Reference: Calculating Realistic PM_{10} Emissions from Cooling Towers, Joel Reisman and Gordon Frisbie, Abstract No. 216

TDS was based on the average TDS of the existing cooling towers
HAP emissions estimated by Holly based on storage tank HAPs emissions determined using the TANKS software, averaging the last 8 years, and multiplying by 2 standard deviations.
New cooling tower
VOC emission factor from AP-42 Section 5.1-2 controlled

Cooling Tower #11 Emissions
Holly Marketing & Refining Company

Reference: South Coast Air Quality Management District, Guidelines for Calculating Emissions from Cooling Towers, June 2006
E = Cooling tower circulating water rate (gal/min) * TDS/10^6 * Drift loss (%)/100 * density of water * 60 * operating hours

	$E_{(PM)}$ =	468.18	lb/yr
	$E_{(PM)}$ =	0.23	tn/yr - for two cells
	$E_{(PM)}$ =	0.0534	lb/hr
	$E_{(PM10)}$ =	137.84	lb/yr
	$E_{(PM10)}$ =	0.069	tn/yr - for two cells
	$E_{(PM10)}$ =	0.0157	lb/hr
	$E_{(PM2.5)}$ =	0.86	lb/yr
	$E_{(PM2.5)}$ =	0.000	tn/yr - for two cells
	$E_{(PM2.5)}$ =	0.0001	lb/hr
	$E_{(VOC)}$ =	2391.48	lb/yr
	$E_{(VOC)}$ =	1.20	tn/yr
	$E_{(VOC)}$ =	0.27	lb/hr
HAPS	Benzene	0.39	tn/yr
	Hexane	0.47	tn/yr
	Naphthalene	0.00	tn/yr
	Toluene	0.32	tn/yr
	Xylenes	0.21	tn/yr
	Ethylbenzene	0.01	tn/yr
	2,2,4 Trimethylpentane	0.33	tn/yr
	Chlorine	1.44	tn/yr

Water Circulating Rate (gal/min)	6,500	for one new cell
Concentration of Total Dissolved Solids (ppm by weight)	2738.56	
Drift Loss of Circulating Water (%)	0.000	
Density of Water (lbs/gal)	8.34	
Conversion of Minutes to Hours	60	
Annual Operating Hours (hr/yr)	8760	

Assumptions:

Reference: Calculating Realistic PM_{10} Emissions from Cooling Towers, Joel Reisman and Gordon Frisbie, Abstract No. 216

TDS based on average TDS for cooling tower 11
HAP emissions estimated by Holly based on storage tank HAPs emissions determined using the TANKS software, averaging the last 8 years, and multiplying by 2 standard deviations.
Existing cooling tower expanded by adding a cell
VOC emission factor from AP-42 Section 5.1-2 controlled

Cooling Tower #4-#8 Emissions
Holly Marketing & Refining Company

Reference: South Coast Air Quality Management District, Guidelines for Calculating Emissions from Cooling Towers, June 2006
E = Cooling tower circulating water rate (gal/min) * TDS/10^6 * Drift loss * density of water * 60 * operating hours

$E_{(voc)}$ =	9749.88	lb/yr			
$E_{(voc)}$ =	4.87	tn/yr	-44.15 tons	VOC Baseline 2007-2008	Net Emiss.
$E_{(voc)}$ =	1.11	lb/hr			-39.28

Where:

Water Circulating Rate (gal/min)	26,500
Concentration of Total Dissolved Solids (ppm by weight)	2964.9
Drift Loss of Circulating Water	0.000
Density of Water (lbs/gal)	8.34
Conversion of Minutes to Hours	60
Annual Operating Hours (hr/yr)	8760

Assumptions:
TDS was based on the average TDS of the existing cooling towers
HAP emissions estimated by Holly based on storage tank HAPs emissions determined using the TANKS software, averaging the last 8 years, and multiplying by 2 standard deviations.
VOC emission factor from AP-42 Section 5.1-2 controlled
Circulation rate for cooling towers 4-8

Vacuum Furnace Heater (33H1) - New
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	(lb/hr)	Emissions (lb/yr)	(tn/yr)
NOx	130		0.02		2.600	22776.00	11.39
SO2	130	10.13		1020	1.291	11308.48	5.65
VOC	130		0.005		0.702	6149.52	3.07
PM_{10}	130		0.00051		0.066	580.79	0.29
$PM_{2.5}$	130		0.00042		0.055	478.30	0.24
CO	130		0.08		10.400	91104.00	45.55
lead	130	0.0005		1020	6.37E-05	0.56	2.79E-04
benzene	130	2.10E-03		1020	2.68E-04	2.34E+00	0.00117
formaldehyde	130	7.50E-02		1020	9.56E-03	8.37E+01	4.19E-02
hexane	130	1.8		1020	2.29E-01	2.01E+03	1.00E+00
naphthalene	130	6.10E-04		1020	7.77E-05	6.81E-01	3.41E-04
toluene	130	3.40E-03		1020	4.33E-04	3.80E+00	1.90E-03
arsenic	130	2.00E-04		1020	2.55E-05	2.23E-01	1.12E-04
beryllium	130	1.20E-05		1020	1.53E-06	1.34E-02	6.70E-06
cadmium	130	1.10E-03		1020	1.40E-04	1.23E+00	6.14E-04
chromium	130	1.40E-03		1020	1.78E-04	1.56E+00	7.82E-04
cobalt	130	8.40E-05		1020	1.07E-05	9.38E-02	4.69E-05
manganese	130	3.80E-04		1020	4.84E-05	4.24E-01	2.12E-04
mercury	130	2.60E-04		1020	3.31E-05	2.90E-01	1.45E-04
nickel	130	2.10E-03		1020	2.68E-04	2.34E+00	1.17E-03
selenium	130	2.40E-05		1020	3.06E-06	2.68E-02	1.34E-05
Total HAPS							1.05

Assumptions
Selective Catalytic Reduction
Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion
PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

Emissions Calculations for Diesel Emergency Generator
Holly Marketing & Refining Company

EPA Reference: EPA Standards and AP-42, Section 3.3 Gasoline and Diesel Engines

Pollutant	Emission Factors			Rating				Operating Hours	Emissions	Emissions
	(g/HP-hr)	(lb/MMBtu)	(lb/HP-hr)	(HP)	(MMBtu/hr)	(g/hr)	(lb/hr)	(hr/yr)	(lb/yr)	(tns/yr)
PM	0.025			540	1.37	13.5	0.030	50	1.49	0.00074
PM_{10}	0.025			540	1.37	13.5	0.030	50	1.49	0.00074
$PM_{2.5}$	0.0025			540	1.37	1.4	0.003	50	0.15	0.00007
SO_2			2.05E-03	540	1.37		1.107	50	55.35	0.0277
NO_x	3.7			540	1.37	1998.0	4.396	50	219.78	0.1099
CO	0.26			540	1.37	140.4	0.309	50	15.44	0.0077
HC	0.03			540	1.37	16.2	0.036	50	1.78	0.0009
Benzene		9.33E-04		540	1.37		1.28E-03	50	0.06	3.20E-05
Toluene		4.09E-04		540	1.37		5.60E-04	50	0.03	1.40E-05
Xylenes		2.85E-04		540	1.37		3.90E-04	50	0.02	9.76E-06
Formaldehyde		1.18E-03		540	1.37		1.62E-03	50	0.08	4.04E-05
Acetaldehyde		7.67E-03		540	1.37		1.05E-02	50	0.53	2.63E-04
Acrolein		9.25E-05		540	1.37		1.27E-04	50	0.01	3.17E-06
Naphthalene		8.48E-05		540	1.37		1.16E-04	50	0.01	2.90E-06
Total HAP										3.65E-04

Assumptions:
540 HP Caterpillar Diesel Generator Set
Sulfur content not to exceed 15 ppm
HP = 2545.46 BTU/hr; therefore, 540 HP = 1374548.4 BTU/hr or 1.37 mmBTU/hr
HAPs emissions based on AP-42, Section 3.3 Gasoline and Diesel Engines
HC, NOx, CO, PM emissions from manufacturer provided emissions rates
10% of PM_{10} emissions assumed to be $PM_{2.5}$. References: EPA 2001, Procedures Document for National Emissions Inventory, Criteria Pollutants and EPA 2006, Documentation for the Final 2002 Nonpoint Section National Emissions Inventory for Criteria and Hazardous Air Pollutants.

Storage Tanks - Converted
Holly Refining & Marketing

Source	Pollutant	PTE Emissions (lb/yr)	PTE Emissions (tn/yr)	Baseline Emissions (tn/yr)	Net Emissions (tn/yr)	Comment
Tank 71	VOC	447.79	0.224	-0.471	-0.25	Baseline 2007-2008
Tank 72	VOC	722.06	0.361	-0.69	-0.33	Baseline 2007-2008
					-0.58	Total

Flare Emissions (South Flare)
Holly Marketing & Refining Company

References: AP-42 Section 13.5 Industrial Flares
California Air Resources Board
EPA's Technology Transfer Network
API Compendium of Greenhouse Gas Emission Methodologies for the Oil and Gas Industry

$E_{(lb/hr)}$ = flare gas vol (scf/hr) * HHV (Btu/scf) * (1 MMBtu/1000000 Btu) * EF (lb/MMBtu)

flare gas vol	17,000.0	scf/hr
HHV	1150	Btu/scf
$EF_{(CO)}$ =	0.37	lb/MMBtu
$EF_{(NOx)}$ =	0.068	lb/MMBtu
$EF_{(VOC)}$ =	5.6	lb/MMcf
$EF_{(benzene)}$ =	0.159	lb/MMcf
$EF_{(formaldehyde)}$ =	1.169	lb/MMcf
$EF_{(naphthalene)}$ =	0.011	lb/MMcf
$EF_{(acetaldehyde)}$ =	0.043	lb/MMcf
$EF_{(acrolein)}$ =	0.01	lb/MMcf
$EF_{(propylene)}$ =	2.44	lb/MMcf
$EF_{(toluene)}$ =	0.058	lb/MMcf
$EF_{(xylenes)}$ =	0.029	lb/MMcf
$EF_{(ethylbenzene)}$ =	1.44	lb/MMcf
$EF_{(hexane)}$ =	0.029	lb/MMcf
$EF_{(SO2)}$ =	0.024	lb/hr

Pollutant	Emissions (lb/hr)	Emissions (TPY)	Baseline (TPY)	Net Emissions (TPY)	
CO	7.2335	31.68	0.00	31.68	Baseline 2010-2011
NOx	1.3294	5.82	-0.925	4.90	Baseline 2004-2005
VOC	9.52E-02	0.42	-4.29	-3.87	Baseline 2007-2008
Benzene	2.70E-03	1.18E-02			
Formaldehyde	1.99E-02	8.70E-02			
Naphthalene	1.87E-04	8.19E-04			
Acetaldehyde	7.31E-04	3.20E-03			
Acrolein	1.70E-04	7.45E-04			
Propylene	4.15E-02	1.82E-01			
Toluene	9.86E-04	4.32E-03			
Xylene	4.93E-04	2.16E-03			
Ethylbenzene	2.45E-02	1.07E-01			
Hexane	4.93E-04	2.16E-03			
Total HAPS		4.01E-01			
SO_2	0.024	0.1042	-4.42	-4.32	Baseline 2005-2006

Assumptions:
Flare efficiency - 98%
Average methane concentration of total HC is 55% per AP-42
Questar - 1 grain S/100 scf
HAPS speciation from CARB
VOC emission factor from webfire database

Existing Sulfur Recovery Unit Incinerator

SO_2 ER (tn/yr) = [20 LTPD * 0.002 (99.8% efficiency)*2240 tons/2000LT * 1.988 lb/SO2/lbS * 365 days/yr]

SO_2 =	32.5	TPY
SO_2 =	-217.15	SO2 baseline 2005-2006
SO_2 =	-184.6	Net decrease in emissions

NOx =	-0.850	2004/2005 Baseline ✓
VOC =	-0.047	2007/2008 Baseline ✓
PM_{10} =	-0.062	2005/2006 Baseline ✓
$PM_{2.5}$ =	-0.070	2008/2009 Baseline ✓
CO =	-0.76	2010/2011 Baseline ✓

Assumptions:
Emissions from existing sulfur recovery incinerator routed to wet scrubber

Truck Unloading
Holly Refining and Marketing Company

Black and yellow wax becomes a solid at ambient temperatures. No emissions are expected.

Assumptions:
Addition of 12 bays

Propane Pit Flare - To Be Removed
Holly Marketing & Refining Company

Source	Pollutant	Emissions (tn/yr)	Comment
Propane Pit Flare	NOx	-5.36	Baseline 2004-2005 ✓
	SO2	0	Baseline 2005-2006 ✓
	VOC	-1.55	Baseline 2007-2008 ✓
	PM_{10}	-0.93	Baseline 2005-2006 ✓
	$PM_{2.5}$	-2.19	Baseline 2008-2009 ✓
	CO	-129.27	Baseline 2010-2011 ✓

Tank Stab-in Asphalt Tank Heaters
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	(lb/hr)	Emissions per Heater (lb/yr)	(tn/yr)	2012 6 heaters (tn/yr)	2006 2 heaters (tn/yr)
NOx	0.8	100		1020	0.0784	687.06	0.34	2.06	0.69
SO2	0.8	10.13		1020	0.0079	69.59	0.03	0.21	0.07
VOC	0.8		0.005		0.0043	37.84	0.02	0.11	0.04
PM_{10}	0.8		0.00051		0.0004	3.57	1.79E-03	0.01	0.00
$PM_{2.5}$	0.8		0.00042		0.0003	2.94	1.47E-03	0.01	0.00
CO	0.8		0.08		0.0640	560.64	0.28	1.68	0.56
lead	0.8	0.0005		1020	3.92E-07	0.00	1.72E-06	1.03E-05	3.44E-06
benzene	0.8	2.10E-03		1020	1.65E-06	1.44E-02	7.21E-06	4.33E-05	1.44E-05
formaldehyde	0.8	7.50E-02		1020	5.88E-05	5.15E-01	2.58E-04	1.55E-03	5.15E-04
hexane	0.8	1.8		1020	1.41E-03	1.24E+01	6.18E-03	3.71E-02	1.24E-02
naphthalene	0.8	6.10E-04		1020	4.78E-07	4.19E-03	2.10E-06	1.26E-05	4.19E-06
toluene	0.8	3.40E-03		1020	2.67E-06	2.34E-02	1.17E-05	7.01E-05	2.34E-05
arsenic	0.8	2.00E-04		1020	1.57E-07	1.37E-03	6.87E-07	4.12E-06	1.37E-06
beryllium	0.8	1.20E-05		1020	9.41E-09	8.24E-05	4.12E-08	2.47E-07	8.24E-08
cadmium	0.8	1.10E-03		1020	8.63E-07	7.56E-03	3.78E-06	2.27E-05	7.56E-06
chromium	0.8	1.40E-03		1020	1.10E-06	9.62E-03	4.81E-06	2.89E-05	9.62E-06
cobalt	0.8	8.40E-05		1020	6.59E-08	5.77E-04	2.89E-07	1.73E-06	5.77E-07
manganese	0.8	3.80E-04		1020	2.98E-07	2.61E-03	1.31E-06	7.83E-06	2.61E-06
mercury	0.8	2.60E-04		1020	2.04E-07	1.79E-03	8.93E-07	5.36E-06	1.79E-06
nickel	0.8	2.10E-03		1020	1.65E-06	1.44E-02	7.21E-06	4.33E-05	1.44E-05
selenium	0.8	2.40E-05		1020	1.88E-08	1.65E-04	8.24E-08	4.95E-07	1.65E-07
Total HAPS							0.01	0.04	0.01

Assumptions

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Small Boilers (<100), uncontrolled burners

SO_2 emissions based on H_2S content of 60 ppmv

8 total stab-in heaters

PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

West KVG - To Be Replaced with electric driver
Holly Marketing & Refining Company

Source	Pollutant	Emissions (tn/yr)	Comment
West KVG	NOx	-34.685	Baseline 2004-2005
	SO2	0	Baseline 2005-2006
	VOC	-2.06	Baseline 2007-2008
	PM_{10}	-0.075	Baseline 2005-2006
	$PM_{2.5}$	0	Baseline 2008-2009
	CO	-9.28	Baseline 2010-2011

East KVG - To Be Replaced with electric driver
Holly Marketing & Refining Company

Source	Pollutant	Emissions (tn/yr)	Comment
East KVG	NOx	-36.695	Baseline 2004-2005
	SO2	0	Baseline 2005-2006
	VOC	-2.035	Baseline 2007-2008
	PM_{10}	-0.085	Baseline 2005-2006
	$PM_{2.5}$	0	Baseline 2008-2009
	CO	-12.92	Baseline 2010-2011

West SVG - To Be Replaced with electric driver
Holly Marketing & Refining Company

Source	Pollutant	Emissions (tn/yr)	Comment
West SVG	NOx	-12.88	Baseline 2004-2005
	SO2	0	Baseline 2005-2006
	VOC	-0.19	Baseline 2007-2008
	PM_{10}	-0.06	Baseline 2005-2006
	$PM_{2.5}$	-0.065	Baseline 2008-2009
	CO	-22.36	Baseline 2010-2011

East SVG - To Be Replaced with electric driver
Holly Marketing & Refining Company

Source	Pollutant	Emissions (tn/yr)	Comment
East SVG	NOx	-14.45	Baseline 2004-2005
	SO2	0	Baseline 2005-2006
	VOC	-0.215	Baseline 2007-2008
	PM_{10}	-0.04	Baseline 2005-2006
	$PM_{2.5}$	-0.065	Baseline 2008-2009
	CO	-23.79	Baseline 2010-2011

Other Permitted Contemporaneous Emissions

Project	PM10 (TPY)	PM2.5 (TPY)	NOx (TPY)	CO (TPY)	SO2 (TPY)	VOC (TPY)	HAPS (TPY)	Note
Install 250 gpm charge pump	--	--	--	--	--	0.03	--	DAQE-AN101230040-11 - VOC emission increase of 0.03 TPY (PTE)
Install 3 dedicated ethanol unloading areas	--	--	--	--	--	0.05	--	DAQE-101230039-11 - VOC emission increase of 0.05 TPY (PTE)
Incorporation of FCCU NOx and SO2 limits from CD	--	--	--	--	--	--	--	DAQE-AN101230038-10. 7 day rolling NOx limit 180 ppm; 160 ppm for SOx.
	--	--	--	--	--	--	--	365-day rolling average limit is 110 ppm NOx; 50 ppm SOx
Install Benzene Sat Unit #23 (23H1)	0.69	0.69	0.64	7.57	2.4	0.5	0.2	NOI Dated April 29, 2010; AO DAQE-0101230036-10
Boiler #5 NOx Limit	--	--	--	--	--	--	--	Incorporation of CD Limit using SCR - NOx - 0.03 lb/Mmbtu 3-hr avg. From 12.26 to 9.2 TPY
Incorporate NSPS Subpart A & J for CO Emissions to FCCU	--	--	--	--	--	--	--	DAQE-AN101230032-10 - 500 ppm limit
Addition of Boilers #9 and #10	0.09	0.08	15.65	28.94	20.69	3.13	1.45	NOI dated October 14, 2009; AO DAQE-AN0101230031-10, PM adjusted for new factors.
Incorporate CD Limits for SRU, heaters/boilers, flare, benzene waste, LDAR	--	--	--	--	--	--	--	DAQE-AN101230027-09
Addition of 135 KW John Deere Portable Diesel Generator	0.02	0.02	0.66	0.12	0.001	0.01	--	
Totals	0.80	0.79	16.95	36.63	23.091	3.64	1.65	

Holly Refinery: Revised Netting Analysis (updated)

Including Additional Reductions

April 10, 2013

4/10/13

HOLLYFRONTIER

HOLLY REFINING & MARKETING COMPANY – WOODS CROSS LLC
1070 West 500 South • West Bountiful, Utah 84087-1442
(801) 299-6600 • Fax (801) 299-6609

On March 25th, 2013 representatives from Holly Refining & Marketing Company – Woods Cross LLC ("Holly") met with representatives from the Division of Air Quality ("DAQ") to discuss the status of Holly's request to modify its Approval Order to incorporate changes to the previously permitted Modernization Project. It was made clear to Holly at that meeting that even if the DAQ agreed to the requested permit modification on the basis of the netting analysis that was submitted by Holly on March 21st, the final Approval Order would not be issued until there was a resolution, whether by EPA concurrence or by litigation, on the alleged inclusion of Consent Decree reductions in that netting analysis, and that the expected delay in obtaining such resolution would likely result in further delay in issuance of the permit. Accordingly, Holly has identified additional measures that it will voluntarily undertake to reduce emissions from existing equipment, and has modified the netting analysis to remove the disputed Consent Decree reductions and still demonstrate minimal emission increases. While these additional voluntary emission reductions will address the comments and should alleviate concerns about Holly's alleged use of the reductions from Consent Decree requirements in the netting analysis, they are also consistent with Holly's values to minimize our emissions and lessen our impact on the environment.

The additional emissions reductions will be obtained by replacing the gas-driven engines on 4 compressors with electric motors. The 4 compressors are the FCC KVG East and West gas compressors 4-4a and 4-4b (DAQ IDs 5499 and 5502) and the Reformer SVG East and West gas compressors 6-4a and 6-4b (DAQ IDs 5503 and 5504).

We have revised the netting analysis, removing the previous contributions to the netting analysis that included the emissions reductions that were referenced in our Consent Decree. The revised analysis now includes the increases associated with the new equipment that we are requesting, adds the equipment that was previously permitted and that we still plan to construct, adds other contemporaneous increases in emissions resulting from minor changes we have permitted but were otherwise unrelated to the Modernization Project, and then incorporates the other reductions in emissions that we have proposed or recently achieved.

A revised netting analysis was conducted in accordance with the suggested procedures for determining net emissions changes at a source as found in EPA's New Source Review Workshop Manual, Prevention of Significant Deterioration and Nonattainment Area Permitting. These procedures are as follows:

1. Determine the emissions increases (but not any decreases) from the proposed project. If increases are significant, proceed; if not, the source is not subject to review.
2. Determine the beginning and ending dates of the contemporaneous period as it relates to the proposed modification.
3. Determine which emissions units at the source experienced (or will experience, including any proposed decreases resulting from the proposed project) a creditable increase or decrease in emissions during the contemporaneous period.
4. Determine which emissions changes are creditable.

5. Determine, on a pollutant-by-pollutant basis, the amount of each contemporaneous and creditable emissions increase and decrease.
6. Sum all contemporaneous and creditable increases and decreases with the increase from the proposed modification to determine if a significant net emissions increase will occur.

Davis County is attainment for the following pollutants: NOx, SOx, VOC, CO, and GHG. In accordance with Step 1, the emissions increases from the proposed project were determined and are presented as revised NOI Table 3-3 (found in Attachment 1). Startup and shutdown emissions from the proposed project sources were also included in the Step 1 project totals. VOC emissions include 15.25 tpy of fugitive emissions. Significance for criteria pollutants is defined in R307-101-2 and for GHGs in R307-405-3.The project estimated emissions including startup and shutdown emissions are as follows:

NO_X + 81.47 tpy + 1.58 tpy = 83.05 tpy > 40 tpy significance
SO_2 + 38.23 tpy + 0.03 tpy = 38.26 tpy < 40 tpy significance
VOC + 32.29 tpy + 0.09 tpy = 32.38 tpy < 40 tpy significance
CO + 334.66 tpy + 8.61 tpy = 343.27 tpy > 100 tpy significance
GHG + 262,389 metric tpy CO2e > 75,000 tpy CO2e

The project emissions increases from NO_X, CO, and GHG are significant; therefore, a netting analysis was prepared for NO_X, and CO emissions looking back five (5) years at contemporaneous emission increases and decreases.

In Step 2, the contemporaneous period is defined. For this project, the contemporaneous period is defined as beginning five years prior to the start of construction on the proposed project and ending when the project begins operation. This means that if construction will commence on the equipment requested in the July 2012 NOI sometime in the next 6 months, say July 2013, then the contemporaneous period start date is July, 2008, five years prior to the commencement of construction. The contemporaneous period end date will be the date on which the proposed equipment has been built and is fully operational, in other words, when the increase from the change "occurs." Any increases or decreases in actual emissions that occurred after July 2008 and before final installation of the requested equipment, will be considered contemporaneous. Site work for construction is scheduled to begin as soon as approval to proceed is obtained. Startup of the earliest portions of this project is anticipated to begin in April 2014. Completion of the entire project is projected by December 2016.

Baseline actual emissions for project affected sources were calculated in accordance with 40 CFR 52.21 and are presented below. These emissions are based on a consecutive 24-month period in the past 10 years as reported in the Holly Refinery annual emission inventories. A revised NOI Table 3-2 is presented in Attachment 1.

NO_X: January 2004- December 2005
CO: January 2010 - December 2011

In Steps 3-5, any other increases and decreases in actual emissions at Holly that were contemporaneous with the particular change and were creditable were evaluated. Baseline actual emissions for calculating increases and decreases were determined in accordance with 40 CFR Part 52.21 (b)(48). An increase or decrease in actual emission is creditable only if actual emission increases or decreases have not been relied on when issuing a permit. In addition, an increase in actual emissions is creditable only to the extent that the new level of actual emissions exceeds the old level. A decrease in actual emissions is creditable only to the extent that: (a) the old level of actual emissions exceeds the new level of actual

emissions; (b) it is enforceable as a practical matter at and after the time that actual construction on the particular change begins; and (c) it has approximately the same qualitative significance for public health and welfare as that attributed to the increase from the particular change.

For this revised netting analysis, as mentioned previously, Holly only considered those creditable emissions that were ***not*** subject to Consent Decree requirements and ***not*** relied on for previously issued permits. Tables 2 and 3 present summaries of the contemporaneous creditable emission increases and decreases. Increases associated with new equipment that was permitted in the 2007 Approval Order but began operation in the contemporaneous period have been included as contemporaneous emissions.

The netting analysis does not include any change in emissions from heaters 8H1 and 12H1 because there were no significant changes in actual emissions from those heaters. Emissions before replacing the burners were determined using AP-42 emission factors of 100 lb/scf of NO_X (or at 1020 Btu/scf, 0.098 lbs/MMBtu of NO_X). Results from performance tests conducted after the installation of next-generation ultra-low NO_X burners in 2008 showed actual emissions between .072 and .085 lb/MMBtu of NO_X for the two heaters, a slight reduction that we have treated as inconsequential for these purposes. Because the actual performance of the new burners did not result in the reductions anticipated in the 2007 Approval Order, the permitted emissions were later readjusted back up in a subsequent modification in 2009.

The netting analysis does include a reduction in emissions from the planned shutdown of Frozen Earth Propane Storage Facility (Propane Pit), and the historical flaring from that facility. Baseline emissions for the flare at the propane pit were calculated based on the AP-42 emission factors for flares. The pit flare was replaced in November 2009 to comply with New Source Performance Standards (NSPS). Compliance with NSPS affects neither the AP-42 emission factor calculation, which is based on the amount of propane used, nor the baseline calculation, because the NSPS standards do not include emission controls or other modifications that would result in a decrease in emissions. See 40 C.F.R. § 60.18(b)-(f). Accordingly, the post-control baseline emissions and pre-control baseline emissions are identical. EPA's January 18, 2013 letter agrees that the consent decree allows use of the reductions from the shutdown of the propane pit flare so long as the new pit flare is in compliance with NSPS at the time it is shut down, which was demonstrated in Holly's April 2010 performance test report and July 29, 2010 semi-annual progress report.

A summary of the contemporaneous increases/decreases in emissions for NO_X and CO are presented below and in revised NOI Table 3-4 presented in Attachment 1. Please note that emissions within parenthesis are negative values.

NO_X: + 58.7 tpy (contemporaneous) - 104.9 tpy (this project) = (46.2) tpy
CO: + 186.7 tpy (contemporaneous) - 198.4 tpy (this project) = (11.7) tpy

In Step 6, all contemporaneous and creditable increases and decreases with the increase from the proposed modification were summed to determine if a significant net emissions increase will occur. The net emission increases for NO_X and CO are as follows:

NO_X: 83.05 tpy - 46.2 tpy = 36.85 tpy increase < 40 tpy significance
CO: 343.27 tpy – 11.72 tpy = 331.55 tpy increase > 100 tpy significance

Thus, PSD review is triggered for CO and GHG emissions. The analysis, considering contemporaneous emissions, netted Holly Refinery out of PSD review for NO_X. GHG emissions were revised from the

2012 NOI submittal to reflect the removal of 26H1 hot oil furnace and replacement of 4 compressor drivers with electric motors. Table 3-6 of the 2012 NOI has been revised and included in Attachment 1. It shows an increase of GHG emission of 5,364,708 metric tpy CO2e, including products.

Existing GHG emissions were estimated at 656,530 metric tpy CO_2e, which includes previously permitted equipment. A CO_2e emission limitation of 910,186 would be based on the existing GHG emissions (656,530 metric tpy CO_2e) plus the proposed increase in GHG emissions (262,389 metric tpy CO_2e minus 8,733 metric tpy CO_2e in proposed reductions). This total does not include the estimated product GHG emission increase (5,102,319 metric tpy CO_2e).

Davis County is nonattainment for PM2.5 and Holly Refinery has been defined as a contributing source to the Salt Lake County PM10 non-attainment area. The project estimated emissions for PM10 and PM2.5 are presented below and in revised Table 3-3.

PM10: +9.54 tpy < 15 tpy
PM2.5: +9.19 tpy < 10 tpy

The project emissions of PM10 and PM2.5 are below significance levels.

Based on the revised netting analysis, overall emissions (including all increases and decreases) for criteria and hazardous pollutants are estimated to be as follows:

NOx -	+36.85 TPY
SO2 -	-109.8 TPY
VOC -	+4.24TPY
PM10 -	+10.00 TPY
PM2.5 -	+8.34 TPY
CO -	+331.55 TPY
Lead -	+0.002 TPY
HAPs -	+20.11 (TPY) (with 9.14 tons single pollutant increase for hexane)

We believe that this will address the remaining concerns presented in comments to the proposed Approval Order. If you have any questions or need additional information, please call me at (801) 299-6625.

Sincerely,

Michael S. Astin, P.E.
Environmental Manager

Attachment

c: C. Harry (Utah DAQ)
M. Wright, Jr.
File 2.5.1

Attachment 1
Revised NOI Tables

Table 3-2

Baseline Actual 24-Month Period

Pollutant	Consecutive 24-month Period
PM_{10}	January 2005 - December 2006
$PM_{2.5}$	January 2008- December 2009
SO_2	January 2005 - December 2006
NO_x	January 2004 – December 2005
CO	January 2010 – December 2011
VOC	January 2007- December 2008

Table 3-3

Proposed PTE Increased Emissions from Heavy Crude Processing Project New and Modified Equipment Only

Emission Unit	PM_{10} (TPY)	$PM_{2.5}$ (TPY)	SO_2 (TPY)	NO_x (TPY)	VOC (TPY)	CO (TPY)	Total HAPS (TPY)
24H1 Crude Furnace #3 (new)	0.13	0.11	2.61	10.51	1.42	21.02	0.49
25H1 FCC#2 Feed Heater (new)	0.10	0.08	1.96	7.88	1.06	15.77	0.36
FCCU #2 Wet Scrubber (new)	8.15	8.15	17.70	19.91	--	154.85	--
27H1 Reactor Charge Heater (new)	0.22	0.18	4.31	8.67	2.34	34.69	0.80
20H3 Reactor Charge Heater (new)	0.09	0.08	1.83	7.38	1.00	14.75	0.34
Boiler #11 (new)	0.20	0.16	3.88	7.82	1.56	14.47	0.72
Sour Water Stripper	--	--	--	--	--	--	--
Cooling Tower #10 (new)	0.10	0.0006	--	--	1.56	--	2.07
Cooling Tower #11 (modified)	0.07	0.0004	--	--	1.19	--	2.07
33H1 Vacuum Furnace Heater (new)	0.29	0.24	5.65	11.39	3.07	45.6	1.05
540 HP Diesel Generator (new)	0.0007	0.00007	0.03	0.11	0.0009	0.008	0.0004
Other Emergency Equipment	0.06	0.06	0.06	0.84	0.0009	0.18	0.00
Stab-in Asphalt Tank Heaters (new)	0.01	0.01	0.21	2.06	0.11	1.68	0.04
New and Modified Tanks (See Table 2-1)	--	--	--	--	3.64	--	0.02
Fugitives from leaks (new)	--	--	--	--	15.3	--	0.85
South Flare (modified)	--	--	--	4.9	--	31.7	0.40
12 Additional Truck Bays for Black Wax Crude	--	--	--	--	--	--	--
Startup and Shutdown Emissions	0.14	0.14	0.04	1.92	0.11	10.48	--
Project Total	9.56	9.21	38.27	83.39	32.40	345.14	9.2
NSR/Significant Emissions Rate	15	10	40	40	40	100	NA
Significant	No	No[1]	No	Yes	No[1]	Yes	--

[1] Davis County is non-attainment for $PM_{2.5}$ and maintenance for ozone; thus, $PM_{2.5}$ and VOC emissions are subject to NNSR permitting requirements provisions.

Table 3-4

Contemporaneous Project Emission Increases/Decreases

Project	Emission Changes			Source
	NO_2 (TPY)	CO (TPY)	CO_2e (metric TPY)	
Install GOHT charge heater, fractionator reboiler, 10H2 hot oil heater, hydrogen plant furnace #1, hydrogen plant deaerator vent, hydrogen fugitives, hydrogen plant furnace #2, asphalt tank, 2 stab-in heaters, new and modified tanks, increased tank thruput, fugitives	41.8	150.0	171,622	DAQE-AN0101230023-07 (includes previously permitted equipment)
Install 250 gpm charge pump	--	--	--	DAQE-AN101230040-11
Install 3 dedicated ethanol unload areas	--	--	--	DAQE-101230039-11
Incorporation of FCCU NO_x and SO_2 Limits from CD	--	--	--	DAQE-AN101230038-10
Install Benzene Sat Unit #23 and boiler #5 NOx limit	0.64	7.57	--	NOI Dated April 29, 2010
Incorporate NSPS Subpart A & J for CO Emissions to FCCU	--	--	--	DAQE-AN101230032-10
Addition of Boilers #9 and #10	15.65	28.94	74,998	NOI dated October 14, 2009; AO DAQE-AN0101230031-10, PM adjusted for new factors.
Incorporate CD Requirements & Add 135 KW diesel generator	0.66[1]	0.12	--	DAQE-AN101230027-09
Propane Pit Flare	-5.36	-129.27	-360	2012 NOI
Existing SRU	-0.85	-0.76	-1025	2012 NOI
4a KVG West	-34.7	-9.28	-2630	Proposed removal March 2013
4b KVG East	-36.7	-12.9	-2630	Proposed removal March 2013
6a SVG West	-12.9	-22.4	-1044	Proposed removal March 2013
6b SVG East	-14.5	-23.8	-1044	Proposed removal March 2013
Total Increases	58.7	186.7	246,620	
Total Decreases	-104.9	-198.4	-8,733	

CD - July 2008 Consent Decree

[1] The NO_2 emissions do not include the increase of 39.3 tons of NO_2 emissions listed in DAQE-AN101230027-09 abstract for heaters 8H1 and 12H1. This emission increase was based on October 8, 2009 performance test results, and reflect adjustment of the permitted emissions related to the NGULNB performance being only nominally better than the replaced burners. These tests were conducted in compliance with the CD after the replacement of the original heater burners with NGULNB or equivalent.

Table 3-6

PTE Greenhouse Gas Emission Estimates for Proposed Heavy Crude Processing Project at Holly Refining & Marketing Company Woods Cross Refinery

Equipment	CO_2 (MTPY)	CH_4 (MTPY)	N_2O (MTPY)
20H3 Reactor Charge Heater	17,660.6	0.35	0.03
24H1 Crude Furnace #3	25,169.6	0.49	0.05
25H1 FCC#2 Feed Heater	18,877.2	0.37	0.04
FCC	53,846.7	1.58	0.32
27H1 Reactor Charge Heater	41,529.8	0.82	0.08
33 H1 Vacuum Furnace Heater	54,534.0	1.07	0.11
#11 Boiler	37,460.7	0.74	0.07
Process Flare (South)	10,070.0	30.40	0.101
Asphalt Heaters (6 total)	2,013.5	0.06	0.004
Tanks	NA	1.00	NA
Fugitives (Leaks)	NA	9.60	NA
Product Combustion	5,102,319	NA	NA
Total w/o Product	261,162	46.48	0.81
Total	5,363,481	46.48	0.81
Total CO_2e (w/o product)			**262,389**
Total CO_2e			**5,364,708**

Note: Table does not include proposed reductions.

Emissions for proposed modified sources, by pollutant, by year, in tons per year

		2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
4a	PM10	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.14	0.15	0.15
	PM2.5	0.00	0.00	0.00	0.00	0.17	0.00	0.15	0.14	0.15	0.15
	SOx	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	NOx	13.41	14.81	16.50	14.44	15.17	15.14	35.84	33.53	36.70	35.87
	VOC	1.87	2.06	2.30	2.01	2.11	2.11	0.47	0.44	0.48	0.47
	CO	8.82	9.74	10.85	9.49	9.98	9.96	55.42	51.85	56.75	55.47
4b	PM10	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.14	0.12	0.11
	PM2.5	0.00	0.00	0.00	0.00	0.16	0.00	0.17	0.14	0.12	0.11
	SOx	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	NOx	19.52	19.78	20.31	15.25	13.99	13.26	40.84	32.55	29.79	26.50
	VOC	2.72	2.76	2.83	2.12	1.95	1.85	0.53	0.42	0.39	0.35
	CO	12.83	13.01	13.36	10.03	9.20	8.72	63.15	50.33	46.07	40.98
6a	PM10	0.06	0.06	0.07	0.06	0.06	0.07	0.05	0.06	0.06	0.06
	PM2.5	0.06	0.06	0.07	0.06	0.06	0.07	0.05	0.06	0.06	0.06
	SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NOx	13.54	15.38	16.81	15.30	13.97	16.89	10.90	14.86	14.87	14.86
	VOC	0.18	0.20	0.22	0.20	0.18	0.22	0.14	0.19	0.19	0.19
	CO	20.93	23.79	26.00	23.66	21.60	26.11	16.85	22.97	22.99	22.98
6b	PM10	0.06	0.06	0.08	0.05	0.08	0.02	0.06	0.06	0.06	0.06
	PM2.5	0.06	0.06	0.08	0.05	0.08	0.02	0.06	0.06	0.06	0.06
	SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NOx	16.17	14.60	18.56	12.88	19.87	5.12	14.04	14.86	14.87	14.86
	VOC	0.21	0.19	0.24	0.17	0.26	0.07	0.18	0.19	0.19	0.19
	CO	25.00	22.58	28.70	19.92	30.72	7.91	21.71	22.97	22.99	22.98

Revised Modernization Project
Holly Woods Cross Refinery

Pollutant	Previously Permitted and Contemporaneous Emissions																													
	GOHT/C Charge Heater[1] (TPY)	Fractionator Reboiler[1] (TPY)	Hot Oil Heater 10H2[1] (TPY)	H2 Plant Furnace #1[1] (TPY)	H2 Plant Deserator Vent[1] (TPY)	Hydrogen fugitives[1] (TPY)	H2 Plant Furnace #2[1] (TPY)	Asphalt Tank[1] (TPY)	Stab-in Heaters[1] (TPY)	New & Modified Tanks[1] (TPY)	Increased Tank Thruput[1] (TPY)	Fugitives[1] (TPY)	Other Contem.[2] (TPY)																	
NOx	2.61	8.23	8.67	10.78			10.78		0.69				16.95	10.51	7.88	19.91	8.67	7.38	7.82			11.39	0.11	0.84						
SO2	0.65	2.04	4.31	5.35			5.35		0.07				23.09	2.61	1.96	17.70	4.31	1.83	3.88			5.65	0.03	0.06						
VOC	0.35	1.11	2.34	2.91	3.20	0.055	2.91	0.11	0.04	0.30	0.84	3.88	3.64	1.42	1.06	0.00	2.34	1.00	1.56	1.56	1.20	3.07	8.91E-04	6.78E-02	3.64					
PM10	0.03	0.10	0.22	0.27			0.27		0.00				0.80	0.13	0.10	8.15	0.22	0.09	0.20	0.10	0.07	0.29	7.43E-04	5.94E-02						
PM2.5	0.03	0.09	0.18	0.23			0.23		0.00				0.79	0.11	0.08	8.15	0.18	0.08	0.16	0.00	0.00	0.24	7.43E-05	5.94E-02						
CO	5.37	16.95	35.71	44.40	2.63		44.40		0.56				36.63	21.02	15.77	154.85	34.69	14.75	14.47			45.55	7.72E-03	1.80E-01						
lead	3.20E-05	1.01E-04	2.13E-04	2.64E-04			2.64E-04		3.44E-06					1.29E-04	9.66E-05		2.13E-04	9.04E-05	1.92E-04			2.79E-04								
benzene	1.34E-04	4.24E-04	8.93E-04	1.11E-03			1.11E-03		1.44E-05	0.27	0.13			5.41E-04	4.06E-04		8.93E-04	3.80E-04	8.05E-04	0.25	0.39	1.17E-03	3.20E-05	4.60E-05	4.16E-03						
formaldehyde	4.80E-03	1.51E-02	3.19E-02	3.96E-02			3.96E-02		5.15E-04					1.93E-02	1.45E-02		3.19E-02	1.36E-02	2.88E-02			4.19E-02	4.04E-05	5.81E-05						
hexane	1.15E-01	3.63E-01	7.65E-01	9.51E-01			9.51E-01		1.24E-02	4.71E-01	1.04E-01			4.64E-01	3.48E-01		7.65E-01	3.25E-01	6.90E-01	0.31	0.47	1.00E+00			8.76E-03					
naphthalene	3.90E-05	1.23E-04	2.59E-04	3.22E-04			3.22E-04		4.19E-06	1.70E-04	1.73E-04			1.57E-04	1.18E-04		2.59E-04	1.10E-04	2.34E-04	4.00E-04	6.00E-04	3.41E-04	2.90E-06	4.18E-06						
toluene	2.18E-04	6.86E-04	1.45E-03	1.80E-03			1.80E-03		2.34E-05	2.81E-01	8.45E-02			8.76E-04	6.57E-04		1.45E-03	6.15E-04	1.30E-03	0.21	0.32	1.90E-03	1.40E-05	2.01E-05	5.99E-03					
arsenic	1.28E-05	4.04E-05	8.50E-05	1.06E-04			1.06E-04		1.37E-06					5.15E-05	3.86E-05		8.50E-05	3.62E-05	7.67E-05			1.12E-04								
beryllium	7.68E-07	2.42E-06	5.10E-06	6.34E-06			6.34E-06		8.24E-08					3.09E-06	2.32E-06		5.10E-06	2.17E-06	4.60E-06			6.70E-06								
cadmium	7.04E-05	2.22E-04	4.68E-04	5.81E-04			5.81E-04		7.56E-06					2.83E-04	2.13E-04		4.68E-04	1.99E-04	4.22E-04			6.14E-04								
chromium	8.96E-05	2.83E-04	5.95E-04	7.40E-04			7.40E-04		9.62E-06					3.61E-04	2.71E-04		5.95E-04	2.53E-04	5.37E-04			7.82E-04								
cobalt	5.37E-06	1.70E-05	3.57E-05	4.44E-05			4.44E-05		5.77E-07					2.16E-05	1.62E-05		3.57E-05	1.52E-05	3.22E-05			4.69E-05								
manganese	2.43E-05	7.67E-05	1.62E-04	2.01E-04			2.01E-04		2.61E-06					9.79E-05	7.34E-05		1.62E-04	6.87E-05	1.46E-04			2.12E-04								
mercury	1.66E-05	5.25E-05	1.11E-04	1.37E-04			1.37E-04		1.79E-06					6.70E-05	5.02E-05		1.11E-04	4.70E-05	9.97E-05			1.45E-04								
nickel	1.34E-04	4.24E-04	8.93E-04	1.11E-03			1.11E-03		1.44E-05					5.41E-04	4.06E-04		8.93E-04	3.80E-04	8.05E-04			1.17E-03								
selenium	1.54E-06	4.84E-06	1.02E-05	1.27E-05			1.27E-05		1.65E-07					6.18E-06	4.64E-06		1.02E-05	4.34E-06	9.20E-06			1.34E-05								
Xylene										1.01E-01	4.50E-02									0.14	0.21		9.76E-06	1.40E-05	2.76E-03				
Ethylbenzene										1.08E-02	2.38E-03									9.00E-03	1.41E-02				3.75E-04				
Cyclohexane										2.00E-01	6.51E-02																		
Trimethylbenzene										5.15E-03	1.13E-03									0.21	0.33								
Isooctane										2.40E-01	5.29E-02																		
Chlorine																				0.94	1.44								
Acetaldehyde																							2.63E-04	3.78E-04					
Acrolein																							3.17E-06	4.56E-06					
Propylene																													
2,2,4-Trimethylpentane																													
Undesignated HAPS													1.65																
Total HAPS	0.12	0.38	0.80	1.00	0.00	0.00	1.00	0.00	0.01	1.58	0.49	0.00	1.65	0.49	0.36	0.00	0.80	0.34	0.72	2.07	3.17	1.05	0.00	0.00	0.02					

[1] DAQE-AN0101230023-07

[2] DAQE-AN101230027-09, DAQE-AN101230032-10, DAQE-AN101230038-10, DAQE-101230039-11, DAQE-AN101230040-11

[3] See other contem. permitted emiss. workbook spreadsheet for complete details.

Revised Modernizatior
Holly Woods Cross Re

Pollutant	Heaters (TPY)	Tank Roof Flare (TPY)	South Flare Increase (TPY)	Sulfur Loading Increase (TPY)	Emissions Reductions: South Flare Decrease (TPY)	Tanks T1 & T2 Conversion (TPY)	Cooling Towers 64-68 (TPY)	Propane Flare (TPY)	Existing SRU (TPY)	4a KVG W (TPY)	4b KVG E (TPY)	4a SVG N (TPY)	4b SVG E (TPY)	Total Net Emissions Increase (TPY)	PSD/NNSR Trigger Levels (TPY)	PSD/NNSR Triggered in Step 1	Contemp. Emission Decrease Total (TPY)	Contemp. Emissions Increase Total (TPY)	Net Total (TPY)	PSD/NNSR Trigger Levels (TPY)	PSD/NNSR Triggered
NOx		2.06	4.90	1.58				-5.36	-0.85	-34.69	-36.70	-12.88	-14.45	83.05	40	Yes	-104.92	58.7	36.9	40	No
SO2		0.21		0.03	-4.32			0.00	-184.64	0.00	0.00	0.00	0.00	38.26	40	No	-188.96	40.8	-109.8	40	No
VOC	15.25	0.11		0.09	-3.87	-0.58	-39.28	-1.55	-0.05	-2.06	-2.04	-0.19	-0.22	32.38	25	Yes	-49.82	21.7	4.24	25	No
PM10		0.01		0.12				-0.93	-0.06	-0.08	-0.09	-0.06	-0.04	9.54	15	No	-1.25	1.7	10.00	15	No
PM2.5		0.01		0.12				-2.19	-0.07	0.00	0.00	-0.07	-0.07	9.19	10	No	-2.39	1.5	8.34	10	No
CO		1.68	31.68	8.61				-129.27	-0.76	-9.28	-12.92	-22.36	-23.79	343.27	100	Yes	-198.38	186.66	331.55	100	Yes
lead		1.03E-05												0.001				8.78E-04	0.002		
benzene	0.80	4.33E-05	0.01											1.461				4.08E-01	1.868		
formaldehyde		1.55E-03	8.70E-02											0.239				1.32E-01	0.370		
hexane	0.98	3.71E-02	2.16E-03											5.407				3.73E+00	9.141		
naphthalene	0.00	1.26E-05	8.19E-04											4.38E-03				1.41E-03	0.006		
toluene	0.66	7.01E-05	4.32E-03											1.21E+00				3.72E-01	1.581		
arsenic		4.12E-06												4.04E-04				3.51E-04	0.001		
beryllium		2.47E-07												2.42E-05				2.11E-05	0.000		
cadmium		2.27E-05												2.22E-03				1.93E-03	0.004		
chromium		2.89E-05												2.83E-03				2.46E-03	0.005		
cobalt		1.73E-06												1.70E-04				1.47E-04	0.000		
manganese		7.83E-06												7.67E-04				6.67E-04	0.001		
mercury		5.36E-06												5.25E-04				4.56E-04	0.001		
nickel		4.33E-05												4.24E-03				3.69E-03	0.008		
selenium		4.95E-07												4.85E-05				4.21E-05	0.000		
Xylene	0.44		2.16E-03											0.799				1.46E-01	0.945		
Ethylbenzene	0.03		0.11											0.160				1.32E-02	0.173		
Cyclohexane														0.000				2.65E-01	0.265		
Trimethylbenzene														0.539				6.28E-03	0.545		
Isooctane														0.000				2.93E-01	0.293		
Chlorine														2.384					2.384		
Acetaldehyde			3.20E-03											0.004					0.004		
Acrolein			7.45E-04											0.001					0.001		
Propylene			1.82E-01											0.182					0.182		
2,2,4-Trimethylpentane	0.68													0.676					0.676		
Undesignated HAPS																		1.65E+00	1.7		
Total HAPS	3.60	0.04	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		13.08			0.00	7.03	20.11		

[1] DAQE-AN0101230023
[2] DAQE-AN101230027-
[2] See other contem. peri

Emissions for proposed modified sources, by pollutant, by year, in tons per year

		2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	Avg of highest 2 consec. yrs
4H1	PM10	0.90	1.11	0.89	0.90	1.00	0.94	0.91	1.08	0.98	1.00	0.93
X	PM2.5	0.90	1.11	0.89	0.90	1.00	0.94	0.91	1.08	0.98	1.00	0.90
	SOx	0.21	0.39	0.37	0.25	0.21	0.20	0.40	1.58	0.59	0.26	0.30
	NOx	5.91	7.32	5.87	5.93	6.57	6.16	6.01	7.12	6.42	6.55	6.57
	VOC	0.65	0.80	0.65	0.65	0.72	0.68	0.66	0.78	0.71	0.72	0.69
	CO	9.93	12.29	9.86	9.96	11.04	10.35	10.10	11.96	10.78	11.01	11.11
8H1	PM10	2.53	2.44	2.25	2.27	2.49	2.45	2.43	2.72	2.36	2.31	2.44
	PM2.5	2.53	2.44	2.25	2.27	2.49	2.45	2.43	2.72	2.36	2.31	2.26
	SOx	0.58	0.86	0.95	0.62	0.51	0.53	1.06	3.97	1.44	0.59	0.80
	NOx	2.89	2.59	2.45	29.90	32.70	32.25	31.96	35.73	31.10	30.39	33.85
	VOC	1.83	1.77	1.63	1.64	1.80	1.77	1.76	1.97	1.71	1.67	1.72
	CO	27.95	26.99	24.91	25.12	27.47	27.09	26.85	30.01	26.12	25.53	27.47
10H1	PM10	0.32	0.32	0.30	0.28	0.29	0.27	0.28	0.35	0.34	0.34	0.28
X	PM2.5	0.32	0.32	0.30	0.28	0.29	0.27	0.28	0.35	0.34	0.34	0.29
	SOx	0.07	0.11	0.12	0.08	0.06	0.06	0.12	0.51	0.21	0.09	0.09
	NOx	4.22	4.21	3.89	3.71	3.78	3.54	3.74	4.63	4.52	4.46	4.19
	VOC	0.23	0.23	0.21	0.20	0.21	0.19	0.21	0.25	0.25	0.25	0.20
	CO	3.55	3.54	3.27	3.12	3.17	2.97	3.14	3.89	3.79	3.74	3.55
12H1	PM10	0.80	0.91	0.84	0.82	0.82	0.70	0.86	0.91	0.92	0.84	0.78
	PM2.5	0.80	0.91	0.84	0.82	0.82	0.70	0.86	0.91	0.92	0.84	0.83
	SOx	0.18	0.32	0.35	0.22	0.17	0.15	0.38	1.34	0.56	0.22	0.27
	NOx	0.38	0.40	0.38	10.78	10.73	9.16	11.34	12.03	12.04	11.08	11.69
	VOC	0.58	0.66	0.61	0.59	0.59	0.50	0.62	0.66	0.66	0.61	0.59
	CO	8.87	10.11	9.32	9.05	9.01	7.69	9.53	10.11	10.12	9.31	9.49
Boiler #5	PM10	0.48	0.13	1.26	1.17	1.20	1.03	1.08	0.95	1.13	1.02	1.06
	PM2.5	0.48	0.13	1.26	1.17	1.20	1.03	1.08	0.95	1.13	1.02	1.22
	SOx	0.11	0.05	0.53	0.32	0.25	0.22	0.47	1.39	0.69	0.26	0.35
	NOx	6.32	1.68	16.58	15.34	15.80	13.60	14.15	12.55	14.91	13.43	13.35
	VOC	0.35	0.09	0.91	0.84	0.87	0.75	0.78	0.69	0.82	0.74	0.85
	CO	5.31	1.41	13.92	12.89	13.27	11.42	11.89	10.54	12.53	11.28	3.36

Boiler #6	PM10	38.23	38.48	40.09	38.50	38.46	57.41	57.07	54.10	57.12	56.27	57.24
	PM2.5	35.57	35.81	37.30	35.83	8.93	35.82	35.61	33.75	35.64		36.57
	SOx	28.44	29.35	323.80	310.98	310.66	285.22	283.50	269.11	283.73	279.50	284.36
	NOx	58.05	72.08	57.92	55.63	55.57	55.61	55.29	52.41	55.33	54.51	53.85
	VOC	0.72	0.82	0.83	0.67	0.74	0.65	0.58	0.64	0.78	0.65	0.70
	CO	33.79	25.24	12.73	10.19	11.23	9.95	8.81	9.85	11.90	9.92	29.51
Boiler #8	PM10	1.08	1.23	1.32	1.44	1.57	1.24	1.05	0.74	0.73	1.35	1.15
	PM2.5	1.08	1.23	1.32	1.44	1.57	1.24	1.05	0.74	0.73	1.35	1.38
	SOx	0.25	0.44	0.55	0.39	1.60	0.24	0.46	1.08	0.44	0.35	0.35
	NOx	7.13	8.09	8.68	9.46	10.33	8.13	6.92	4.86	4.78	8.88	5.89
	VOC	0.78	0.89	0.95	1.04	1.14	0.89	0.76	0.53	0.53	0.98	1.09
	CO	11.97	13.59	14.58	15.90	17.35	13.67	11.63	8.16	8.04	14.91	12.78
Clark	PM10	0.00	0.00	0.75	0.68	0.77	0.81	0.87	0.76	0.76	0.76	0.84
	PM2.5	0.00	0.00	0.75	0.68	0.77	0.81	0.87	0.76	0.76	0.76	0.72
	SOx	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
												Based on 2005 stack test:
	NOx	0.00	0.00	37.90	34.23	39.01	40.87	43.93	38.35	38.35	38.35	41.14 33.81
	VOC	0.00	0.00	2.34	2.12	2.41	2.53	2.72	2.37	2.37	2.37	2.27
	CO	0.00	0.00	6.90	6.23	7.10	7.44	7.99	6.98	6.98	6.98	0.00
C3 Pit fl.	PM10	2.60	2.60	2.60	1.78	2.51	1.21	0.65	0.52	0.20	0.26	0.93
	PM2.5	2.60	2.60	2.60	1.78	2.51	1.21	0.65	0.52	0.20	0.26	2.19
	SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NOx	23.76	23.76	23.76	16.28	22.87	11.06	5.97	4.75	1.81	5.90	5.36
	VOC	1.88	1.88	1.88	1.29	1.81	0.88	0.47	0.38	0.14	0.19	1.55
	CO	129.27	129.27	129.27	88.58	124.45	60.17	32.49	25.86	9.87	32.11	129.27
SRU	PM10	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.07	0.06	0.06
	PM2.5	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.07	0.06	0.07
	SOx	122.45	182.94	119.62	125.39	170.78	170.78	263.52	149.37	159.08	147.73	217.15
	NOx	0.90	0.90	0.89	0.90	0.80	0.74	0.85	0.85	0.86	0.78	0.85
	VOC	0.05	0.05	0.05	0.05	0.04	0.04	0.05	0.05	0.05	0.04	0.05
	CO	0.76	0.76	0.75	0.75	0.68	0.62	0.71	0.71	0.72	0.65	0.76

Totals	PM10	45.79	45.86	49.18	46.73	47.87	64.91	64.07	60.76	63.29	62.87	64.49
	PM2.5	43.13	43.19	46.39	44.06	18.34	43.32	42.61	40.41	41.81	6.60	45.22
	SOx	152.01	213.96	445.81	437.93	483.97	457.14	549.39	426.26	445.94	428.65	503.27
	NOx	99.43	109.50	148.56	172.52	187.82	171.42	170.41	161.53	159.18	163.32	165.97
	VOC	6.19	6.16	9.20	8.24	9.39	8.01	7.74	7.29	7.06	7.25	8.82
	CO	217.92	207.37	212.38	168.71	210.57	138.05	109.90	102.22	86.28	110.69	212.64
		2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	
4a	PM10	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.14	0.15	0.15	0.08
	PM2.5	0.00	0.00	0.00	0.00	0.17	0.00	0.15	0.14	0.15	0.15	0.00
	SOx	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NOx	13.41	14.81	16.50	14.44	15.17	15.14	35.84	33.53	36.70	35.87	34.69
	VOC	1.87	2.06	2.30	2.01	2.11	2.11	0.47	0.44	0.48	0.47	2.06
	CO	8.82	9.74	10.85	9.49	9.98	9.96	55.42	51.85	56.75	55.47	9.28
4b	PM10	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.14	0.12	0.11	0.09
	PM2.5	0.00	0.00	0.00	0.00	0.16	0.00	0.17	0.14	0.12	0.11	0.00
	SOx	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NOx	19.52	19.78	20.31	15.25	13.99	13.26	40.84	32.55	29.79	26.50	36.70
	VOC	2.72	2.76	2.83	2.12	1.95	1.85	0.53	0.42	0.39	0.35	2.04
	CO	12.83	13.01	13.36	10.03	9.20	8.72	63.15	50.33	46.07	40.98	12.92
6a	PM10	0.06	0.06	0.07	0.06	0.06	0.07	0.05	0.06	0.06	0.06	0.06
	PM2.5	0.06	0.06	0.07	0.06	0.06	0.07	0.05	0.06	0.06	0.06	0.07
	SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NOx	13.54	15.38	16.81	15.30	13.97	16.89	10.90	14.86	14.87	14.86	12.88
	VOC	0.18	0.20	0.22	0.20	0.18	0.22	0.14	0.19	0.19	0.19	0.19
	CO	20.93	23.79	26.00	23.66	21.60	26.11	16.85	22.97	22.99	22.98	22.36
6b	PM10	0.06	0.06	0.08	0.05	0.08	0.02	0.06	0.06	0.06	0.06	0.04
	PM2.5	0.06	0.06	0.08	0.05	0.08	0.02	0.06	0.06	0.06	0.06	0.07
	SOx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NOx	16.17	14.60	18.56	12.88	19.87	5.12	14.04	14.86	14.87	14.86	14.45

	VOC	0.21	0.19	0.24	0.17	0.26	0.07	0.18	0.19	0.19	0.19	0.22
	CO	25.00	22.58	28.70	19.92	30.72	7.91	21.71	22.97	22.99	22.98	23.79
Totals	PM10	45.91	45.98	49.33	46.84	48.01	65.00	64.50	61.16	63.68	63.25	64.75
	PM2.5	43.25	43.31	46.54	44.17	18.81	43.41	43.04	40.81	42.20	6.98	45.35
	SOx	152.03	213.98	445.83	437.95	483.97	457.14	549.39	426.26	445.94	428.65	503.27
	NOx	162.07	174.07	220.74	230.39	250.82	221.83	272.03	257.33	255.41	255.41	264.68
	VOC	11.17	11.37	14.79	12.74	13.89	12.26	9.06	8.53	8.31	8.45	13.32
	CO	285.50	276.49	291.29	231.81	282.07	190.75	267.03	250.34	235.08	253.10	280.99
		2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	
South Flare	PM10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00
	PM2.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00
	SOx	0.00	0.00	2.38	4.44	1.27	2.55	9.79	6.15			6.17
	NOx	0.00	0.00	0.80	2.32	1.32	0.52	0.37	0.48			0.43
	VOC	0.00	0.00	1.65	4.78	3.80	1.08	0.76	0.84			4.29
	CO	0.00	0.00	4.35	12.62	4.76	2.85	2.02	2.21			0.00

GOHT/C Charge Heater - New

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emission (lb/yr)	Emission (tn/yr)
NOx	14.9		0.04		5220.96	2.61
SO2	14.9			1020	1296.13	0.65
VOC	14.9	5.5		1020	703.81	0.35
PM10	14.9		0.00051		66.57	0.03
PM2.5	14.9		0.00042		54.82	0.03
CO	14.9	84		1020	10749.04	5.37
lead	14.9	0.0005		1020	0.06	3.20E-05
benzene	14.9	2.10E-03		1020	2.69E-01	1.34E-04
formaldehyde	14.9	7.50E-02		1020	9.60E+00	4.80E-03
hexane	14.9	1.8		1020	2.30E+02	1.15E-01
naphthalene	14.9	6.10E-04		1020	7.81E-02	3.90E-05
toluene	14.9	3.40E-03		1020	4.35E-01	2.18E-04
arsenic	14.9	2.00E-04		1020	2.56E-02	1.28E-05
beryllium	14.9	1.20E-05		1020	1.54E-03	7.68E-07
cadmium	14.9	1.10E-03		1020	1.41E-01	7.04E-05
chromium	14.9	1.40E-03		1020	1.79E-01	8.96E-05
cobalt	14.9	8.40E-05		1020	1.07E-02	5.37E-06
manganese	14.9	3.80E-04		1020	4.86E-02	2.43E-05
mercury	14.9	2.60E-04		1020	3.33E-02	1.66E-05
nickel	14.9	2.10E-03		1020	2.69E-01	1.34E-04
selenium	14.9	2.40E-05		1020	3.07E-03	1.54E-06
Total HAPS						1.21E-01

Assumptions

Ultra low NO_x burners

20 mmBTU/hr absorbed, 85% efficient, 15% more for maximum, up 10% for HHV, may reduce emissions based on limited operation (only during startup?)

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Small Boilers - Low Nox burners

SO_2 emissions based on H_2S content of 60 ppmv

Was installed in December 2008 at 14.9 million

PM10 and PM2.5 emissions based on EPA PM emission factors for gas-fired boilers (NEI Inventory)

Fractionator Reboiler

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emission (lb/yr)	Emission (tn/yr)
NOx	47.0		0.04		16468.80	8.23
SO2	47.0			1020	4088.45	2.04
VOC	47.0	5.5		1020	2220.06	1.11
PM10	47.0		0.00051		209.98	0.10
PM2.5	47.0		0.00042		172.92	0.09
CO	47.0	84		1020	33906.35	16.95
lead	47.0	0.0005		1020	2.02E-01	1.01E-04
benzene	47.0	2.10E-03		1020	8.48E-01	4.24E-04
formaldehyde	47.0	7.50E-02		1020	3.03E+01	1.51E-02
hexane	47.0	1.8		1020	7.27E+02	3.63E-01
naphthalene	47.0	6.10E-04		1020	2.46E-01	1.23E-04
toluene	47.0	3.40E-03		1020	1.37E+00	6.86E-04
arsenic	47.0	2.00E-04		1020	8.07E-02	4.04E-05
beryllium	47.0	1.20E-05		1020	4.84E-03	2.42E-06
cadmium	47.0	1.10E-03		1020	4.44E-01	2.22E-04
chromium	47.0	1.40E-03		1020	5.65E-01	2.83E-04
cobalt	47.0	8.40E-05		1020	3.39E-02	1.70E-05
manganese	47.0	3.80E-04		1020	1.53E-01	7.67E-05
mercury	47.0	2.60E-04		1020	1.05E-01	5.25E-05
nickel	47.0	2.10E-03		1020	8.48E-01	4.24E-04
selenium	47.0	2.40E-05		1020	9.69E-03	4.84E-06
Total HAPS						3.81E-01

Assumptions

Ultra low NO_x burners

31.68 mmBTU/hr absorbed, 85% efficient, 15% more for maximum, up 10% for HHV.

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Small Boilers - Low Nox burners

SO_2 emissions based on H_2S content of 60 ppmv

Installed at 47.0 MMBtu/hr (HHV) in December 2008

PM10 and PM2.5 emissions based on EPA PM emission factors for gas-fired boilers (NEI Inventory)

Sour Water Stripper Unit

No air emissions are expected from this unit.

Assumptions:
Unit built

10 H2 Hot Oil Heater

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emission (lb/yr)	Emission (tn/yr)
NOx	99		0.02		17344.80	8.67
SO2	99			1020	8611.84	4.31
VOC	99	5.5		1020	4676.29	2.34
PM10	99		0.00051		442.29	0.22
PM2.5	99		0.00042		364.24	0.18
CO	99	84		1020	71419.76	35.71
lead	99	0.0005		1020	0.43	2.13E-04
benzene	99	2.10E-03		1020	1.79E+00	8.93E-04
formaldehyde	99	7.50E-02		1020	6.38E+01	3.19E-02
hexane	99	1.8		1020	1.53E+03	7.65E-01
naphthalene	99	6.10E-04		1020	5.19E-01	2.59E-04
toluene	99	3.40E-03		1020	2.89E+00	1.45E-03
arsenic	99	2.00E-04		1020	1.70E-01	8.50E-05
beryllium	99	1.20E-05		1020	1.02E-02	5.10E-06
cadmium	99	1.10E-03		1020	9.35E-01	4.68E-04
chromium	99	1.40E-03		1020	1.19E+00	5.95E-04
cobalt	99	8.40E-05		1020	7.14E-02	3.57E-05
manganese	99	3.80E-04		1020	3.23E-01	1.62E-04
mercury	99	2.60E-04		1020	2.21E-01	1.11E-04
nickel	99	2.10E-03		1020	1.79E+00	8.93E-04
selenium	99	2.40E-05		1020	2.04E-02	1.02E-05
Total HAPS						8.02E-01

Assumptions

70.8 mmBTU/hr absorbed, 85% efficient, 8% more for maximum, up 10% for HHV

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Small Boilers - Low Nox burners

SO_2 emissions based on H_2S content of 60 ppmv

Proposed change - 10H2 will be equipped with LNB and SCR.

SCR added to control NOx emission.

Proposed emissions based on approximately 21 lb/MMscf or 0.02 lb/MMBtu

Natural gas/refinery fuel gas combusted

PM10 and PM2.5 emissions based on EPA PM emission factors for gas-fired boilers (NEI Inventory)

Hydrogen Reformer Furnace #1

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emission (lb/yr)	Emission (tn/yr)
NOx	123.1		0.02		21567.12	10.78
SO2	123.1			1020	10708.26	5.35
VOC	123.1	5.5		1020	5814.66	2.91
PM10	123.1		0.00051		549.96	0.27
PM2.5	123.1		0.00042		452.91	0.23
CO	123.1	84		1020	88805.79	44.40
lead	123.1	0.0005		1020	0.53	2.64E-04
benzene	123.1	2.10E-03		1020	2.22E+00	1.11E-03
formaldehyde	123.1	7.50E-02		1020	7.93E+01	3.96E-02
hexane	123.1	1.8		1020	1.90E+03	9.51E-01
naphthalene	123.1	6.10E-04		1020	6.45E-01	3.22E-04
toluene	123.1	3.40E-03		1020	3.59E+00	1.80E-03
arsenic	123.1	2.00E-04		1020	2.11E-01	1.06E-04
beryllium	123.1	1.20E-05		1020	1.27E-02	6.34E-06
cadmium	123.1	1.10E-03		1020	1.16E+00	5.81E-04
chromium	123.1	1.40E-03		1020	1.48E+00	7.40E-04
cobalt	123.1	8.40E-05		1020	8.88E-02	4.44E-05
manganese	123.1	3.80E-04		1020	4.02E-01	2.01E-04
mercury	123.1	2.60E-04		1020	2.75E-01	1.37E-04
nickel	123.1	2.10E-03		1020	2.22E+00	1.11E-03
selenium	123.1	2.40E-05		1020	2.54E-02	1.27E-05
Total HAPS						9.97E-01

Assumptions:

Low NOx burners and SCR

Scaled from Artesia at 10 mmscfd with 2 reformer feed furnaces @ 61.55 mmbtu/hr HHV released, 4 burners each.

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Large Boilers - Low Nox burners

SO_2 emissions based on H_2S content of 60 ppmv

Unit not built but still planning on being built

PM10 and PM2.5 emissions based on EPA PM emission factors for gas-fired boilers (NEI Inventory)

Hydrogen Reformer Deaerator Vent

	Artesia (tn/yr)	Artesia (lb/hr)	Ratio to Artesia Unit	(tn/yr)
VOC	1.6		2	3.20
CO		0.3	2	2.63

Assumptions:

CO scaled from Holly's Artesia NM facility permit application at 10 mmscfd and 0.3 lbs/hr.
VOC - emission rate obtained from Holly's Artesia NM facility engineering
Vent to be installed

Hydrogen Unit Fugitives

Pollutant	Emission Rate (tn/yr) [1]		Ratio	Emissions (lb/yr)	Emissions (tn/yr)
VOC		0.38	0.1460	110.95	0.055

Assumptions:

1) Emission rate based on 2004 testing from gas values (0.38 tons for 1370 values)
Ratio based on 200 valves

Hydrogen Reformer Furnace #2

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emission (lb/yr)	Emission (tn/yr)
NOx	123.1		0.02		21567.12	10.78
SO2	123.1			1020	10708.26	5.35
VOC	123.1	5.5		1020	5814.66	2.91
PM10	123.1		0.00051		549.96	0.27
PM2.5	123.1		0.00042		452.91	0.23
CO	123.1	84		1020	88805.79	44.40
lead	123.1	0.0005		1020	0.53	2.64E-04
benzene	123.1	2.10E-03		1020	2.22E+00	1.11E-03
formaldehyde	123.1	7.50E-02		1020	7.93E+01	3.96E-02
hexane	123.1	1.8		1020	1.90E+03	9.51E-01
naphthalene	123.1	6.10E-04		1020	6.45E-01	3.22E-04
toluene	123.1	3.40E-03		1020	3.59E+00	1.80E-03
arsenic	123.1	2.00E-04		1020	2.11E-01	1.06E-04
beryllium	123.1	1.20E-05		1020	1.27E-02	6.34E-06
cadmium	123.1	1.10E-03		1020	1.16E+00	5.81E-04
chromium	123.1	1.40E-03		1020	1.48E+00	7.40E-04
cobalt	123.1	8.40E-05		1020	8.88E-02	4.44E-05
manganese	123.1	3.80E-04		1020	4.02E-01	2.01E-04
mercury	123.1	2.60E-04		1020	2.75E-01	1.37E-04
nickel	123.1	2.10E-03		1020	2.22E+00	1.11E-03
selenium	123.1	2.40E-05		1020	2.54E-02	1.27E-05
Total HAPS						9.97E-01

Assumptions:

Low NOx burners and SCR

Scaled from Artesia at 10 mmscfd with 2 reformer feed furnaces @ 61.55 mmbtu/hr HHV released, 4 burners each.

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Large Boilers - Low Nox burners

SO_2 emissions based on H_2S content of 60 ppmv

Unit not built but still planning on being built

PM10 and PM2.5 emissions based on EPA PM emission factors for gas-fired boilers (NEI Inventory)

Asphalt Tank Emissions

VOC =	0.025	lb/hr
VOC =	219	lb/yr
VOC =	0.11	tn/yr

Assumptions:
Emissions from small amount of residual solvent

2006 Tank Modifications

Total Emissions	New VOC Emissions lbs	Existing VOC Emissions lbs	Net Emissions lbs	Net Emissions tns
#6 Fuel Oil Tank 1	11.32		11.32	0.0057
#6 Fuel Oil Tank 2	11.32		11.32	0.0057
New Cutter Tank	576.51		576.51	0.2883
Tank 28	0.00	69.8	-69.8	-0.0349
Tank 59	110.62	39.4	71.22	0.0356
Total Emissions				0.3003

2006 Increased Tank Throughput

Tank	Type	Contents	Increase	VOC Emissions (tons/yr)			HAPS Emissions (lb/year)								
				Standing	Withdrawal	Total	Benzene	Xylene	Toluene	Ethylbenzene	Naphthalene	Hexane	Cyclohexane	Trimethylbenzene	Isooctane
12	IFR	Reformer Charge	0.44	0	0.00	0.00	3.190	0.026	5.764	0.000	0.000	0.000	0.000	0.000	0.000
323	IFR	Reformer Charge	0.44	0	0.00	0.00	2.935	0.022	5.236	0.000	0.000	0.000	0.000	0.000	0.000
71	IFR	NHDS Charge	0.11	0	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
106	EFR	Gasoline	0.11	0	0.00	0.00	1.476	0.532	1.969	0.095	0.000	3.482	0.766	0.046	0.000
107	EFR	Gasoline	0.11	0	0.00	0.00	1.458	2.017	6.760	0.306	0.000	5.899	0.151	0.141	14.325
108	EFR	Gasoline	0.11	0	0.01	0.01	3.056	1.707	4.700	0.288	0.000	8.580	1.584	0.207	0.000
132	EFR	Gasoline	0.11	0	0.00	0.00	1.570	1.263	3.732	0.194	0.000	5.122	0.613	0.136	4.752
145	EFR	Gasoline	0.11	0	0.00	0.00	14.202	3.422	17.150	0.646	0.000	41.495	7.382	0.132	0.000
146	EFR	Gasoline	0.11	0	0.00	0.00	1.305	1.357	5.613	0.215	0.000	5.346	0.135	0.062	12.406
72	IFR	Cat Gas/Gasoline	0.11	0	0.00	0.00	0.428	0.231	0.523	0.019	0.000	1.106	0.162	0.028	0.000
101	EFR	Cat Gasoline	0.11	0	0.00	0.00	1.180	1.532	1.300	0.000	0.000	3.527	0.000	0.287	0.000
138	IFR	Cat Gas/Isomerate	0.11	0	0.00	0.00	1.263	0.108	0.097	0.000	0.000	5.446	3.728	0.019	0.000
104	EFR	Isomerate	0.11	0	0.00	0.00	1.283	0.000	0.000	0.000	0.000	5.777	4.125	0.000	0.000
105	EFR	Reform./Isom	0.11	0	0.00	0.00	5.598	0.642	2.866	0.127	0.000	16.482	13.688	0.006	0.000
100	EFR	Reformate	0.11	0	0.00	0.00	6.069	2.562	9.970	0.491	0.000	0.000	5.745	0.029	0.000
102	EFR	Crude Oil	0.51	0	0.05	0.05	45.201	0.000	7.732	0.000	0.041	0.000	14.071	0.000	0.000
121	EFR	Crude Oil	0.51	0	0.08	0.08	24.577	14.020	5.574	0.000	0.061	0.000	7.604	0.000	0.000
126	EFR	Crude Oil	0.51	0	0.09	0.09	17.355	15.152	5.013	0.000	0.071	0.000	5.335	0.000	0.000
135	EFR	Cat Gas/Alky	0.11	0	0.00	0.00	0.471	0.450	0.482	0.000	0.000	1.433	0.000	0.042	5.237
109	EFR	Alkylate	0.11	0	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.030	0.000	0.000	16.155
103	EFR	Gas Oil/Crude	0.38	0	0.00	0.00									
35	VFR	Gas Oil	0.38	0	0.01	0.01	132.615	45.045	84.481	2.378	0.173	103.725	65.088	1.133	52.875
59	VFR	Gas Oil/Fuel Oil	0.38	0	0.00	0.00									
11	VFR	Fuel Oil	8.75	0	0.00	0.00									
15	VFR	Fuel Oil	8.75	0	0.09	0.09									
31	VFR	Fuel Oil	8.75	0	0.00	0.00									
37	VFR	Fuel Oil	8.75	0	0.00	0.00									
49	VFR	Fuel Oil	8.75	0	0.00	0.00									
52	VFR	Fuel Oil	8.75	0	0.09	0.09									
53	VFR	Fuel Oil	8.75	0	0.00	0.00									
54	VFR	Fuel Oil	8.75	0	0.00	0.00									
55	VFR	Fuel Oil	8.75	0	0.00	0.00									
56	VFR	Fuel Oil	8.75	0	0.00	0.00									
57	VFR	Fuel Oil	8.75	0	0.00	0.00									
58	VFR	Fuel Oil	8.75	0	0.00	0.00									
139	VFR	Fuel Oil/SDA Charge	2.33	0	0.00	0.00									
140	VFR	SDA Charge	2.33	0	0.00	0.00									
143	VFR	Diesel	0.92	0	0.00	0.00									
23	VFR	Diesel	0.92	0	0.15	0.15									
24	VFR	Diesel	0.92	0	0.15	0.15									
4	VFR	Diesel	0.92	0	0.00	0.00									
47	VFR	Diesel	0.92	0	0.13	0.13									
28	VFR	Diesel/Light Cycle Oil	-1	-0.03	-0.01	-0.04									
48	VFR	Light Cycle Oil	0.11	0	0.00	0.00									
14	VFR	Kerosene	0	0	0.00	0.00									
20	VFR	Jet Kerosene	0	0	0.00	0.00									
128	EFR	Jet Fuel	0	0	0.00	0.00									
63	VFR	Jet Fuel/Naphtha	0	0	0.00	0.00									
129	EFR	Naphtha	0.44	0	0.00	0.00									
127	VFR	Naphtha	0.44	0	0.02	0.02									
70	VFR	Gas Oil/Fuel Oil	0.38	0	0.00	0.00									
77	VFR	Naphtha/Jet Kerosene	0	0	0.00	0.00									
78	VFR	Naphtha/Jet Kerosene	0	0	0.00	0.00									
19	VFR	Stove Oil	0	0	0.00	0.00									
131	VFR	Stove Oil	0	0	0.00	0.00									
50	HFR	Stove Oil	0	0	0.00	0.00									
51	HFR	Stove Oil	0	0	0.00	0.00									
137	VFR	Propane		0	0.00	0.00									
122	HFR	Propane		0	0.00	0.00									
123	HFR	Propane		0	0.00	0.00									
136	HFR	Propane		0	0.00	0.00									
147	HFR	Propane		0	0.00	0.00									
148	HFR	Propane		0	0.00	0.00									
124	HFR	Butane		0	0.00	0.00									
125	HFR	Butane		0	0.00	0.00									
149	HFR	Butane		0	0.00	0.00									
150	HFR	Butane		0	0.00	0.00									
151	HFR	Butane		0	0.00	0.00									
133	HFR	Isobutane		0	0.00	0.00									
134	HFR	Isobutane		0	0.00	0.00									
152	HFR	Isobutane		0	0.00	0.00									
153	HFR	Isobutane		0	0.00	0.00									
141	HFR	Solvent		0	0.00	0.00									
159	HFR	NGL		0	0.00	0.00									
						0.84	265.230	90.090	168.962	4.756	0.347	207.449	130.177	2.266	105.750
							0.13	0.05	0.08	0.00	0.00	0.10	0.07	0.00	0.05

Tank	Type	Contents	Movement		VOC Emissions (tons/yr)			HAPS Emissions (lb/year)								
			Turnovers	1000 gallons	Standing	Withdrawal	Total	Benzene	Xylene	Toluene	Ethylbenzene	Naphthalene	Hexane	Cyclohexane	Trimethylbenzene	Isooctane
12	IFR	Reformer Charge	0.15	61	0.23	0	0.23	7.25	0.06	13.1	0	0	0	0	0	0
323	IFR	Reformer Charge	0.09	56	0.24	0	0.24	6.67	0.05	11.9	0	0	0	0	0	0
71	IFR	NHDS Charge	0.38	1280	0	0	0	0	0	0	0	0	0	0	0	0
106	EFR	Gasoline	6.91	7112	1.04	0.01	1.05	13.42	4.84	17.9	0.86	0	31.65	6.96	0.42	0
107	EFR	Gasoline	16.16	16628	3.23	0.03	3.26	13.25	18.34	61.45	2.78	0	53.63	1.37	1.28	130.23
108	EFR	Gasoline	38.43	39469	2.04	0.07	2.11	27.78	15.52	42.73	2.62	0	78	14.4	1.88	0
132	EFR	Gasoline	9.34	9632	1.78	0.02	1.8	14.27	11.48	33.93	1.76	0	46.56	5.57	1.24	43.2
145	EFR	Gasoline	0.66	110	10.46	0	10.46	129.11	31.11	155.91	5.87	0	377.23	67.11	1.2	0
146	EFR	Gasoline	11.82	1974	2.98	0.01	2.99	11.86	12.34	51.03	1.95	0	48.6	1.23	0.56	112.78
72	IFR	Cat Gas/Gasoline	1	5249	0.53	0	0.53	3.89	2.1	4.75	0.17	0	10.05	1.47	0.25	0
101	EFR	Cat Gasoline	10.38	23359	2.67	0.03	2.7	10.73	13.93	11.82	0	0	32.06	0	2.61	0
138	IFR	Cat Gas/Isomerate	1.39	2585	0.59	0	0.59	11.48	0.98	0.88	0	0	49.51	33.89	0.17	0
104	EFR	Isomerate	3.44	3530	0.44	0.02	0.46	11.66	0	0	0	0	52.52	37.5	0	0
105	EFR	Reform./Isom	10.65	10961	1.57	0.02	1.59	50.89	5.84	26.05	1.15	0	149.84	124.44	0.05	0
100	EFR	Reformate	13.71	30722	1.24	0.03	1.27	55.17	23.29	90.64	4.46	0	0	52.23	0.26	0
102	EFR	Crude Oil	10.35	23038	0.63	0.1	0.73	88.63	0	15.16	0	0.08	0	27.59	0	0
121	EFR	Crude Oil	10.68	44915	2.28	0.15	2.43	48.19	27.49	10.93	0	0.12	0	14.91	0	0
126	EFR	Crude Oil	15.12	41054	0.47	0.18	0.65	34.03	29.71	9.83	0	0.14	0	10.46	0	0
135	EFR	Cat Gas/Alky	0.66	1231	1.45	0	1.45	4.28	4.09	4.38	0	0	13.03	0	0.38	47.61
109	EFR	Alkylate	20.81	21417	1.03	0.04	1.07	0	0	0	0	0	0.27	0	0	146.86
103	EFR	Gas Oil/Crude	2.35	2428	0.03	0	0.03									
35	VFR	Gas Oil	4.78	12252	0.04	0.03	0.07									
59	VFR	Gas Oil/Fuel Oil	0.2	234	0.02	0	0.02									
11	VFR	Fuel Oil	0	0	0.01	0	0.01									
15	VFR	Fuel Oil	12.83	2528	0.01	0.01	0.02									
31	VFR	Fuel Oil	7.26	7251	0	0	0									
37	VFR	Fuel Oil	23.84	3442	0	0	0									
49	VFR	Fuel Oil	1.16	2615	0	0	0									
52	VFR	Fuel Oil	44.74	1680	0	0.01	0.01									
53	VFR	Fuel Oil	41.94	1575	0	0	0									
54	VFR	Fuel Oil	35.15	1320	0	0	0									
55	VFR	Fuel Oil	36.22	1360	0	0	0									
56	VFR	Fuel Oil	38.96	1463	0	0	0									
57	VFR	Fuel Oil	39.62	1487	0	0	0									
58	VFR	Fuel Oil	15.83	9072	0	0	0									
139	VFR	Fuel Oil/SDA Charge	1.75	1102	0.02	0	0.02									
140	VFR	SDA Charge	3.49	2201	0	0	0									
143	VFR	Diesel	0.51	80	0.01	0	0.01									
23	VFR	Diesel	114.64	43645	0.02	0.16	0.18									
24	VFR	Diesel	31.31	18195	0.05	0.16	0.21									
4	VFR	Diesel	0	0	0	0	0									
47	VFR	Diesel	12.71	16068	0.12	0.14	0.26									
28	VFR	Diesel/Light Cycle Oil	1.51	1803	0.03	0.01	0.04									
48	VFR	Light Cycle Oil	5.02	5730	0.03	0.02	0.05									
14	VFR	Kerosene	2.27	222	0	0	0									
20	VFR	Jet Kerosene	20.34	5955	0.04	0.06	0.1									
128	EFR	Jet Fuel	12.87	5459	0.03	0.01	0.04									
63	VFR	Jet Fuel/Naphtha	7.41	7400	0.11	0.07	0.18									
129	EFR	Naphtha	1.92	4447	0	0	0	0	0	0	0	0	0	0	0	0
127	VFR	Naphtha	7.34	9448	0.06	0.04	0.1									
70	VFR	Gas Oil/Fuel Oil	2.37	7093	0.07	0.01	0.08									
77	VFR	Naphtha/Jet Kerosene	4.99	1041	0.01	0.01	0.02									
78	VFR	Naphtha/Jet Kerosene	3.09	645	0.01	0	0.01									
19	VFR	Stove Oil	7.5	2202	0	0	0									
131	VFR	Stove Oil	5.78	15669	0	0	0									
50	HFR	Stove Oil			0	0	0									
51	HFR	Stove Oil			0	0	0									
137	VFR	Propane			0	0	0									
122	HFR	Propane			0	0	0									
123	HFR	Propane			0	0	0									
136	HFR	Propane			0	0	0									
147	HFR	Propane			0	0	0									
148	HFR	Propane			0	0	0									
124	HFR	Butane			0	0	0									
125	HFR	Butane			0	0	0									
149	HFR	Butane			0	0	0									
150	HFR	Butane			0	0	0									
151	HFR	Butane			0	0	0									
133	HFR	Isobutane			0	0	0									
134	HFR	Isobutane			0	0	0									
152	HFR	Isobutane			0	0	0									
153	HFR	Isobutane			0	0	0									
141	HFR	Solvent			0	0	0									
159	HFR	NGL			0	0	0									
								542.56	201.2	562.39	21.62	0.34	942.95	399.13	10.3	480.68
								0.27128	0.101	0.2812	0.01081	0.00017	0.4715	0.199565	0.00515	0.24034

Crude Furnace #3 (24H1) - New
Holly Marketing & Refining Company
Reference: AP-42, Section 1.4 Natural Gas Combustion, Small Boilers

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	(lb/hr)	Emissions (lb/yr)	(tn/yr)
NOx	60		0.04		2.400	21024.00	10.51
SO2	60			1020	0.596	5219.30	2.61
VOC	60		0.005		0.324	2838.24	1.42
PM_{10}	60		0.00051		0.031	268.06	0.13
$PM_{2.5}$	60		0.00042		0.025	220.75	0.11
CO	60		0.08		4.800	42048.00	21.02
lead	60	0.0005		1020	2.94E-05	0.26	1.29E-04
benzene	60	2.10E-03		1020	1.24E-04	1.08E+00	5.41E-04
formaldehyde	60	7.50E-02		1020	4.41E-03	3.86E+01	1.93E-02
hexane	60	1.8		1020	1.06E-01	9.28E+02	4.64E-01
naphthalene	60	6.10E-04		1020	3.59E-05	3.14E-01	1.57E-04
toluene	60	3.40E-03		1020	2.00E-04	1.75E+00	8.76E-04
arsenic	60	2.00E-04		1020	1.18E-05	1.03E-01	5.15E-05
beryllium	60	1.20E-05		1020	7.06E-07	6.18E-03	3.09E-06
cadmium	60	1.10E-03		1020	6.47E-05	5.67E-01	2.83E-04
chromium	60	1.40E-03		1020	8.24E-05	7.21E-01	3.61E-04
cobalt	60	8.40E-05		1020	4.94E-06	4.33E-02	2.16E-05
manganese	60	3.80E-04		1020	2.24E-05	1.96E-01	9.79E-05
mercury	60	2.60E-04		1020	1.53E-05	1.34E-01	6.70E-05
nickel	60	2.10E-03		1020	1.24E-04	1.08E+00	5.41E-04
selenium	60	2.40E-05		1020	1.41E-06	1.24E-02	6.18E-06
Total HAPS							0.49

Assumptions:
New heater to be installed on second crude unit
Ultra Low NO_x burners
SO_2 emissions based on H_2S content of 60 ppmv
PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

FCC #2 Feed Heater (25H1) - New
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	(lb/hr)	Emissions (lb/yr)	(tn/yr)
NOx	45		0.04		1.800	15768.00	7.88
SO2	45	10.1281		1020	0.447	3914.47	1.96
VOC	45		0.005		0.243	2128.68	1.06
PM_{10}	45		0.00051		0.023	201.04	0.10
$PM_{2.5}$	45		0.00042		0.019	165.56	0.08
CO	45		0.08		3.600	31536.00	15.77
lead	45	0.0005		1020	2.21E-05	0.19	9.66E-05
benzene	45	2.10E-03		1020	9.26E-05	8.12E-01	4.06E-04
formaldehyde	45	7.50E-02		1020	3.31E-03	2.90E+01	1.45E-02
hexane	45	1.8		1020	7.94E-02	6.96E+02	3.48E-01
naphthalene	45	6.10E-04		1020	2.69E-05	2.36E-01	1.18E-04
toluene	45	3.40E-03		1020	1.50E-04	1.31E+00	6.57E-04
arsenic	45	2.00E-04		1020	8.82E-06	7.73E-02	3.86E-05
beryllium	45	1.20E-05		1020	5.29E-07	4.64E-03	2.32E-06
cadmium	45	1.10E-03		1020	4.85E-05	4.25E-01	2.13E-04
chromium	45	1.40E-03		1020	6.18E-05	5.41E-01	2.71E-04
cobalt	45	8.40E-05		1020	3.71E-06	3.25E-02	1.62E-05
manganese	45	3.80E-04		1020	1.68E-05	1.47E-01	7.34E-05
mercury	45	2.60E-04		1020	1.15E-05	1.00E-01	5.02E-05
nickel	45	2.10E-03		1020	9.26E-05	8.12E-01	4.06E-04
selenium	45	2.40E-05		1020	1.06E-06	9.28E-03	4.64E-06
Total HAPS							0.36

Assumptions

Ultra Low NO_x burners

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion

SO_2 emissions based on H_2S content of 60 ppmv

PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

FCCU #2 Scrubber - New
Holly Marketing & Refining Company

Equations Used:

$PM_{10}/PM_{2.5}$ = 6200 lb coke burn/hr /1000 * Consent Decree FCCU PM limit*operating hours per year

SO_2 = Maximum daily FCC flue gas flow rate * Consent Decree FCCU SOx limit *(1/379.5 scf*MW SOx)*Operating hours per year

NO_x = Maximum daily FCC flue gas flow rate * Consent Decree FCCU NOx limit *(1/379.5 scf*MW NOx)*Operating hours per year

CO = Maximum daily FCC flue gas flow rate * Consent Decree FCCU CO limit *(1/379.5 scf*MW CO)*Operating hours per year

		Emissions	
Pollutant	**lb/hr**	**(lb/yr)**	**(tn/yr)**
NO_x	4.545	39818.18	19.91
SO2	4.040	35393.94	17.70
VOC	Neg.	Neg.	Neg.
PM_{10}	1.9	16293.6	8.15
$PM_{2.5}$	1.86	16293.6	8.15
CO	35.354	309697	154.85

Assumptions:

Emissions controlled through wet gas scrubber		
NOx from CD controlled fluid catalytic cracking units:	40	Holly Consent Decree FCCU NOx final limits (ppmvd 0% O2 365 day average)
SO2 from CD controlled fluid catalytic cracking units:	25	Holly Consent Decree FCCU SOx final limits (ppmvd 0% O2 365 day average)
PM10 from CD controlled fluid catalytic cracking units:	0.3	Ja
PM2.5 from CD controlled fluid catalytic cracking units:	0.3	All PM10 assumed to be PM2.5 (lb/1000 lb coke burn)
CO Emission Limit for FCCU:	500	ppm (1 hr average 0% O2)
VOC from controlled fluid catalytic cracking units:	Neg	AP-42 Emission Factors from Table 5.1-1 (lb/10^3 bbl fresh feed) [TOC]
Plant Wide Annual Operating Time:	8760	hr
Conversion from scf to lb mol:	379.5	scf -> lb mol
Maximum daily FCC flue gas flow rate:	23	mmscfd (Engineering Calculation)
Maximum hourly FCC regenerator coke burn rate:	6200	lbs coke burn / hr (Engineering Calculation)
Molecular Weight of CO:	28	lb/lb-mol
Molecular Weight of NOx:	45	lb/lb-mol
Molecular Weight of SOx:	64	lb/lb-mol

Reactor Charge Heater (27H1) - New
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (tn/yr)
NOx	99		0.02		1.98	17344.80	8.67
SO2	99	10.13		1020	0.98	8611.84	4.31
VOC	99		0.005		0.53	4683.10	2.34
PM_{10}	99		0.00051		0.05	442.29	0.22
$PM_{2.5}$	99		0.00042		0.04	364.24	0.18
CO	99		0.08		7.92	69379.20	34.69
lead	99	0.0005		1020	4.85E-05	0.43	2.13E-04
benzene	99	2.10E-03		1020	2.04E-04	1.79E+00	8.93E-04
formaldehyde	99	7.50E-02		1020	7.28E-03	6.38E+01	3.19E-02
hexane	99	1.8		1020	1.75E-01	1.53E+03	7.65E-01
naphthalene	99	6.10E-04		1020	5.92E-05	5.19E-01	2.59E-04
toluene	99	3.40E-03		1020	3.30E-04	2.89E+00	1.45E-03
arsenic	99	2.00E-04		1020	1.94E-05	1.70E-01	8.50E-05
beryllium	99	1.20E-05		1020	1.16E-06	1.02E-02	5.10E-06
cadmium	99	1.10E-03		1020	1.07E-04	9.35E-01	4.68E-04
chromium	99	1.40E-03		1020	1.36E-04	1.19E+00	5.95E-04
cobalt	99	8.40E-05		1020	8.15E-06	7.14E-02	3.57E-05
manganese	99	3.80E-04		1020	3.69E-05	3.23E-01	1.62E-04
mercury	99	2.60E-04		1020	2.52E-05	2.21E-01	1.11E-04
nickel	99	2.10E-03		1020	2.04E-04	1.79E+00	8.93E-04
selenium	99	2.40E-05		1020	2.33E-06	2.04E-02	1.02E-05
Total HAPS							0.80

Assumptions

Low NO_x burners and Selective Catalytic Reduction

NOx emissions based on 20 lb/mmscf (estimated)

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion

SO_2 emissions based on H_2S content of 60 ppmv

PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

Reactor Charge Heater (20H3) - New
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (tn/yr)
NOx	42.1		0.04		1.68	14751.84	7.38
SO2	42.1	10.1281		1020	0.42	3662.21	1.83
VOC	42.1		0.005		0.23	1991.50	1.00
PM_{10}	42.1		0.00051		0.02	188.09	0.09
$PM_{2.5}$	42.1		0.00042		0.02	154.89	0.08
CO	42.1		0.08		3.37	29503.68	14.75
lead	42.1	0.0005		1020	2.06E-05	0.18	9.04E-05
benzene	42.1	2.10E-03		1020	8.67E-05	7.59E-01	3.80E-04
formaldehyde	42.1	7.50E-02		1020	3.10E-03	2.71E+01	1.36E-02
hexane	42.1	1.8		1020	7.43E-02	6.51E+02	3.25E-01
naphthalene	42.1	6.10E-04		1020	2.52E-05	2.21E-01	1.10E-04
toluene	42.1	3.40E-03		1020	1.40E-04	1.23E+00	6.15E-04
arsenic	42.1	2.00E-04		1020	8.25E-06	7.23E-02	3.62E-05
beryllium	42.1	1.20E-05		1020	4.95E-07	4.34E-03	2.17E-06
cadmium	42.1	1.10E-03		1020	4.54E-05	3.98E-01	1.99E-04
chromium	42.1	1.40E-03		1020	5.78E-05	5.06E-01	2.53E-04
cobalt	42.1	8.40E-05		1020	3.47E-06	3.04E-02	1.52E-05
manganese	42.1	3.80E-04		1020	1.57E-05	1.37E-01	6.87E-05
mercury	42.1	2.60E-04		1020	1.07E-05	9.40E-02	4.70E-05
nickel	42.1	2.10E-03		1020	8.67E-05	7.59E-01	3.80E-04
selenium	42.1	2.40E-05		1020	9.91E-07	8.68E-03	4.34E-06
Total HAPS							0.34

Assumptions

Ultra Low NO_x burners

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion

SO_2 emissions based on H_2S content of 60 ppmv

PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

Reactor Charge Heater (20H3) - New
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (tn/yr)
NOx	42.1		0.04		1.68	14751.84	7.38
SO2	42.1	10.1281		1020	0.42	3662.21	1.83
VOC	42.1		0.005		0.23	1991.50	1.00
PM_{10}	42.1		0.00051		0.02	188.09	0.09
$PM_{2.5}$	42.1		0.00042		0.02	154.89	0.08
CO	42.1		0.08		3.37	29503.68	14.75
lead	42.1	0.0005		1020	2.06E-05	0.18	9.04E-05
benzene	42.1	2.10E-03		1020	8.67E-05	7.59E-01	3.80E-04
formaldehyde	42.1	7.50E-02		1020	3.10E-03	2.71E+01	1.36E-02
hexane	42.1	1.8		1020	7.43E-02	6.51E+02	3.25E-01
naphthalene	42.1	6.10E-04		1020	2.52E-05	2.21E-01	1.10E-04
toluene	42.1	3.40E-03		1020	1.40E-04	1.23E+00	6.15E-04
arsenic	42.1	2.00E-04		1020	8.25E-06	7.23E-02	3.62E-05
beryllium	42.1	1.20E-05		1020	4.95E-07	4.34E-03	2.17E-06
cadmium	42.1	1.10E-03		1020	4.54E-05	3.98E-01	1.99E-04
chromium	42.1	1.40E-03		1020	5.78E-05	5.06E-01	2.53E-04
cobalt	42.1	8.40E-05		1020	3.47E-06	3.04E-02	1.52E-05
manganese	42.1	3.80E-04		1020	1.57E-05	1.37E-01	6.87E-05
mercury	42.1	2.60E-04		1020	1.07E-05	9.40E-02	4.70E-05
nickel	42.1	2.10E-03		1020	8.67E-05	7.59E-01	3.80E-04
selenium	42.1	2.40E-05		1020	9.91E-07	8.68E-03	4.34E-06
Total HAPS							0.34

Assumptions

Ultra Low NO_x burners

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion

SO_2 emissions based on H_2S content of 60 ppmv

PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

Sour Water Stripper
Holly Marketing & Refining Company

No air emissions expected from this unit.

Assumptions:
Emissions controlled through existing sour water stripper/ammonia stripping unit prior to treatment in existing SRU.

Boiler #11 - New
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (MMBtu/hr)	Conversion lb/mmscf to lb/MMBtu	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (tn/yr)
NOx	89.3		0.02		1.786	15645.36	7.82
SO2	89.3	10.1281		1020	0.886	7768.05	3.88
VOC	89.3		0.004		0.357	3129.07	1.56
PM_{10}	89.3		0.00051		0.046	398.96	0.20
$PM_{2.5}$	89.3		0.00042		0.038	328.55	0.16
CO	89.3		0.037		3.304	28943.92	14.47
lead	89.3	0.0005		1020	4.38E-05	0.38	1.92E-04
benzene	89.3	2.10E-03		1020	1.84E-04	1.61E+00	8.05E-04
formaldehyde	89.3	7.50E-02		1020	6.57E-03	5.75E+01	2.88E-02
hexane	89.3	1.8		1020	1.58E-01	1.38E+03	6.90E-01
naphthalene	89.3	6.10E-04		1020	5.34E-05	4.68E-01	2.34E-04
toluene	89.3	3.40E-03		1020	2.98E-04	2.61E+00	1.30E-03
arsenic	89.3	2.00E-04		1020	1.75E-05	1.53E-01	7.67E-05
beryllium	89.3	1.20E-05		1020	1.05E-06	9.20E-03	4.60E-06
cadmium	89.3	1.10E-03		1020	9.63E-05	8.44E-01	4.22E-04
chromium	89.3	1.40E-03		1020	1.23E-04	1.07E+00	5.37E-04
cobalt	89.3	8.40E-05		1020	7.35E-06	6.44E-02	3.22E-05
manganese	89.3	3.80E-04		1020	3.33E-05	2.91E-01	1.46E-04
mercury	89.3	2.60E-04		1020	2.28E-05	1.99E-01	9.97E-05
nickel	89.3	2.10E-03		1020	1.84E-04	1.61E+00	8.05E-04
selenium	89.3	2.40E-05		1020	2.10E-06	1.84E-02	9.20E-06
Total HAPS							0.72

Assumptions
Selective Catalytic Reduction for emissions control
HAPs Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion
SO_2 emissions based on H_2S content of 60 ppmv
CO emissions based on manufacturer supplied emission rate of 0.037 lb/MMbtu
PM10/PM2.5 emissions based on manufacturer supplied emission rate of 0.01 lb/MMBtu
NOx emissions based on 0.02 lb/MMBtu
VOC emissions based on manufacturer supplied emissions rate of 0.004 lb/MMBtu

Cooling Tower #10 Emissions
Holly Marketing & Refining Company

Reference: South Coast Air Quality Management District, Guidelines for Calculating Emissions from Cooling Towers, June 2006
E = Cooling tower circulating water rate (gal/min) * TDS/10^6 * Drift loss * density of water * 60 * operating hours

$E_{(PM)}$ =	662.83	lb/yr
$E_{(PM)}$ =	0.33	tn/yr
$E_{(PM)}$ =	0.0757	lb/hr
$E_{(PM10)}$ =	190.65	lb/yr
$E_{(PM10)}$ =	0.095	tn/yr
$E_{(PM10)}$ =	0.0218	lb/hr
$E_{(PM2.5)}$ =	1.20	lb/yr
$E_{(PM2.5)}$ =	0.001	tn/yr
$E_{(PM2.5)}$ =	0.0001	lb/hr
$E_{(VOC)}$ =	3127.32	lb/yr
$E_{(VOC)}$ =	1.56	tn/yr
$E_{(VOC)}$ =	0.36	lb/hr

HAPS	Benzene	0.25	tn/yr
	Hexane	0.31	tn/yr
	Naphthalene	0.00	tn/yr
	Toluene	0.21	tn/yr
	Xylenes	0.14	tn/yr
	Ethylbenzene	0.01	tn/yr
	2,2,4 Trimethylpentane	0.21	tn/yr
	Chlorine	0.94	tn/yr

Where:

Water Circulating Rate (gal/min)	8,500
Concentration of Total Dissolved Solids (ppm by weight)	2964.9
Drift Loss of Circulating Water	0.000
Density of Water (lbs/gal)	8.34
Conversion of Minutes to Hours	60
Annual Operating Hours (hr/yr)	8760

Assumptions:

Reference: Calculating Realistic PM_{10} Emissions from Cooling Towers, Joel Reisman and Gordon Frisbie, Abstract No. 216

TDS was based on the average TDS of the existing cooling towers
HAP emissions estimated by Holly based on storage tank HAPs emissions determined using the TANKS software, averaging the last 8 years, and multiplying by 2 standard deviations.
New cooling tower
VOC emission factor from AP-42 Section 5.1-2 controlled

Cooling Tower #11 Emissions
Holly Marketing & Refining Company

Reference: South Coast Air Quality Management District, Guidelines for Calculating Emissions from Cooling Towers, June 2006
E = Cooling tower circulating water rate (gal/min) * TDS/10^6 * Drift loss (%)/100 * density of water * 60 * operating hours

	$E_{(PM)}$ =	468.18	lb/yr
	$E_{(PM)}$ =	0.23	tn/yr - for two cells
	$E_{(PM)}$ =	0.0534	lb/hr
	$E_{(PM10)}$ =	137.84	lb/yr
	$E_{(PM10)}$ =	0.069	tn/yr - for two cells
	$E_{(PM10)}$ =	0.0157	lb/hr
	$E_{(PM2.5)}$ =	0.86	lb/yr
	$E_{(PM2.5)}$ =	0.000	tn/yr - for two cells
	$E_{(PM2.5)}$ =	0.0001	lb/hr
	$E_{(VOC)}$ =	2391.48	lb/yr
	$E_{(VOC)}$ =	1.20	tn/yr
	$E_{(VOC)}$ =	0.27	lb/hr
HAPS	Benzene	0.39	tn/yr
	Hexane	0.47	tn/yr
	Naphthalene	0.00	tn/yr
	Toluene	0.32	tn/yr
	Xylenes	0.21	tn/yr
	Ethylbenzene	0.01	tn/yr
	2,2,4 Trimethylpentane	0.33	tn/yr
	Chlorine	1.44	tn/yr

Water Circulating Rate (gal/min)	6,500	for one new cell
Concentration of Total Dissolved Solids (ppm by weight)	2738.56	
Drift Loss of Circulating Water (%)	0.000	
Density of Water (lbs/gal)	8.34	
Conversion of Minutes to Hours	60	
Annual Operating Hours (hr/yr)	8760	

Assumptions:

Reference: Calculating Realistic PM_{10} Emissions from Cooling Towers, Joel Reisman and Gordon Frisbie, Abstract No. 216

TDS based on average TDS for cooling tower 11
HAP emissions estimated by Holly based on storage tank HAPs emissions determined using the TANKS software, averaging the last 8 years, and multiplying by 2 standard deviations.
Existing cooling tower expanded by adding a cell
VOC emission factor from AP-42 Section 5.1-2 controlled

Average Daily Crude Feed (barrels)

Year	Crude Feed	Average	SD	Average + 3SD	Daily
2009	9600949				
2010	9952070	9890265	263898.5	10681960.57	29265.6454
2011	10117776				

Ratio of HAPS to VOC for Tanks (lbs/ton)

	VOC (tons)	HAPS (lbs)						
	VOC	Benzene	Xylene	Toluene	Ethylbenzene	Napthalene	Hexane	2,2,4- Trimethylpentane
2001	29.14	755.960	389.360	606.790	27.290	1.110	668.310	
Ratio		25.942	13.362	20.823	0.937	0.038	22.934	
2002	28.7	545.990	359.670	518.540	21.650	1.040	586.020	
Ratio		19.024	12.532	18.068	0.754	0.036	20.419	
2003	30.76	444.550	187.170	431.350	16.310	0.260	619.660	
Ratio		14.452	6.085	14.023	0.530	0.008	20.145	
2006	30.76	539.450	181.640	566.960	22.610	0.270	909.150	410.720
Ratio		17.537	5.905	18.432	0.735	0.009	29.556	13.352
2007	37.12	2710.410	235.580	660.110	26.740	0.380	1029.990	288.830
Ratio		73.016	6.346	17.783	0.720	0.010	27.748	7.781
2008	38.21	570.660	204.050	578.430	23.210	0.300	922.810	200.340
Ratio		14.935	5.340	15.136	0.607	0.008	24.151	5.243
2009	38.21	503.300	214.970	588.120	24.920	0.270	942.410	335.110
Ratio		13.172	5.626	15.392	0.652	0.007	24.664	8.770
2010	38.21	544.720	208.720	623.270	26.170	0.200	1058.060	390.710
Ratio		14.256	5.462	16.312	0.685	0.005	27.691	10.226
Average Ratios		17.046	7.582	16.996	0.703	0.015	24.663	9.074
Standard Deviation		4.421	3.334	2.198	0.120	0.014	3.479	6.950
Final Average Ratio		25.89	14.25	21.39	0.9421	0.0425	31.60	21.79

note: 2004 and 2005 data not available, 2007 benzene was an extreme outlier so it was left out of the average

Old Fractions of Cooling Tower Feed

4	0.165
6	0.137
7	0.148
8	0.340
11	0.210

New Fractions of Cooling Tower Feed

4	0.125000
6	0.104167
7	0.104167
8	0.218750
10	0.177083
11	0.270833

PM = Water Circulation Rate * Drift Rate * TDS

Year	Circulation Rate Millions Gallons per year
2001	15150
2002	14451
2003	14023
2004	15279
2005	15279
2006	14495
2007	231.94
2008	13550
2009	15379
2010	15864

Design Recirculation Rates	GPM
CT 4	6000
CT 6	5000
CT 7	5000
CT 8	10500
CT 10	8500
CT 11 Before	6500
CT 11 After	13000
Total Before	33000
Total After	48000

Assumptions: Additions to Cooling Tower 11 have no effect on TDS, Cooling Tower 10 will have the same average TDS as the rest of the Cooling Towers

Total PM PTE

Cooling Tower	Drift Rate	TDS	Total PM (lbs/year)	2.5 Mass %	10 Mass %	PM 2.5	PM 10
CT 4	0.002	2860.95	150491.93	0.18	29.08	274.48	43755.75
CT 6	0.002	3233.89	141757.59	0.18	27.96	253.27	39630.23
CT 7	0.002	2962.36	129855.33	0.18	28.77	235.53	37360.56
CT 8	0.002	3028.73	278805.88	0.18	28.57	503.84	79659.85
CT 10	0.000006	2964.90	662.83	0.18	28.76	1.20	190.65
CT 11 Before	0.000006	2738.56	468.18	0.18	29.44	0.86	137.84
CT 11 After	0.000006	2738.56	936.35	0.18	29.44	1.72	275.68
Total for old Equipment						1267.97	200544.22
Total With Expansion						1270.03	200872.72

From the NALCO Handbook, evaporation is considered to be 1% of the recirculation rate for every 10 degree drop. 3% for 30 degrees

(This analysis assumes that chlorine in water evaporates at the same rate as the water.)

Drift Rate = Used .002 without drift eliminators and .000006 with drift eliminators

Avg. Cl (ppm)	lb H2O/gallon	lb Cl/gallon
1.63	8.331	1.36E-05

For PTE on Chlorine New Equipment

Tower	Evaporation (ppm)	Evaporation (gallons/year)	Drift (ppm)	Drift (gallons/year)
4	180	9.46E+07	12	6.31E+06
6	150	7.88E+07	10	5.26E+06
7	150	7.88E+07	10	5.26E+06
8	315	1.66E+08	21	1.10E+07
10	255	1.34E+08	0.051	2.68E+04
11	390	2.05E+08	0.078	4.10E+04
Totals	1440	7.57E+08	53.129	2.79E+07
Cl lost (lb/yr)		10287		379

For PTE on Chlorine Old Equipment

Tower	Evaporation (ppm)	Evaporation (gallons/year)	Drift (ppm)	Drift (gallons/year)
4	180	9.46E+07	12	6.31E+06
6	150	7.88E+07	10	5.26E+06
7	150	7.88E+07	10	5.26E+06
8	315	1.66E+08	21	1.10E+07
11	195	1.02E+08	0.039	2.05E+04
Totals	990	4.18E+08	53.039	2.79E+07
Cl lost (lb/yr)		5668		378

6046

Interrpolation of PM_{10} and $PM_{2.5}$ Percentages - Cooling Towers

Reference: Calculating Realistic PM_{10} Emissions from Cooling Towers - Joel Reisman and Gordon Frisbie

$y2 = y_o + (y_1 - y_o)/(x_1 - x_o)*(x_1 - x_o)$ - linear interrpolation formula

(TDS = 7700 ppmw) Solid Part. Dia. (µm)	EPRI % Mass Smaller
1.518	0
2.5	0.127
3.037	0.196
4.555	0.226
6.073	0.514
7.591	1.816
9.11	5.702
10	14.875
10.628	21.348

(TDS = 11000 ppmw) Solid Part. Dia. (µm)	EPRI % Mass Smaller
1.71	0
2.5	0.091
3.42	0.196
5.13	0.226
6.84	0.514
8.55	1.816
10	5.111
10.26	5.702

For 2010 PM 2.5 and PM 10 DATA

	CT 4	CT 6	CT 7	CT 8	CT 11
Average TDS	2346	2179	2232	2232	2064
Throughput	4978.47	4148.72	4459.88	10268.09	6326.80
Drift Fraction	0.00	0.00	0.00	0.00	0.00
Total PM	102414.22	79257.23	87283.20	200952.59	343.41
2.5 Mass %	0.19	0.19	0.19	0.19	0.19
10 Mass Perce	30.62	31.12	30.96	30.96	31.47
PM 2.5	195.06	146.97	164.68	379.15	0.65
PM 10	31357.82	24665.46	27023.79	62217.13	108.06

Totals lbs/year
886.52
145372.26

Assumptions:

Used Table 2 data from reference

	4 Basin		6 Basin		7 Basin		8 Basin		11 Basin	
Date	Conductivity	TDS	Conductivity	TDS	Conductivity	TDS	Conductivity	TDS	Conductivity	TDS
4/14/2010	3276	2293	3967	2777	3479	2435	3438	2407	2702	1891
4/29/2010	3143	2200	3652	2556	3764	2635	3015	2111	2869	2008
5/4/2010	3073	2151	2968	2078	3048	2134	3371	2360	3011	2108
5/11/2010	3310	2317	3544	2481	2715	1901	3010	2107	2250	1575
5/18/2010	3051	2136	3053	2137	2329	1630	3400	2380	3198	2239
5/26/2010	4234	2964	2274	1592	2816	1971	3008	2106	3281	2297
6/1/2010	3459	2421	4682	3277	3382	2367	3299	2309	3028	2120
6/7/2010	3427	2399	3350	2345	3335	2335	3449	2414	2851	1996
6/25/2010	3432	2402	4345	3042	3410	2387	3139	2197	2056	1439
6/30/2010	2837	1986	3032	2122	2096	1467	2069	1448	2750	1925
7/8/2010	3560	2492	2879	2015	3036	2125	3311	2318	3347	2343
7/16/2010	3270	2289	3615	2531	3376	2363	3421	2395	3355	2349
7/22/2010	3249	2274	2902	2031	3401	2381	3861	2703	3010	2107
7/28/2010	3189	2232	4320	3024	3223	2256	3438	2407	2800	1960
8/5/2010	2917	2042	1980	1386	3336	2335	3013	2109	3195	2237
8/10/2010	3146	2202	2803	1962	3553	2487	3289	2302	3271	2290
8/27/2010	3443	2410	3904	2733	3314	2320	3478	2435	3213	2249
9/2/2010	3656	2559	2626	1838	2699	1889	3144	2201	2927	2049
9/9/2010	3504	2453	3267	2287	3409	2386	2855	1999	2951	2066
9/15/2010	4106	2874	3660	2562	3422	2395	2502	1751	3150	2205
9/23/2010	3384	2369	3528	2470	3906	2734	2845	1992	2241	1569
9/30/2010	3524	2467	3341	2339	3405	2384	2970	2079	2425	1698
10/5/2010	3543	2480	3156	2209	2772	1940	2700	1890	1987	1391
10/11/2010	3488	2442	4144	2901	3730	2611	3733	2613	2790	1953
10/19/2010	3529	2470	2468	1728	3500	2450	3168	2218	3162	2213
10/28/2010	3408	2386	3663	2564	3427	2399	3157	2210	2781	1947
11/4/2010	3485	2440		#VALUE!	3527	2469	2390	1673	3609	2526
11/8/2010	3452	2416		#VALUE!	3095	2167	2204	1543	3932	2752
11/10/2010		0	1392	974	1510	1057		0		0
11/15/2010	3500	2450	2032	1422	2910	2037	3454	2418	3087	2161
11/22/2010	3000	2100	3800	2660	2685	1880	3684	2579	3451	2416
12/2/2010	3431	2402	2635	1845	3002	2101	3750	2625	2394	1676
12/9/2010	2313	1619	3041	2129	3407	2385	3900	2730	3002	2101
12/15/2010	2751	1926	2171	1520	3630	2541	3600	2520	3041	2129
12/21/2010	3683	2578	1642	1149	3903	2732	3190	2233	3024	2117
12/29/2010	3550	2485	2005	1404	3253	2277	3360	2352	3045	2132
1/7/2011	3524	2467	2286	1600	3308	2316	3434	2404	2671	1870
1/12/2011	3576	2503	1822	1275	2949	2064	3127	2189	2401	1681
1/18/2011	1970	1379	2384	1669	2931	2052	4377	3064	3668	2568
1/24/2011	1857	1300	2226	1558	2982	2087	3418	2393	3261	2283
2/1/2011	1870	1309	1545	1082	3279	2295	2971	2080	2948	2064
2/7/2011	1991	1394	1660	1162	3500	2450	2072	1450	3281	2297
2/14/2011	2445	1712	1574	1102	3748	2624	2264	1585	3406	2384
2/23/2011	2942	2059	1607	1125	3500	2450	2360	1652	3425	2398
2/28/2011	2958	2071	1685	1180	3447	2413	2315	1621	3359	2351
3/7/2011	3170	2219	1952	1366	3903	2732	2635	1845	3304	2313
3/15/2011	3363	2354	2392	1674	3202	2241	3180	2226	3352	2346
3/21/2011	3005	2104	2429	1700	3440	2408	3056	2139	3419	2393
3/31/2011	2664	1865	3962	2773	3360	2352	3580	2506	3380	2366
4/4/2011	2947	2063	3514	2460	4582	3207	3432	2402	3534	2474
4/8/2011		0	1345	942	1623	1136		0		0
4/11/2011	3037	2126	2010	1407	1936	1355	2997	2098	3305	2314
4/18/2011	3220	2254	2135	1495	2910	2037	3265	2286	3423	2396
4/27/2011	2733	1913	2750	1925	3535	2475	3471	2430	3155	2209
5/3/2011	2702	1891	4529	3170	3742	2619	3133	2193	3480	2436
5/10/2011	3075	2153	1469	1028	3116	2181	3056	2139	3087	2161
5/17/2011	3000	2100	3400	2380	3115	2181	3275	2293	3369	2358
5/25/2011	3220	2254	3500	2450	3262	2283	3590	2513	3037	2126
6/2/2011	3199	2239	2348	1644	3180	2226	3530	2471	3352	2346
6/8/2011	3393	2375	3060	2142	3223	2256	3687	2581	3075	2153
6/15/2011	3360	2352	3384	2369	3117	2182	3200	2240	3219	2253
6/21/2011	3308	2316	2810	1967	3195	2237	3620	2534	3707	2595
6/28/2011	3215	2251	3729	2610	3328	2330	4242	2969	3353	2347
7/7/2011	3320	2324	3083	2158	3800	2660	4167	2917	3164	2215
7/14/2011	3419	2393	4008	2806	3425	2398	4830	3381	3815	2671
7/19/2011	2850	1995	2781	1947	3495	2447	4015	2811	3345	2342
7/26/2011	3402	2381	3870	2709	2838	1987	3675	2573	3615	2531
8/3/2011	3089	2162	3126	2188	3178	2225	2432	1702	3316	2321
	Average	2218		2017		2254		2270		2179
	Standard Deviation	321.363075		608.2225		354.2127		379.4075		279.9763
Final Average TDS		2860.95191		3233.887		2962.364		3028.735		2738.565

Cooling Tower #4-#8 Emissions
Holly Marketing & Refining Company

Reference: South Coast Air Quality Management District, Guidelines for Calculating Emissions from Cooling Towers, June 2006
E = Cooling tower circulating water rate (gal/min) * TDS/10^6 * Drift loss * density of water * 60 * operating hours

$E_{(VOC)}$ =	9749.88	lb/yr			Net Emiss.
$E_{(VOC)}$ =	4.87	tn/yr	-44.15 tons	VOC Baseline 2007-2008	-39.28
$E_{(VOC)}$ =	1.11	lb/hr			

Where:

Water Circulating Rate (gal/min)	26,500
Concentration of Total Dissolved Solids (ppm by weight)	2964.9
Drift Loss of Circulating Water	0.000
Density of Water (lbs/gal)	8.34
Conversion of Minutes to Hours	60
Annual Operating Hours (hr/yr)	8760

Assumptions:
TDS was based on the average TDS of the existing cooling towers
HAP emissions estimated by Holly based on storage tank HAPs emissions determined using the TANKS software, averaging the last 8 years, and multiplying by 2 standard deviations.
VOC emission factor from AP-42 Section 5.1-2 controlled
Circulation rate for cooling towers 4-8

Vacuum Furnace Heater (33H1) - New
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/mmscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	(lb/hr)	Emissions (lb/yr)	(tn/yr)
NOx	130		0.02		2.600	22776.00	11.39
SO2	130	10.13		1020	1.291	11308.48	5.65
VOC	130		0.005		0.702	6149.52	3.07
PM_{10}	130		0.00051		0.066	580.79	0.29
$PM_{2.5}$	130		0.00042		0.055	478.30	0.24
CO	130		0.08		10.400	91104.00	45.55
lead	130	0.0005		1020	6.37E-05	0.56	2.79E-04
benzene	130	2.10E-03		1020	2.68E-04	2.34E+00	0.00117
formaldehyde	130	7.50E-02		1020	9.56E-03	8.37E+01	4.19E-02
hexane	130	1.8		1020	2.29E-01	2.01E+03	1.00E+00
naphthalene	130	6.10E-04		1020	7.77E-05	6.81E-01	3.41E-04
toluene	130	3.40E-03		1020	4.33E-04	3.80E+00	1.90E-03
arsenic	130	2.00E-04		1020	2.55E-05	2.23E-01	1.12E-04
beryllium	130	1.20E-05		1020	1.53E-06	1.34E-02	6.70E-06
cadmium	130	1.10E-03		1020	1.40E-04	1.23E+00	6.14E-04
chromium	130	1.40E-03		1020	1.78E-04	1.56E+00	7.82E-04
cobalt	130	8.40E-05		1020	1.07E-05	9.38E-02	4.69E-05
manganese	130	3.80E-04		1020	4.84E-05	4.24E-01	2.12E-04
mercury	130	2.60E-04		1020	3.31E-05	2.90E-01	1.45E-04
nickel	130	2.10E-03		1020	2.68E-04	2.34E+00	1.17E-03
selenium	130	2.40E-05		1020	3.06E-06	2.68E-02	1.34E-05
Total HAPS							1.05

Assumptions
Selective Catalytic Reduction
Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion
PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

Emissions Calculations for Diesel Emergency Generator
Holly Marketing & Refining Company

EPA Reference: EPA Standards and AP-42, Section 3.3 Gasoline and Diesel Engines

Pollutant	Emission Factors			Rating				Operating Hours	Emissions	Emissions
	(g/HP-hr)	(lb/MMBtu)	(lb/HP-hr)	(HP)	(MMBtu/hr)	(g/hr)	(lb/hr)	(hr/yr)	(lb/yr)	(tns/yr)
PM	0.025			540	1.37	13.5	0.030	50	1.49	0.00074
PM_{10}	0.025			540	1.37	13.5	0.030	50	1.49	0.00074
$PM_{2.5}$	0.0025			540	1.37	1.4	0.003	50	0.15	0.00007
SO_2			2.05E-03	540	1.37		1.107	50	55.35	0.0277
NO_x	3.7			540	1.37	1998.0	4.396	50	219.78	0.1099
CO	0.26			540	1.37	140.4	0.309	50	15.44	0.0077
HC	0.03			540	1.37	16.2	0.036	50	1.78	0.0009
Benzene		9.33E-04		540	1.37		1.28E-03	50	0.06	3.20E-05
Toluene		4.09E-04		540	1.37		5.60E-04	50	0.03	1.40E-05
Xylenes		2.85E-04		540	1.37		3.90E-04	50	0.02	9.76E-06
Formaldehyde		1.18E-03		540	1.37		1.62E-03	50	0.08	4.04E-05
Acetaldehyde		7.67E-03		540	1.37		1.05E-02	50	0.53	2.63E-04
Acrolein		9.25E-05		540	1.37		1.27E-04	50	0.01	3.17E-06
Naphthalene		8.48E-05		540	1.37		1.16E-04	50	0.01	2.90E-06
Total HAP										3.65E-04

Assumptions:
540 HP Caterpillar Diesel Generator Set
Sulfur content not to exceed 15 ppm
HP = 2545.46 BTU/hr; therefore, 540 HP = 1374548.4 BTU/hr or 1.37 mmBTU/hr
HAPs emissions based on AP-42, Section 3.3 Gasoline and Diesel Engines
HC, NOx, CO, PM emissions from manufacturer provided emissions rates
10% of PM_{10} emissions assumed to be $PM_{2.5}$. References: EPA 2001, Procedures Document for National Emissions Inventory, Criteria Pollutants and EPA 2006, Documentation for the Final 2002 Nonpoint Section National Emissions Inventory for Criteria and Hazardous Air Pollutants.

Increased hours for Emergency Equipment
Holly Refining & Marketing Company

EPA Reference: EPA Standards and AP-42, Section 3.3 Gasoline and Diesel Engines

Pollutant	Water Well #3 Rating		Fire Pump No.1 Rating		Fire Pump No.2 Rating		Fire Pump Rating		Diesel Compressors (3) Rating		Cummings Gen. Rating		Control Room Gen. Rating		Emission Factor		Operating Hours	Water Well 3 Emissions	FP NO. 1 Emissions	FP NO. 2 Emissions	FP Emissions	DC (3) Emissions	Cum. Gen Emissions	Con. Room Gen Emissions	Total Emissions
	(HP)	(MMBtu/hr)	(HP)	(MMBtu/hr)	(HP)	(MMBtu/hr)	(HP)	(MMBtu/hr)	(HP)	(MMBtu/hr)	(HP)	(MMBtu/hr)	(HP)	(MMBtu/hr)	(lb/MMBtu)	(lb/HP-hr)	(hr/yr)	(tns/yr)	(tns/yr)	(tns/yr)	(tns/yr)	(tns/yr)	(tns/yr)	(tns/yr)	(tns/yr)
PM_{10}	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10		2.20E-03	20	4.93E-03	0.0086	0.0086	0.0040	0.0145	0.0103	0.0084	0.0594
$PM_{2.5}$	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10		2.20E-03	20	4.93E-03	0.0086	0.0086	0.0040	0.0145	0.0103	0.0084	0.0594
SO_2	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10		2.05E-03	20	4.59E-03	0.0081	0.0081	0.0037	0.0135	0.0096	0.0078	0.0554
NO_x	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10		3.10E-02	20	6.94E-02	0.1218	0.1218	0.0558	0.2046	0.1457	0.1178	0.8370
CO	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10		6.68E-03	20	1.50E-02	0.0263	0.0263	0.0120	0.0441	0.0314	0.0254	0.1804
VOC	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10		2.51E-03	20	5.62E-03	0.0099	0.0099	0.0045	0.0166	0.0118	0.0095	0.0678
Benzene	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10	9.33E-04		20	5.32E-06	9.33E-06	9.33E-06	4.27E-06	1.57E-05	1.12E-06	9.02E-07	4.60E-05
Toluene	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10	4.09E-04		20	2.33E-06	4.09E-06	4.09E-06	1.87E-06	6.87E-06	4.89E-07	3.96E-07	2.01E-05
Xylenes	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10	2.85E-04		20	1.63E-06	2.85E-06	2.85E-06	1.31E-06	4.79E-06	3.41E-07	2.76E-07	1.40E-05
Formaldehyde	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10	1.18E-03		20	6.73E-06	1.18E-05	1.18E-05	5.41E-06	1.98E-05	1.41E-06	1.14E-06	5.81E-05
Acetaldehyde	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10	7.67E-03		20	4.37E-05	7.67E-05	7.67E-05	3.51E-05	1.29E-04	9.18E-06	7.42E-06	3.78E-04
Acrolein	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10	9.25E-05		20	5.27E-07	9.25E-07	9.25E-07	4.24E-07	1.55E-06	1.11E-07	8.95E-08	4.56E-06
Naphthalene	224	0.57	393	1.000	393	1.000	180	0.46	220	0.560	470	0.120	380	0.10	8.48E-05		20	4.84E-07	8.48E-07	8.48E-07	3.89E-07	1.42E-06	1.01E-07	8.20E-08	4.18E-06
Total HAP																	20	6.07E-05	1.07E-04	1.07E-04	4.88E-05	1.79E-04	1.27E-05	1.03E-05	5.25E-04

Assumptions:
Sulfur content not to exceed 15 ppm.
HP = 2545.46 BTU/hr
20 additional operating hours requested

Storage Tanks - New and Modified
Holly Refining & Marketing

SERVICE	Tank No.	Product	Heated	Size (BBLS)	Volume (Gallons)	Height (ft)	Diameter (ft)	Type	Net Throughput (gallons/year)	Total VOC Emissions (lb)	Benzene (lb)	Ethylbenzene (lb)	Hexane (lb)	Toluene (lb)	Xylene (lb)
Black Wax Crude Oil	70	Black wax crude	No	80,306	2,471,782	35	126	Cone	15,427,595	395.69	1.98	0.0	0.0	0.0	0.0
Black Wax Crude Oil	71	Black wax crude	No	67,155	3,217,980	36	126	Cone	20,084,980	447.79	2.24	0.0	0.0	0.0	0.0
Black Wax Crude Oil	72	Black wax crude	No	106,811	5,188,982	36	160	Cone	32,386,965	722.06	3.61	0.0	0.0	0.0	0.0
Poly Gasoline Unit Product	85	Poly Gas	No	19,600	832,200	NA	60	Pontoon	15,811,800	1703.46	0.0	0.0	0.21	0.0	0.0
Gas Oil Storage	86	Gas Oil	No	109,660	4,286,555	31	160	Cone	26,754,450	518.75	0.0	0.0	0.0	0.0	0.0
Gas Oil Storage	87	Gas Oil	No	109,660	4,286,555	31	160	Cone	26,754,450	518.75	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	88	Lubes feed	Yes	26,730	1,137,150	40	70	Cone	10,545,745	62.95	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	89	Lubes feed	Yes	26,730	1,137,150	40	70	Cone	10,545,745	62.95	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	90	Lubes feed	Yes	13,600	580,180	40	50	Cone	10,545,745	56.44	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	91	Lubes feed	Yes	13,600	580,180	40	50	Cone	10,545,745	56.44	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	92	Lubes feed	Yes	13,600	580,180	40	50	Cone	10,545,745	56.44	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	93	Lubes feed	Yes	13,600	580,180	40	50	Cone	10,545,745	56.44	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	94	Lubes feed	Yes	13,600	580,180	40	50	Cone	10,545,745	56.44	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	95	Lubes feed	Yes	13,600	580,180	40	50	Cone	10,545,745	56.44	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	96	Lubes feed	Yes	13,600	580,180	40	50	Cone	10,545,745	56.44	0.0	0.0	0.0	0.0	0.0
Hydroisomerization Unit Lube and Feed Products	97	Lubes feed	Yes	13,600	580,180	40	50	Cone	10,545,745	56.44	0.0	0.0	0.0	0.0	0.0
Gasoline	98	Gasoline	No	19,600	845,970		60	IFR	12,689,550	1268.7	0.5	0.8	17.3	12.0	5.5
ULSD #2	99	ULS Diesel	No	66,000	2,950,235	40	110	Cone	25,054,220	566.33	0.0	0.0	0.0	0.0	0.0
Storm and waste water storage	158	Waste Water	No	64,315	2,701,230	40	110.0	FR	NA	NA	0.0	0.0	0.0	0.0	0.0
Sour Water Feed	168	Sour Water	No	30,952	1,299,984	40	80.0	FR	NA	NA	0.0	0.0	0.0	0.0	0.0
ULSD #2	170	ULS Diesel	No	66,000	2,950,235	40	110	Cone	25,054,220	566.33	0.0	0.0	0.0	0.0	0.0
Propane	171-174	Propane	No	1,600				Hor. Elliptical		NA					
Totals (tn/yr)										3.64	4.16E-03	3.75E-04	8.76E-03	5.99E-03	2.76E-03

Assumptions:
VFR - Vertical fixed roof tank
IFR - Internal floating roof tank
EFR - External floating roof tank
No HAP emissions expected from gas oil storage
0.05% benzene in liquid for black wax crude - MSDS Silver Eagle Refining
0.1 K factor

Storage Tanks - Converted
Holly Refining & Marketing

Source	Pollutant	PTE Emissions (lb/yr)	PTE Emissions (tn/yr)	Baseline Emissions (tn/yr)	Net Emissions (tn/yr)	Comment
Tank 71	VOC	447.79	0.224	-0.471	-0.25	Baseline 2007-2008
Tank 72	VOC	722.06	0.361	-0.69	-0.33	Baseline 2007-2008
					-0.58	Total

2006 Modernization Project Fugitive Component Count
New

2% Leak Rate	Total Count	Emission Factor (kg/hr/source)	2% Leaking	Emissions (lb/day)	Emissions (tons/yr)
Gas valves:	354.85	0.0268	7.09707317	10.07	1.84
Light liquid valves:	630	0.0109	12.6	7.27	1.33
Heavy liquid valves:	630	0.00023	12.6	0.15	0.03
Light liquid pump seals:	1	0.114	0.02	0.12	0.02
Heavy liquid pump seals:	1	0.021	0.02	0.02	0.00
Compressor seals:	1	0.636	0.02	0.67	0.12
Pressure relief valves:	12.37	0.16	0.24731707	2.09	0.38
Connectors:	3229.71	0.00025	64.5941463	0.85	0.16
Open-ended lines	0	0.0023	0	0.00	0.00
Sampling connections:	0	0.015	0	0.00	0.00
					3.88

Unit	Component	Count
20	Gas valves:	55
	Light liquid valves:	630
	Heavy liquid valves:	630
	Light liquid pump seals:	1
	Heavy liquid pump seals:	1
	Compressor seals:	1
	PSVs:	8
	Connectors:	2630
	Open-ended lines	0
	Sampling connections:	0
21	Gas valves:	124
	Light liquid valves:	0
	Heavy liquid valves:	0
	Light liquid pump seals:	0
	Heavy liquid pump seals:	0
	Compressor seals:	0
	PSVs:	3
	Connectors:	248
	Open-ended lines	0
	Sampling connections:	0
30	Gas valves:	0
	Light liquid valves:	0
	Heavy liquid valves:	0
	Light liquid pump seals:	0
	Heavy liquid pump seals:	0
	Compressor seals:	0
	Connectors:	0
	Open-ended lines	0
	Sampling connections:	0
33	Gas valves:	175.85
	Light liquid valves:	0
	Heavy liquid valves:	0
	Light liquid pump seals:	0
	Heavy liquid pump seals:	0
	Compressor seals:	0
	PSVS	1.37
	Connectors:	351.71
	Open-ended lines	0
	Sampling connections:	0

El Dorado	41	MMSCF/Day
WX	14	MMSCF/Day
	0.34146341	
El Dorado	WX	
515	175.85	
0	0	
0	0	
0	0	
0	0	
0	0	
4	1.37	
104	351.71	
0	0	
0	0	

based on El Dorado Refinery's Hydrogen Plant

New Unit	Valve Count From
GHC (GOHC)	Current unit count
NaHS	Current unit count
Vacuum	Negligible
Hydrogen	

Fugitives from Leaks - New Equipment
Holly Marketing & Refining Company

Total Count	Emission Factor (kg/hr/source)	2% Leaking	Emissions (lb/day)	Emissions (tons/yr)
1553.088316	0.0268	31.06176632	44.05	8.04
2272.808666	0.0109	45.45617332	26.22	4.79
2272.808666	0.00023	45.45617332	0.55	0.10
44.38783386	0.114	0.887756677	5.36	0.98
44.38783386	0.021	0.887756677	0.99	0.18
2.909254268	0.636	0.058185085	1.96	0.36
7	0.16	0.14	1.19	0.22
12197.4113	0.00025	243.9482259	3.23	0.59
0	0.0023	0	0.00	0.00
0	0.015	0	0.00	0.00
				15.25

Component	Count		Count
Gas valves:	766.5655885	- modeled after Unit 4	803
Light liquid val	420.0359389		440
Heavy liquid v.	420.0359389		440
Light liquid pu	17.18328841		18
Heavy liquid p	17.18328841		18
Compressor s	1.909254268		2
Connectors:	3213.274933		3366
Open-ended li	0		0
Sampling conr	0		0
Gas valves:	135.7954545	- modeled after Unit 8	239
Light liquid val	280.6818182		494
Heavy liquid v.	280.6818182		494
Light liquid pu	5.113636364		9
Heavy liquid p	5.113636364		9
Compressor s	0		0
Connectors:	1394.318182		2454
Open-ended li	0		0
Sampling conr	0		0
Gas valves:	202.7272727	- modeled after Unit 7	223
Light liquid val	649.0909091		714
Heavy liquid v.	649.0909091		714
Light liquid pu	9.090909091		10
Heavy liquid p	9.090909091		10
Compressor s	0		0
Connectors:	3001.818182		3302
Open-ended li	0		0
Sampling conr	0		0
Gas valves:	55	- modeled after Unit 9	55
Light liquid val	630		630
Heavy liquid v.	630		630
Light liquid pu	1		1
Heavy liquid p	1		1
Compressor s	1		1
Connectors:	2630		2630
Open-ended li	0		0
Sampling conr	0		0
Gas valves:	228	- left same, add boiler #11, delete boiler #6	
Light liquid val	15		
Heavy liquid v.	15		
Light liquid pu	0		
Heavy liquid p	0		
Compressor s	0		
Connectors:	516		
Open-ended li	0		
Sampling conr	0		
Gas valves:	51	-same as north flare	
Light liquid val	50		
Heavy liquid v.	50		
Light liquid pu	4		
Heavy liquid p	4		
Compressor s	0		
Connectors:	302		
Open-ended li	0		
Sampling conr	0		
Gas valves:	45	-left same	
Light liquid val	166		
Heavy liquid v.	166		
Light liquid pu	6		
Heavy liquid p	6		
Compressor s	0		

New Unit
FCCU
Crude
Poly Gas
Hydro Isom
Boiler #11
South Flare
Additional Unloading

New Units
Max Thru
FCCU
Crude
Poly Gas
Hydro Isom
Crude Flash Twr

Connectors:	754		
Open-ended li	0		
Sampling conr	0		
Gas valves:	69	- modeled after Unit 8 Crude Tower	
Light liquid val	62		30
Heavy liquid v	62		10
Light liquid pu	2		7
Heavy liquid p	2		14
Compressor s	0		32
Connectors:	386		4
Open-ended li	0		5
Sampling conr	0		15
PSV	2		5

HAP Fugitives from Leaks - New Equipment
Holly Marketing & Refining Company

		TPY
Fugitives	Valves and Fittings	40.4
Fugitives	Pumps	3.5
Fugitives	Compressors	1.6
Fugitives	Pressure Relief Valves	0.2
Fugitives	Connectors	1.8
Fugitives	Valves and Fittings	12.4
Fugitives	Pumps	1.1
Fugitives	Compressors	0.4
Fugitives	Pressure Relief Valves	0.2
Fugitives	Connectors	0.6
		Total

Calculations found in Cooling Tower PTE
Based off averages from 2001 - 2010

TONS per year

Benzene	Xylene	Toluene	Ethylbenzene	Naphthalene	Hexane	2,2,4-Trimethylpentane
0.522	0.288	0.432	0.019	0.001	0.638	0.440
0.045	0.025	0.037	0.002	0.000	0.055	0.038
0.021	0.011	0.017	0.001	0.000	0.025	0.017
0.002	0.001	0.002	0.000	0.000	0.002	0.002
0.024	0.013	0.020	0.001	0.000	0.029	0.020
0.161	0.089	0.133	0.006	0.000	0.197	0.136
0.014	0.008	0.012	0.001	0.000	0.017	0.012
0.005	0.003	0.004	0.000	0.000	0.006	0.004
0.002	0.001	0.002	0.000	0.000	0.002	0.002
0.007	0.004	0.006	0.000	0.000	0.009	0.006
0.803	0.442	0.664	0.029	0.001	0.981	0.676

Pounds per Ton VOC emitted

Benzene	Xylene	Toluene	Ethylbenzene	Napthalene	Hexane	2,2,4- Trimethylpentane
25.89	14.25	21.39	0.9421	0.0425	31.60	21.79

Flare Emissions (South Flare)
Holly Marketing & Refining Company

References: AP-42 Section 13.5 Industrial Flares
California Air Resources Board
EPA's Technology Transfer Network
API Compendium of Greenhouse Gas Emission Methodologies for the Oil and Gas Industry

$E_{(lb/hr)}$ = flare gas vol (scf/hr) * HHV (Btu/scf) * (1 MMBtu/1000000 Btu) * EF (lb/MMBtu)

flare gas vol	17,000.0	scf/hr
HHV	1150	Btu/scf
$EF_{(CO)}$ =	0.37	lb/MMBtu
$EF_{(NOx)}$ =	0.068	lb/MMBtu
$EF_{(VOC)}$ =	5.6	lb/MMcf
$EF_{(benzene)}$ =	0.159	lb/MMcf
$EF_{(formaldehyde)}$ =	1.169	lb/MMcf
$EF_{(naphthalene)}$ =	0.011	lb/MMcf
$EF_{(acetaldehyde)}$ =	0.043	lb/MMcf
$EF_{(acrolein)}$ =	0.01	lb/MMcf
$EF_{(propylene)}$ =	2.44	lb/MMcf
$EF_{(toluene)}$ =	0.058	lb/MMcf
$EF_{(xylenes)}$ =	0.029	lb/MMcf
$EF_{(ethylbenzene)}$ =	1.44	lb/MMcf
$EF_{(hexane)}$ =	0.029	lb/MMcf
$EF_{(SO2)}$ =	0.024	lb/hr

Pollutant	Emissions (lb/hr)	Emissions (TPY)	Baseline (TPY)	Net Emissions (TPY)	
CO	7.2335	31.68	0.00	31.68	Baseline 2010-2011
NOx	1.3294	5.82	-0.925	4.90	Baseline 2004-2005
VOC	9.52E-02	0.42	-4.29	-3.87	Baseline 2007-2008
Benzene	2.70E-03	1.18E-02			
Formaldehyde	1.99E-02	8.70E-02			
Naphthalene	1.87E-04	8.19E-04			
Acetaldehyde	7.31E-04	3.20E-03			
Acrolein	1.70E-04	7.45E-04			
Propylene	4.15E-02	1.82E-01			
Toluene	9.86E-04	4.32E-03			
Xylene	4.93E-04	2.16E-03			
Ethylbenzene	2.45E-02	1.07E-01			
Hexane	4.93E-04	2.16E-03			
Total HAPS		4.01E-01			
SO_2	0.024	0.1042	-4.42	-4.32	Baseline 2005-2006

Assumptions:
Flare efficiency - 98%
Average methane concentration of total HC is 55% per AP-42
Questar - 1 grain S/100 scf
HAPS speciation from CARB
VOC emission factor from webfire database

Pollutant	New Crude (TPY)	New FCC (TPY)	Hydrocracker/Hydroisom Unit (TPY)	Totals (TPY)
NO_x	0.15	0.46	0.97	1.58
CO	0.84	2.5	5.27	8.61
SO_x	0	0.01	0.02	0.03
PM_{10}	0.01	0.04	0.07	0.12
$PM_{2.5}$	0.01	0.04	0.07	0.12
VOC	0.01	0.03	0.05	0.09

Existing Sulfur Recovery Unit Incinerator

SO_2 ER (tn/yr) = [20 LTPD * 0.002 (99.8% efficiency)*2240 tons/2000LT * 1.988 lb/SO2/lbS * 365 days/yr]

SO_2 =	32.5	TPY
SO_2 =	-217.15	SO2 baseline 2005-2006
SO_2 =	-184.6	Net decrease in emissions

NOx =	-0.850	2004/2005 Baseline
VOC =	-0.047	2007/2008 Baseline
PM_{10} =	-0.062	2005/2006 Baseline
$PM_{2.5}$ =	-0.070	2008/2009 Baseline
CO =	-0.76	2010/2011 Baseline

Assumptions:
Emissions from existing sulfur recovery incinerator routed to wet scrubber

Truck Unloading
Holly Refining and Marketing Company

Black and yellow wax becomes a solid at ambient temperatures. No emissions are expected.

Assumptions:
Addition of 12 bays

Propane Pit Flare - To Be Removed
Holly Marketing & Refining Company

Source	Pollutant	Emissions (tn/yr)	Comment
Propane Pit Flare	NOx	-5.36	Baseline 2004-2005
	SO2	0	Baseline 2005-2006
	VOC	-1.55	Baseline 2007-2008
	PM_{10}	-0.93	Baseline 2005-2006
	$PM_{2.5}$	-2.19	Baseline 2008-2009
	CO	-129.27	Baseline 2010-2011

Tank Stab-in Asphalt Tank Heaters
Holly Marketing & Refining Company

Pollutant	Equipment Rating (MMBtu/hr)	Emission Factor (lb/MMscf)	Emission Factor (lb/MMBtu)	Conversion lb/mmscf to lb/MMBtu	(lb/hr)	Emissions per Heater (lb/yr)	(tn/yr)	2012 6 heaters (tn/yr)	2006 2 heaters (tn/yr)
NOx	0.8	100		1020	0.0784	687.06	0.34	2.06	0.69
SO2	0.8	10.13		1020	0.0079	69.59	0.03	0.21	0.07
VOC	0.8		0.005		0.0043	37.84	0.02	0.11	0.04
PM_{10}	0.8		0.00051		0.0004	3.57	1.79E-03	0.01	0.00
$PM_{2.5}$	0.8		0.00042		0.0003	2.94	1.47E-03	0.01	0.00
CO	0.8		0.08		0.0640	560.64	0.28	1.68	0.56
lead	0.8	0.0005		1020	3.92E-07	0.00	1.72E-06	1.03E-05	3.44E-06
benzene	0.8	2.10E-03		1020	1.65E-06	1.44E-02	7.21E-06	4.33E-05	1.44E-05
formaldehyde	0.8	7.50E-02		1020	5.88E-05	5.15E-01	2.58E-04	1.55E-03	5.15E-04
hexane	0.8	1.8		1020	1.41E-03	1.24E+01	6.18E-03	3.71E-02	1.24E-02
naphthalene	0.8	6.10E-04		1020	4.78E-07	4.19E-03	2.10E-06	1.26E-05	4.19E-06
toluene	0.8	3.40E-03		1020	2.67E-06	2.34E-02	1.17E-05	7.01E-05	2.34E-05
arsenic	0.8	2.00E-04		1020	1.57E-07	1.37E-03	6.87E-07	4.12E-06	1.37E-06
beryllium	0.8	1.20E-05		1020	9.41E-09	8.24E-05	4.12E-08	2.47E-07	8.24E-08
cadmium	0.8	1.10E-03		1020	8.63E-07	7.56E-03	3.78E-06	2.27E-05	7.56E-06
chromium	0.8	1.40E-03		1020	1.10E-06	9.62E-03	4.81E-06	2.89E-05	9.62E-06
cobalt	0.8	8.40E-05		1020	6.59E-08	5.77E-04	2.89E-07	1.73E-06	5.77E-07
manganese	0.8	3.80E-04		1020	2.98E-07	2.61E-03	1.31E-06	7.83E-06	2.61E-06
mercury	0.8	2.60E-04		1020	2.04E-07	1.79E-03	8.93E-07	5.36E-06	1.79E-06
nickel	0.8	2.10E-03		1020	1.65E-06	1.44E-02	7.21E-06	4.33E-05	1.44E-05
selenium	0.8	2.40E-05		1020	1.88E-08	1.65E-04	8.24E-08	4.95E-07	1.65E-07
Total HAPS							0.01	0.04	0.01

Assumptions

Emission estimates based on AP-42, Section 1.4 Natural Gas Combustion, Small Boilers (<100), uncontrolled burners

SO_2 emissions based on H_2S content of 60 ppmv

8 total stab-in heaters

PM10 and PM2.5 Emission factors from EPA PM Emission Factors for Gas-Fired Boilers EPA 2011 NEI

West KVG - To Be Replaced with electric driver
Holly Marketing & Refining Company

Source	Pollutant	Emissions (tn/yr)	Comment
West KVG	NOx	-34.685	Baseline 2004-2005
	SO2	0	Baseline 2005-2006
	VOC	-2.06	Baseline 2007-2008
	PM_{10}	-0.075	Baseline 2005-2006
	$PM_{2.5}$	0	Baseline 2008-2009
	CO	-9.28	Baseline 2010-2011

East KVG - To Be Replaced with electric driver
Holly Marketing & Refining Company

Source	Pollutant	Emissions (tn/yr)	Comment
East KVG	NOx	-36.695	Baseline 2004-2005
	SO2	0	Baseline 2005-2006
	VOC	-2.035	Baseline 2007-2008
	PM_{10}	-0.085	Baseline 2005-2006
	$PM_{2.5}$	0	Baseline 2008-2009
	CO	-12.92	Baseline 2010-2011

West SVG - To Be Replaced with electric driver
Holly Marketing & Refining Company

Source	Pollutant	Emissions (tn/yr)	Comment
West SVG	NOx	-12.88	Baseline 2004-2005
	SO2	0	Baseline 2005-2006
	VOC	-0.19	Baseline 2007-2008
	PM_{10}	-0.06	Baseline 2005-2006
	$PM_{2.5}$	-0.065	Baseline 2008-2009
	CO	-22.36	Baseline 2010-2011

East SVG - To Be Replaced with electric driver
Holly Marketing & Refining Company

Source	Pollutant	Emissions (tn/yr)	Comment
East SVG	NOx	-14.45	Baseline 2004-2005
	SO2	0	Baseline 2005-2006
	VOC	-0.215	Baseline 2007-2008
	PM_{10}	-0.04	Baseline 2005-2006
	$PM_{2.5}$	-0.065	Baseline 2008-2009
	CO	-23.79	Baseline 2010-2011

Other Permitted Contemporaneous Emissions

Project	PM10 (TPY)	PM2.5 (TPY)	NOx (TPY)	CO (TPY)	SO2 (TPY)	VOC (TPY)	HAPS (TPY)	Note
Install 250 gpm charge pump	--	--	--	--	--	0.03	--	DAQE-AN101230040-11 - VOC emission increase of 0.03 TPY (PTE)
Install 3 dedicated ethanol unloading areas	--	--	--	--	--	0.05	--	DAQE-101230039-11 - VOC emission increase of 0.05 TPY (PTE)
Incorporation of FCCU NOx and SO2 limits from CD	--	--	--	--	--	--	--	DAQE-AN101230038-10. 7 day rolling NOx limit 180 ppm; 160 ppm for SOx.
	--	--	--	--	--	--	--	365-day rolling average limit is 110 ppm NOx; 50 ppm SOx
Install Benzene Sat Unit #23 (23H1)	0.69	0.69	0.64	7.57	2.4	0.5	0.2	NOI Dated April 29, 2010; AO DAQE-0101230036-10
Boiler #5 NOx Limit	--	--	--	--	--	--	--	Incorporation of CD Limit using SCR - NOx - 0.03 lb/Mmbtu 3-hr avg. From 12.26 to 9.2 TPY
Incorporate NSPS Subpart A & J for CO Emissions to FCCU	--	--	--	--	--	--	--	DAQE-AN101230032-10 - 500 ppm limit
Addition of Boilers #9 and #10	0.09	0.08	15.65	28.94	20.69	3.13	1.45	NOI dated October 14, 2009; AO DAQE-AN0101230031-10, PM adjusted for new factors.
Incorporate CD Limits for SRU, heaters/boilers, flare, benzene waste, LDAR	--	--	--	--	--	--	--	DAQE-AN101230027-09
Addition of 135 KW John Deere Portable Diesel Generator	0.02	0.02	0.66	0.12	0.001	0.01	--	
Totals	0.80	0.79	16.95	36.63	23.091	3.64	1.65	

Holly Refinery: Update to Appendix C

April 22, 2013

Appendix C (update) (4/22/13)

Holly Refining & Marketing Company Woods Cross Refinery

Potential to Emit Estimate

Note: Based on maximums and likely high values, not equivalent to emission limits nor based on AO factors for emission calculations

A.O. #	ID	Description	Capacity bbls	Maximum Rating MMBtu/hr	Maximum Rating HP	Emissions (Tons per year) PM 10	PM 2.5	SO2	NOx	VOC	CO	NH3
Approval Order Limited Sources												
II.A.3	4H1	4H1 FCC Furnace		39.9		1.3	1.3	1.7	7.0	0.9	14.4	5.5
II.A.4	4K1A	KVG Compressor (West)			660							
II.A.5	4K1B	KVG Compressor (East)			660							
II.A.6	4V82	FCC Scrubber				13.6	13.6	17.7	19.9	0.0	154.8	0.0
II.A.7	4-97-0010	Oxygen Injection Skid										
II.A.8	FCC 34"	FCC Flue gas bypass 34" stack										
II.A.10	6H1	Reformer Reheat Furnace		54.7		1.8	1.8	2.4	23.5	1.3	19.7	7.5
II.A.11	6H3	Reformer Reheater		37.7		1.2	1.2	1.6	16.2	0.9	13.6	5.2
II.A.12	6H2	Reformer Reboiler		12		0.4	0.4	0.5	5.2	0.3	4.3	1.6
II.A.13	6K1	SVG Compressor (East)			325							
II.A.14	6K2	SVG Compressor (West)			325							
II.A.16	7H3	7H3 H. F. Alkylation Reboiler		33.3		1.1	1.1	1.4	5.9	0.8	12.0	4.6
II.A.17	7H1	7H1 Alky Regen Furnace		4.4		0.1	0.1	0.2	1.9	0.1	1.6	0.6
II.A.19	8H1	Crude Furnace # 1		99		3.2	3.2	4.3	34.7	2.3	35.7	13.6
II.A.22	9H1	DHDS Reactor Charge Heater		8.1		0.3	0.3	0.4	3.5	0.2	2.9	1.1
II.A.23	9H2	DHDS Stripper Reboiler		4.1		0.1	0.1	0.2	1.8	0.1	1.5	0.6
II.A.25	10H1	Asphalt Mix Heater		13.2		0.4	0.4	0.6	5.7	0.3	4.8	1.8
II.A.26	10H2	Hot Oil Furnace		99		0.2	0.2	4.3	8.5	2.3	35.7	13.6
II.A.28	11H1	SRGP Depentanizer Reboiler		24.2		0.8	0.8	1.1	10.4	0.6	8.7	3.3
II.A.29	11K2	SRGP Electric Compressor										
II.A.31	12H1	NHDS Reactor Charge Furnace		50.2		1.6	1.6	2.2	17.6	1.2	18.1	6.9
II.A.33	13H1	Isomerization Reactor Feed Furnace		6.5		0.2	0.2	0.3	2.8	0.2	2.3	0.9
II.A.39	19H1	DHT Reactor Charge Heater		18.1		0.0	0.0	0.8	3.2	0.4	6.5	2.5
II.A.41	20H1	20H1: Reactor Charge Heater		14.9		0.0	0.0	0.6	2.6	0.4	5.4	2.0
II.A.42	20H2	20H2: Fractionator Charge Heater		47		0.1	0.1	2.0	8.3	1.1	17.0	6.5
New	20H3	20H3 Reactor Charge Heater		42.1		0.1	0.1	1.8	7.4	1.0	15.2	5.8
II.A.46	23H1	Reformate Splitter Reboiler Heater		21		0.0	0.0	0.9	3.7	0.5	7.6	2.9
New	24H1	Crude Furnace #3		60		0.1	0.1	2.6	10.6	1.4	21.6	8.2
New	25H1	FCC #2 Feed Heater		45		0.1	0.1	2.0	7.9	1.1	16.2	6.2
New	Scrubber	FCC #2 Scrubber				13.6	13.6	17.7	19.9	0.0	154.8	0.0
New	26H1	Hot Oil Furnace		14								
New	27H1	27H1 Reactor Charge Furnace		99		0.2	0.2	4.3	8.5	2.3	35.7	13.6
II.A.48	30H1	Hydrogen Reformer Feed Furnace		123.1		0.3	0.2	5.4	10.6	2.9	44.4	16.9
II.A.49	30H2	Hydrogen Reformer Feed Furnace		123.1		0.3	0.2	5.4	10.6	2.9	44.4	16.9
Replace	33H1	Vacuum Furnace Heater		130		0.3	0.2	5.7	11.2	3.1	46.9	17.9
II.A.62	Boiler # 4	#4 Boiler		35.6		1.2	1.2	1.5	15.3	0.8	12.8	4.9
II.A.63	Boiler # 5	#5 Boiler		70		2.3	2.3	3.0	6.1	1.7	25.2	9.6
II.A.65	Boiler # 8	#8 Boiler		92.7		0.2	0.2	4.0	8.1	2.2	33.4	12.7
II.A.66	Boiler # 9	#9 Boiler		89.3		0.2	0.2	3.9	7.8	2.1	32.2	12.3
II.A.67	Boiler # 10	#10 Boiler		89.3		0.2	0.2	3.9	7.8	2.1	32.2	12.3
New	Boiler # 11	#11 Boiler		89.3		0.2	0.2	3.9	7.8	2.1	14.5	12.3
II.A.80	68H2	North In-Tank Asphalt Heater		0.8		0.0	0.0	0.0	0.3	0.0	0.3	0.1
II.A.81	68H3	South In-Tank Asphalt		0.8		0.0	0.0	0.0	0.3	0.0	0.3	0.1

		Heater										
II.A.82	68H4	NW In-Tank Asphalt Heater		0.8		0.0	0.0	0.0	0.3	0.0	0.3	0.1
II.A.83	68H5	NE In-Tank Asphalt Heater		0.8		0.0	0.0	0.0	0.3	0.0	0.3	0.1
New	68H6	SE In-Tank Asphalt Heater		0.8		0.0	0.0	0.0	0.3	0.0	0.3	0.1
New	68H7	SW In-Tank Asphalt Heater		0.8		0.0	0.0	0.0	0.3	0.0	0.3	0.1
New	68H10	North In-Tank Asphalt Heater		0.8		0.0	0.0	0.0	0.3	0.0	0.3	0.1
New	68H11	South In-Tank Asphalt Heater		0.8		0.0	0.0	0.0	0.3	0.0	0.3	0.1
New	68H12	North In-Tank Asphalt Heater		0.8		0.0	0.0	0.0	0.3	0.0	0.3	0.1
New	68H13	South In-Tank Asphalt Heater		0.8		0.0	0.0	0.0	0.3	0.0	0.3	0.1
II.A.201	Generator	ETF portable Diesel Generator			208	0.3	0.3	0.3	4.2	0.0	0.9	
					Total	46.2	45.7	108.9	329.4	39.8	900.2	231.4
Approval Order Non-Limited Sources												
II.A.69	CWT # 4	Cooling Tower # 4 (2 stacks)				21.9	0.1			1.1		
II.A.70	CWT # 6	Cooling Tower # 6 (1 stack)				19.8	0.1			0.9		
II.A.71	CWT # 7	Cooling Tower # 7 (2 stacks)				18.7	0.1			1.0		
II.A.72	CWT # 8	Cooling Tower # 8 (2 stacks)				39.8	0.3			2.3		
New	CWT # 10	Cooling Tower # 10 (1 stack)				0.1	0.0			1.6		
Expand	CWT # 11	Cooling Tower # 11 (2 stacks)				0.1	0.0			2.4		
II.A.74	Wastewater	Wastewater Treatment Plant								45.1		
II.A.76	Flare	Process Flare (south)		19.6		0.0	0.0	0.1	5.8	0.4	31.7	
II.A.77	Flare	Process Flare (north)		19.6		0.0	0.0	0.1	5.8	0.4	31.7	
II.A.85	Tank 11	Petroleum Liquids	9868							0.0		
II.A.86	Tank 12	Petroleum Liquids	9868							0.2		
II.A.87	Tank 14	Petroleum Liquids	2539							0.0		
II.A.88	Tank 15	Petroleum Liquids	5181							0.0		
II.A.89	Tank 19	Petroleum Liquids	7463							0.0		
II.A.90	Tank 20	Petroleum Liquids	7504							0.1		
II.A.91	Tank 21	Petroleum Liquids	354							0.0		
II.A.92	Tank 23	Petroleum Liquids	14600							0.3		
II.A.93	Tank 24	Petroleum Liquids	15016							0.3		
II.A.94	Tank 28	Petroleum Liquids	29663							0.0		
II.A.95	Tank 29	Petroleum Liquids	336							0.0		
II.A.96	Tank 31	Petroleum Liquids	29756							0.0		
II.A.97	Tank 35	Petroleum Liquids	105000							0.4		
II.A.98	Tank 37	Petroleum Liquids	3217							0.0		
II.A.99	Tank 42A	Petroleum Liquids	20							0.0		
II.A.100	Tank 47	Petroleum Liquids	30129							0.6		
II.A.101	Tank 48	Petroleum Liquids	29782							0.1		
II.A.103	Tank 50	Petroleum Liquids	700							0.0		
II.A.104	Tank 51	Petroleum Liquids	580							0.0		
II.A.105	Tank 52	Petroleum Liquids	1008							0.0		
II.A.106	Tank 53	Petroleum Liquids	1008							0.0		
II.A.107	Tank 54	Petroleum Liquids	1008							0.0		
II.A.108	Tank 55	Petroleum Liquids	1008							0.0		
II.A.109	Tank 56	Petroleum Liquids	1008							0.0		
II.A.110	Tank 57	Petroleum Liquids	1008							0.0		
II.A.111	Tank 58	Petroleum Liquids	15229							0.0		
II.A.112	Tank 59	Petroleum Liquids	30019							0.0		
II.A.114	Tank 61	Petroleum Liquids	1008							0.0		
II.A.115	Tank 63	Petroleum Liquids	30135							0.3		
II.A.116	Tank 64	Petroleum Liquids	1011							0.0		
II.A.117	Tank 65	Petroleum Liquids	1011							0.0		
II.A.118	Tank 70	Petroleum Liquids	80306							0.2		

.A.119	Tank 71	Petroleum Liquids	67155	0.2
.i.A.120	Tank 72	Petroleum Liquids	106811	0.4
II.A.121	Tank 73	Petroleum Liquids	1077	0.0
II.A.122	Tank 74	Petroleum Liquids	2039	0.0
II.A.123	Tank 75	Petroleum Liquids	2039	0.0
II.A.124	Tank 76	Petroleum Liquids	2039	0.0
II.A.125	Tank 77	Petroleum Liquids	5141	0.0
II.A.126	Tank 78	Petroleum Liquids	5141	0.0
II.A.127	Tank 79	Petroleum Liquids	10000	0.0
II.A.128	Tank 80	Petroleum Liquids	10000	0.0
II.A.133	Tank 85	Petroleum Liquids	76540	1.1
II.A.134	Tank 86	Petroleum Liquids	109660	0.3
II.A.135	Tank 87	Petroleum Liquids	109660	0.3
II.A.136	Tank 88	Petroleum Liquids	26730	0.0
New	Tank 89	Petroleum Liquids	26730	0.0
New	Tank 90	Petroleum Liquids	13600	0.0
New	Tank 91	Petroleum Liquids	13600	0.0
New	Tank 92	Petroleum Liquids	13600	0.0
New	Tank 93	Petroleum Liquids	13600	0.0
New	Tank 94	Petroleum Liquids	13600	0.0
New	Tank 95	Petroleum Liquids	13600	0.0
New	Tank 96	Petroleum Liquids	13600	0.0
New	Tank 97	Petroleum Liquids	13600	0.0
New	Tank 98	Petroleum Liquids	19600	0.6
New	Tank 99	Petroleum Liquids	66000	0.3
II.A.137	Tank 100	Petroleum Liquids	53372	1.3
II.A.138	Tank 101	Petroleum Liquids	53564	2.7
II.A.139	Tank 102	Petroleum Liquids	52990	0.1
II.A.140	Tank 103	Petroleum Liquids	24686	0.5
.A.141	Tank 104	Petroleum Liquids	24435	1.9
II.A.142	Tank 105	Petroleum Liquids	24501	1.1
II.A.143	Tank 106	Petroleum Liquids	24524	1.5
II.A.144	Tank 107	Petroleum Liquids	24501	3.3
II.A.145	Tank 108	Petroleum Liquids	24450	2.3
II.A.146	Tank 109	Petroleum Liquids	24490	1.1
II.A.150	Tank 117	Petroleum Liquids	506	0.1
II.A.151	Tank 118	Petroleum Liquids	657	0.1
II.A.152	Tank 121	Petroleum Liquids	100129	3.2
II.A.153	Tank 122	Petroleum Liquids	400	0.0
II.A.154	Tank 123	Petroleum Liquids	400	0.0
II.A.157	Tank 126	Petroleum Liquids	64675	1.3
II.A.158	Tank 127	Petroleum Liquids	30497	0.6
II.A.159	Tank 128	Petroleum Liquids	10100	0.0
II.A.160	Tank 129	Petroleum Liquids	55074	0.2
II.A.162	Tank 131	Petroleum Liquids	65159	0.0
II.A.163	Tank 132	Petroleum Liquids	24455	2.4
II.A.164	Tank 133	Petroleum Liquids	1582	0.0
II.A.165	Tank 134	Petroleum Liquids	1582	0.0
II.A.166	Tank 135	Petroleum Liquids	44154	1.9
II.A.167	Tank 136	Petroleum Liquids	806	0.0
II.A.168	Tank 137	Petroleum Liquids	141418	0.0
II.A.169	Tank 138	Petroleum Liquids	44247	0.0
II.A.170	Tank 139	Petroleum Liquids	14957	0.0
II.A.171	Tank 140	Petroleum Liquids	14857	0.0
II.A.172	Tank 141	Petroleum Liquids	1618	0.0
II.A.173	Tank 143	Petroleum Liquids	4008	0.0
II.A.174	Tank 145	Petroleum Liquids	3985	10.5
.A.175	Tank 146	Petroleum Liquids	3985	3.0
II.A.176	Tank 147	Petroleum Liquids	714	0.0

II.A.177	Tank 148	Petroleum Liquids	714							0.0			
II.A.178	Tank 149	Petroleum Liquids	714							0.0			
II.A.179	Tank 150	Petroleum Liquids	714							0.0			
II.A.180	Tank 151	Petroleum Liquids	714							0.0			
II.A.181	Tank 152	Petroleum Liquids	714							0.0			
II.A.182	Tank 153	Petroleum Liquids	714							0.0			
II.A.183	Tank 159	Petroleum Liquids	4999							0.0			
New	Tank 170	Petroleum Liquids	66000							0.3			
New	Tank 171	Petroleum Liquids	1600							0.0			
New	Tank 172	Petroleum Liquids	1600							0.0			
New	Tank 173	Petroleum Liquids	1600							0.0			
New	Tank 174	Petroleum Liquids	1600							0.0			
II.A.196	Tank 323	Petroleum Liquids	14686							0.2			
II.A.197	Tank 324	Petroleum Liquids	714							0.0			
II.A.202/3	Load/Unload1	Crude, Gas Oil, NGL, Fuel Oil								0.2			
II.A.204	Generators2	Emergency Equipment (10 items)		540	0.2	0.2	0.2	0.0	0.2	0.5			
II.A.204	Generators	Emergency Equipment (10 items)		540	1.1	1.1	1.0	0.0	1.2	3.2			
II.A.205	Water Tanks3	Water Storage Tanks											
				Total	101.6	1.9	1.4	11.6	102.6	67.1	0.0		
	Fugitives	Valves and Fittings							2713.4				
	Fugitives	Pumps							237.3				
	Fugitives	Compressors							98.3				
	Fugitives	Pressure Relief Valves							7.7				
	Fugitives	Connectors							123.8				
	Loading	Controlled to MACT limit							7.9				
	Tank Cleaning	Largest 20% of tanks, 2-week outage							85.5				
				Total					3273.9				
			Total		147.8	47.6	110.3	341.1	3416.2	967.3	231.4		
					PM10	PM2.5	SOx	NOx	VOC	CO			

Fuel Gas	AP-42 heating value of natural/plant gas (Btu/scf):	1020	
Burners	NOx from uncontrolled burners:	100	lb/mmscf from AP-42 Table 1.4-1
	NOx from controlled burners:	41	A.O. emissions factor
	NOx from new SCR-controlled burners:	20	lb/mmscf estimate
	CO from all burners:	84	lb/mmscf from AP-42 Table 1.4-1
	SO2 from all burners:	10.12806	lb/mmscf @ 60 ppm average
	PM10 from non-NSPS burners:	7.6	lb/mmscf from AP-42 Table 1.4-2
	PM2.5 from non-NSPS burners:	7.6	All PM10 assumed to be PM2.5
	PM10 from NSPS burners:	0.5202	lb/mmscf from EPA NEI
	PM2.5 from NSPS burners:	0.4284	lb/mmscf from EPA NEI
	VOC from all burners:	5.5	lb/mmscf from AP-42 Table 1.4-2
	NH3 from all burners:	32	lb/mmscf from "Development and Selection of Ammonia Emission Factors," August 1994, Table 7.4
	CO from new boilers	0.037	lb/mmbtu from vendor sheet
	VOC from new boilers	0.004	lb/mmbtu from vendor sheet
Engines	NOx from uncontrolled 2-stroke lean burn engines:	3.17	lb/mmBTU from AP-42 Table 3.2-1 (lb/mmBtu)
	CO from uncontrolled 2-stroke lean burn engines:	0.386	lb/mmBTU from AP-42 Table 3.2-1 (lb/mmBtu)
	SO2 from uncontrolled 2-stroke lean burn engines:	0.00	lb/mmBTU from AP-42 Table 3.2-1 (lb/mmBtu)
	PM10 from uncontrolled 2-stroke lean burn engines:	0.04831	lb/mmBTU from AP-42 Table 3.2-1 (lb/mmBtu)
	PM2.5 from uncontrolled 2-stroke lean burn engines:	0.04831	All PM10 assumed to be PM2.5 (lb/HP-hr)
	VOC from uncontrolled 2-stroke lean burn engines:	0.12	lb/mmBTU from AP-42 Table 3.2-1 (lb/mmBtu)
	NOx from uncontrolled 4-stroke lean burn engines:	0.85	lb/mmBTU from AP-42 Table 3.2-2 (lb/mmBtu)
	CO from uncontrolled 4-stroke lean burn engines:	0.56	lb/mmBTU from AP-42 Table 3.2-2 (lb/mmBtu)
	SO2 from uncontrolled 4-stroke lean burn engines:	0.00	lb/mmBTU from AP-42 Table 3.2-2 (lb/mmBtu)
	PM10 from uncontrolled 4-stroke lean burn engines:	0.009987	lb/mmBTU from AP-42 Table 3.2-2 (lb/mmBtu)
	PM2.5 from uncontrolled 4-stroke lean burn engines:	0.009987	All PM10 assumed to be PM2.5 (lb/HP-hr)
	VOC from uncontrolled 4-stroke lean burn engines:	0.1180	lb/mmBTU from AP-42 Table 3.2-2 (lb/mmBtu)

	NOx from uncontrolled 4-stroke rich burn engines:		2.27	AP-42 Emission Factors from Table 3.2-3 (lb/mmBtu)		
	CO from uncontrolled 4-stroke rich burn engines:		3.72	AP-42 Emission Factors from Table 3.2-3 (lb/mmBtu)		
	SO2 from uncontrolled 4-stroke rich burn engines:		5.88E-04	AP-42 Emission Factors from Table 3.2-3 (lb/mmBtu)		
	PM10 from uncontrolled 4-stroke rich burn engines:		0.01941	AP-42 Emission Factors from Table 3.2-3 (lb/mmBtu)		
	PM2.5 from uncontrolled 4-stroke rich burn engines:		0.01941	All PM10 assumed to be PM2.5 (lb/HP-hr)		
	VOC from uncontrolled 4-stroke rich burn engines:		0.0296	AP-42 Emission Factors from Table 3.2-3 (lb/mmBtu)		
	NOx from uncontrolled diesel industrial engines:		3.10E-02	AP-42 Emission Factors from Table 3.3-1 (lb/HP-hr)		
	CO from uncontrolled diesel industrial engines:		6.68E-03	AP-42 Emission Factors from Table 3.3-1 (lb/HP-hr)		
	SOx from uncontrolled diesel industrial engines:		2.05E-03	AP-42 Emission Factors from Table 3.3-1 (lb/HP-hr)		
	PM10 from uncontrolled diesel industrial engines:		2.20E-03	AP-42 Emission Factors from Table 3.3-1 (lb/HP-hr)		
	PM2.5 from uncontrolled diesel industrial engines:		2.20E-03	All PM10 assumed to be PM2.5 (lb/HP-hr)		
	VOC from uncontrolled diesel industrial engines:		2.51E-03	AP-42 Emission Factors from Table 3.3-1 (lb/HP-hr) [TOC]		
	Horsepower(mechanical) conversion to Btu/hr:		2542.5	AP-42 Appendix A Conversion factors (HP to Btu/hr)		
	NH3 from reciprocating compressor engines:		200	AP-42 Emission Factors from Table 5.1-1 (lb/mmscf)		
FCC	NOx from CD controlled fluid catalytic cracking units:		40	Holly Consent Decree FCCU NOx final limits (ppmvd 0% O2 365 day average)		
	SO2 from CD controlled fluid catalytic cracking units:		25	Holly Consent Decree FCCU SOx final limits (ppmvd 0% O2 365 day average)		
	PM10 from CD controlled fluid catalytic cracking units:		0.5	Holly Consent Decree FCCU PM final limits (lb/1000 lb coke burn)		
	PM2.5 from CD controlled fluid catalytic cracking units:		0.5	All PM10 assumed to be PM2.5 (lb/1000 lb coke burn)		
	PM10 from coerced State level:		0.3	Holly Consent Decree FCCU PM final limits (lb/1000 lb coke burn)		
	PM2.5 from coerced State level:		0.3	All PM10 assumed to be PM2.5 (lb/1000 lb coke burn)		
	VOC from controlled fluid catalytic cracking units:		Neg	AP-42 Emission Factors from Table 5.1-1 (lb/10^3 bbl fresh feed) [TOC]		
	NH3 from controlled fluid catalytic cracking units:		Neg	AP-42 Emission Factors from Table 5.1-1 (lb/10^3 bbl fresh feed)		
Fugitives	VOC from uncontrolled cooling towers:		6	AP-42 Emission Factors from Table 5.1-2 (lb/10^6 gal cooling water)		
	VOC from controlled cooling towers:		0.7	AP-42 Emission Factors from Table 5.1-2 (lb/10^6 gal cooling water)		
	PM from existing cooling towers:			From cooling tower calculation tab		
	PM from cooling towers:		0.019	AP-42 Emission Factors from Table 13.4-1 (lb/1000 gal cooling water)		
	VOC from controlled Oil/water separators:		0.2	AP-42 Emission Factors from Table 5.1-2 (lb/10^3 gal waste water)		
	Unknown cooling water rate:		40	AP-42 Emission Factors from Table 5.1-2 note b, assume 40 times refinery feed rate in gallons (gallons)		
	Unknown waste water rate:		0.95	AP-42 Emission Factors from Table 5.1-2 note c, assume 0.95 times refinery feed rate in gallons (gallons)		
	Gas valves:	6513	0.0268	kg/hr/source, Protocol for Equipment Leak Emission Estimates, Table 2-2		
	Light liquid valves:	9560	0.0109	kg/hr/source, Protocol for Equipment Leak Emission Estimates, Table 2-2		
	Heavy liquid valves:	9560	0.00023	kg/hr/source, Protocol for Equipment Leak Emission Estimates, Table 2-2		
	Light liquid pump seals:	182	0.114	kg/hr/source, Protocol for Equipment Leak Emission Estimates, Table 2-2		
	Heavy liquid pump seals:	182	0.021	kg/hr/source, Protocol for Equipment Leak Emission Estimates, Table 2-2		
	Compressor seals:	16	0.636	kg/hr/source, Protocol for Equipment Leak Emission Estimates, Table 2-2		
	Pressure relief valves:	5	0.16	kg/hr/source, Protocol for Equipment Leak Emission Estimates, Table 2-2		
	Connectors:	51266	0.00025	kg/hr/source, Protocol for Equipment Leak Emission Estimates, Table 2-2		
	Open-ended lines	0	0.0023	kg/hr/source, Protocol for Equipment Leak Emission Estimates, Table 2-2		
	Sampling connections:	0	0.015	kg/hr/source, Protocol for Equipment Leak Emission Estimates, Table 2-2		
anks	Tank 71		126	feet diameter	62	lb/lbmole
	Tank 72		160	feet diameter	62	lb/lbmole
	Tank 121		150	feet diameter	50	lb/lbmole

	Tank 126	114	feet diameter	50	lb/lbmole
	Days out of service with hydrocarbon	14	days		
Loading	MACT limit	10	mg/liter loaded		
	Loading limit	4500000	bbls		
Constants	Plant Wide Annual Operating Time:	8760	hr		
&	Conversion from scf to lb mol:	379.5	scf -> lb mol		
Basis	Maximum daily FCC flue gas flow rate:	23	mmscfd (Engineering Calculation)		
	Maximum hourly FCC regenerator coke burn rate:	6200	lbs coke burn / hr (Engineering Calculation)		
	Molecular Weight of CO:	28	lb/lb-mol		
	Molecular Weight of NOx:	45	lb/lb-mol		
	Molecular Weight of SOx:	64	lb/lb-mol		
	Annual Refinery Feed:	11315000	bbls		
Limitations taken from A.O. # DAQE-AN0101230032-10					
II.B.1.b	NOx emission limit from stack tests on 8H1 & 12H1:	0.08	lb/mmBtu (3 hr average basis)		
II.B.1.b	NOx emission limit from boilers with SCR:	0.02	lb/mmBtu (3 hr average basis)		
II.B.1.e	Refinery fuel gas H2S concentration:	160	ppm (3 hr average basis)		
II.B.1.h	ETF Emergency Generator Annual Operating Time:	1300	hr		
II.B.1.j	FCC Annual Throughput Limitation:	3250000	bbls		
II.B.2.a	CO Emission Limit for FCCU:	500	ppm (1 hr average 0% O2)		
II.B.4.a	SRU #1 SO2 limit	582	tpy SO2		
II.B.4.a	SRU #2 SO2 limit	90	tpy SO2		
II.B.4.a	SRU #3 SO2 limit	90	tpy SO2		
II.B.5.a	FCC PM10 limit	32	tpy PM10		
II.B.4.a	Cap source SO2 limit	192	tpy SO2		
II.B.5.a	Cap source PM10 limit	47.5	tpy PM10		
II.B.6.a	Cap source NOx limit	670	tpy NOx		
Limitations taken from HEP LOD A.O.					
	Annual Gasoline Loading Limitation:	4500000	bbls		
Organic HAPs	2-Methylnaphthalene	0.000024	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
for Heaters	3-Methylchloranthrene	0.000002	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
and Boilers	7,12-Dimethylbenz(a)anthracene	0.000016	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Acenaphthene	0.000002	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Acenaphtylene	0.000002	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Anthracene	0.000002	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Benz(a)anthracene	0.000002	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Benzene	0.002100	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Benzo(a)pyrene	0.000001	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Benzo(b)fluroanthene	0.000002	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Benzo(g,h,i)perylene	0.000001	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Benzo(k)fluroanthene	0.000002	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Chrysene	0.000002	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Dibenzo(a,h)anthracene	0.000001	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Dichlorobenzene	0.001200	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Fluoranthene	0.000003	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Fluorene	0.000003	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Formaldehyde	0.075000	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Hexane	1.800000	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Indeno(1,2,3-cd)pyrene	0.000002	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Naphthalene	0.000610	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Phenanathrene	0.000017	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Pyrene	0.000005	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
	Toluene	0.003400	AP-42 Emission Factors from Table 1.4-3 (lb/mmscf)		
Inorganic HAPs	Arsenic from natural/plant gas combustion:	0.0002	AP-42 Emission Factors from Table 1.4-4 (lb/mmscf)		
for Heaters	Beryllium from natural/plant gas combustion:	0.000012	AP-42 Emission Factors from Table 1.4-4 (lb/mmscf)		
and Boilers	Cadmium from natural/plant gas combustion:	0.0011	AP-42 Emission Factors from Table 1.4-4 (lb/mmscf)		
	Chromium from natural/plant gas combustion:	0.0014	AP-42 Emission Factors from Table 1.4-4 (lb/mmscf)		
	Cobalt from natural/plant gas combustion:	0.000084	AP-42 Emission Factors from Table 1.4-4 (lb/mmscf)		
	Manganese from natural/plant gas combustion:	0.00038	AP-42 Emission Factors from Table 1.4-4 (lb/mmscf)		
	Mercury from natural/plant gas combustion:	0.00026	AP-42 Emission Factors from Table 1.4-4 (lb/mmscf)		

	Nickel from natural/plant gas combustion:	0.0021		AP-42 Emission Factors from Table 1.4-4 (lb/mmscf)
	Selenium from natural/plant gas combustion:	0.000024		AP-42 Emission Factors from Table 1.4-4 (lb/mmscf)
	Lead from natural/plant gas combustion:	0.0005		AP-42 Emission Factors from Table 1.4-2 (lb/mmscf)
HAPs for	Benzene	0.000933		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
Emergency	Toluene	0.000409		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
Generators	Xylenes	0.000285		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Propylene	0.000258		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	1,3-Butadiene	3.91E-05		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Formaldehyde	0.00118		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Acetaldehyde	0.000767		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Acrolein	9.25E-05		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Naphthalene	8.48E-05		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Acenaphtylene	5.06E-06		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Acenaphthene	1.42E-06		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Fluorene	2.92E-05		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Phenanthrene	2.94E-05		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Anthracene	1.87E-06		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Fluoranthene	7.61E-06		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Pyrene	4.78E-06		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Benz(a)anthracene	1.68E-06		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Chrysene	3.53E-07		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Benzo(b)fluroanthene	9.91E-08		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Benzo(k)fluroanthene	1.55E-07		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Benzo(a)pyrene	1.88E-07		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Indeno(1,2,3-cd)pyrene	3.75E-07		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Dibenzo(a,h)anthracene	5.83E-07		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
	Benzo(g,h,i)perylene	4.89E-07		AP-42 Emission Factors from Table 3.3-2 (lb/MMBtu)
Flare	Average non-upset throughput to flare:	17000	scfh	
North &	Average HHV of flare gas:	1150	BTU/scf	
South	Assumed flare efficiency:	98	%	
	Average CH4 concentration of flare gas:	55	%	AP-42
	PM emission factor for industrial flares:	0	lb/MMBtu	AP-42 Emission Factors from Table 13.5 (lb/MMBtu)
	CO emission factor for industrial flares:	0.37	lb/MMBtu	AP-42 Emission Factors from Table 13.5 (lb/MMBtu)
	NOx emission factor for industrial flares:	0.068	lb/MMBtu	AP-42 Emission Factors from Table 13.5 (lb/MMBtu)
	HC emission factor for industrial flares:	0.14	lb/MMBtu	AP-42 Emission Factors from Table 13.5 (lb/MMBtu)
	VOC emission factor for industrial flares:	5.6	lb/mmscf	VOC emisssion factor from webfire database
	Benzene emission factor for industrial flares:	0.159	lb/MMscf	AP-42 Emission Factors from Table 13.5 (lb/MMBtu)
	Formaldehyde emission factor for industrial flares:	1.169	lb/MMscf	AP-42 Emission Factors from Table 13.5 (lb/MMBtu)
	Naphthalene emission factor for industrial flares:	0.011	lb/MMscf	AP-42 Emission Factors from Table 13.5 (lb/MMBtu)
	Acetaldehyde emission factor for industrial flares:	0.043	lb/MMscf	AP-42 Emission Factors from Table 13.5 (lb/MMBtu)
	Acrolein emission factor for industrial flares:	0.01	lb/MMscf	AP-42 Emission Factors from Table 13.5 (lb/MMBtu)
	Propylene emission factor for industrial flares:	2.44	lb/MMscf	AP-42 Emission Factors from Table 13.5 (lb/MMBtu)
	Toluene emission factor for industrial flares:	0.058	lb/MMscf	AP-42 Emission Factors from Table 13.5 (lb/MMBtu)
	Xylenes emission factor for industrial flares:	0.029	lb/MMscf	AP-42 Emission Factors from Table 13.5 (lb/MMBtu)
	Ethylbenzene emission factor for industrial flares:	1.44	lb/MMscf	AP-42 Emission Factors from Table 13.5 (lb/MMBtu)
	Hexane emission factor for industrial flares:	0.029	lb/MMscf	AP-42 Emission Factors from Table 13.5 (lb/MMBtu)
	SO2 emission factor for industrial flares:	0.0238	lb/hr	
Wastewater	Average Beginning Inventory:	90370	Barrels	HOPs (2008, 2009, 2010)

	Average Reciepts:					8883931	Barrels	HOPs (2008, 2009, 2010)
	Average Ending Inventory:					86857	Barrels	HOPs (2008, 2009, 2010)
	2 x Standard Deviation + Avg Begin:					105868	Barrels	HOPs (2008, 2009, 2010)
	2 x Standard Deviation + Avg Recpt.:					10339027	Barrels	HOPs (2008, 2009, 2010)
	2 x Standard Deviation + Avg Ending:					105956	Barrels	HOPs (2008, 2009, 2010)
	VOC per 1000 gallons water:					0.2	lb/1000 gal	AP-42 Emission Factors from Table 5.1-2
						0.95		AP-42 Emission Factors from Table 5.1-2
		Benzene	Toluene	Ethylbenzene	Xylenes	Napthalene	Units	
	Average	3.577695	5.410343	0.3018029	2.128819	0.024055	Tons/yr.	WATERS 9, (Years 2006, 2007, 2008, 2009, 2010)
	Stand Dev	0.059255	1.279672	0.0883681	0.7022132	0.005787	Tons/yr.	
	Total	3.696204	7.969686	0.4785391	3.5332454	0.035629	Tons/yr.	Average + 2*standard deviation
Flare	Average non-upset throughput to flare:					260	scfh	
Propane	Average HHV of flare gas:					2518	BTU/scf	
	SO2 emission factor for industrial flares:					3.64E-04	lb/hr	

Holly Refinery: NOI to Incorporate NOx emission Limits into AO

April 30, 2013

HOLLYFRONTIER

HOLLY REFINING & MARKETING COMPANY – WOODS CROSS LLC

1070 West 500 South • West Bountiful, Utah 84087-1442

(801) 299-6600 • Fax (801) 299-6609

UTAH DEPARTMENT OF
ENVIRONMENTAL QUALITY

APR 30 2013

DIVISION OF AIR QUALITY

April 26, 2013

Mr. Bryce Bird, Director
Division of Air Quality
Utah Dept. of Environmental Quality
195 North 1950 West
Salt Lake City, Utah 84114-4820

CERTIFIED MAIL: 7012 2920 0000 3468 5634

RE: **Notice of Intent to Incorporate NO_X Emission Limits into Approval Order**

Dear Mr. Bird:

As you are aware, Holly Refining and Marketing Company – Woods Cross LLC submitted a Notice of Intent (NOI) for a modification to our Approval order on May 23, 2012, which we subsequently revised on July 13, 2012 and again on April 1, 2013. In those modifications, we included a Nitrogen Oxides (NO_X) emission limit on our Boiler #8 that complies with paragraphs 46c and 137 of the Holly Refining and Marketing Company Consent Decree (CD) entered July 2, 2008. In accordance with paragraph 46 of our CD, Boiler # 8 is now equipped with a selective catalytic reduction (SCR) alternative NO_X control technology. A performance test was conducted April 22, 2013, and the results are enclosed. The results of the performance test demonstrate our ability to comply with the NO_X emission limit of 0.02 lbs NOx/mmBtu on a 3-hour average basis as set forth in the aforementioned NOI.

If you have any questions or need additional information, please contact Eric Benson at (801) 299-6623.

Sincerely,

Michael S. Astin, P.E.
Environmental Manager

cc: C. Harry (Utah DAQ)
File 2.6.3.1.046

c: Director, Air Enforcement Division
Office of Civil Enforcement
c/o Matrix New World Engineering Inc.
26 Columbia Turnpike, 2nd Floor
Florham Park, NJ 07932

T.L. Garrett, Esq.
Covington & Burling, LLP
1201 Pennsylvania Ave., N.W.
Washington, D.C. 20004

Air Program Director
Office of Enforcement, Compliance & Environmental Justice
Environmental Protection Agency, Region 8
1595 Wynkoop Street
Denver, CO 80202-1129

D. McWatters
M. Astin (r) File 2.6.3.1.149

ec: csullivan@matrixneworld.com
foley.patrick@epa.gov
ostrand.laurie@epamail.epa.gov
D. Lamp
J. Stump

Holly Frontier Refining

Revision 0, April 23, 2013

TEST REPORT

Sources: **Boiler # 8**

Purpose: **Carbon Monoxide and Nitrogen Oxides Performance Test**

Submitted to:

HOLLY Frontier Refining and Marketing Company
Woods Cross Refinery
1070 West 500 South
West Bountiful, Utah 84087-1442

Submitted by:

CCI Environmental Consultants, Inc.
3855 South 500 West, Suite A
Salt Lake City, Utah 84115

Test Date: **April 22, 2013**

Holly Frontier Refining

TEST REPORT

Revision 0, April 23, 2013

Sources: **Boiler # 8**

Purpose: **Carbon Monoxide and Nitrogen Oxides Performance Test**

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1070 West 500 South
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CCI Environmental Consultants, Inc.
3855 South 500 West, Suite A
Salt Lake City, Utah 84115

Test Date: **April 22, 2013**

Sources: **Boiler # 8**

Purpose: **Carbon Monoxide and Nitrogen Oxides Performance Test**

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Appendix B Process Data – Gas Consumption and Fuel Analysis
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1.0 INTRODUCTION

1.1 Responsible Groups

Name of plant:	Holly Refining & Marketing Company
Plant Test Representative:	Eric Benson **Woods Cross Refinery** 1070 West 500 South West Bountiful, Utah 84087-1442
Phone Number:	801 299-6623
Plant Address:	Woods Cross Refinery 393 South 800 West Woods Cross, Utah 84087
Testing Company Name:	CCI Environmental Consultants, Inc.
Responsible Test Manager:	Larry Cottone
Phone Number:	801 269 0550
e-mail address:	larrycottone@juno.com
Address:	3855 South 500 West, Suite A Salt Lake City, Utah 84115
Regulatory Agency:	Utah Division of Air Quality
Name:	Joe Randolph
Phone Number:	801 536 4000
e-mail address:	jrandolph@utah.gov
Address:	150 North 1950 West Salt Lake City, Utah 84114-4820

1.2 Overall Purpose of the Emission Test

Regulations:	40 CFR 60.11 and 40 CFR 60.13 40 CFR 63 Subpart DDDDD
Permit number:	DAQE-AN0101-230023-12
Process tested:	Boiler # 8
Instrumentation to be Audited:	None.
Air pollution control equipment:	Selective Catalytic Reducer.
Sampling locations:	Exhaust stack.
Parameters to be measured:	Nitrogen Oxide, Carbon Monoxide and Oxygen
Reference Methods Employed:	Reference Methods 3A, 7E, 10 and 19.
Test Date:	April 22, 2013.

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 Process Tested

The Boiler # 8 is used to generate steam for refinery processes. The boiler is fired using refinery gas. The boiler employs stack gas heat recovery.

2.2 Control Equipment Description

The boiler is equipped with a catalytic selective reducer to control tail gas nitrogen oxide emissions.

2.3 Flue Gas Sampling Locations

Test Location(s):	Vertical stack. See figure 1 for a photo of the stack
Stack diameter:	The stack diameter is 1.6 m (64 inches).
Nearest upstream disturbance:	Diameter reduction.
Nearest upstream disturbance distance:	Approximately 72 inches
Nearest downstream disturbance:	Stack exit to atmosphere.
Nearest downstream dist. distance:	Approximately 72 inches

The exhaust stack does not meet Reference Method 1 criteria. A temporary stack extension was fabricated for this test program and the resulting dimensions are reflected above. The length of the extension was approximately 72 inches with an approximate inside diameter of 64 inches. Three test points were sampled on a single measurement line.

2.4 Process Sampling Locations

Fuel gas samples are collected by refinery personnel periodically and submitted to an outside laboratory for analysis. Fuel gas samples were submitted for Ultimate Analysis, the results of which were used by CCI for Reference Method 19 emission factor calculations. An Fd factor was calculated and used to calculate NOx emission rates in units of pounds per mmBtu. The analysis and the fFactor calculation sheet is reproduced in Appendix B.

2.5 Calculation of Emission Reporting Units

CCI measured oxygen (O_2), nitrogen oxides (NO_X) and carbon monoxide (CO) concentrations on a dry basis. Those measurements were used to calculate emission concentrations of NO_X corrected to 0 percent oxygen and emission concentrations of CO corrected to 3 percent oxygen.

The nitrogen oxides emission rates were also calculated in units of pounds per million BTU using the following equation:

$$NO_X \text{ (lbs/mmBTU)} = NO_X \text{ (ppmvd)} \times CF \times F_d \times (20.9 / (20.9 - \%O_2))$$

Where:

$CF = 1.194e^{-7}$ for NO_X

F_d = Fuel Factor on dry basis

NO_X (ppmvd) = NO_X measured using Reference Method 7E

$\%O_2$ = % oxygen measured on a dry basis using Reference Method 3A.

The Fd calculations are included in Appendix B along with fuel combustion rates and the fuel analysis representative of the test day.

3.0 SUMMARY AND DISCUSSION OF TEST PROGRAM

The objective of the test program was to determine the carbon monoxide and nitrogen oxides emission concentrations from Boilers #8 operated by the Holly Frontier Woods Cross Refinery. The NO_X emissions were calculated and reported in terms of pounds per million BTU and ppmvd corrected to 0 percent oxygen.

The test program also determined the carbon monoxide emission rate in accordance with 40 CFR 63 Subpart DDDDD, Table 5. The CO emissions were calculated and reported in parts per million on a dry basis corrected to 3 percent oxygen.

Table 1 summarizes the results of the test program. The calculation of average emissions and Reference Method test data for Boiler #8 are included in Appendix A. Calibration gas certifications are in Appendix C.

Table 1: Summary of Results for Boiler #8

	Test Results, As measured				
	Start Time	End Time	Oxygen Percent dry	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Run 1	15:43:15	16:43:15	3.5	14.2	56.4
Run 2	16:54:30	17:54:30	4.1	13.5	4.1
Run 3	18:08:00	19:08:00	4.0	12.7	8.1
	Averages		3.9	13.5	22.9

	Compliance Results				
	Start Time	End Time	Nitrogen Oxides lbs/mmBtu	Nitrogen Oxides ppmvd @ 0% O_2	Carbon Monoxide ppmvd @ 3% O_2
Run 1	15:43:15	16:43:15	0.017	17.1	58
Run 2	16:54:30	17:54:30	0.016	16.8	4.4
Run 3	18:08:00	19:08:00	0.015	15.7	8.6
	Averages		0.016	16.5	23.7

F_d = 8213 **dscf per mmBtu, Fuel analysis and calculations are illustrated in Appendix B.**

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 Test Methods

The following Reference Methods were employed for this test program:

Reference Method	Parameter
Reference Method 3A	Oxygen
Reference Method 7E	Nitrogen Oxides
Reference Method 10	Carbon Monoxide

Figure 1 illustrates the CCI Method 3A, 7E and 10 sampling train.

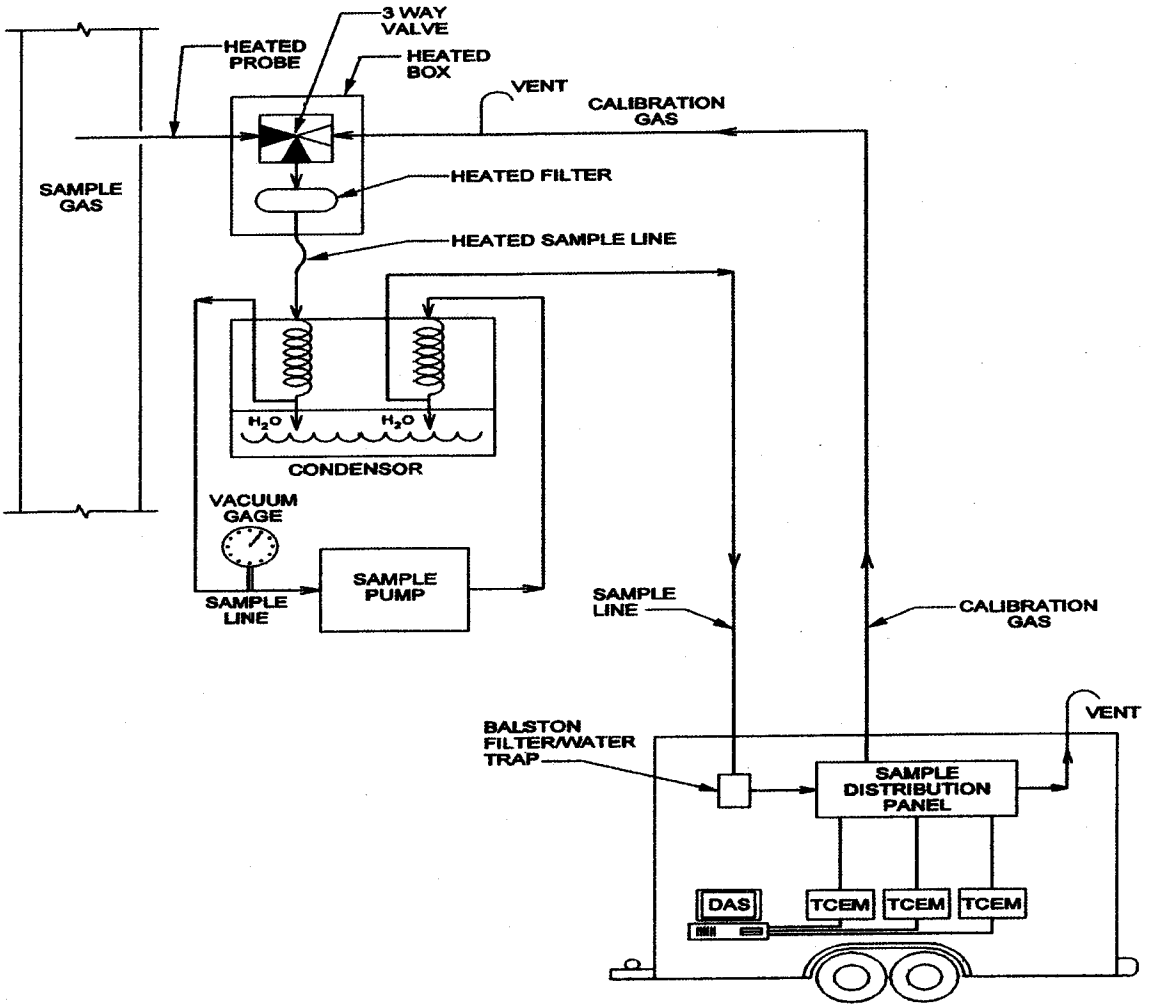
4.2 Sample Procedures

The sampling and analytical procedures described in the Reference Methods were employed for this test program.

4.3 Process Test Methods

A fuel gas sample was collected by refinery personnel and submitted to an outside laboratory for Ultimate analysis. The results are included in Appendix C. CCI used the analysis to calculate a representative Fd factor for the test program, which is also included in Appendix C.

Figure 1 Transportable Continuous Emission Monitoring System



5.0 INTERNAL QA/QC ACTIVITIES

5.1 QA/QC PROCEDURES

At a minimum, the QA/QC checks required by the Reference Methods and relevant Performance Specifications were employed. A converter check was conducted in the field; however, there was a small hole is the converter bag sample and there was not a replacement in the field. Although it was apparent to the operator that the converter was working properly, it slightly exceeded the 2% specification in Method 7E. The converter check was repeated in the office with a new bag and it passed. Both converter checks are found in Appendix A.

5.2 QA AUDITS

No audit materials were provided by the UDAQ.

Appendix A

Boiler #8

Calculation of Average Emissions, Reference Method CEMS Calibration, Bias and Drift, Converter Check and Raw Data

Calculation of Average Emissions

Holly Frontier
Woods Cross Refinery
Boiler 8

Date:4/22/13

CCI Environmental Consultants
15:43:15 16:43:15
CEMS
Cottone
Run 1

Calibration Gas Value		Initial Calibration	Final Calibration	Average
0.00	percent O_2	-0.08 %	-0.09 %	-0.09
10.95	percent O_2	10.44 %	10.43 %	10.44
0.0	ppm NO_X	0.6 ppm	0.6 ppm	0.62
104.4	ppm NO_X	108.6 ppm	107.3 ppm	107.92
0.0	ppm CO	1.9 ppm	1.9 ppm	1.87
102.1	ppm CO	96.4 ppm	96.4 ppm	96.39

Mean Reference Values:		**Corrected Results:**		**Basis:**
3.31	percent O_2	**3.50**	percent O_2	DRY
15.2	ppm NO_X	**14.2**	ppm NO_X	DRY
54.1	ppm CO	**56.4**	ppm CO	DRY

Emission Calculations:

0.0170	NO_X Lbs/mmBtu from O_2	**17.1**	NOx @ 0% O2 from O2
0.0400	CO Lbs/mmBtu from O_2	**58.0**	CO @ 3% O2 from O2

Calculation of Average Emissions

Holly Frontier
Woods Cross Refinery
Boiler 8

Date:4/22/13

CCI Environmental Consultants
16:54:30 17:54:30
CEMS
Cottone
Run 2

Calibration Gas Value		Initial Calibration	Final Calibration	Average
0.00	percent O_2	-0.09 %	-0.02 %	-0.06
10.95	percent O_2	10.43 %	10.38 %	10.41
0.0	ppm NO_X	0.6 ppm	0.6 ppm	0.62
104.4	ppm NO_X	107.3 ppm	103.8 ppm	105.51
0.0	ppm CO	1.9 ppm	1.8 ppm	1.85
102.1	ppm CO	96.4 ppm	96.5 ppm	96.45

Mean Reference Values:		**Corrected Results:**		**Basis:**
3.89	percent O_2	**4.10**	percent O_2	DRY
14.2	ppm NO_X	**13.5**	ppm NO_X	DRY
5.6	ppm CO	**4.1**	ppm CO	DRY

Emission Calculations:

0.0160	NO_X Lbs/mmBtu from O_2	**16.8**	NOx @ 0% O2 from O2
0.0030	CO Lbs/mmBtu from O_2	**4.4**	CO @ 3% O2 from O2

Calculation of Average Emissions

Holly Frontier
Woods Cross Refinery
Boiler 8

Date:4/22/13

CCI Environmental Consultants
18:08:00 19:08:00
CEMS
Cottone
Run 3

Calibration Gas Value		Initial Calibration	Final Calibration	Average
0.00	percent O_2	-0.02 %	-0.10 %	-0.06
10.95	percent O_2	10.38 %	10.48 %	10.43
0.0	ppm NO_X	0.6 ppm	0.5 ppm	0.56
104.4	ppm NO_X	103.8 ppm	103.1 ppm	103.43
0.0	ppm CO	1.8 ppm	2.0 ppm	1.91
102.1	ppm CO	96.5 ppm	96.6 ppm	96.54

Mean Reference Values:

3.79	percent O_2	**4.00**	percent O_2	DRY
13.1	ppm NO_X	**12.7**	ppm NO_X	DRY
9.4	ppm CO	**8.1**	ppm CO	DRY

Corrected Results: **Basis:**

Emission Calculations:

0.0150	NO_X Lbs/mmBtu from O_2	**15.7**	NOx @ 0% O2 from O2
0.0060	CO Lbs/mmBtu from O_2	**8.6**	CO @ 3% O2 from O2

Analyzer Calibration Error

Holly Frontier
Woods Cross Refinery
Boiler 8

Date:4/22/13

CCI Environmental Consultants
Air Quality Division
CEMS
Cottone
Runs 1-3

Oxygen Monitor

Method 3A

Full Scale: 23.37 %

Serial Number: CAI 100F

Cylinder Number	Reference Gas Concentration	Analyzer Response	Difference	Calibration Error (%)
CC 102731/cg5	0.00 %	0.11 %	0.11 %	0.47 %
SG 9166109BAL/cg1	10.95 %	10.67 %	-0.28 %	-1.20 %
CC 102820/cg2	23.37 %	23.28 %	-0.09 %	-0.39 %

Nitrogen Oxides Monitor

Method 7E

Full Scale: 221.2 ppm

Serial Number: 42CHL-69546-363

Cylinder Number	Reference Gas Concentration	Analyzer Response	Difference	Calibration Error (%)
SG 9166109BAL/cg1	0.0 ppm	1.2 ppm	1.2 ppm	0.54 %
CC 102731/cg5	104.4 ppm	104.1 ppm	-0.3 ppm	-0.14 %
XCO13008B/cg4	221.2 ppm	219.4 ppm	-1.8 ppm	-0.81 %

Carbon Monoxide Monitor

Method 10

Full Scale: 216.4 ppm

Serial Number: 01-0005

Cylinder Number	Reference Gas Concentration	Analyzer Response	Difference	Calibration Error (%)
SG 9166109BAL/cg1	0.0 ppm	2.3 ppm	2.3 ppm	1.06 %
CC 102731/cg5	102.1 ppm	103.1 ppm	1.0 ppm	0.46 %
XCO13008B/cg4	216.4 ppm	218.9 ppm	2.5 ppm	1.16 %

Sampling System Bias and Drift

Holly Frontier
Woods Cross Refinery
Boiler 8

Date:4/22/13

CCI Environmental Consultants
15:43:15 16:43:15
CEMS
Cottone
Run 1

Monitor Type	Analyzer Cal Response	Initial Cal Value	Pre Run Bias (%)	Final Cal Value	Post Run Bias (%)	Total Run Drift (%)
O_2	0.11 %	-0.08 %	-0.81 %	-0.09 %	-0.86 %	-0.04 %
O_2	10.67 %	10.44 %	-0.98 %	10.43 %	-1.03 %	-0.04 %
NO_X	1.2 ppm	0.6 ppm	-0.27 %	0.6 ppm	-0.27 %	0.00 %
NO_X	104.1 ppm	108.6 ppm	2.03 %	107.3 ppm	1.45 %	-0.59 %
CO	2.3 ppm	1.9 ppm	-0.18 %	1.9 ppm	-0.18 %	0.00 %
CO	103.1 ppm	96.4 ppm	-3.10 %	96.4 ppm	-3.10 %	0.00 %

Sampling System Bias and Drift

Holly Frontier
Woods Cross Refinery
Boiler 8

Date:4/22/13

CCI Environmental Consultants
16:54:30 17:54:30
CEMS
Cottone
Run 2

Monitor Type	Analyzer Cal Response	Initial Cal Value	Pre Run Bias (%)	Final Cal Value	Post Run Bias (%)	Total Run Drift (%)
O_2	0.11 %	-0.09 %	-0.86 %	-0.02 %	-0.56 %	0.30 %
O_2	10.67 %	10.43 %	-1.03 %	10.38 %	-1.24 %	-0.21 %
NO_X	1.2 ppm	0.6 ppm	-0.27 %	0.6 ppm	-0.27 %	0.00 %
NO_X	104.1 ppm	107.3 ppm	1.45 %	103.8 ppm	-0.14 %	-1.58 %
CO	2.3 ppm	1.9 ppm	-0.18 %	1.8 ppm	-0.23 %	-0.05 %
CO	103.1 ppm	96.4 ppm	-3.10 %	96.5 ppm	-3.05 %	0.05 %

Sampling System Bias and Drift

Holly Frontier
Woods Cross Refinery
Boiler 8

Date:4/22/13

CCI Environmental Consultants
18:08:00 19:08:00
CEMS
Cottone
Run 3

Monitor Type	Analyzer Cal Response	Initial Cal Value	Pre Run Bias (%)	Final Cal Value	Post Run Bias (%)	Total Run Drift (%)
O_2	0.11 %	-0.02 %	-0.56 %	-0.10 %	-0.90 %	-0.34 %
O_2	10.67 %	10.38 %	-1.24 %	10.48 %	-0.81 %	0.43 %
NO_X	1.2 ppm	0.6 ppm	-0.27 %	0.5 ppm	-0.32 %	-0.05 %
NO_X	104.1 ppm	103.8 ppm	-0.14 %	103.1 ppm	-0.45 %	-0.32 %
CO	2.3 ppm	1.8 ppm	-0.23 %	2.0 ppm	-0.15 %	0.08 %
CO	103.1 ppm	96.5 ppm	-3.05 %	96.6 ppm	-3.02 %	0.03 %

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
dcg2	4/22/2013	10:11:15	20.63	0.4	2.3
dcg2	4/22/2013	10:11:30	22.89	0.7	2.5
dcg2	4/22/2013	10:11:45	23.70	2.2	2.5
dcg2	4/22/2013	10:12:00	23.77	1.6	2.4
dcg2	4/22/2013	10:12:15	23.78	1.2	2.3
dcg2	4/22/2013	10:12:30	23.77	2.3	2.1
dcg2	4/22/2013	10:12:45	23.29	2.9	1.9
dcg2	4/22/2013	10:13:00	23.26	4.1	1.9
dcg2	4/22/2013	10:13:15	23.28	4.5	1.9
o2high1	4/22/2013	10:13:15	23.28	4.5	1.9
dcg4	4/22/2013	10:13:30	23.01	3.7	1.9
dcg4	4/22/2013	10:13:45	11.45	2.8	11.4
dcg4	4/22/2013	10:14:00	1.50	52.7	76.4
dcg4	4/22/2013	10:14:15	0.38	132.1	124.3
dcg4	4/22/2013	10:14:30	0.24	223.3	161.7
dcg4	4/22/2013	10:14:45	0.19	225.8	190.3
dcg4	4/22/2013	10:15:00	0.17	223.7	208.7
dcg4	4/22/2013	10:15:15	0.15	221.6	222.0
dcg4	4/22/2013	10:15:30	0.14	219.4	230.0
dcg4	4/22/2013	10:15:45	0.13	218.4	235.9
dcg4	4/22/2013	10:16:00	0.13	217.2	239.5
dcg4	4/22/2013	10:16:15	0.12	216.1	235.9
dcg4	4/22/2013	10:16:30	0.12	215.7	218.9
dcg4	4/22/2013	10:16:45	0.11	215.2	218.6
dcg4	4/22/2013	10:17:00	0.11	214.7	218.9
cohigh1	4/22/2013	10:17:00	0.11	214.7	218.9
noxhigh1	4/22/2013	10:15:30	0.14	219.4	230.0
dcg1	4/22/2013	10:18:15	11.85	19.5	120.9
dcg1	4/22/2013	10:18:30	10.69	17.8	85.5
dcg1	4/22/2013	10:18:45	10.61	5.9	60.6
dcg1	4/22/2013	10:19:00	10.63	2.1	43.2
dcg1	4/22/2013	10:19:15	10.64	1.4	30.5
dcg1	4/22/2013	10:19:30	10.65	1.2	22.0
dcg1	4/22/2013	10:19:45	10.66	0.9	15.9
dcg1	4/22/2013	10:20:00	10.66	0.8	11.8
dcg1	4/22/2013	10:20:15	10.67	0.6	8.3
dcg1	4/22/2013	10:20:30	10.67	0.6	5.6
dcg1	4/22/2013	10:20:45	10.67	0.6	3.4
dcg1	4/22/2013	10:21:00	10.67	0.4	2.5
dcg1	4/22/2013	10:21:15	10.67	0.3	2.3
coezero1	4/22/2013	10:21:15	10.67	0.3	2.3
noxezero1	4/22/2013	10:19:30	10.65	1.2	22.0
o2mid1	4/22/2013	10:21:00	10.67	0.4	2.5
dcg5	4/22/2013	10:22:15	11.92	0.4	2.1
dcg5	4/22/2013	10:22:30	1.77	12.1	5.3

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
dcg5	4/22/2013	10:22:45	0.35	78.6	49.6
dcg5	4/22/2013	10:23:00	0.19	101.1	70.2
dcg5	4/22/2013	10:23:15	0.16	103.0	84.0
dcg5	4/22/2013	10:23:30	0.14	103.5	91.4
dcg5	4/22/2013	10:23:45	0.13	103.6	97.8
dcg5	4/22/2013	10:24:00	0.12	103.9	101.5
dcg5	4/22/2013	10:24:15	0.11	104.1	103.1
dcg5	4/22/2013	10:24:30	0.11	104.1	104.1
o2ezero1	4/22/2013	10:24:30	0.11	104.1	104.1
comid1	4/22/2013	10:24:15	0.11	104.1	103.1
noxmid1	4/22/2013	10:24:30	0.11	104.1	104.1
Converter Check	4/22/2013	10:31:30	19.78	99.8	9.5
Converter Check	4/22/2013	10:31:45	19.79	100.0	9.2
Converter Check	4/22/2013	10:32:00	19.80	100.0	8.9
Converter Check	4/22/2013	10:32:15	19.79	100.0	8.8
Converter Check	4/22/2013	10:32:30	19.78	100.0	8.6
Converter Check	4/22/2013	10:32:45	19.79	100.2	8.4
Converter Check	4/22/2013	10:33:00	19.79	100.2	8.3
Converter Check	4/22/2013	10:33:15	19.80	100.2	8.1
Converter Check	4/22/2013	10:33:30	19.81	100.3	7.8
Converter Check	4/22/2013	10:33:45	19.82	100.1	7.7
Converter Check	4/22/2013	10:34:00	19.81	100.0	7.5
Converter Check	4/22/2013	10:34:15	19.82	100.0	7.4
Converter Check	4/22/2013	10:34:30	19.82	100.0	7.4
Converter Check	4/22/2013	10:34:45	19.82	100.0	7.2
Converter Check	4/22/2013	10:35:00	19.83	100.0	7.1
Converter Check	4/22/2013	10:35:15	19.83	100.0	7.0
Converter Check	4/22/2013	10:35:30	19.83	99.9	6.9
Converter Check	4/22/2013	10:35:45	19.83	100.0	6.9
Converter Check	4/22/2013	10:36:00	19.83	99.8	6.7
Converter Check	4/22/2013	10:36:15	19.83	99.8	6.6
Converter Check	4/22/2013	10:36:30	19.83	99.8	6.6
Converter Check	4/22/2013	10:36:45	19.83	99.8	6.4
Converter Check	4/22/2013	10:37:00	19.83	99.8	6.4
Converter Check	4/22/2013	10:37:15	19.85	99.8	6.4
Converter Check	4/22/2013	10:37:30	19.84	99.8	6.3
Converter Check	4/22/2013	10:37:45	19.85	99.8	6.2
Converter Check	4/22/2013	10:38:00	19.87	99.8	6.2
Converter Check	4/22/2013	10:38:15	19.86	99.6	6.1
Converter Check	4/22/2013	10:38:30	19.87	99.6	6.0
Converter Check	4/22/2013	10:38:45	19.86	99.5	6.0
Converter Check	4/22/2013	10:39:00	19.86	99.5	6.0
Converter Check	4/22/2013	10:39:15	19.86	99.5	6.0
Converter Check	4/22/2013	10:39:30	19.86	99.5	6.0
Converter Check	4/22/2013	10:39:45	19.88	99.5	6.0
Converter Check	4/22/2013	10:40:00	19.90	99.5	6.0
Converter Check	4/22/2013	10:40:15	19.90	99.5	6.1
Converter Check	4/22/2013	10:40:30	19.81	99.5	6.2

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Converter Check	4/22/2013	10:40:45	19.49	99.5	6.3
Converter Check	4/22/2013	10:41:00	19.39	99.3	6.5
Converter Check	4/22/2013	10:41:15	19.57	99.3	6.5
Converter Check	4/22/2013	10:41:30	19.72	99.3	6.6
Converter Check	4/22/2013	10:41:45	20.01	99.3	6.6
Converter Check	4/22/2013	10:42:00	20.08	99.3	6.6
Converter Check	4/22/2013	10:42:15	19.65	99.2	6.6
Converter Check	4/22/2013	10:42:30	19.33	99.1	6.6
Converter Check	4/22/2013	10:42:45	19.20	99.2	6.6
Converter Check	4/22/2013	10:43:00	19.32	99.2	6.8
Converter Check	4/22/2013	10:43:15	19.16	99.2	6.8
Converter Check	4/22/2013	10:43:30	19.28	99.2	6.9
Converter Check	4/22/2013	10:43:45	19.82	99.0	7.1
Converter Check	4/22/2013	10:44:00	19.90	99.0	7.2
Converter Check	4/22/2013	10:44:15	19.80	99.0	7.5
Converter Check	4/22/2013	10:44:30	19.52	99.0	7.9
Converter Check	4/22/2013	10:44:45	19.60	99.0	8.4
Converter Check	4/22/2013	10:45:00	19.50	99.0	8.7
Converter Check	4/22/2013	10:45:15	19.19	98.9	8.9
Converter Check	4/22/2013	10:45:30	19.45	98.8	8.6
Converter Check	4/22/2013	10:45:45	19.49	98.8	8.4
Converter Check	4/22/2013	10:46:00	19.32	98.8	8.2
Converter Check	4/22/2013	10:46:15	19.48	98.8	8.1
Converter Check	4/22/2013	10:46:30	19.68	98.8	8.1
Converter Check	4/22/2013	10:46:45	19.75	98.8	8.2
Converter Check	4/22/2013	10:47:00	19.87	98.7	8.4
Converter Check	4/22/2013	10:47:15	19.77	98.6	8.7
Converter Check	4/22/2013	10:47:30	19.79	98.6	9.0
Converter Check	4/22/2013	10:47:45	19.87	98.6	9.5
Converter Check	4/22/2013	10:48:00	19.87	98.6	10.3
Converter Check	4/22/2013	10:48:15	19.75	98.6	13.1
Converter Check	4/22/2013	10:48:30	19.54	98.5	21.6
Converter Check	4/22/2013	10:48:45	19.35	98.6	27.2
Converter Check	4/22/2013	10:49:00	19.09	98.6	28.6
Converter Check	4/22/2013	10:49:15	19.25	98.4	29.1
Converter Check	4/22/2013	10:49:30	19.56	98.3	28.8
Converter Check	4/22/2013	10:49:45	19.39	98.3	27.9
Converter Check	4/22/2013	10:50:00	19.82	98.2	26.9
Converter Check	4/22/2013	10:50:15	19.88	98.3	26.0
Converter Check	4/22/2013	10:50:30	19.89	98.3	24.9
Converter Check	4/22/2013	10:50:45	19.78	98.2	23.9
Converter Check	4/22/2013	10:51:00	19.69	98.1	23.2
Converter Check	4/22/2013	10:51:15	19.37	98.1	23.3
Converter Check	4/22/2013	10:51:30	19.17	98.1	23.8
Converter Check	4/22/2013	10:51:45	19.27	98.1	24.7
Converter Check	4/22/2013	10:52:00	19.71	98.1	26.8
Converter Check	4/22/2013	10:52:15	19.42	98.1	42.5
Converter Check	4/22/2013	10:52:30	19.69	97.9	51.8

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Converter Check	4/22/2013	10:52:45	19.82	98.0	52.7
Converter Check	4/22/2013	10:53:00	19.74	97.9	51.3
Converter Check	4/22/2013	10:53:15	19.62	97.9	48.0
Converter Check	4/22/2013	10:53:30	19.56	97.9	42.3
Converter Check	4/22/2013	10:53:45	19.35	97.7	40.2
Converter Check	4/22/2013	10:54:00	19.24	97.6	40.3
Converter Check	4/22/2013	10:54:15	19.59	97.6	41.4
Converter Check	4/22/2013	10:54:30	19.69	97.6	43.3
Converter Check	4/22/2013	10:54:45	19.82	97.6	47.0
Converter Check	4/22/2013	10:55:00	19.82	97.7	53.7
Converter Check	4/22/2013	10:55:15	19.76	97.7	58.7
Converter Check	4/22/2013	10:55:30	19.76	97.6	62.4
Converter Check	4/22/2013	10:55:45	19.56	97.6	65.4
Converter Check	4/22/2013	10:56:00	19.69	97.5	68.0
Converter Check	4/22/2013	10:56:15	19.87	97.4	68.4
Converter Check	4/22/2013	10:56:30	19.86	97.4	68.0
Converter Check	4/22/2013	10:56:45	19.70	97.4	67.6
Converter Check	4/22/2013	10:57:00	19.80	97.5	67.7
Converter Check	4/22/2013	10:57:15	19.86	97.4	68.5
Converter Check	4/22/2013	10:57:30	20.04	97.4	68.5
Converter Check	4/22/2013	10:57:45	20.09	97.2	68.5
Converter Check	4/22/2013	10:58:00	20.13	97.2	68.5
Converter Check	4/22/2013	10:58:15	19.81	97.2	68.5
Converter Check	4/22/2013	10:58:30	19.98	97.2	68.5
Converter Check	4/22/2013	10:58:45	20.02	97.2	68.5
Converter Check	4/22/2013	10:59:00	19.95	97.2	68.5
Converter Check	4/22/2013	10:59:15	19.84	97.2	68.5
Converter Check	4/22/2013	10:59:30	20.01	97.2	68.5
Converter Check	4/22/2013	10:59:45	20.06	97.2	68.4
Converter Check	4/22/2013	11:00:00	19.87	97.2	68.5
Converter Check	4/22/2013	11:00:15	19.90	97.2	68.5
Converter Check	4/22/2013	11:00:30	19.91	97.2	70.5
Converter Check	4/22/2013	11:00:45	19.94	97.0	78.8
Converter Check	4/22/2013	11:01:00	19.94	97.2	82.5
Converter Check	4/22/2013	11:01:15	19.90	97.0	79.4
averun1	4/22/2013	10:31:30	19.72	98.7	26.4
scg1	4/22/2013	15:11:45	4.22	16.8	37.2
scg1	4/22/2013	15:12:00	4.31	16.9	20.9
scg1	4/22/2013	15:12:15	4.30	16.9	12.3
scg1	4/22/2013	15:12:30	4.24	16.8	7.0
scg1	4/22/2013	15:12:45	3.91	16.8	4.0
scg1	4/22/2013	15:13:00	3.08	17.2	4.4
scg1	4/22/2013	15:13:15	6.14	17.2	84.3
scg1	4/22/2013	15:13:30	10.09	15.1	126.0
scg1	4/22/2013	15:13:45	10.36	5.3	117.5
scg1	4/22/2013	15:14:00	10.40	1.1	73.9
scg1	4/22/2013	15:14:15	10.41	0.6	43.1
scg1	4/22/2013	15:14:30	10.42	0.4	23.4

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
scg1	4/22/2013	15:14:45	10.43	0.4	10.5
scg1	4/22/2013	15:15:00	10.44	0.4	2.9
scg1	4/22/2013	15:15:15	10.44	0.5	1.9
cozero1	4/22/2013	15:15:15	10.44	0.5	1.9
noxzero1	4/22/2013	15:14:15	10.41	0.6	43.1
o2span1	4/22/2013	15:15:15	10.44	0.5	1.9
scg5	4/22/2013	15:15:30	10.45	0.6	1.9
scg5	4/22/2013	15:15:45	10.44	0.5	1.9
scg5	4/22/2013	15:16:00	10.44	0.4	1.9
scg5	4/22/2013	15:16:15	10.44	0.4	1.9
scg5	4/22/2013	15:16:30	12.37	0.4	1.9
scg5	4/22/2013	15:16:45	7.03	0.4	1.9
scg5	4/22/2013	15:17:00	0.66	14.3	1.9
scg5	4/22/2013	15:17:15	0.08	46.3	3.9
scg5	4/22/2013	15:17:30	0.01	98.8	40.4
scg5	4/22/2013	15:17:45	-0.01	110.2	60.8
scg5	4/22/2013	15:18:00	-0.02	112.9	67.9
scg5	4/22/2013	15:18:15	-0.04	114.4	73.7
scg5	4/22/2013	15:18:30	-0.04	114.6	78.9
scg5	4/22/2013	15:18:45	-0.05	114.2	83.2
scg5	4/22/2013	15:19:00	-0.05	114.3	86.5
scg5	4/22/2013	15:19:15	-0.06	114.4	88.4
scg5	4/22/2013	15:19:30	-0.06	114.1	89.7
scg5	4/22/2013	15:19:45	-0.06	114.2	90.5
scg5	4/22/2013	15:20:00	-0.07	114.1	90.9
scg5	4/22/2013	15:20:15	-0.07	114.1	91.1
scg5	4/22/2013	15:20:30	-0.07	114.0	91.2
scg5	4/22/2013	15:20:45	-0.07	114.1	91.4
scg5	4/22/2013	15:21:00	-0.08	114.1	91.5
scg5	4/22/2013	15:21:15	-0.08	114.1	91.6
o2zero1	4/22/2013	15:21:00	-0.08	114.1	91.5
cospan1	4/22/2013	15:21:15	-0.08	114.1	91.6
noxspan1	4/22/2013	15:17:45	-0.01	110.2	60.8
scg5	4/22/2013	15:22:30	2.67	104.6	92.3
scg5	4/22/2013	15:22:45	15.35	104.1	91.9
scg5	4/22/2013	15:23:00	18.87	60.9	89.7
scg5	4/22/2013	15:23:15	18.84	17.4	67.0
scg5	4/22/2013	15:23:30	9.84	5.8	32.3
scg5	4/22/2013	15:23:45	0.88	11.7	33.4
scg5	4/22/2013	15:24:00	0.10	70.3	41.4
scg5	4/22/2013	15:24:15	0.01	114.4	59.2
scg5	4/22/2013	15:24:30	-0.02	114.1	73.1
scg5	4/22/2013	15:24:45	-0.04	114.0	79.2
scg5	4/22/2013	15:25:00	-0.05	114.1	82.8
scg5	4/22/2013	15:25:15	-0.06	112.5	85.3
scg5	4/22/2013	15:25:30	-0.06	106.1	87.1
scg5	4/22/2013	15:25:45	-0.07	106.7	88.3
scg5	4/22/2013	15:26:00	-0.07	108.3	89.1

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
scg5	4/22/2013	15:26:15	-0.07	108.3	90.7
scg5	4/22/2013	15:26:30	-0.08	108.3	95.8
scg5	4/22/2013	15:26:45	-0.08	108.5	96.1
scg5	4/22/2013	15:27:00	-0.08	108.6	96.4
o2zero1	4/22/2013	15:27:00	-0.08	108.6	96.4
cospan1	4/22/2013	15:27:00	-0.08	108.6	96.4
noxspan1	4/22/2013	15:27:00	-0.08	108.6	96.4
Run 1	4/22/2013	15:43:15	3.46	15.4	27.9
Run 1	4/22/2013	15:43:30	3.53	15.4	28.6
Run 1	4/22/2013	15:43:45	3.54	15.4	28.1
Run 1	4/22/2013	15:44:00	3.54	15.4	27.2
Run 1	4/22/2013	15:44:15	3.62	15.3	26.1
Run 1	4/22/2013	15:44:30	3.59	15.2	24.6
Run 1	4/22/2013	15:44:45	3.46	15.2	22.7
Run 1	4/22/2013	15:45:00	3.35	15.2	21.6
Run 1	4/22/2013	15:45:15	3.40	15.2	22.1
Run 1	4/22/2013	15:45:30	3.41	15.0	23.5
Run 1	4/22/2013	15:45:45	3.53	15.2	25.2
Run 1	4/22/2013	15:46:00	3.61	15.2	26.7
Run 1	4/22/2013	15:46:15	3.59	15.0	27.4
Run 1	4/22/2013	15:46:30	3.55	14.9	27.3
Run 1	4/22/2013	15:46:45	3.34	14.9	26.6
Run 1	4/22/2013	15:47:00	3.19	15.2	26.7
Run 1	4/22/2013	15:47:15	3.25	15.0	28.0
Run 1	4/22/2013	15:47:30	3.22	14.8	33.4
Run 1	4/22/2013	15:47:45	3.46	14.9	51.7
Run 1	4/22/2013	15:48:00	3.56	14.9	53.2
Run 1	4/22/2013	15:48:15	3.47	15.1	47.4
Run 1	4/22/2013	15:48:30	3.35	15.2	40.3
Run 1	4/22/2013	15:48:45	3.18	15.2	41.0
Run 1	4/22/2013	15:49:00	3.15	15.2	49.2
Run 1	4/22/2013	15:49:15	3.07	15.2	67.6
Run 1	4/22/2013	15:49:30	3.22	15.2	83.9
Run 1	4/22/2013	15:49:45	3.36	15.0	86.3
Run 1	4/22/2013	15:50:00	3.31	15.2	81.7
Run 1	4/22/2013	15:50:15	3.26	15.2	71.7
Run 1	4/22/2013	15:50:30	3.14	15.2	60.9
Run 1	4/22/2013	15:50:45	3.03	15.4	62.7
Run 1	4/22/2013	15:51:00	3.07	15.2	76.9
Run 1	4/22/2013	15:51:15	3.21	15.2	96.5
Run 1	4/22/2013	15:51:30	3.36	15.2	97.8
Run 1	4/22/2013	15:51:45	3.38	15.2	87.9
Run 1	4/22/2013	15:52:00	3.22	15.2	68.8
Run 1	4/22/2013	15:52:15	3.17	15.4	64.6
Run 1	4/22/2013	15:52:30	3.19	15.4	64.6
Run 1	4/22/2013	15:52:45	3.05	15.4	66.0
Run 1	4/22/2013	15:53:00	3.20	15.1	70.1
Run 1	4/22/2013	15:53:15	3.27	14.9	76.5

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Run 1	4/22/2013	15:53:30	3.34	14.9	78.7
Run 1	4/22/2013	15:53:45	3.38	14.9	75.1
Run 1	4/22/2013	15:54:00	3.38	14.9	64.3
Run 1	4/22/2013	15:54:15	3.11	14.9	53.1
Run 1	4/22/2013	15:54:30	3.03	15.0	62.6
Run 1	4/22/2013	15:54:45	2.99	15.3	90.9
Run 1	4/22/2013	15:55:00	3.00	15.4	124.3
Run 1	4/22/2013	15:55:15	3.13	15.1	134.5
Run 1	4/22/2013	15:55:30	3.17	14.7	127.9
Run 1	4/22/2013	15:55:45	3.28	14.7	107.0
Run 1	4/22/2013	15:56:00	3.19	14.8	84.4
Run 1	4/22/2013	15:56:15	3.00	15.0	81.0
Run 1	4/22/2013	15:56:30	3.07	15.2	88.7
Run 1	4/22/2013	15:56:45	3.02	15.2	117.2
Run 1	4/22/2013	15:57:00	3.10	14.9	133.8
Run 1	4/22/2013	15:57:15	3.20	15.0	131.1
Run 1	4/22/2013	15:57:30	3.24	14.9	115.6
Run 1	4/22/2013	15:57:45	3.22	14.8	92.5
Run 1	4/22/2013	15:58:00	3.16	14.7	81.9
Run 1	4/22/2013	15:58:15	3.07	14.7	76.3
Run 1	4/22/2013	15:58:30	3.16	14.9	78.4
Run 1	4/22/2013	15:58:45	3.15	14.9	83.2
Run 1	4/22/2013	15:59:00	3.21	14.9	89.3
Run 1	4/22/2013	15:59:15	3.24	14.7	90.6
Run 1	4/22/2013	15:59:30	3.31	14.7	87.5
Run 1	4/22/2013	15:59:45	3.39	14.7	77.8
Run 1	4/22/2013	16:00:00	3.34	14.8	58.4
Run 1	4/22/2013	16:00:15	3.22	15.0	51.6
Run 1	4/22/2013	16:00:30	3.27	15.0	53.8
Run 1	4/22/2013	16:00:45	3.23	15.0	56.8
Run 1	4/22/2013	16:01:00	3.23	15.0	59.3
Run 1	4/22/2013	16:01:15	3.39	15.0	60.2
Run 1	4/22/2013	16:01:30	3.42	14.7	59.3
Run 1	4/22/2013	16:01:45	3.44	14.7	57.4
Run 1	4/22/2013	16:02:00	3.39	14.7	54.1
Run 1	4/22/2013	16:02:15	3.21	14.9	48.7
Run 1	4/22/2013	16:02:30	3.14	15.2	49.1
Run 1	4/22/2013	16:02:45	3.04	15.0	58.1
Run 1	4/22/2013	16:03:00	3.11	15.0	84.0
Run 1	4/22/2013	16:03:15	3.23	15.0	95.0
Run 1	4/22/2013	16:03:30	3.23	14.9	94.4
Run 1	4/22/2013	16:03:45	3.31	14.7	90.6
Run 1	4/22/2013	16:04:00	3.27	14.8	80.3
Run 1	4/22/2013	16:04:15	3.16	15.1	68.9
Run 1	4/22/2013	16:04:30	3.10	15.3	68.8
Run 1	4/22/2013	16:04:45	3.05	15.2	74.1
Run 1	4/22/2013	16:05:00	2.92	15.3	114.7
Run 1	4/22/2013	16:05:15	3.07	15.2	153.6

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Run 1	4/22/2013	16:05:30	3.17	15.2	162.6
Run 1	4/22/2013	16:05:45	3.12	15.2	155.6
Run 1	4/22/2013	16:06:00	3.16	15.3	123.6
Run 1	4/22/2013	16:06:15	3.16	15.4	96.7
Run 1	4/22/2013	16:06:30	3.21	15.4	85.7
Run 1	4/22/2013	16:06:45	3.12	15.4	80.7
Run 1	4/22/2013	16:07:00	3.07	15.4	80.1
Run 1	4/22/2013	16:07:15	3.21	15.4	82.5
Run 1	4/22/2013	16:07:30	3.20	15.2	84.7
Run 1	4/22/2013	16:07:45	3.27	15.2	85.8
Run 1	4/22/2013	16:08:00	3.24	15.1	84.1
Run 1	4/22/2013	16:08:15	3.17	15.0	80.5
Run 1	4/22/2013	16:08:30	3.15	15.3	73.3
Run 1	4/22/2013	16:08:45	3.15	15.6	67.5
Run 1	4/22/2013	16:09:00	3.15	15.3	66.6
Run 1	4/22/2013	16:09:15	3.13	15.2	69.0
Run 1	4/22/2013	16:09:30	3.24	15.3	73.2
Run 1	4/22/2013	16:09:45	3.26	15.4	76.5
Run 1	4/22/2013	16:10:00	3.28	15.4	76.6
Run 1	4/22/2013	16:10:15	3.34	15.4	73.6
Run 1	4/22/2013	16:10:30	3.20	15.3	65.8
Run 1	4/22/2013	16:10:45	3.10	15.2	57.3
Run 1	4/22/2013	16:11:00	3.19	15.2	58.8
Run 1	4/22/2013	16:11:15	3.18	15.4	61.2
Run 1	4/22/2013	16:11:30	3.29	15.6	64.0
Run 1	4/22/2013	16:11:45	3.37	15.2	64.8
Run 1	4/22/2013	16:12:00	3.33	15.1	63.7
Run 1	4/22/2013	16:12:15	3.32	15.1	62.1
Run 1	4/22/2013	16:12:30	3.24	15.2	59.2
Run 1	4/22/2013	16:12:45	3.17	15.2	55.8
Run 1	4/22/2013	16:13:00	3.23	15.3	56.4
Run 1	4/22/2013	16:13:15	3.22	15.4	59.0
Run 1	4/22/2013	16:13:30	3.07	15.4	60.6
Run 1	4/22/2013	16:13:45	3.16	15.4	62.3
Run 1	4/22/2013	16:14:00	3.15	15.1	63.4
Run 1	4/22/2013	16:14:15	3.22	15.1	64.1
Run 1	4/22/2013	16:14:30	3.29	15.2	64.3
Run 1	4/22/2013	16:14:45	3.27	15.2	63.5
Run 1	4/22/2013	16:15:00	3.32	15.1	62.1
Run 1	4/22/2013	16:15:15	3.31	15.0	60.2
Run 1	4/22/2013	16:15:30	3.19	15.1	57.7
Run 1	4/22/2013	16:15:45	3.15	15.0	56.4
Run 1	4/22/2013	16:16:00	3.05	15.2	57.8
Run 1	4/22/2013	16:16:15	3.09	15.2	62.2
Run 1	4/22/2013	16:16:30	3.18	15.0	71.5
Run 1	4/22/2013	16:16:45	3.23	15.3	75.4
Run 1	4/22/2013	16:17:00	3.21	15.2	74.4
Run 1	4/22/2013	16:17:15	3.27	15.2	72.5

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Run 1	4/22/2013	16:17:30	3.25	15.4	69.4
Run 1	4/22/2013	16:17:45	3.21	15.6	63.6
Run 1	4/22/2013	16:18:00	3.20	15.7	55.2
Run 1	4/22/2013	16:18:15	3.10	15.7	52.4
Run 1	4/22/2013	16:18:30	3.15	15.6	55.3
Run 1	4/22/2013	16:18:45	3.26	15.2	58.9
Run 1	4/22/2013	16:19:00	3.21	15.4	61.9
Run 1	4/22/2013	16:19:15	3.22	15.4	63.3
Run 1	4/22/2013	16:19:30	3.24	15.4	63.3
Run 1	4/22/2013	16:19:45	3.24	15.4	62.4
Run 1	4/22/2013	16:20:00	3.23	15.4	61.5
Run 1	4/22/2013	16:20:15	3.23	15.4	61.1
Run 1	4/22/2013	16:20:30	3.16	15.5	61.1
Run 1	4/22/2013	16:20:45	3.17	15.6	61.6
Run 1	4/22/2013	16:21:00	3.22	15.3	62.3
Run 1	4/22/2013	16:21:15	3.27	15.2	62.7
Run 1	4/22/2013	16:21:30	3.33	15.2	62.6
Run 1	4/22/2013	16:21:45	3.41	15.2	61.7
Run 1	4/22/2013	16:22:00	3.33	15.3	59.1
Run 1	4/22/2013	16:22:15	3.21	15.4	51.2
Run 1	4/22/2013	16:22:30	3.26	15.5	41.1
Run 1	4/22/2013	16:22:45	3.36	15.0	40.5
Run 1	4/22/2013	16:23:00	3.43	15.0	39.7
Run 1	4/22/2013	16:23:15	3.41	15.0	38.7
Run 1	4/22/2013	16:23:30	3.38	15.0	37.6
Run 1	4/22/2013	16:23:45	3.42	15.0	36.4
Run 1	4/22/2013	16:24:00	3.36	15.2	35.3
Run 1	4/22/2013	16:24:15	3.26	15.2	34.5
Run 1	4/22/2013	16:24:30	3.27	15.2	34.7
Run 1	4/22/2013	16:24:45	3.37	15.0	35.4
Run 1	4/22/2013	16:25:00	3.38	15.2	36.1
Run 1	4/22/2013	16:25:15	3.35	15.1	36.7
Run 1	4/22/2013	16:25:30	3.37	15.0	37.2
Run 1	4/22/2013	16:25:45	3.33	15.2	37.6
Run 1	4/22/2013	16:26:00	3.19	15.1	38.2
Run 1	4/22/2013	16:26:15	3.28	14.9	38.8
Run 1	4/22/2013	16:26:30	3.36	15.1	39.2
Run 1	4/22/2013	16:26:45	3.52	15.2	39.1
Run 1	4/22/2013	16:27:00	3.50	15.1	38.1
Run 1	4/22/2013	16:27:15	3.42	15.1	36.0
Run 1	4/22/2013	16:27:30	3.40	15.2	31.6
Run 1	4/22/2013	16:27:45	3.43	15.2	27.0
Run 1	4/22/2013	16:28:00	3.51	15.2	24.9
Run 1	4/22/2013	16:28:15	3.56	15.2	23.6
Run 1	4/22/2013	16:28:30	3.56	15.2	22.5
Run 1	4/22/2013	16:28:45	3.53	15.0	21.2
Run 1	4/22/2013	16:29:00	3.41	15.0	19.8
Run 1	4/22/2013	16:29:15	3.37	15.1	19.3

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Run 1	4/22/2013	16:29:30	3.46	15.0	19.8
Run 1	4/22/2013	16:29:45	3.44	15.2	20.5
Run 1	4/22/2013	16:30:00	3.46	15.1	21.4
Run 1	4/22/2013	16:30:15	3.33	15.2	22.4
Run 1	4/22/2013	16:30:30	3.31	15.3	24.1
Run 1	4/22/2013	16:30:45	3.33	15.2	26.8
Run 1	4/22/2013	16:31:00	3.34	15.2	29.6
Run 1	4/22/2013	16:31:15	3.33	15.2	30.7
Run 1	4/22/2013	16:31:30	3.46	15.2	31.0
Run 1	4/22/2013	16:31:45	3.60	15.3	30.2
Run 1	4/22/2013	16:32:00	3.55	15.2	28.8
Run 1	4/22/2013	16:32:15	3.35	15.2	27.2
Run 1	4/22/2013	16:32:30	3.25	15.4	26.6
Run 1	4/22/2013	16:32:45	3.21	15.4	27.4
Run 1	4/22/2013	16:33:00	3.26	15.4	29.9
Run 1	4/22/2013	16:33:15	3.45	15.4	33.8
Run 1	4/22/2013	16:33:30	3.47	15.4	34.6
Run 1	4/22/2013	16:33:45	3.48	15.4	32.3
Run 1	4/22/2013	16:34:00	3.36	15.6	28.1
Run 1	4/22/2013	16:34:15	3.24	15.7	22.1
Run 1	4/22/2013	16:34:30	3.18	15.7	20.7
Run 1	4/22/2013	16:34:45	3.20	15.6	24.5
Run 1	4/22/2013	16:35:00	3.44	15.3	33.3
Run 1	4/22/2013	16:35:15	3.57	15.2	38.7
Run 1	4/22/2013	16:35:30	3.66	15.4	36.8
Run 1	4/22/2013	16:35:45	3.62	15.3	32.5
Run 1	4/22/2013	16:36:00	3.49	15.4	25.1
Run 1	4/22/2013	16:36:15	3.35	15.5	21.3
Run 1	4/22/2013	16:36:30	3.31	15.5	21.8
Run 1	4/22/2013	16:36:45	3.48	15.4	22.8
Run 1	4/22/2013	16:37:00	3.51	15.2	23.1
Run 1	4/22/2013	16:37:15	3.61	15.2	22.8
Run 1	4/22/2013	16:37:30	3.65	15.2	22.1
Run 1	4/22/2013	16:37:45	3.64	15.2	21.0
Run 1	4/22/2013	16:38:00	3.53	15.2	19.6
Run 1	4/22/2013	16:38:15	3.41	15.3	18.1
Run 1	4/22/2013	16:38:30	3.52	15.3	17.6
Run 1	4/22/2013	16:38:45	3.59	15.2	17.4
Run 1	4/22/2013	16:39:00	3.70	15.3	16.8
Run 1	4/22/2013	16:39:15	3.64	15.4	16.0
Run 1	4/22/2013	16:39:30	3.61	15.3	15.2
Run 1	4/22/2013	16:39:45	3.67	15.5	14.6
Run 1	4/22/2013	16:40:00	3.62	15.4	14.3
Run 1	4/22/2013	16:40:15	3.52	15.5	14.1
Run 1	4/22/2013	16:40:30	3.60	15.4	14.2
Run 1	4/22/2013	16:40:45	3.64	15.2	14.1
Run 1	4/22/2013	16:41:00	3.61	15.3	14.1
Run 1	4/22/2013	16:41:15	3.70	15.4	13.9

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Run 1	4/22/2013	16:41:30	3.59	15.5	13.7
Run 1	4/22/2013	16:41:45	3.59	15.7	13.6
Run 1	4/22/2013	16:42:00	3.56	15.7	13.4
Run 1	4/22/2013	16:42:15	3.53	15.7	13.4
Run 1	4/22/2013	16:42:30	3.51	15.6	13.4
Run 1	4/22/2013	16:42:45	3.43	15.4	13.4
Run 1	4/22/2013	16:43:00	3.38	15.4	13.5
averun 1	4/22/2013	15:43:15	3.31	15.2	54.1
scg5	4/22/2013	16:43:30	3.30	15.2	13.9
scg5	4/22/2013	16:43:45	3.33	15.3	14.3
scg5	4/22/2013	16:44:00	4.67	15.7	15.1
scg5	4/22/2013	16:44:15	12.89	15.9	16.1
scg5	4/22/2013	16:44:30	2.76	16.7	17.4
scg5	4/22/2013	16:44:45	0.15	26.0	25.6
scg5	4/22/2013	16:45:00	-0.01	84.8	54.3
scg5	4/22/2013	16:45:15	-0.04	106.1	66.7
scg5	4/22/2013	16:45:30	-0.06	106.9	75.0
scg5	4/22/2013	16:45:45	-0.07	107.2	81.7
scg5	4/22/2013	16:46:00	-0.08	107.5	87.4
scg5	4/22/2013	16:46:15	-0.08	107.4	90.7
scg5	4/22/2013	16:46:30	-0.09	107.4	92.9
scg5	4/22/2013	16:46:45	-0.09	107.3	94.6
scg5	4/22/2013	16:47:00	-0.09	107.2	95.7
scg5	4/22/2013	16:47:15	-0.09	107.3	96.4
o2zero1	4/22/2013	16:47:15	-0.09	107.3	96.4
cospan1	4/22/2013	16:47:15	-0.09	107.3	96.4
noxspan1	4/22/2013	16:47:15	-0.09	107.3	96.4
scg1	4/22/2013	16:47:30	-0.09	107.3	96.8
scg1	4/22/2013	16:47:45	-0.10	106.9	97.0
scg1	4/22/2013	16:48:00	-0.10	105.5	97.2
scg1	4/22/2013	16:48:15	-0.01	106.7	97.3
scg1	4/22/2013	16:48:30	4.24	108.2	97.2
scg1	4/22/2013	16:48:45	9.59	98.4	95.9
scg1	4/22/2013	16:49:00	10.31	39.8	69.4
scg1	4/22/2013	16:49:15	10.38	10.3	41.9
scg1	4/22/2013	16:49:30	10.40	1.1	29.9
scg1	4/22/2013	16:49:45	10.42	0.8	19.5
scg1	4/22/2013	16:50:00	10.42	0.6	13.5
scg1	4/22/2013	16:50:15	10.43	0.6	8.4
scg1	4/22/2013	16:50:30	10.44	0.6	3.3
scg1	4/22/2013	16:50:45	10.43	0.6	1.9
scg1	4/22/2013	16:51:00	10.43	0.6	1.9
cozero1	4/22/2013	16:50:45	10.43	0.6	1.9
noxzero1	4/22/2013	16:50:45	10.43	0.6	1.9
o2span1	4/22/2013	16:50:45	10.43	0.6	1.9
Run 2	4/22/2013	16:54:30	3.56	15.3	11.0
Run 2	4/22/2013	16:54:45	3.48	15.1	11.5
Run 2	4/22/2013	16:55:00	3.63	15.3	12.1

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Run 2	4/22/2013	16:55:15	3.68	15.3	12.6
Run 2	4/22/2013	16:55:30	3.72	15.3	13.0
Run 2	4/22/2013	16:55:45	3.73	15.1	13.0
Run 2	4/22/2013	16:56:00	3.84	15.1	12.9
Run 2	4/22/2013	16:56:15	3.90	15.3	12.4
Run 2	4/22/2013	16:56:30	3.82	15.4	12.0
Run 2	4/22/2013	16:56:45	3.73	15.1	11.5
Run 2	4/22/2013	16:57:00	3.69	15.2	11.1
Run 2	4/22/2013	16:57:15	3.59	15.2	10.8
Run 2	4/22/2013	16:57:30	3.69	15.3	10.7
Run 2	4/22/2013	16:57:45	3.82	15.0	10.7
Run 2	4/22/2013	16:58:00	3.84	14.7	10.6
Run 2	4/22/2013	16:58:15	3.74	15.1	10.4
Run 2	4/22/2013	16:58:30	3.67	15.2	10.3
Run 2	4/22/2013	16:58:45	3.60	15.4	10.2
Run 2	4/22/2013	16:59:00	3.57	15.2	10.1
Run 2	4/22/2013	16:59:15	3.50	15.2	10.1
Run 2	4/22/2013	16:59:30	3.52	15.2	10.1
Run 2	4/22/2013	16:59:45	3.63	15.4	10.3
Run 2	4/22/2013	17:00:00	3.61	15.3	10.5
Run 2	4/22/2013	17:00:15	3.57	15.3	10.7
Run 2	4/22/2013	17:00:30	3.63	15.3	10.9
Run 2	4/22/2013	17:00:45	3.56	15.5	11.0
Run 2	4/22/2013	17:01:00	3.58	15.6	11.2
Run 2	4/22/2013	17:01:15	3.63	15.5	11.5
Run 2	4/22/2013	17:01:30	3.65	15.5	11.6
Run 2	4/22/2013	17:01:45	3.71	15.6	11.7
Run 2	4/22/2013	17:02:00	3.72	15.4	11.7
Run 2	4/22/2013	17:02:15	3.70	15.5	11.5
Run 2	4/22/2013	17:02:30	3.90	15.7	11.4
Run 2	4/22/2013	17:02:45	3.88	15.5	11.2
Run 2	4/22/2013	17:03:00	3.84	15.8	10.9
Run 2	4/22/2013	17:03:15	3.72	15.7	10.6
Run 2	4/22/2013	17:03:30	3.61	15.7	10.2
Run 2	4/22/2013	17:03:45	3.65	15.6	10.0
Run 2	4/22/2013	17:04:00	3.54	15.4	10.0
Run 2	4/22/2013	17:04:15	3.80	15.3	10.0
Run 2	4/22/2013	17:04:30	3.90	15.3	10.0
Run 2	4/22/2013	17:04:45	3.94	15.4	9.8
Run 2	4/22/2013	17:05:00	3.96	15.2	9.3
Run 2	4/22/2013	17:05:15	3.90	15.4	8.7
Run 2	4/22/2013	17:05:30	3.80	15.4	7.7
Run 2	4/22/2013	17:05:45	3.82	15.6	6.4
Run 2	4/22/2013	17:06:00	3.77	15.4	5.6
Run 2	4/22/2013	17:06:15	3.76	15.5	5.4
Run 2	4/22/2013	17:06:30	3.87	15.7	5.3
Run 2	4/22/2013	17:06:45	3.81	15.6	5.1
Run 2	4/22/2013	17:07:00	3.76	15.4	4.9

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Run 2	4/22/2013	17:07:15	3.75	15.4	4.9
Run 2	4/22/2013	17:07:30	3.74	15.4	4.9
Run 2	4/22/2013	17:07:45	3.66	15.4	5.1
Run 2	4/22/2013	17:08:00	3.64	15.4	5.1
Run 2	4/22/2013	17:08:15	3.58	15.2	5.3
Run 2	4/22/2013	17:08:30	3.64	15.2	5.5
Run 2	4/22/2013	17:08:45	3.73	15.4	5.5
Run 2	4/22/2013	17:09:00	3.73	15.4	5.5
Run 2	4/22/2013	17:09:15	3.72	15.2	5.5
Run 2	4/22/2013	17:09:30	3.71	15.0	5.5
Run 2	4/22/2013	17:09:45	3.62	15.0	5.5
Run 2	4/22/2013	17:10:00	3.58	15.3	5.5
Run 2	4/22/2013	17:10:15	3.65	15.2	5.6
Run 2	4/22/2013	17:10:30	3.60	15.2	5.7
Run 2	4/22/2013	17:10:45	3.63	15.2	5.9
Run 2	4/22/2013	17:11:00	3.70	15.2	6.0
Run 2	4/22/2013	17:11:15	3.77	15.2	6.2
Run 2	4/22/2013	17:11:30	3.82	15.3	6.3
Run 2	4/22/2013	17:11:45	3.75	15.4	6.4
Run 2	4/22/2013	17:12:00	3.55	15.4	6.2
Run 2	4/22/2013	17:12:15	3.52	15.3	6.3
Run 2	4/22/2013	17:12:30	3.52	15.2	6.3
Run 2	4/22/2013	17:12:45	3.57	15.3	6.4
Run 2	4/22/2013	17:13:00	3.67	15.2	6.5
Run 2	4/22/2013	17:13:15	3.80	14.9	6.5
Run 2	4/22/2013	17:13:30	3.74	14.9	6.5
Run 2	4/22/2013	17:13:45	3.52	15.0	6.5
Run 2	4/22/2013	17:14:00	3.48	15.2	6.7
Run 2	4/22/2013	17:14:15	3.45	15.2	7.0
Run 2	4/22/2013	17:14:30	3.46	15.4	7.4
Run 2	4/22/2013	17:14:45	3.61	15.4	8.2
Run 2	4/22/2013	17:15:00	3.75	15.4	9.3
Run 2	4/22/2013	17:15:15	3.73	15.1	10.2
Run 2	4/22/2013	17:15:30	3.62	15.1	10.4
Run 2	4/22/2013	17:15:45	3.39	15.2	10.6
Run 2	4/22/2013	17:16:00	3.42	15.5	11.4
Run 2	4/22/2013	17:16:15	3.36	15.4	12.6
Run 2	4/22/2013	17:16:30	3.47	15.1	15.4
Run 2	4/22/2013	17:16:45	3.54	14.8	19.0
Run 2	4/22/2013	17:17:00	3.54	14.6	20.7
Run 2	4/22/2013	17:17:15	3.54	14.8	20.9
Run 2	4/22/2013	17:17:30	3.46	14.8	21.0
Run 2	4/22/2013	17:17:45	3.40	14.8	20.7
Run 2	4/22/2013	17:18:00	3.42	15.1	20.8
Run 2	4/22/2013	17:18:15	3.52	15.2	21.2
Run 2	4/22/2013	17:18:30	3.50	15.2	21.3
Run 2	4/22/2013	17:18:45	3.67	15.3	20.9
Run 2	4/22/2013	17:19:00	3.88	15.0	20.0

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Run 2	4/22/2013	17:19:15	3.89	14.9	17.0
Run 2	4/22/2013	17:19:30	3.96	14.9	8.6
Run 2	4/22/2013	17:19:45	3.90	14.9	4.9
Run 2	4/22/2013	17:20:00	3.73	14.8	2.4
Run 2	4/22/2013	17:20:15	3.75	14.7	1.9
Run 2	4/22/2013	17:20:30	3.72	14.6	1.9
Run 2	4/22/2013	17:20:45	3.84	14.5	2.1
Run 2	4/22/2013	17:21:00	4.01	14.5	2.6
Run 2	4/22/2013	17:21:15	3.93	14.3	2.8
Run 2	4/22/2013	17:21:30	3.79	14.1	2.9
Run 2	4/22/2013	17:21:45	3.86	14.0	3.1
Run 2	4/22/2013	17:22:00	4.04	13.9	3.2
Run 2	4/22/2013	17:22:15	4.25	14.2	3.2
Run 2	4/22/2013	17:22:30	4.44	14.3	3.1
Run 2	4/22/2013	17:22:45	4.73	14.5	2.7
Run 2	4/22/2013	17:23:00	5.08	14.9	2.2
Run 2	4/22/2013	17:23:15	5.10	15.2	1.9
Run 2	4/22/2013	17:23:30	5.15	15.4	1.8
Run 2	4/22/2013	17:23:45	4.98	15.5	1.9
Run 2	4/22/2013	17:24:00	4.53	15.3	1.9
Run 2	4/22/2013	17:24:15	3.93	15.5	1.8
Run 2	4/22/2013	17:24:30	3.77	15.3	1.8
Run 2	4/22/2013	17:24:45	4.02	14.3	1.9
Run 2	4/22/2013	17:25:00	4.36	13.3	1.9
Run 2	4/22/2013	17:25:15	4.53	12.6	1.9
Run 2	4/22/2013	17:25:30	4.49	12.5	1.9
Run 2	4/22/2013	17:25:45	4.15	12.7	1.8
Run 2	4/22/2013	17:26:00	4.01	13.1	1.8
Run 2	4/22/2013	17:26:15	3.80	13.4	1.8
Run 2	4/22/2013	17:26:30	3.82	13.5	1.8
Run 2	4/22/2013	17:26:45	4.04	13.4	1.9
Run 2	4/22/2013	17:27:00	4.17	13.0	1.9
Run 2	4/22/2013	17:27:15	4.19	13.1	1.9
Run 2	4/22/2013	17:27:30	4.22	13.1	1.9
Run 2	4/22/2013	17:27:45	4.11	13.1	1.8
Run 2	4/22/2013	17:28:00	4.10	13.3	1.9
Run 2	4/22/2013	17:28:15	4.06	13.4	1.8
Run 2	4/22/2013	17:28:30	4.13	13.5	1.9
Run 2	4/22/2013	17:28:45	4.20	13.7	1.9
Run 2	4/22/2013	17:29:00	4.29	13.6	1.9
Run 2	4/22/2013	17:29:15	4.31	13.6	1.8
Run 2	4/22/2013	17:29:30	4.22	13.4	1.9
Run 2	4/22/2013	17:29:45	4.16	13.5	1.9
Run 2	4/22/2013	17:30:00	4.26	13.7	1.9
Run 2	4/22/2013	17:30:15	4.21	13.6	1.9
Run 2	4/22/2013	17:30:30	4.21	13.6	1.9
Run 2	4/22/2013	17:30:45	4.32	13.6	1.9
Run 2	4/22/2013	17:31:00	4.35	13.6	1.8

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Run 2	4/22/2013	17:31:15	4.34	13.6	1.9
Run 2	4/22/2013	17:31:30	4.35	13.6	1.8
Run 2	4/22/2013	17:31:45	4.17	13.6	1.8
Run 2	4/22/2013	17:32:00	4.19	13.7	1.9
Run 2	4/22/2013	17:32:15	4.21	13.5	1.9
Run 2	4/22/2013	17:32:30	4.18	13.4	1.8
Run 2	4/22/2013	17:32:45	4.28	13.5	1.8
Run 2	4/22/2013	17:33:00	4.21	13.2	1.9
Run 2	4/22/2013	17:33:15	4.21	13.1	1.9
Run 2	4/22/2013	17:33:30	4.12	13.1	1.8
Run 2	4/22/2013	17:33:45	4.08	13.0	1.9
Run 2	4/22/2013	17:34:00	4.08	13.2	1.8
Run 2	4/22/2013	17:34:15	4.05	13.4	1.9
Run 2	4/22/2013	17:34:30	4.05	13.2	1.8
Run 2	4/22/2013	17:34:45	4.05	13.0	1.8
Run 2	4/22/2013	17:35:00	4.09	12.9	1.8
Run 2	4/22/2013	17:35:15	4.10	12.8	1.8
Run 2	4/22/2013	17:35:30	4.00	12.8	1.8
Run 2	4/22/2013	17:35:45	3.96	12.9	1.8
Run 2	4/22/2013	17:36:00	4.09	12.9	1.9
Run 2	4/22/2013	17:36:15	4.07	12.9	1.9
Run 2	4/22/2013	17:36:30	4.16	12.9	1.9
Run 2	4/22/2013	17:36:45	4.22	13.0	1.8
Run 2	4/22/2013	17:37:00	4.11	12.7	1.9
Run 2	4/22/2013	17:37:15	4.04	12.9	1.9
Run 2	4/22/2013	17:37:30	4.05	12.9	1.8
Run 2	4/22/2013	17:37:45	4.05	12.9	1.9
Run 2	4/22/2013	17:38:00	4.09	12.9	1.9
Run 2	4/22/2013	17:38:15	4.08	13.0	1.9
Run 2	4/22/2013	17:38:30	4.12	12.9	1.8
Run 2	4/22/2013	17:38:45	4.02	12.9	1.8
Run 2	4/22/2013	17:39:00	4.06	12.7	1.8
Run 2	4/22/2013	17:39:15	4.05	12.9	1.9
Run 2	4/22/2013	17:39:30	4.00	12.9	1.9
Run 2	4/22/2013	17:39:45	4.01	12.9	1.9
Run 2	4/22/2013	17:40:00	4.05	12.9	1.9
Run 2	4/22/2013	17:40:15	4.02	13.0	1.8
Run 2	4/22/2013	17:40:30	3.92	13.2	1.8
Run 2	4/22/2013	17:40:45	3.76	13.1	1.8
Run 2	4/22/2013	17:41:00	3.73	13.3	1.9
Run 2	4/22/2013	17:41:15	3.81	13.0	1.8
Run 2	4/22/2013	17:41:30	3.92	12.9	1.8
Run 2	4/22/2013	17:41:45	3.93	13.0	3.5
Run 2	4/22/2013	17:42:00	3.88	12.9	4.7
Run 2	4/22/2013	17:42:15	3.81	12.9	4.4
Run 2	4/22/2013	17:42:30	3.79	12.9	4.3
Run 2	4/22/2013	17:42:45	3.86	13.1	4.5
Run 2	4/22/2013	17:43:00	3.92	13.1	4.8

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Run 2	4/22/2013	17:43:15	3.93	12.9	5.0
Run 2	4/22/2013	17:43:30	3.92	13.1	4.9
Run 2	4/22/2013	17:43:45	3.87	13.1	4.7
Run 2	4/22/2013	17:44:00	3.86	12.9	4.4
Run 2	4/22/2013	17:44:15	3.86	12.9	4.1
Run 2	4/22/2013	17:44:30	3.86	13.1	3.7
Run 2	4/22/2013	17:44:45	3.87	13.1	3.7
Run 2	4/22/2013	17:45:00	3.88	13.1	3.9
Run 2	4/22/2013	17:45:15	4.00	12.9	3.9
Run 2	4/22/2013	17:45:30	4.09	13.1	3.9
Run 2	4/22/2013	17:45:45	4.04	13.1	3.5
Run 2	4/22/2013	17:46:00	3.96	13.1	2.9
Run 2	4/22/2013	17:46:15	3.89	13.1	2.1
Run 2	4/22/2013	17:46:30	3.90	13.1	1.8
Run 2	4/22/2013	17:46:45	3.99	13.1	1.8
Run 2	4/22/2013	17:47:00	3.93	13.1	1.8
Run 2	4/22/2013	17:47:15	3.94	13.1	1.8
Run 2	4/22/2013	17:47:30	3.92	13.1	1.8
Run 2	4/22/2013	17:47:45	3.96	13.1	1.9
Run 2	4/22/2013	17:48:00	3.98	13.1	2.2
Run 2	4/22/2013	17:48:15	4.00	13.1	2.5
Run 2	4/22/2013	17:48:30	4.10	13.1	2.5
Run 2	4/22/2013	17:48:45	4.01	13.2	2.0
Run 2	4/22/2013	17:49:00	3.99	13.1	1.9
Run 2	4/22/2013	17:49:15	4.00	13.1	1.9
Run 2	4/22/2013	17:49:30	3.91	13.2	1.9
Run 2	4/22/2013	17:49:45	3.92	13.3	1.9
Run 2	4/22/2013	17:50:00	3.91	13.1	1.9
Run 2	4/22/2013	17:50:15	3.96	13.1	2.0
Run 2	4/22/2013	17:50:30	3.94	13.1	2.1
Run 2	4/22/2013	17:50:45	3.95	13.0	2.0
Run 2	4/22/2013	17:51:00	3.89	13.1	1.9
Run 2	4/22/2013	17:51:15	3.83	13.0	1.9
Run 2	4/22/2013	17:51:30	3.83	12.9	1.8
Run 2	4/22/2013	17:51:45	3.89	12.9	1.8
Run 2	4/22/2013	17:52:00	3.89	12.9	1.8
Run 2	4/22/2013	17:52:15	3.83	13.0	1.9
Run 2	4/22/2013	17:52:30	3.85	12.9	2.4
Run 2	4/22/2013	17:52:45	3.88	12.9	3.3
Run 2	4/22/2013	17:53:00	3.91	12.9	3.9
Run 2	4/22/2013	17:53:15	3.95	13.1	4.0
Run 2	4/22/2013	17:53:30	3.92	13.1	3.9
Run 2	4/22/2013	17:53:45	3.96	13.0	3.5
Run 2	4/22/2013	17:54:00	3.87	13.1	2.9
Run 2	4/22/2013	17:54:15	3.83	12.9	2.4
averun 2	4/22/2013	16:54:30	3.89	14.2	5.6
scg5	4/22/2013	17:54:45	3.74	12.6	3.6
scg5	4/22/2013	17:55:00	3.70	12.3	7.5

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
scg5	4/22/2013	17:55:15	3.69	12.2	12.2
scg5	4/22/2013	17:55:30	9.17	12.5	13.3
scg5	4/22/2013	17:55:45	11.86	10.6	13.1
scg5	4/22/2013	17:56:00	1.39	12.8	13.7
scg5	4/22/2013	17:56:15	0.07	68.3	36.0
scg5	4/22/2013	17:56:30	-0.02	95.8	54.3
scg5	4/22/2013	17:56:45	-0.05	103.0	67.7
scg5	4/22/2013	17:57:00	-0.06	103.3	76.6
scg5	4/22/2013	17:57:15	-0.07	103.7	82.8
scg5	4/22/2013	17:57:30	-0.08	103.8	89.7
scg5	4/22/2013	17:57:45	-0.09	103.7	92.7
scg5	4/22/2013	17:58:00	-0.09	103.8	94.1
scg5	4/22/2013	17:58:15	-0.09	103.8	95.5
scg5	4/22/2013	17:58:30	-0.09	103.8	96.5
o2zero1	4/22/2013	17:56:30	-0.02	95.8	54.3
cospan1	4/22/2013	17:58:30	-0.09	103.8	96.5
noxspan1	4/22/2013	17:58:30	-0.09	103.8	96.5
scg1	4/22/2013	17:58:45	-0.10	103.7	97.1
scg1	4/22/2013	17:59:00	-0.10	103.8	97.3
scg1	4/22/2013	17:59:15	-0.10	103.3	97.3
scg1	4/22/2013	17:59:30	-0.10	103.6	97.4
scg1	4/22/2013	17:59:45	2.43	103.7	97.4
scg1	4/22/2013	18:00:00	7.49	99.8	96.9
scg1	4/22/2013	18:00:15	10.01	73.0	75.7
scg1	4/22/2013	18:00:30	10.30	33.4	50.1
scg1	4/22/2013	18:00:45	10.34	2.5	34.9
scg1	4/22/2013	18:01:00	10.35	1.0	24.2
scg1	4/22/2013	18:01:15	10.36	0.7	15.3
scg1	4/22/2013	18:01:30	10.36	0.6	10.2
scg1	4/22/2013	18:01:45	10.37	0.6	5.0
scg1	4/22/2013	18:02:00	10.37	0.6	1.9
scg1	4/22/2013	18:02:15	10.38	0.6	1.8
cozero1	4/22/2013	18:02:15	10.38	0.6	1.8
noxzero1	4/22/2013	18:02:15	10.38	0.6	1.8
o2span1	4/22/2013	18:02:15	10.38	0.6	1.8
Run 3	4/22/2013	18:08:00	3.77	13.1	12.9
Run 3	4/22/2013	18:08:15	3.82	13.1	12.7
Run 3	4/22/2013	18:08:30	3.85	12.9	12.5
Run 3	4/22/2013	18:08:45	3.70	12.9	12.2
Run 3	4/22/2013	18:09:00	3.57	13.1	11.8
Run 3	4/22/2013	18:09:15	3.54	13.1	11.8
Run 3	4/22/2013	18:09:30	3.56	13.1	12.3
Run 3	4/22/2013	18:09:45	3.65	13.1	13.3
Run 3	4/22/2013	18:10:00	3.74	13.1	14.6
Run 3	4/22/2013	18:10:15	3.76	13.0	14.7
Run 3	4/22/2013	18:10:30	3.64	13.1	14.3
Run 3	4/22/2013	18:10:45	3.46	13.1	13.9
Run 3	4/22/2013	18:11:00	3.50	13.3	14.2

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Run 3	4/22/2013	18:11:15	3.54	13.4	15.5
Run 3	4/22/2013	18:11:30	3.62	13.4	17.7
Run 3	4/22/2013	18:11:45	3.72	13.2	19.9
Run 3	4/22/2013	18:12:00	3.79	13.1	20.1
Run 3	4/22/2013	18:12:15	3.68	13.3	18.3
Run 3	4/22/2013	18:12:30	3.51	13.4	16.4
Run 3	4/22/2013	18:12:45	3.54	13.4	15.3
Run 3	4/22/2013	18:13:00	3.58	13.3	15.8
Run 3	4/22/2013	18:13:15	3.55	13.5	17.4
Run 3	4/22/2013	18:13:30	3.76	13.4	20.0
Run 3	4/22/2013	18:13:45	3.84	13.4	21.1
Run 3	4/22/2013	18:14:00	3.93	13.4	19.8
Run 3	4/22/2013	18:14:15	3.88	13.6	17.0
Run 3	4/22/2013	18:14:30	3.72	13.6	10.9
Run 3	4/22/2013	18:14:45	3.73	13.6	7.5
Run 3	4/22/2013	18:15:00	3.59	13.6	7.5
Run 3	4/22/2013	18:15:15	3.70	13.6	9.3
Run 3	4/22/2013	18:15:30	3.81	13.6	11.2
Run 3	4/22/2013	18:15:45	3.93	13.5	12.2
Run 3	4/22/2013	18:16:00	3.86	13.4	11.9
Run 3	4/22/2013	18:16:15	3.79	13.2	10.9
Run 3	4/22/2013	18:16:30	3.62	13.4	10.3
Run 3	4/22/2013	18:16:45	3.60	13.5	10.3
Run 3	4/22/2013	18:17:00	3.66	13.4	10.6
Run 3	4/22/2013	18:17:15	3.83	13.2	11.1
Run 3	4/22/2013	18:17:30	3.95	13.1	11.2
Run 3	4/22/2013	18:17:45	3.97	13.1	11.1
Run 3	4/22/2013	18:18:00	3.76	13.1	10.7
Run 3	4/22/2013	18:18:15	3.73	13.3	10.3
Run 3	4/22/2013	18:18:30	3.63	13.2	10.0
Run 3	4/22/2013	18:18:45	3.67	13.1	10.1
Run 3	4/22/2013	18:19:00	3.80	13.1	10.4
Run 3	4/22/2013	18:19:15	3.83	13.0	10.7
Run 3	4/22/2013	18:19:30	3.89	12.9	10.8
Run 3	4/22/2013	18:19:45	3.94	12.8	10.8
Run 3	4/22/2013	18:20:00	3.86	13.0	10.5
Run 3	4/22/2013	18:20:15	3.75	13.3	10.3
Run 3	4/22/2013	18:20:30	3.72	13.1	10.1
Run 3	4/22/2013	18:20:45	3.64	13.1	10.1
Run 3	4/22/2013	18:21:00	3.77	13.1	10.3
Run 3	4/22/2013	18:21:15	3.87	12.9	10.3
Run 3	4/22/2013	18:21:30	3.93	12.9	10.3
Run 3	4/22/2013	18:21:45	3.98	12.9	10.2
Run 3	4/22/2013	18:22:00	3.90	12.9	9.9
Run 3	4/22/2013	18:22:15	3.74	12.9	9.6
Run 3	4/22/2013	18:22:30	3.62	13.2	9.4
Run 3	4/22/2013	18:22:45	3.68	13.2	9.4
Run 3	4/22/2013	18:23:00	3.84	13.1	9.6

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Run 3	4/22/2013	18:23:15	3.91	13.0	9.7
Run 3	4/22/2013	18:23:30	3.92	12.9	9.6
Run 3	4/22/2013	18:23:45	3.78	12.7	9.4
Run 3	4/22/2013	18:24:00	3.72	13.0	9.2
Run 3	4/22/2013	18:24:15	3.78	12.9	9.1
Run 3	4/22/2013	18:24:30	3.74	13.0	9.1
Run 3	4/22/2013	18:24:45	3.80	13.0	9.1
Run 3	4/22/2013	18:25:00	3.88	13.0	9.1
Run 3	4/22/2013	18:25:15	3.86	13.0	9.1
Run 3	4/22/2013	18:25:30	3.86	12.7	9.1
Run 3	4/22/2013	18:25:45	3.76	12.6	8.9
Run 3	4/22/2013	18:26:00	3.76	13.0	8.9
Run 3	4/22/2013	18:26:15	3.80	13.0	9.0
Run 3	4/22/2013	18:26:30	3.81	13.0	9.0
Run 3	4/22/2013	18:26:45	3.92	13.0	8.9
Run 3	4/22/2013	18:27:00	3.96	12.8	8.7
Run 3	4/22/2013	18:27:15	3.91	13.1	8.7
Run 3	4/22/2013	18:27:30	3.93	12.9	8.5
Run 3	4/22/2013	18:27:45	3.92	12.8	8.3
Run 3	4/22/2013	18:28:00	3.89	12.7	8.0
Run 3	4/22/2013	18:28:15	3.86	12.9	7.6
Run 3	4/22/2013	18:28:30	3.89	12.7	7.6
Run 3	4/22/2013	18:28:45	3.85	12.7	7.5
Run 3	4/22/2013	18:29:00	3.85	12.8	7.4
Run 3	4/22/2013	18:29:15	3.91	12.9	7.3
Run 3	4/22/2013	18:29:30	3.97	12.9	7.2
Run 3	4/22/2013	18:29:45	3.93	12.7	7.1
Run 3	4/22/2013	18:30:00	3.81	12.7	6.8
Run 3	4/22/2013	18:30:15	3.91	12.7	6.6
Run 3	4/22/2013	18:30:30	3.97	12.9	6.5
Run 3	4/22/2013	18:30:45	3.99	12.9	6.4
Run 3	4/22/2013	18:31:00	4.01	13.0	6.2
Run 3	4/22/2013	18:31:15	3.95	12.9	5.9
Run 3	4/22/2013	18:31:30	3.86	13.0	5.5
Run 3	4/22/2013	18:31:45	3.82	13.0	5.1
Run 3	4/22/2013	18:32:00	3.82	12.8	5.0
Run 3	4/22/2013	18:32:15	3.82	12.9	5.1
Run 3	4/22/2013	18:32:30	3.86	12.9	5.3
Run 3	4/22/2013	18:32:45	3.96	12.8	5.4
Run 3	4/22/2013	18:33:00	4.00	12.5	5.4
Run 3	4/22/2013	18:33:15	3.96	12.4	5.1
Run 3	4/22/2013	18:33:30	3.84	12.6	5.0
Run 3	4/22/2013	18:33:45	3.77	12.6	5.1
Run 3	4/22/2013	18:34:00	3.81	12.7	5.3
Run 3	4/22/2013	18:34:15	3.89	12.9	5.5
Run 3	4/22/2013	18:34:30	3.96	12.6	5.7
Run 3	4/22/2013	18:34:45	3.88	12.6	5.7
Run 3	4/22/2013	18:35:00	3.92	12.6	5.7

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Run 3	4/22/2013	18:35:15	4.02	12.8	5.7
Run 3	4/22/2013	18:35:30	4.11	12.9	5.6
Run 3	4/22/2013	18:35:45	4.10	13.0	5.3
Run 3	4/22/2013	18:36:00	3.97	13.0	4.9
Run 3	4/22/2013	18:36:15	3.81	12.9	4.4
Run 3	4/22/2013	18:36:30	3.69	12.9	4.0
Run 3	4/22/2013	18:36:45	3.75	12.9	4.1
Run 3	4/22/2013	18:37:00	3.92	12.9	4.5
Run 3	4/22/2013	18:37:15	4.13	12.7	4.7
Run 3	4/22/2013	18:37:30	4.18	12.9	4.6
Run 3	4/22/2013	18:37:45	4.04	12.9	4.2
Run 3	4/22/2013	18:38:00	3.93	13.0	3.4
Run 3	4/22/2013	18:38:15	3.83	13.1	2.7
Run 3	4/22/2013	18:38:30	3.67	13.1	2.6
Run 3	4/22/2013	18:38:45	3.77	13.0	3.3
Run 3	4/22/2013	18:39:00	3.89	12.9	4.3
Run 3	4/22/2013	18:39:15	3.98	12.9	5.4
Run 3	4/22/2013	18:39:30	3.91	12.9	5.8
Run 3	4/22/2013	18:39:45	3.80	12.9	5.8
Run 3	4/22/2013	18:40:00	3.64	12.6	5.9
Run 3	4/22/2013	18:40:15	3.57	12.6	6.6
Run 3	4/22/2013	18:40:30	3.63	12.6	10.1
Run 3	4/22/2013	18:40:45	3.60	12.4	21.6
Run 3	4/22/2013	18:41:00	3.58	12.4	23.1
Run 3	4/22/2013	18:41:15	3.56	12.3	23.4
Run 3	4/22/2013	18:41:30	3.63	12.5	23.6
Run 3	4/22/2013	18:41:45	3.70	12.6	23.5
Run 3	4/22/2013	18:42:00	3.72	12.6	22.8
Run 3	4/22/2013	18:42:15	3.71	12.6	21.2
Run 3	4/22/2013	18:42:30	3.62	12.9	18.0
Run 3	4/22/2013	18:42:45	3.66	12.9	15.8
Run 3	4/22/2013	18:43:00	3.63	12.9	15.2
Run 3	4/22/2013	18:43:15	3.61	13.1	15.3
Run 3	4/22/2013	18:43:30	3.81	12.9	15.5
Run 3	4/22/2013	18:43:45	3.91	12.9	15.0
Run 3	4/22/2013	18:44:00	3.96	13.0	14.1
Run 3	4/22/2013	18:44:15	3.94	13.2	11.7
Run 3	4/22/2013	18:44:30	3.79	13.4	8.2
Run 3	4/22/2013	18:44:45	3.68	13.4	7.4
Run 3	4/22/2013	18:45:00	3.65	13.5	8.2
Run 3	4/22/2013	18:45:15	3.83	13.4	10.0
Run 3	4/22/2013	18:45:30	3.92	13.1	10.6
Run 3	4/22/2013	18:45:45	3.99	13.1	10.4
Run 3	4/22/2013	18:46:00	3.97	13.3	9.3
Run 3	4/22/2013	18:46:15	3.82	13.1	7.4
Run 3	4/22/2013	18:46:30	3.70	13.2	5.7
Run 3	4/22/2013	18:46:45	3.75	13.2	5.8
Run 3	4/22/2013	18:47:00	3.89	13.1	6.2

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Run 3	4/22/2013	18:47:15	3.91	12.9	6.5
Run 3	4/22/2013	18:47:30	3.89	12.9	6.5
Run 3	4/22/2013	18:47:45	3.76	12.9	6.2
Run 3	4/22/2013	18:48:00	3.68	13.1	6.0
Run 3	4/22/2013	18:48:15	3.76	13.2	6.0
Run 3	4/22/2013	18:48:30	3.93	13.4	6.1
Run 3	4/22/2013	18:48:45	3.96	13.2	6.3
Run 3	4/22/2013	18:49:00	3.97	13.1	6.3
Run 3	4/22/2013	18:49:15	3.86	13.1	6.2
Run 3	4/22/2013	18:49:30	3.70	13.2	6.1
Run 3	4/22/2013	18:49:45	3.68	13.2	6.1
Run 3	4/22/2013	18:50:00	3.70	13.1	6.2
Run 3	4/22/2013	18:50:15	3.79	13.1	6.4
Run 3	4/22/2013	18:50:30	3.82	13.1	6.5
Run 3	4/22/2013	18:50:45	3.89	13.1	6.5
Run 3	4/22/2013	18:51:00	3.86	13.1	6.5
Run 3	4/22/2013	18:51:15	3.82	13.1	6.3
Run 3	4/22/2013	18:51:30	3.69	13.1	6.2
Run 3	4/22/2013	18:51:45	3.74	13.3	6.1
Run 3	4/22/2013	18:52:00	3.82	13.5	6.1
Run 3	4/22/2013	18:52:15	3.86	13.4	6.1
Run 3	4/22/2013	18:52:30	3.90	13.1	6.1
Run 3	4/22/2013	18:52:45	3.82	13.2	6.1
Run 3	4/22/2013	18:53:00	3.75	13.4	5.9
Run 3	4/22/2013	18:53:15	3.77	13.4	6.1
Run 3	4/22/2013	18:53:30	3.73	13.3	6.1
Run 3	4/22/2013	18:53:45	3.71	13.3	6.2
Run 3	4/22/2013	18:54:00	3.87	13.4	6.5
Run 3	4/22/2013	18:54:15	3.91	13.2	6.7
Run 3	4/22/2013	18:54:30	3.96	13.2	6.9
Run 3	4/22/2013	18:54:45	3.89	13.2	7.0
Run 3	4/22/2013	18:55:00	3.76	13.2	6.9
Run 3	4/22/2013	18:55:15	3.70	13.4	6.6
Run 3	4/22/2013	18:55:30	3.65	13.4	6.6
Run 3	4/22/2013	18:55:45	3.69	13.4	6.8
Run 3	4/22/2013	18:56:00	3.75	13.3	7.1
Run 3	4/22/2013	18:56:15	3.83	13.2	7.6
Run 3	4/22/2013	18:56:30	3.86	13.2	7.9
Run 3	4/22/2013	18:56:45	3.86	13.2	8.2
Run 3	4/22/2013	18:57:00	3.79	13.4	8.3
Run 3	4/22/2013	18:57:15	3.70	13.4	8.4
Run 3	4/22/2013	18:57:30	3.77	13.4	8.6
Run 3	4/22/2013	18:57:45	3.76	13.2	8.6
Run 3	4/22/2013	18:58:00	3.77	13.2	8.6
Run 3	4/22/2013	18:58:15	3.67	13.2	8.4
Run 3	4/22/2013	18:58:30	3.68	13.2	8.5
Run 3	4/22/2013	18:58:45	3.71	13.4	8.8
Run 3	4/22/2013	18:59:00	3.79	13.3	9.0

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Run 3	4/22/2013	18:59:15	3.84	13.2	9.2
Run 3	4/22/2013	18:59:30	3.82	13.2	9.1
Run 3	4/22/2013	18:59:45	3.75	13.3	8.9
Run 3	4/22/2013	19:00:00	3.60	13.2	8.8
Run 3	4/22/2013	19:00:15	3.63	13.3	9.0
Run 3	4/22/2013	19:00:30	3.78	13.6	9.6
Run 3	4/22/2013	19:00:45	3.83	13.5	10.3
Run 3	4/22/2013	19:01:00	3.74	13.2	10.2
Run 3	4/22/2013	19:01:15	3.72	13.1	10.1
Run 3	4/22/2013	19:01:30	3.67	13.3	9.8
Run 3	4/22/2013	19:01:45	3.71	13.5	9.8
Run 3	4/22/2013	19:02:00	3.75	13.5	9.9
Run 3	4/22/2013	19:02:15	3.82	13.3	10.0
Run 3	4/22/2013	19:02:30	3.84	13.5	9.8
Run 3	4/22/2013	19:02:45	3.68	13.5	9.4
Run 3	4/22/2013	19:03:00	3.60	13.2	9.3
Run 3	4/22/2013	19:03:15	3.60	13.2	9.5
Run 3	4/22/2013	19:03:30	3.73	13.2	10.3
Run 3	4/22/2013	19:03:45	3.75	13.2	11.9
Run 3	4/22/2013	19:04:00	3.79	13.2	12.4
Run 3	4/22/2013	19:04:15	3.80	13.2	11.9
Run 3	4/22/2013	19:04:30	3.80	13.2	11.1
Run 3	4/22/2013	19:04:45	3.76	13.4	10.1
Run 3	4/22/2013	19:05:00	3.70	13.3	9.8
Run 3	4/22/2013	19:05:15	3.77	13.2	9.7
Run 3	4/22/2013	19:05:30	3.78	13.2	9.9
Run 3	4/22/2013	19:05:45	3.81	13.2	9.9
Run 3	4/22/2013	19:06:00	3.83	13.1	9.8
Run 3	4/22/2013	19:06:15	3.81	13.2	9.7
Run 3	4/22/2013	19:06:30	3.76	13.2	9.6
Run 3	4/22/2013	19:06:45	3.77	13.2	9.8
Run 3	4/22/2013	19:07:00	3.85	13.2	9.8
Run 3	4/22/2013	19:07:15	3.89	13.0	9.7
Run 3	4/22/2013	19:07:30	3.92	13.0	9.5
Run 3	4/22/2013	19:07:45	3.89	13.0	9.0
averun 3	4/22/2013	18:08:00	3.79	13.1	9.4
scg5	4/22/2013	19:08:00	3.83	13.2	8.4
scg5	4/22/2013	19:08:15	3.84	13.4	7.7
scg5	4/22/2013	19:08:30	3.74	13.4	7.1
scg5	4/22/2013	19:08:45	3.79	13.4	7.0
scg5	4/22/2013	19:09:00	3.86	13.3	7.2
scg5	4/22/2013	19:09:15	1.54	15.7	7.6
scg5	4/22/2013	19:09:30	0.06	34.7	22.8
scg5	4/22/2013	19:09:45	-0.05	71.9	47.0
scg5	4/22/2013	19:10:00	-0.07	101.8	62.1
scg5	4/22/2013	19:10:15	-0.08	102.5	72.8
scg5	4/22/2013	19:10:30	-0.08	102.8	82.0
scg5	4/22/2013	19:10:45	-0.09	103.1	87.4

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
scg5	4/22/2013	19:11:00	-0.09	103.1	90.4
scg5	4/22/2013	19:11:15	-0.09	103.1	92.6
scg5	4/22/2013	19:11:30	-0.09	103.1	95.2
scg5	4/22/2013	19:11:45	-0.10	103.1	96.6
o2zero1	4/22/2013	19:11:45	-0.10	103.1	96.6
cospan1	4/22/2013	19:11:45	-0.10	103.1	96.6
noxspan1	4/22/2013	19:11:45	-0.10	103.1	96.6
scg1	4/22/2013	19:12:00	-0.10	103.1	97.1
scg1	4/22/2013	19:12:15	-0.10	103.2	97.5
scg1	4/22/2013	19:12:30	-0.10	103.7	97.5
scg1	4/22/2013	19:12:45	0.29	103.6	97.6
scg1	4/22/2013	19:13:00	3.94	102.5	97.6
scg1	4/22/2013	19:13:15	9.61	93.2	89.7
scg1	4/22/2013	19:13:30	10.32	39.1	56.0
scg1	4/22/2013	19:13:45	10.40	10.0	39.8
scg1	4/22/2013	19:14:00	10.43	1.1	27.1
scg1	4/22/2013	19:14:15	10.45	0.8	18.4
scg1	4/22/2013	19:14:30	10.46	0.7	12.2
scg1	4/22/2013	19:14:45	10.47	0.5	6.4
scg1	4/22/2013	19:15:00	10.48	0.5	2.0
cozero1	4/22/2013	19:15:00	10.48	0.5	2.0
noxzero1	4/22/2013	19:15:00	10.48	0.5	2.0
o2span1	4/22/2013	19:15:00	10.48	0.5	2.0
Converter Check	4/23/2013	17:10:00		159.9	
Converter Check	4/23/2013	17:10:15		160.0	
Converter Check	4/23/2013	17:10:30		160.2	
Converter Check	4/23/2013	17:10:45		160.0	
Converter Check	4/23/2013	17:11:00		159.8	
Converter Check	4/23/2013	17:11:15		159.6	
Converter Check	4/23/2013	17:11:30		159.5	
Converter Check	4/23/2013	17:11:45		159.4	
Converter Check	4/23/2013	17:12:01		159.6	
Converter Check	4/23/2013	17:12:15		159.6	
Converter Check	4/23/2013	17:12:30		159.8	
Converter Check	4/23/2013	17:12:45		159.9	
Converter Check	4/23/2013	17:13:00		160.1	
Converter Check	4/23/2013	17:13:15		160.2	
Converter Check	4/23/2013	17:13:30		160.6	
Converter Check	4/23/2013	17:13:45		160.6	
Converter Check	4/23/2013	17:14:00		160.6	
Converter Check	4/23/2013	17:14:15		160.4	
Converter Check	4/23/2013	17:14:30		160.1	
Converter Check	4/23/2013	17:14:45		160.1	
Converter Check	4/23/2013	17:15:00		160.3	
Converter Check	4/23/2013	17:15:15		160.2	
Converter Check	4/23/2013	17:15:30		159.9	
Converter Check	4/23/2013	17:15:45		160.2	
Converter Check	4/23/2013	17:16:00		160.1	

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Converter Check	4/23/2013	17:16:15		160.1	
Converter Check	4/23/2013	17:16:30		160.1	
Converter Check	4/23/2013	17:16:45		160.1	
Converter Check	4/23/2013	17:17:00		160.3	
Converter Check	4/23/2013	17:17:15		160.5	
Converter Check	4/23/2013	17:17:30		160.3	
Converter Check	4/23/2013	17:17:45		160.3	
Converter Check	4/23/2013	17:18:00		160.3	
Converter Check	4/23/2013	17:18:15		160.4	
Converter Check	4/23/2013	17:18:30		160.7	
Converter Check	4/23/2013	17:18:45		160.7	
Converter Check	4/23/2013	17:19:00		160.6	
Converter Check	4/23/2013	17:19:15		160.9	
Converter Check	4/23/2013	17:19:30		161.0	
Converter Check	4/23/2013	17:19:45		161.1	
Converter Check	4/23/2013	17:20:00		161.3	
Converter Check	4/23/2013	17:20:15		161.3	
Converter Check	4/23/2013	17:20:30		161.3	
Converter Check	4/23/2013	17:20:45		161.3	
Converter Check	4/23/2013	17:21:00		161.2	
Converter Check	4/23/2013	17:21:15		161.0	
Converter Check	4/23/2013	17:21:30		160.9	
Converter Check	4/23/2013	17:21:45		161.0	
Converter Check	4/23/2013	17:22:00		160.8	
Converter Check	4/23/2013	17:22:15		160.7	
Converter Check	4/23/2013	17:22:30		161.2	
Converter Check	4/23/2013	17:22:45		161.3	
Converter Check	4/23/2013	17:23:00		161.3	
Converter Check	4/23/2013	17:23:15		161.1	
Converter Check	4/23/2013	17:23:30		161.0	
Converter Check	4/23/2013	17:23:45		161.0	
Converter Check	4/23/2013	17:24:00		161.0	
Converter Check	4/23/2013	17:24:15		160.9	
Converter Check	4/23/2013	17:24:30		160.8	
Converter Check	4/23/2013	17:24:45		160.8	
Converter Check	4/23/2013	17:25:00		161.0	
Converter Check	4/23/2013	17:25:15		161.5	
Converter Check	4/23/2013	17:25:30		161.9	
Converter Check	4/23/2013	17:25:45		161.6	
Converter Check	4/23/2013	17:26:00		161.4	
Converter Check	4/23/2013	17:26:15		161.1	
Converter Check	4/23/2013	17:26:30		160.9	
Converter Check	4/23/2013	17:26:45		161.1	
Converter Check	4/23/2013	17:27:00		161.2	
Converter Check	4/23/2013	17:27:15		161.3	
Converter Check	4/23/2013	17:27:30		161.7	
Converter Check	4/23/2013	17:27:45		161.7	
Converter Check	4/23/2013	17:28:00		161.5	

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Converter Check	4/23/2013	17:28:15		161.4	
Converter Check	4/23/2013	17:28:30		161.2	
Converter Check	4/23/2013	17:28:45		161.6	
Converter Check	4/23/2013	17:29:00		161.4	
Converter Check	4/23/2013	17:29:15		161.2	
Converter Check	4/23/2013	17:29:30		161.3	
Converter Check	4/23/2013	17:29:45		161.5	
Converter Check	4/23/2013	17:30:00		161.7	
Converter Check	4/23/2013	17:30:15		161.8	
Converter Check	4/23/2013	17:30:30		161.7	
Converter Check	4/23/2013	17:30:45		161.6	
Converter Check	4/23/2013	17:31:00		161.7	
Converter Check	4/23/2013	17:31:15		161.6	
Converter Check	4/23/2013	17:31:30		161.3	
Converter Check	4/23/2013	17:31:45		161.6	
Converter Check	4/23/2013	17:32:00		161.7	
Converter Check	4/23/2013	17:32:15		161.5	
Converter Check	4/23/2013	17:32:30		161.3	
Converter Check	4/23/2013	17:32:45		161.5	
Converter Check	4/23/2013	17:33:00		161.8	
Converter Check	4/23/2013	17:33:15		161.7	
Converter Check	4/23/2013	17:33:30		161.3	
Converter Check	4/23/2013	17:33:45		161.3	
Converter Check	4/23/2013	17:34:00		161.3	
Converter Check	4/23/2013	17:34:15		161.3	
Converter Check	4/23/2013	17:34:30		161.1	
Converter Check	4/23/2013	17:34:45		161.4	
Converter Check	4/23/2013	17:35:00		161.8	
Converter Check	4/23/2013	17:35:15		161.9	
Converter Check	4/23/2013	17:35:30		162.1	
Converter Check	4/23/2013	17:35:45		161.8	
Converter Check	4/23/2013	17:36:00		161.7	
Converter Check	4/23/2013	17:36:15		161.5	
Converter Check	4/23/2013	17:36:30		161.5	
Converter Check	4/23/2013	17:36:45		161.2	
Converter Check	4/23/2013	17:37:00		161.3	
Converter Check	4/23/2013	17:37:15		161.4	
Converter Check	4/23/2013	17:37:30		161.6	
Converter Check	4/23/2013	17:37:45		161.5	
Converter Check	4/23/2013	17:38:00		161.7	
Converter Check	4/23/2013	17:38:15		161.7	
Converter Check	4/23/2013	17:38:30		161.7	
Converter Check	4/23/2013	17:38:45		161.5	
Converter Check	4/23/2013	17:39:00		161.9	
Converter Check	4/23/2013	17:39:15		162.1	
Converter Check	4/23/2013	17:39:30		161.8	
Converter Check	4/23/2013	17:39:45		162.1	
Converter Check	4/23/2013	17:40:00		162.2	

Gas Type	Date	Time	Oxygen (% dry)	Nitrogen Oxides (ppmvd)	Carbon Monoxide (ppmvd)
Converter Check	4/23/2013	17:40:15		162.1	
Converter Check	4/23/2013	17:40:30		161.8	
Converter Check	4/23/2013	17:40:45		162.3	

Appendix B

Process Data –Fuel Gas Analysis

Client:	Holly			Requested by:	
Sample:	feul gas, 4/22/13		Approve	Date/Time:	4/22/2013 12:44
Lab. No.:	S. George	Method File:	RGA FINAL5.M	P. O. No.	
Operator:	SYSTEM			Data File:	001F0101.D
Sample Info.:					0

Peak Name	Mol%	Wt%	SPGreal Gas	GBTU/CF
Methane	12.0521	13.2660	0.0668	121.7265 ✓
Ethane	4.8571	10.0208	0.0504	85.9562
Propane	14.0554	42.5248	0.2141	353.6476
Isobutane	2.2461	8.9571	0.0451	73.0397
n-Butane	1.2710	5.0685	0.0255	41.4624
Isopentane	0.8814	4.3632	0.0220	35.2633
n-Pentane	0.5308	2.6279	0.0132	21.2801
Neopentane	0.0092	0.0453	0.0002	0.3649
n-Hexane	0.0755	0.4462	0.0022	3.5893
n-Heptane	0.0149	0.1024	0.0005	0.8193
Ethylene	0.8661	1.6671	0.0084	13.8551
Propylene	0.4118	1.1890	0.0060	9.6073
1-Butene	0.0198	0.0761	0.0004	0.6087
c-2-Butene	0.0109	0.0421	0.0002	0.3361
t-2-Butene	0.0166	0.0639	0.0003	0.5089
Isobutene	0.0273	0.1051	0.0005	0.8356
1,3-Butadiene	0.0000	0.0000	0.0000	0.0000
Acetylene	0.0000	0.0000	0.0000	0.0000
Methylacetylene	0.0000	0.0000	0.0000	0.0000
Propadiene	0.0000	0.0000	0.0000	0.0000
Benzene	0.0098	0.0526	0.0003	0.3673
Carbon monoxide	0.0000	0.0000	0.0000	0.0000
Carbon dioxide	0.2490	0.7518	0.0038	0.0000
Hydrogen sulfide	0.0000	0.0000	0.0000	0.0000
Hydrogen	62.3953	8.6303	0.0434	202.2856
Oxygen	0.0000	0.0000	0.0000	0.0000
Nitrogen	0.0000	0.0000	0.0000	0.0000
	100.0000	100.0000	0.5033	965.5538

SPGreal Gas	0.5033	
GBTU/CF	965.5538	GBTU/CF
Molecular Wt.	14.5746	

Unit Tested	Boiler 8			**Date**			April 22, 2013	**Page 1**		
Pollutant				**Fuel Gas Sample Time**						
Fuel Gas Properties										
4/22/13	**0:00**	**Molecular**	**GCV**	**GCV Btu per ft³ of sample**	**Weight per Mole (lbs, gms)**	**Weight % per Mole**	**Net Calorific Value**		**Gross Calorific Value**	
Component	**mole %**	**Weight**	**Btu/ft³**				**MBtu/lb**	**MBtu**	**MBtu/lb**	**MBtu**
CO	-	28	**323**	0.00	0	0.00%				
Hydrogen	62.395	2.02	324.13	202.24	126	8.64%	51.62	6506	61.10	7701
Nitrogen	-	28.02	0	0.00	0	0.00%	0.00	0	0.00	0
Oxygen	-	32	0	0.00	0	0.00%	0.00	0	0.00	0
H_2S	-	34.08	637.16	0.00	0	0.00%	6.55	0	7.10	0
Methane	12.052	16.04	1009.7	121.69	193	13.25%	21.52	4160	23.88	4616
CO_2	0.249	44.01	0	0.00	11	0.75%	0.00	0	0.00	0
Ethylene	0.866	28.05	1599.7	13.86	24	1.67%	20.30	493	21.64	526
Ethane	4.857	30.07	1768.8	85.91	146	10.01%	20.43	2984	22.32	3260
Propane	14.055	44.10	2517.5	353.84	620	42.50%	19.99	12393	21.66	13426
Propylene	0.412	42.08	2333.7	9.61	17	1.19%	19.69	341	21.04	365
Propadiene	-									
Butadiene	-	54.09		0.00	0	0.00%	19.40	0	20.30	0
Isobutane	2.246	58.12	3252.7	73.06	131	8.95%	19.63	2562	21.26	2775
N Butane	1.271	58.12	3262.1	41.46	74	5.06%	19.68	1454	21.31	1574
N Butene	0.020	56.11	3080.7	0.61	1	0.08%	19.50	22	20.84	23
Isobutylene	-	56.11	3061.8	0.00	0	0.00%	19.38	0	20.73	0
Trans Butene	0.017	56.11	3068.2	0.51	1	0.06%	19.38	18	20.73	19
Cis Butene	0.011	56.11	3073.1	0.33	1	0.04%	19.38	12	20.73	13
Isopentane	0.881	72.15	4000.3	35.26	64	4.36%	19.48	1239	21.05	1339
N Pentane	0.531	72.15	4009.6	21.28	38	2.63%	19.52	747	21.09	808
C6+	0.137	86	4756.2	6.50	12	0.81%	19.40	228	20.94	246
Total	100.000			966.2	1,459	100.00%		33,160		36,691

Unit Tested	Boiler 8		Date	April 22, 2013	Page 2
Pollutant	0		Fuel Gas Sample Time	12:00 AM	
	Fuel Gas Properties				
	lb/scf	0.0384			
	scf/lb	26.02			
	mole wt.	14.59			
	Net Heating Value				
	Btu/scf	873.8			
	MBtu/lb	22.74			
	Gross Heating Value				
	Btu/scf	966.8			
	MBtu/lb	25.16			

Unit Tested	Boiler 8	Date	4/22/13	Page 3
Pollutant	0	Fuel Gas Sample Time	0:00	

Component Contributions EPA Method 19

	Number of Hydrogen Atoms	Number of Carbon Atoms	Number of Sulfur Atoms	Number of Nitrogen Atoms	Number of Oxygen Atoms	Mole %	Component Molecular weight	Component Weight Contribution	Component Weight %
CO	0	1	0	0	1	-	28.0104	0.00	0.00
CO_2	0	1	0	0	2	0.249	44.010	0.11	0.75
CH4	4	1	0	0	0	12.052	16.043	1.93	13.26
C_2H_6	6	2	0	0	0	4.857	30.070	1.46	10.02
C_2H_4	4	2	0	0	0	0.866	28.054	0.24	1.67
C_3H_8	8	3	0	0	0	14.055	44.097	6.20	42.50
C_3H_6	6	3	0	0	0	0.412	42.081	0.17	1.19
C_4H_{10}	10	4	0	0	0	3.52	58.124	2.04	14.02
C_4H_8	8	4	0	0	0	0.05	56.108	0.03	0.18
C_5H_{12}	12	5	0	0	0	1.41	72.151	1.02	6.99
C_6	14	6	0	0	0	0.137	86	0.12	0.81
N_2	0	0	0	2	0	-	28.0134	0.00	0.00
H_2	2	0	0	0	0	62.395	2.016	1.26	8.63
O_2	0	0	0	0	2	-	31.9988	0.00	0.00
H_2S	2	0	1	0	0	-	34.076	0.00	0.00
Summation						**100.0001**		**14.5831**	**100.0000**

Unit Tested	Boiler 8			Date		4/22/13	Page 4
Pollutant	0			Fuel Gas Sample Time		0:00	
Elemental Contributions							
by weight	%H	%C	%S	%N	%O		
CO	0.00	0.00	0	0	0.00		
CO_2	0.00	0.21	0	0	0.55		
CH4	3.33	9.93	0	0	0.00		
C_2H_6	2.01	8.00	0	0	0.00		
C_2H_4	0.24	1.43	0	0	0.00		
C_3H_8	7.77	34.73	0	0	0.00		
C_3H_6	0.17	1.02	0	0	0.00		
C_4H_{10}	2.43	11.59	0	0	0.00		
C_4H_8	0.03	0.16	0	0	0.00		
C_5H_{12}	1.17	5.82	0	0	0.00		
C_6	0.13	0.68	0	0	0.00		
N_2	0.00	0.00	0	0.00	0.00		
H_2	8.63	0.00	0	0	0.00		
O_2	0.00	0.00	0	0	0.00		
H_2S	0.00	0.00	0.00	0	0.00		
Summation	**25.92**	**73.54**	**0.00**	**0.00**	**0.55**	100.00	

Atomic Weights	
Carbon, C	12.011
Hydrogen, H	1.008
Oxygen, O	15.9994
Nitrogen, N	14.0067
Sulfur, S	32.06

Unit Tested	**Boiler 8**		**Date**	**4/22/13**	**Page 5**
Pollutant	**0**		**Fuel Gas Sample Time**	**0:00**	

F_d Factor Calculations*

$Fd=K((K_{hd} \times \% H) + (K_c \times \%C) + (K_s \times \%S) + (K_n \times \%N) - (K_o \times \%O) / GCV_w$

EPA Method 19

Equation 19-13

K_{hd}	3.64	scf/lb	94.33				
K_c	1.53	scf/lb	112.52				
K_s	0.57	scf/lb	0.00				
K_n	0.14	scf/lb	0.00				
K_o	0.46	scf/lb	0.25				
			206.60	**8212.7**	scf/MMBtu	**F_d Factor**	(dry basis)

*The oxygen-based F-factor (F_d) is the ratio of combustion off-gas volume (on a dry basis and at zero percent excess oxygen) to the fuel heat input.

GCV (BTU/ft3)	966.8
GCV(BTU/lb)	25156
F_d (scf/MMBtu)	8213

Emission Rate NO_x $E = NO_x$ Con* CF * Fd *(20.9/(20.9 - $\%O_2$)

Equation 19-1

*The oxygen-based F factor (dry basis) is the ratio of combustion gas to heat input at 0 % oxygen.

Constants and Conversion Factors

Molar Volume	379.5	scf/mole	Standard Conditions 60 F and 14.696 psia
Molecular Weight NOx	45.3	lb/mole	
Convert PPM to lb/scf	"= NOx/1000000 *45.3/379.5"	=	1.194E-07
Conversion Factor	1.194E-07		

Appendix C

Reference Method Calibration Gas Certifications

5

Airgas

Airgas Specialty Gases
12722 South Wentworth Avenue
Chicago, IL 60628
(773) 785-3000 Fax: (773) 785-1928
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E04NI99E15A38M0	Reference Number:	54-124311411-3
Cylinder Number:	CC102731	Cylinder Volume:	144 Cu.Ft.
Laboratory:	ASG - Chicago - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12012	Valve Outlet:	660
Gas Code:	SNC	Analysis Date:	Apr 12, 2012

Expiration Date: Apr 12, 2014

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
CARBON MONOXIDE	105.0 PPM	102.1 PPM	G1	+/- 1% NIST Traceable
NITRIC OXIDE	105.0 PPM	104.4 PPM	G1	+/- 1% NIST Traceable
SULFUR DIOXIDE	105.0 PPM	104.4 PPM	G1	+/- 1% NIST Traceable
NITROGEN	Balance			
Total oxides of nitrogen		104.4 PPM		For Reference Only

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM/CO	09060410	CC274351	501.3PPM CARBON MONOXIDE/	Feb 01, 2013
NTRM/NO	11060131	CC330758	248.4PPM NITRIC OXIDE/NITROGEN	Jan 01, 2017
NTRM/SO2	11060821	CC338408	241PPM SULFUR DIOXIDE/NITROGEN	May 13, 2017

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nexus 470 AEP0000428	FTIR	Mar 14, 2012
Nexus 470 AEP0000428	FTIR	Mar 14, 2012
Nexus 470 AEP0000428	FTIR	Mar 14, 2012

Triad Data Available Upon Request

Notes:

Approved for Release

Airgas

Scanned

Airgas Specialty Gases
12722 South Wentworth Avenue
Chicago, IL 60628
(773) 785-3000 Fax: (773) 785-1928
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E04NI99E15A3850	Reference Number:	54-124311411-2
Cylinder Number:	XC013008B	Cylinder Volume:	144 Cu.Ft.
Laboratory:	ASG - Chicago - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12012	Valve Outlet:	660
Gas Code:	SNC	Analysis Date:	Apr 12, 2012

Expiration Date: Apr 12, 2014

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
CARBON MONOXIDE	220.0 PPM	218.4 PPM	G1	+/- 1% NIST Traceable
NITRIC OXIDE	220.0 PPM	221.2 PPM	G1	+/- 1% NIST Traceable
SULFUR DIOXIDE	220.0 PPM	222.1 PPM	G1	+/- 1% NIST Traceable
NITROGEN	Balance			
Total oxides of nitrogen		221.2 PPM		For Reference Only

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM/CO	09060410	CC274351	501.3PPM CARBON MONOXIDE/	Feb 01, 2013
NTRM/NO	11060131	CC330758	248.4PPM NITRIC OXIDE/NITROGEN	Jan 01, 2017
NTRM/SO2	11060821	CC338408	241PPM SULFUR DIOXIDE/NITROGEN	May 13, 2017

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nexus 470 AEP0000428	FTIR	Mar 14, 2012
Nexus 470 AEP0000428	FTIR	Mar 14, 2012
Nexus 470 AEP0000428	FTIR	Mar 14, 2012

Triad Data Available Upon Request

Notes:

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Airgas

Airgas Specialty Gases
12722 South Wentworth Avenue
Chicago, IL 60628
(773) 785-3000 Fax: (773) 785-1928
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E03NI78E15A38L7	Reference Number:	54-124338992-1
Cylinder Number:	SG9166109BAL	Cylinder Volume:	151 Cu.Ft.
Laboratory:	ASG - Chicago - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12012	Valve Outlet:	590
Gas Code:	OC2	Analysis Date:	Oct 02, 2012

Expiration Date: Oct 02, 2020

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
CARBON DIOXIDE	10.25 %	10.28 %	G1	+/- 1% NIST Traceable
OXYGEN	11.00 %	10.95 %	G1	+/- 1% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM/CO2	06120403	CC185079	19.66% CARBON DIOXIDE/NITROGEN	May 01, 2016
NTRM/O2	06120202	CC195927	20.9% OXYGEN/NITROGEN	Dec 01, 2015

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
CO2-1 HORIBA VIA-510 V1E3H7P5	NDIR	Sep 12, 2012
O2-1 HORIBA MPA-510 3VUYL9NR	Paramagnetic	Sep 13, 2012

Triad Data Available Upon Request

Notes:

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Page 1 of 54-124338992-1

Airgas

Airgas Specialty Gases
12722 South Wentworth Avenue
Chicago, IL 60628
(773) 785-3000 Fax: (773) 785-1928
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E03NI56E15A38L8	Reference Number:	54-124330730-2
Cylinder Number:	CC102820	Cylinder Volume:	160 Cu.Ft.
Laboratory:	ASG - Chicago - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12012	Valve Outlet:	296
Gas Code:	OC2	Analysis Date:	Aug 08, 2012

Expiration Date: Aug 08, 2015

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
CARBON DIOXIDE	19.75 %	19.40 %	G1	+/- 1% NIST Traceable
OXYGEN	24.25 %	23.37 %	G2	+/- 1% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM/CO2	06120403	CC185079	19.66% CARBON DIOXIDE/NITROGEN	May 01, 2016
NTRM/O2	06120202	SG9166625BAL	7.015% OXYGEN/	Dec 01, 2015

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
CO2-1 HORIBA VIA-510 V1E3H7P5	NDIR	Jul 14, 2012
O2-1 HORIBA MPA-510 3VUYL9NR	Paramagnetic	Jul 18, 2012

Triad Data Available Upon Request

Notes:

Approved for Release

END OF DOCUMENT