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MARICOPA COUNTY
AIR QUALITY DEPARTMENT

Notification of a Non-Minor Permit Revision
Air Quality Permit No. 080073 403340
Maricopa County, Arizona

Stantec

Prepared for:
Arizona Solar One, LLC
4505 East Chandler Boulevard
Suite 120
Phoenix, Arizona 85048

Prepared by:
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Submitted to:
Maricopa County Air Quality Department
1001 North Central Avenue,
Suite 125
Phoenix, Arizona, 85004

June 2014

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STANDARD APPLICATION

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MARICOPA COUNTY
AIR QUALITY DEPARTMENT
1001 N. Central Ave., Suite 400
Phoenix, Arizona 85004-1944
FAX (602) 506-6985
http://www.maricopa.gov/aq/

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NOTIFICATION OF NON-MINOR PERMIT REVISION

(As required by A.R.S. §49-480 and Maricopa County Air Pollution Control Regulations, Rule 200)

READ INSTRUCTIONS FIRST. ALL APPLICANTS MUST COMPLETE ITEMS 1 THROUGH 20 AND EACH APPLICABLE SECTION A THROUGH Z.

1. BUSINESS NAME (as filed with the Arizona Corporation Commission): Arizona Solar One, LLC

2. IS THIS A PORTABLE SOURCE ?
☐ YES (IF YES, PROVIDE THE CURRENT SITE INFORMATION IN ITEMS 2a, 3, AND 3a)
☒ NO (COMPLETE ITEMS 2a, 3, AND 3a)

2a. ADDRESS OF SITE: 57750 South Painted Rock Dam Road
CITY: Maricopa County STATE: AZ ZIP CODE: 85337

3. CONTACT PERSON AT SITE: William Schlimgen
3a. TELEPHONE AT SITE: 303-882-4581

4. TYPE OF OWNERSHIP: ☐ Corporation ☐ Partnership ☐ Sole Owner ☐ Government ☐ Other - Specify:

5. NAME AND ADDRESS OF OWNERSHIP OR LEGAL ENTITY:
Arizona Solar One, LLC
57750 South Painted Rock Dam Road
Maricopa County, AZ 85337

6. OWNERSHIP CONTACT: Emiliano Garcia Sanz
6a. TELEPHONE: 303-408-3714
6b. FAX:

7. SEND ALL CORRESPONDENCE INCLUDING INVOICE AND PERMIT TO:
COMPANY NAME: Abengoa Solar, Inc.
ADDRESS: 57750 South Painted Rock Dam Road
CITY: Maricopa County STATE: AZ ZIP CODE: 85337
ATTN: Emiliano Garcia Sanz

8. SIC (STANDARD INDUSTRIAL CLASSIFICATION) OR NAICS (NORTH AMERICAN INDUSTRY CLASSIFICATION) CODE(S): 3511

9. EXISTING **AIR QUALITY PERMIT NUMBER** FOR THIS SITE: 080073

10. BRIEF DESCRIPTION OF BUSINESS OR PROCESS AT SITE: Concentrating solar power electrical generating plant

11. OPERATING SCHEDULE: HOURS PER DAY: 24 DAYS PER WEEK: 7 WEEKS PER YEAR: 52

12. PROJECTED START-UP DATE (NEW FACILITIES):

13. THE AUTHORIZED CONTACT PERSON REGARDING THIS APPLICATION IS:

NAME: Louis C. Thanukos, Ph.D. TELEPHONE: 480-829-0457
TITLE: Division Manager FAX: 480-829-8958
COMPANY: Stantec E-MAIL: Louis.thanukos@stantec.com

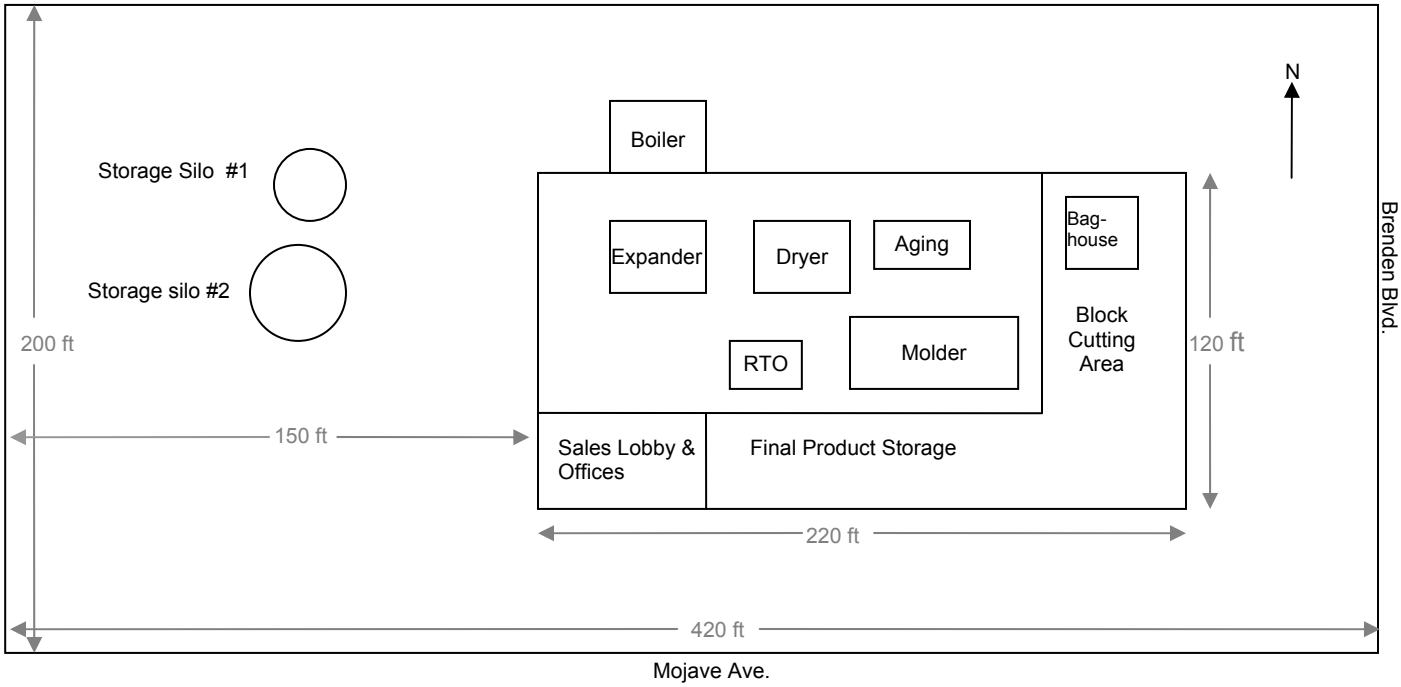
14. I CERTIFY THAT I AM FAMILIAR WITH THE OPERATIONS AND EQUIPMENT REPRESENTED ON THIS APPLICATION AND ATTACHMENTS AND THE INFORMATION PROVIDED HEREIN IS TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

SIGNATURE OF OWNER OR RESPONSIBLE OFFICIAL OF BUSINESS: DATE: 06-26-2014

TYPE OR PRINT NAME AND TITLE: Emiliano Garcia Sanz, Treasurer

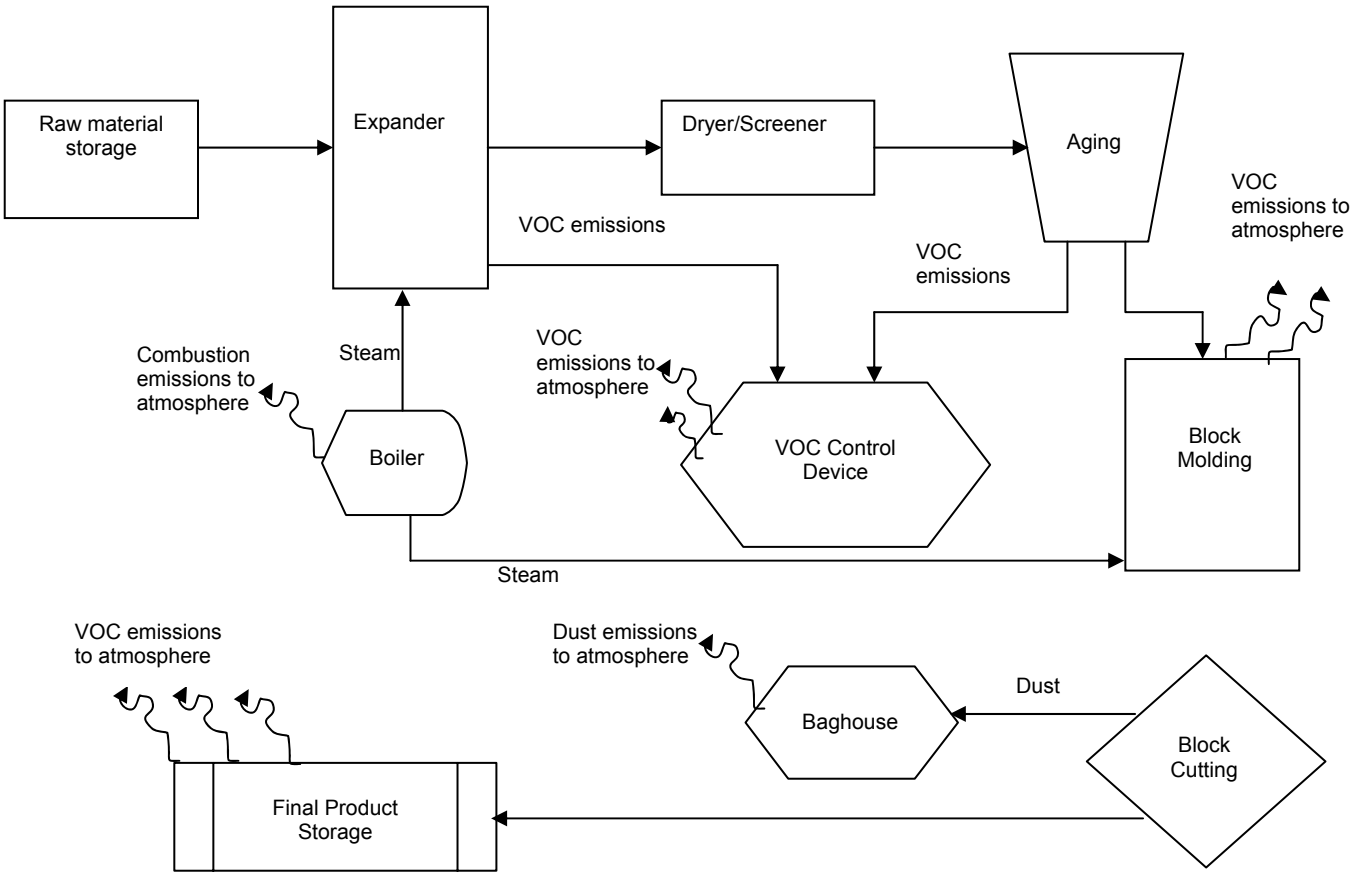
15. SITE DIAGRAM: attach a site layout showing distances to property lines, equipment, controls, ducts, stacks and emission points. Also show storage areas for fuels, raw materials, chemicals, finished products, waste materials, etc.

EXAMPLE SITE DIAGRAM



16. PROCESS FLOW DIAGRAM: Attach a flow diagram which indicates how processes/activities are conducted at the facility. Begin with raw materials and show each step in the production process. Also indicate emissions control devices and all emission points. An example process flow diagram is provided below.

EXAMPLE PROCESS FLOW DIAGRAM



17. OPERATION & MAINTENANCE (O&M) PLAN(S): O&M Plans are required for any process that vents emissions through a control device and includes both add-on control type equipment or processes whose controls are integrated into the design of the process equipment. Indicate if your facility has such control devices (the list below is not an all-inclusive list of control devices).

EQUIPMENT	NO	YES	HOW MANY?
BAGHOUSE	☒	☐	
DUST COLLECTOR / FILTER	☐	☒	2
INCINERATION SYSTEM (E.G., CATALYTIC OR THERMAL OXIDIZER, AFTER BURNER, BOILER, PROCESS HEATER, FLARE) – SPECIFY:	☒	☐	
SCRUBBER	☐	☒	1
ADSORPTION UNIT (E.G., RESIN, CARBON FILTER, OTHER) – SPECIFY: Carbon Adsorption System	☐	☒	1
ABSORPTION UNIT	☒	☐	
OTHER – SPECIFY: Cooling Tower Drift Eliminators	☐	☒	2

If you checked YES to any of these boxes, attach a separate O&M Plan for each control device. The O&M Plan should describe key system operating parameters and appropriate operating ranges for these parameters. For new equipment or processes, provide an educated estimate of the ranges of any parameters to be monitored. These ranges should be supported with manufacturer's test data or other manufacturer's data from engineering calculations and/or experience with the equipment. In addition, O&M Plans should be prepared in accordance with Maricopa County Air Quality Department - Operation and Maintenance (O&M) Plan Guidelines. A copy of these guidelines can be obtained at: http://www.maricopa.gov/aq/divisions/permit_engineering/docs/pdf/OMGuidelines.pdf or by contacting the Permits Program Coordinator at (602) 506-6094. Multiple control devices can be combined in a single O&M Plan providing they are identical in type, capacity, and use. A separate O&M Plan is required for each device that is unique in type, capacity, or use.

18. DUST CONTROL PLAN: The owner and/or operator of a dust-generating operation shall submit to the Control Officer a Dust Control Plan with any permit applications that involve dust-generating operations with a disturbed surface area that equals or exceeds 0.10 acre (4,356 square feet). Facilities subject to Rule 316: Nonmetallic Mineral Processing are also required to submit a Dust Control Plan.

REQUIREMENT	NO	YES	DISTURBED SURFACE AREA ≥ 0.10 ACRE	SUBJECT TO RULE 316
DUST CONTROL PLAN	☐	☒	☐	☐

For further guidance completing the dust control plan, review the "Guidance For Dust Control Permit For Application" document located at http://www.maricopa.gov/aq/divisions/permit_engineering/docs/pdf/Portfolio1.pdf or contact the Dust Compliance Division at (602) 506-6010.

19. APPLICABLE SECTIONS: Review each section of the application and mark below which sections apply to this facility. In the final application, only submit those sections that apply to this facility. Note that Section Z must be completed by all applicants.

- ☒ A FUEL BURNING EQUIPMENT
- ☒ B INTERNAL COMBUSTION ENGINES & TURBINES
- ☒ C PETROLEUM STORAGE TANKS
- ☐ D WATER & SOIL REMEDIATION
- ☐ E-1 SPRAY PAINTING & OTHER SURFACE COATING (EXCLUDING VEHICLE AND WOOD COATING)
- ☐ E-2 VEHICLE & MOBILE EQUIPMENT COATING
- ☐ F WOOD WORKING AND WOOD COATING OPERATIONS
- ☐ G SOLVENT CLEANING
- ☐ H PLATING, ETCHING & OTHER METAL FINISHING PROCESSES
- ☐ I DRY CLEANING EQUIPMENT
- ☐ J GRAPHIC ARTS
- ☐ K-1 CONCRETE BATCH PLANTS
- ☐ K-2 NON-METALLIC MINERAL MINING AND PROCESSING
- ☐ K-3 ASPHALT PRODUCTION
- ☐ K-4 NON-METALLIC MINERAL PROCESSING - CONTINUED
- ☐ L OTHER DUST GENERATING OPERATIONS
- ☐ M ABRASIVE BLASTING
- ☒ X-1 POINT SOURCE EMISSIONS OF HAZARDOUS AIR POLLUTANTS
- ☒ X-2 NON-POINT AREA EMISSION SOURCES FOR HAZARDOUS AIR POLLUTANTS
- ☒ Y OTHER SOURCES
- ☒ Z AIR POLLUTANT EMISSIONS

SECTION A. EXTERNAL FUEL BURNING EQUIPMENT

YOUR FACILITY MAY NOT REQUIRE A NON-TITLE V PERMIT IF THE FACILITY IS ELIGIBLE TO OBTAIN AN AUTHORITY TO OPERATE (ATO) UNDER A GENERAL PERMIT (REFER TO PAGE 4 OF THE INSTRUCTION TO DETERMINE ELIGIBILITY).

Complete this section if you burn natural gas, propane, butane, waste derived fuel, fuel oils, diesel, kerosene, gasoline, coal, charcoal, wood, or any other fossil fuel. Provide complete specifications for non-commercial and special fuels. Describe equipment such as boilers, furnaces, space heaters, water heaters, dryers, pool and spa heaters, kilns, ovens, burners, stoves, steam cleaners, hot water pressure washers, etc, with an input rating of 300,000 Btu/hr or more. Do not include vehicles, forklifts, lawnmowers, weedeaters and hand-held equipment operating on fossil fuels. Use Section Y to describe items such as asphalt kettles, incinerators, crematories, and emission control devices burning fuel. List internal combustion engines and gas turbines in Section B.

FUEL TYPE	EQUIPMENT DESCRIPTION. INCLUDE MAKE & MODEL. DESCRIBE AIR POLLUTION ABATEMENT/CONTROLS, IF ANY	DATE OF INSTALLATION	HOW MANY	NUMBER OF HOURS IN OPERATION DAILY	NUMBER OF HOURS IN OPERATION ANNUALLY	EQUIPMENT RATING (Btu/hr or MM Btu/hr)
Propane	Rental Boiler	2013	1	24	8,760	100 MMBtu/hr (max) 50 MMBtu/hr (avg)

SECTION B. INTERNAL COMBUSTION ENGINES & TURBINES

This section applies to stationary and portable fuel-fired equipment such as generators, fire pumps, air conditioning compressor engines, co-generation units, etc. Indicate in the description if the equipment is used only for emergency purposes. Attach the manufacturer's specification sheets for each engine listing the engine make, model, model year, emission data, and maximum engine power rating. Do not include vehicles, forklifts, lawnmowers and hand-held equipment. Use additional sheets if necessary.

FUEL TYPE	EQUIPMENT DESCRIPTION. INCLUDE MAKE, MODEL, AND INSTALLATION DATE. DESCRIBE AIR POLLUTION ABATEMENT/CONTROLS, IF ANY	DATE OF MANUFACTURE	HOW MANY	NUMBER OF HOURS IN OPERATION DAILY	NUMBER OF HOURS IN OPERATION ANNUALLY	ENGINE RATING[1] (bhp,bkW)	GENSET OUTPUT[2] (hp,kW)
Diesel	Emergency Generators	2012	2	24	500 combined total	4,376 hp each	3,100 kW each
Diesel	Fire Pump	2011	1	24	500	575 hp	N/A

[1] Enter the brake horsepower (bhp) or brake kilowatt (bkW) rating of the engine. This information may be found on the engine faceplate or obtained from the engine manufacturer. NOTE: The engine bhp/bkW rating should not be confused with the output power rating of the generator.

[2] Enter the output power rating of the generator. This information may be found on the generator faceplate or obtained from the generator manufacturer.

SECTION C. PETROLEUM STORAGE TANKS

GASOLINE DISPENSING OPERATIONS MAY NOT REQUIRE A NON-TITLE V PERMIT IF THE FACILITY IS ELIGIBLE TO OBTAIN AN AUTHORITY TO OPERATE (ATO) UNDER A GENERAL PERMIT (REFER TO PAGE 2 OF THE INSTRUCTION TO DETERMINE ELIGIBILITY).

This section applies to storage of gasoline and other fuels which have a true vapor pressure of 1.5 psia (77.6 mm of mercury) or greater under actual loading conditions. Petroleum terminals and bulk plants must use Section Y instead of this section. Also use Section Y to list storage tanks containing liquids with a vapor pressure less than 1.5 psia, non-petroleum organic liquids, caustic solutions, acids, etc.

1. DESCRIBE TANKS AND PRODUCTS STORED:

HOW MANY	CAPACITY OF EACH TANK (GALLONS)	DATE OF INSTALLATION	ABOVE GROUND OR UNDERGROUND	PRODUCT STORED
1	1,000	2013	Aboveground	Gasoline

2. ESTIMATE TOTAL ANNUAL THROUGHPUT FOR EACH PRODUCT STORED IN THESE TANKS (GALLONS/YEAR):

   48,000 gallons/year (average); 96,000 gallons/year (max) _____

3. IS ANY GASOLINE STORED AT THIS FACILITY RESOLD? ☐ YES ☒ NO ☐ N/A (gasoline is not stored at this facility)

4. EMISSION CONTROLS: ☐ STAGE I VAPOR RECOVERY ☐ STAGE II ☒ NONE

5. ☒ SUBMERGED FILL*
   ☐ BOTTOM FILL
   ☐ OTHER, SPECIFY: _____

   * A fill pipe is considered submerged if the discharge opening is completely submerged when the liquid level is six inches (15 cm) from the bottom of the tank. All gasoline storage tanks must be equipped with a submerged fill pipe.

SECTION D. WATER & SOIL REMEDIATION

This section applies to any site where clean-up activities for contaminated soil or water will be conducted.

1. TYPE OF CONTAMINANT: ☐ DIESEL ☐ GASOLINE ☐ OTHER, SPECIFY _____

2. CONTAMINATED MATERIAL: ☐ SOIL ☐ WATER

3. CONTROL DEVICE: ☐ CARBON CANISTER ☐ CATALYTIC OXIDIZER ☐ BIOFILTER
   ☐ THERMAL OXIDIZER ☐ OTHER: _____

4. CONCENTRATION OF EACH CONTAMINANT (Specify unit of measure): _____

5. BRIEFLY DESCRIBE PROCEDURE (Describe fully in the scope of work summary required by Item 8 of this Section):

   _____

6. ESTIMATED VOC EMISSION RATES: BEFORE THE CONTROL DEVICE: _____ LB/DAY; _____ LB/HR
   AFTER THE CONTROL DEVICE: _____ LB/DAY; _____ LB/HR

7. DESCRIBE TYPE, CAPACITY, AND EFFICIENCY OF CONTROLS FOR AIR EMISSIONS:
   (Describe fully in the scope of work summary required by Item 9 of this Section): _____

8. PROJECTED START-UP AND COMPLETION DATES: _____

9. ATTACH FULL DETAILS OF SCOPE OF WORK, TREATMENT PROCEDURES, EQUIPMENT SPECIFICATIONS AND TEST RESULTS. INCLUDE CALCULATIONS USED TO ESTIMATE VOC AND FEDERAL HAZARDOUS AIR POLLUTANT EMISSIONS.

SECTION X1. POINT SOURCE EMISSIONS OF HAZARDOUS AIR POLLUTANTS

COMPLETION OF THIS SECTION IS MANDATORY FOR ALL SOURCE CATEGORIES WITH A PRIMARY SIC CODE LISTED IN MCAQD RULE 372 TABLE 1 AND FOR ALL OTHER FACILITIES WHICH WILL HAVE AN ACTUAL HAZARDOUS AIR POLLUTANT (HAP) EMISSION RATE OF ANY SINGLE FEDERAL HAP ABOVE THE HOURLY OR ANNUAL DEMINIMIS LEVEL SPECIFIED IN RULE 372 TABLE 2.

Rule 372 may be found at: http://www.maricopa.gov/aq/divisions/planning_analysis/rules/docs/372-0706.pdf

SOURCE EQUIPMENT NAME (1)	HAP NAME AND/OR CAS NUMBER (2)	HAP EMISSION RATE		STACK OR POINT DISCHARGE PARAMETERS (5)								
						BUILDING DIMENSIONS				STACK EXIT DATA		
		(lb/hr) (3)	(tons/yr) (4)	STACK ID	STACK HEIGHT ABOVE GROUND (feet)	BUILDING LENGTH (feet)	BUILDING WIDTH (feet)	BUILDING HEIGHT (feet)	DISTANCE FROM STACK TO NEAREST PROPERTY LINE (feet)	DIAMETER or LENGTH x WIDTH (feet)	VELO-CITY (fps)	TEMP. (°F)
Emergency Generators	**See Attachment A**											
Fire Pump	**See Attachment A**											
HTF Ullage System	**See Attachment A**											
TES System Venting	**See Attachment A**											

General Instructions:

(1) Identify each federal hazardous air pollutant (HAP) emission source and each HAP associated with that emission source for the entire plant site. Use as many lines as necessary for each HAP source.

(2) Refer to the list of federal HAPS on the last page of the application.

(3) Pounds per hour (lb/hr) is actual emission rate estimated or measured by applicant to be vented through stack.

(4) Tons per year is actual annual emission rate estimated or measured by applicant to be vented through stack, which takes into account process operating schedule.

(5) Supply additional information as follows on a separate sheet if appropriate:
Stack exit configuration other than a round vertical stack. Show length and width for a rectangular stack. Indicate if discharge is horizontal.
Show layout of adjacent structures if structure is within 3 times stack height above the ground.

SECTION X2. NON-POINT AREA EMISSION SOURCES FOR HAZARDOUS AIR POLLUTANTS

COMPLETION OF THIS SECTION IS MANDATORY FOR ALL SOURCE CATEGORIES WITH A PRIMARY SIC CODE LISTED IN MCAQD RULE 372 TABLE 1 AND FOR ALL OTHER FACILITIES WHICH WILL HAVE AN ACTUAL HAZARDOUS AIR POLLUTANT (HAP) EMISSION RATE OF ANY SINGLE FEDERAL HAP ABOVE THE HOURLY OR ANNUAL DEMINIMIS LEVEL SPECIFIED IN RULE 372 TABLE 2. Rule 372 may be found at: http://www.maricopa.gov/aq/divisions/planning_analysis/rules/docs/372-0706.pdf

SOURCE OR EQUIPMENT NAME (1)	HAP NAME AND/OR CAS NUMBER (2)	HAP EMISSION RATE		DIMENSIONS OF RELEASE SOURCE (5)			BUILDING DIMENSIONS			DISTANCE TO NEAREST PROPERTY LINE (6) (feet)	SOURCE TEMP. (°F)
		(lb/hr) (3)	(tons/yr) (4)	LENGTH (feet)	WIDTH (feet)	HEIGHT (feet)	LENGTH (feet)	WIDTH (feet)	HEIGHT (feet)		
Leaks from HTF System Components	**See Attachment A**										

General Instructions:

(1) Identify each federal hazardous air pollutant (HAP) emission source and each HAP which is not collected by a capture system and is released to the atmosphere. Use as many lines as necessary for each HAP source.

(2) Refer to the list of federal HAPS on the last page of the application.

(3) Pounds per hour (lb/hr) is actual emission rate estimated or measured by applicant to be released from the emission source.

(4) Tons per year is actual annual emission rate estimated or measured by applicant to be released from the emission source. This value should take into account process operating schedules.

(5) Release structure: If the non-point (area) emissions source is located inside a building, provide the dimensions of the building. Otherwise, indicate zero for building dimensions.

(6) Distance to nearest property line is the closest distance from the release structure to the property line.

SECTION Y. OTHER SOURCES

This section is intended for all emissions related activities, equipment and applicable emission controls which are not covered in previous sections. In response to item 2, provide a detailed step-by-step narrative, including how raw materials are handled, stored, processed, mixed, treated, and converted to finished products. Provide flow rates, temperatures, pressures, and other appropriate details concerning each process. Whenever available, provide manufacturer's data sheets and literature. Provide flow diagrams and layouts for each process. Describe in detail how waste materials are generated, handled, stored, processed, mixed, treated and disposed of. An Operation and Maintenance Plan for each air pollution control equipment is required. List each material that is partially recovered, salvaged or otherwise reclaimed. Provide estimates of the quantities of such material recoveries on an annual basis. Describe how the annual quantity figures were developed. USE A SEPARATE SHEET FOR EACH PROCESS OR ACTIVITY.

1. NAME OF PROCESS, EQUIPMENT GROUPING OR ACTIVITY: See Attachment A

2. NARRATIVE DESCRIPTION: HTF System, TES System , Cooling Towers, Dry Chemical Storage

3. EQUIPMENT LIST**:** Include machinery, storage silos, tanks, emission control devices, etc., in this list.

ASSIGNED EQUIPMENT NUMBER	DESCRIBE EACH PIECE OF EQUIPMENT INCLUDE MAKE & MODEL	HOW MANY	DATE OF INSTALLATION	HP, KVA GAL OR OTHER RATING	EXHAUST	
					VENT TO AIR	VENT TO CONTROL (Identify)
	HTF Expansion Vessels	14	2012			Carbon Adsorption System
	HTF Overflow Tanks	2	2012			Carbon Adsorption System
	TES Salt Tanks	12	2012			Chemical Scrubber System
	Cooling Towers	2	2012	90,000 gpm		Drift Eliminators
	Storage Silos	2	2012	3,000 - 3,250 ft^3		Dust Collectors (Bin Vents)

4. MATERIALS LIST:

List all materials handled, stored, processed, used, mixed, treated, or emitted from the facility, including but not limit to chemicals, mixtures, resins, cleaning compounds, etc. Identify each material in sufficient detail and provide material safety data sheets (MSDS) for each material.

MATERIAL	ANNUAL USAGE OR THROUGHPUT (gal/yr or lb/yr)	CHEMICAL COMPOSITION (% by weight)	MATERIAL RECLAIMED OR SHIPPED AS WASTE (gal/yr or lb/yr)	EQUIPMENT NUMBER IN WHICH USED
Heat Transfer Fluid (HTF)	26,500,000 lb/yr	73.5% Diphenyl Ether 26.5% Biphenyl		HTF Expansion and Overflow Tanks
Molten Salt	138,900 tons/yr	60% Sodium Nitrate 40% Potassium Nitrate		TES Salt Tanks
Cooling Water	78,840,000,000 gal/yr	N/A		Cooling Towers
Water Treatment Chemical	8,996,250 lb/yr	Sodium Carbonate (Soda Ash)		Storage Silo
Water Treatment Chemical	7,682,520 lb/yr	Calcium Oxide (Hydrated Lime)		Storage Silo

5. DESCRIBE CONTROL DEVICES:

TYPE OF DEVICE	NAME / ID / CAPACITY	EQUIPMENT CONTROLLED[1]	DATE OF INSTALLATION	CONTROL EFFICIENCY[2] (% WEIGHT)
Carbon Adsorption System		HTF Tanks	2012	95%
Chemical Scrubber System	Tri-NO_X	TES Salt Tanks	2012	99%
Drift Eliminators	Marley XCELplus Eliminator	Cooling Towers	2012	0.0005%
Dust Collectors (Bin Vents)	CHEMCO Silosafe 24 / 1,500 scfm	Storage Silos	2012	0.00088 gr/cf

[1] Specify the equipment number from item 3 for the piece of equipment whose emissions are being controlled by the control device.

[2] PROVIDE WRITTEN DOCUMENTATION OF CONTROL EFFICIENCY (i.e., manufacturer's data or source test data). Attach the manufacturer's specifications and drawings for each air pollution control device listed. Be sure that the locations of all flow devices and pressure/temperature gauges are indicated. Attach an operation and maintenance plan for each piece of control equipment listed above.

SECTION Z-NM. AIR POLLUTANT EMISSIONS

PROVIDE A SUMMARY OF THE PROJECTED ACTUAL AIR EMISSIONS ON AN ANNUAL BASIS FOR THE ENTIRE SITE IN THE FOLLOWING SUMMARY TABLES. ATTACH DETAILED CALCULATIONS TO SUPPORT THE FIGURES. **IF SUPPORTING CALCULATIONS ARE NOT INCLUDED WITH THE APPLICATION, THE APPLICATION WILL BE DEEMED INCOMPLETE.**

PROVIDE A SUMMARY OF THE ACTUAL AIR EMISSIONS ON AN ANNUAL BASIS FOR THE FOLLOWING THREE COLUMNS:

(i) EMISSIONS TO BE RELEASED FROM ONLY THE EQUIPMENT AND AFFECTED PROCESSES DESCRIBED ON THIS NOTIFICATION

(ii) THE ENTIRE SITE PRIOR TO THE MODIFICATION OF THE EQUIPMENT AND PROCESSES DESCRIBED IN (i) ABOVE.

(iii) THE ENTIRE SITE INCLUDING THE EMISSIONS IDENTIFIED IN (i) ABOVE. NORMALLY, THIS COLUMN WILL BE THE SUM OF COLUMNS (i) AND (ii).

POLLUTANT	ACTUAL EMISSIONS OR PROJECTED ACTUAL EMISSIONS IN POUNDS PER YEAR [1]		
	COLUMN (I)	COLUMN (ii)	COLUMN (iii)
CARBON MONOXIDE (CO)			
OXIDES OF NITROGEN (NO_X)			
OXIDES OF SULFUR (SO_X)			
PARTICULATES OF 10 MICRONS OR SMALLER (PM_{10})			
TOTAL SUSPENDED PARTICULATES (TSP), INCLUDING PM_{10}			
VOLATILE ORGANIC COMPOUNDS (VOCs) [2]	23,671	42,329	66,000
FEDERAL HAZARDOUS AIR POLLUTANTS (LIST EACH ONE SEPARATELY)::			
Single HAP	9,520	8,480	18,000
Total HAPs	11,560	19,440	31,000

[1] Potential emissions from HTF Ullage System based on current and proposed allowable emissions limits.

[2] VOCs are defined by EPA at: http://www.epa.gov/ttn/naaqs/ozone/ozonetech/def_voc.htm

Attach detailed calculations to support the figures in the above summary tables. Do not include the emissions from motor vehicles. Include the emissions from stationary sources, portable sources, test areas, experimental facilities, evaporative losses, storage and handling losses, fuel loading and unloading losses, etc. Specifically identify the following in detailed calculations:

1. EMISSIONS FROM EACH POINT SOURCE AND EACH STACK
2. CAPTURE EFFICIENCIES
3. CONTROL EFFICIENCIES
4. OVERALL EFFICIENCIES
5. FUGITIVE EMISSIONS
6. NON-POINT (AREA) EMISSIONS

For particulate (dust) emissions, describe the types of particulates being emitted and the quantities of emissions for each type. Identify and quantify each and every type of VOC that is included in the above summary tables. Whenever a material is identified by a trade name, also provide its generic name and its chemical abstract service (CAS) number.

Help sheets for calculating emissions from specific industries or processes can be obtained at:
http://www.maricopa.gov/aq/divisions/planning_analysis/emissions_inventory/instructions.aspx

FEDERAL HAZARDOUS AIR POLLUTANTS LIST

(Federal Clean Air Act, Title I, Section 112(b))

CAS No.	Chemical name
75070	Acetaldehyde
60355	Acetamide
75058	Acetonitrile
98862	Acetophenone
53963	2-Acetylaminofluorene
107028	Acrolein
79061	Acrylamide
79107	Acrylic acid
107131	Acrylonitrile
107051	Allyl chloride
92671	4-Aminobiphenyl
62533	Aniline
90040	o-Anisidine
1332214	Asbestos
71432	Benzene (including benzene from gasoline)
92875	Benzidine
98077	Benzotrichloride
100447	Benzyl chloride
92524	Biphenyl
117817	Bis(2-ethylhexyl)phthalate (DEHP)
542881	Bis(chloromethyl)ether
75252	Bromoform
106990	1,3-Butadiene
156627	Calcium cyanamide
133062	Captan
63252	Carbaryl
75150	Carbon disulfide
56235	Carbon tetrachloride
463581	Carbonyl sulfide
120809	Catechol
33904	Chloramben
57749	Chlordane
7782505	Chlorine
79118	Chloroacetic acid
532274	2-Chloroacetophenone
108907	Chlorobenzene
510156	Chlorobenzilate
67663	Chloroform
107302	Chloromethyl methyl ether
126998	Chloroprene
1319773	Cresols/Cresylic acid (isomers and mixture)
95487	o-Cresol
108394	m-Cresol
106445	p-Cresol
98828	Cumene
94757	2,4-D, salts and esters
3547044	DDE
334883	Diazomethane
132649	Dibenzofurans
96128	1,2-Dibromo-3-chloropropane
84742	Dibutylphthalate
106467	1,4-Dichlorobenzene(p)
91941	3,3-Dichlorobenzidene
111444	Dichloroethyl ether (Bis(2-chloroethyl)ether)
542756	1,3-Dichloropropene
62737	Dichlorvos
111422	Diethanolamine

CAS No.	Chemical name
121697	N,N-Diethyl aniline (N,N-Dimethylaniline)
64675	Diethyl sulfate
119904	3,3-Dimethoxybenzidine
60117	Dimethyl aminoazobenzene
119937	3,3´-Dimethyl benzidine
79447	Dimethyl carbamoyl chloride
68122	Dimethyl formamide
57147	1,1-Dimethyl hydrazine
131113	Dimethyl phthalate
77781	Dimethyl sulfate
534521	4,6-Dinitro-o-cresol, and salts
51285	2,4-Dinitrophenol
121142	2,4-Dinitrotoluene
123911	1,4-Dioxane (1,4-Diethyleneoxide)
122667	1,2-Diphenylhydrazine
106898	Epichlorohydrin (1-Chloro-2,3-epoxypropane)
106887	1,2-Epoxybutane
140885	Ethyl acrylate
100414	Ethyl benzene
51796	Ethyl carbamate (Urethane)
75003	Ethyl chloride (Chloroethane)
106934	Ethylene dibromide (Dibromoethane)
107062	Ethylene dichloride (1,2-Dichloroethane)
107211	Ethylene glycol
151564	Ethylene imine (Aziridine)
75218	Ethylene oxide
96457	Ethylene thiourea
75343	Ethylidene dichloride (1,1-Dichloroethane)
50000	Formaldehyde
76448	Heptachlor
118741	Hexachlorobenzene
87683	Hexachlorobutadiene
77474	Hexachlorocyclopentadiene
67721	Hexachloroethane
822060	Hexamethylene-1,6-diisocyanate
680319	Hexamethylphosphoramide
110543	Hexane
302012	Hydrazine
7647010	Hydrochloric acid
7664393	Hydrogen fluoride (Hydrofluoric acid)
123319	Hydroquinone
78591	Isophorone
58899	Lindane (all isomers)
108316	Maleic anhydride
67561	Methanol
72435	Methoxychlor
74839	Methyl bromide (Bromomethane)
74873	Methyl chloride (Chloromethane)
71556	Methyl chloroform (1,1,1-Trichloroethane)
60344	Methyl hydrazine
74884	Methyl iodide (Iodomethane)
108101	Methyl isobutyl ketone (Hexone)
624839	Methyl isocyanate
80626	Methyl methacrylate
1634044	Methyl tert butyl ether
101144	4,4-Methylene bis(2-chloroaniline)
75092	Methylene chloride (Dichloromethane)

CAS No.	Chemical name
101688	Methylene diphenyl diisocyanate (MDI)
101779	4,4´-Methylenedianiline
91203	Naphthalene
98953	Nitrobenzene
92933	4-Nitrobiphenyl
100027	4-Nitrophenol
79469	2-Nitropropane
684935	N-Nitroso-N-methylurea
62759	N-Nitrosodimethylamine
59892	N-Nitrosomorpholine
56382	Parathion
82688	Pentachloronitrobenzene (Quintobenzene)
87865	Pentachlorophenol
108952	Phenol
106503	p-Phenylenediamine
75445	Phosgene
7803512	Phosphine
7723140	Phosphorus
85449	Phthalic anhydride
1336363	Polychlorinated biphenyls (Aroclors)
1120714	1,3-Propane sultone
57578	beta-Propiolactone
123386	Propionaldehyde
114261	Propoxur (Baygon)
78875	Propylene dichloride (1,2-Dichloropropane)
75569	Propylene oxide
75558	1,2-Propylenimine(2-Methyl aziridine)
91225	Quinoline
106514	Quinone
100425	Styrene
96093	Styrene oxide
1746016	2,3,7,8-Tetrachlorodibenzo-p-dioxin
79345	1,1,2,2-Tetrachloroethane
127184	Tetrachloroethylene (Perchloroethylene)
7550450	Titanium tetrachloride
108883	Toluene
95807	2,4-Toluene diamine
584849	2,4-Toluene diisocyanate
95534	o-Toluidine
8001352	Toxaphene (chlorinated camphene)
120821	1,2,4-Trichlorobenzene
79005	1,1,2-Trichloroethane
79016	Trichloroethylene
95954	2,4,5-Trichlorophenol
88062	2,4,6-Trichlorophenol
121448	Triethylamine
1582098	Trifluralin
540841	2,2,4-Trimethylpentane
108054	Vinyl acetate
593602	Vinyl bromide
75014	Vinyl chloride
75354	Vinylidene chloride (1,1-Dichloroethylene)
1330207	Xylenes (isomers and mixture)
95476	o-Xylenes
108383	m-Xylenes
106423	p-Xylenes

Chemical name
Antimony Compounds
Arsenic Compounds (inorganic including arsine)
Beryllium Compounds
Cadmium Compounds
Chromium Compounds
Cobalt Compounds
Coke Oven Emissions
Cyanide Compounds[1]
Glycol ethers[2]
Lead Compounds
Manganese Compounds
Mercury Compounds
Fine mineral fibers[3]
Nickel Compounds
Polycylic Organic Matter[4]
Radionuclides (including radon)[5]
Selenium Compounds

For all listings above which contain the word "compounds" and for glycol ethers, unless otherwise specified, these listings are defined as including any unique chemical substance that contains the named chemical as part of that chemical's infrastructure.

[1] X´CN where X = H´ or any other group where a formal dissociation may occur. For example KCN or $Ca(CN)_2$.

[2] Includes mono- and di- ethers of ethylene glycol, diethylene glycol and triethylene glycol $R(OCH_2CH_2)_n$-OR' where:

n = 1, 2 or 3

R = alkyl C7 or less, or phenyl or alkyl substituted phenyl

R´ = H, or alkyl C7 or less, or carboxylic acid ester, sulfate, phosphate, nitrate, or sulfonate.

[3] Includes mineral fiber emissions from facilities manufacturing or processing glass, rock or slag fibers or other mineral derived fibers of average diameter one (1) micrometer or less.

[4] Includes organic compounds with more than one (1) benzene ring and which have a boiling point greater than or equal to 100°C.

[5] A type of atom which spontaneously undergoes radioactive decay

Attachment A

1.0 INTRODUCTION

Air Quality Permit No. 080073 authorizes Arizona Solar One, LLC (ASO) to build, operate, and maintain a concentrating solar power (CSP) electrical generating plant, Solana Generating Station (Solana), near Gila Bend, Arizona. Solana is a 280-megawatt (MW) gross output (250 MW nominal output) electrical generating plant located on approximately 3,000 acres of private land generally located north of Interstate 8 (I-8), west of Painted Rock Dam Road, south of Powerline Road, and east of Bureau of Land Management (BLM) land within unincorporated Maricopa County. Arizona Solar One owns and operates Solana on behalf of Abengoa Solar Inc. (Abengoa Solar).

In compliance with Rule 220 §405.3 of the Maricopa County Air Pollution Control Rules (MCAPCR), this document presents Arizona Solar One's Notification of a Non-Minor Modification to Air Quality Permit No. 080073 to revise the allowable emission limits for the Heat Transfer Fluid (HTF) System, as explained in Section 2.0. The ensuing sections of this document provide the information required for a Non-Title V Non-Minor Permit Revision Application. This includes: (a) a description of proposed modification; (b) an assessment of the facility's potential to emit (PTE); and (c) an assessment of the applicability of the requirements of MCAPCR Rule 372, MCAPCR Rule 310, and MCAPCR Rule 241.

2.0 PROPOSED MODIFICATION

As previously related by ASO, water leaks from the two steam generating trains into the HTF have adversely affected the control efficiency of the Carbon Adsorption System that controls emissions from the Ullage System. The approved O&M Plan for the Ullage System had required replacement of the carbon beds when the outlet concentration of the carbon beds measured a volatile organic compound (VOC) concentration of 100 ppm or greater. Because continuing use of this threshold value for replacement of the carbon beds at approximately $157,000 per change-out was not feasible, ASO revised the threshold value in the O&M plan to 200 ppm on April 21, 2014, and to 243 ppm on April 30, 2014.

As related in ASO's April 30, 2014 amendment to the O&M Plan the total VOC, the highest individual HAP, and the combined total HAP emissions from commencement of operation of the Ullage System (August 13, 2013) through April 30, 2014 were approaching the 12-month total emission limits of the permit, but only 4%, 38%, and 29% respectively of the Title V thresholds. Additionally, because the upset conditions have adversely affected the control efficiency of the Ullage System, the current 12-month limits for VOCs, individual hazardous air pollutants (HAPs), and total HAPs of Arizona Solar One's permit will likely be exceeded, but will remain below the Title V thresholds. As anticipated, based on ASO emission calculations, the allowable 12-month total emission limit for a single HAP of 8,480 lbs in Condition 1 of the permit was exceeded at the end of May 2014. However, this was due more to inaccurate estimations for the potential to emit (PTE) of a single HAP than the current upset conditions at the Solana Facility. ASO subsequently provided Maricopa County Air Quality Department (MCAQD) with an excess emissions report on June 19, 2014 detailing the nature, cause, magnitude, and expected duration of the excess emissions from the HTF System. ASO is currently in the process of procuring a double pipe cooling system to condense water in the overflow tank ullage vapor stream prior to the Carbon Adsorption System. This will mitigate the problem of water in the HTF.

Due to the current upset conditions at the Solana facility and as agreed upon between MCAQD and Arizona Solar One during the meeting on May 15, 2014, ASO is submitting this notification of a non-minor permit revision to revise the allowable emission limits for the HTF System. Table 2.1 presents the current and proposed allowable emission limits for the HTF System.

Table 2.1 Current and Proposed Allowable Emission Limits for the HTF System

Pollutant	Current 12-Month Rolling Total Emission Limits	Proposed 12-Month Rolling Total Emission Limits
Total Volatile Organic Compounds (VOCs)	42,329 lbs	66,000 lbs
Total Hazardous Air Pollutants (HAPs)	19,440 lbs	31,000 lbs
Any Single HAP	8,480 lbs	18,000 lbs

The proposed emission limits in this notification will ensure that emissions of any single HAP will remain below the Title V threshold of 10 tons per year. In order to demonstrate compliance with the proposed emission limits and ensure that HAP emissions remain below the Title V thresholds, ASO proposes additional monitoring requirements for the HTF Ullage system. Currently, the O&M Plan for the Ullage System requires that weekly VOC concentration measurements of the outlet streams from the Carbon Adsorption System be taken to assess when the carbon beds are approaching breakthrough. Due to the upset conditions, ASO has increased monitoring frequency and is currently taking daily VOC measurements.

Since the proposed emission limit for any single HAP from the HTF System increases the facility-wide PTE to 90% of the Title V threshold, ASO proposes daily monitoring of the VOC concentration of the carbon bed outlet streams while upset conditions continue. Once a significant amount of water has been removed from the HTF and it is no longer affecting the control efficiency of the Carbon Adsorption System, ASO proposes that monitoring of the carbon bed outlet streams be relaxed accordingly. ASO proposes the following requirements for monitoring emissions from the Ullage System:

> Daily monitoring of the VOC concentration of the carbon adsorption system outlet streams. If daily VOC outlet concentrations are less than 100 ppm for 14 consecutive days, then monitoring will be reduced to weekly VOC measurements. However, if VOC outlet concentrations equal or exceed 100 ppm during any of the weekly readings, daily monitoring of the carbon bed outlet stream will resume and continue until another 14 consecutive day period with VOC outlet concentration below 100 ppm passes, at which time the monitoring frequency will be reduced again to once per week.

ASO will revise the O&M Plan to reflect the proposed revisions in this notification of a non-minor permit revision. As described in Section 3.1.1.2, the maximum (breakthrough) VOC concentration in order to remain at or below 90% of the single HAP Title V threshold will be dependent on actual flow rates and venting times. Consequently, ASO proposes that the breakthrough VOC concentration be continually evaluated based on the most recent rolling 12-month total emission of HAPs (benzene).

3.0 POTENTIAL TO EMIT

This section summarizes the increase in the facility-wide potential to emit (PTE) of regulated air pollutants due to the revision of the allowable emission limits for the HTF System. Regulated pollutants include VOCs and HAPs. The increase in the facility-wide PTE of VOCs and HAPs is summarized in Table 3.1.

Table 3.1 first shows the facility-wide PTE of VOCs and HAPs as presented in the notification of a non-minor permit revision application submitted to MCAQD on February 21, 2012. Next, the table presents the correct PTE of VOCs and HAPs as calculated based on updated data for the worst-case scenarios for both single and total HAP emissions prior to the current revision of the allowable emission limits for the HTF System. Finally, the table shows the maximum emissions (PTE) calculated using actual and potential VOC and HAP emissions from the HTF System that may result from the current upset conditions at the facility. The facility-wide PTE of VOCs and HAPs presented in the February 21, 2012 application is being corrected to reflect the updated information.

Table 3.1 Increase in Facility-wide PTE of VOCs and HAPs Due to Non-Minor Modification [a]							
Process Description	**Annual Emissions (tpy)**						
	VOC	**Biphenyl**	**Benzene**	**Toluene**	**Phenol**	**Hi Boilers (Dibenzofuran)**	**Total HAPs**
PTE from Notification of a Non-Minor Permit Revision Application dated 2/21/2012							
Fuel Combustion Sources	3.16	0	6.55E-03	2.44E-03	0	0	0.0152
HTF Ullage System	2.20	7.87E-03	2.086	0.0744	0.0134	8.49E-04	2.182
HTF System Equipment Leaks	18.96	4.232	1.505	0.146	1.042	0.611	7.535
Total Annual Emissions	24.32	4.24	3.60	0.223	1.055	0.612	9.733
Corrected PTE Prior to Revision of Allowable Emission Limits for the HTF System							
Fuel Combustion Sources	3.16	0	7.00E-03	3.17E-03	0	0	0.421
HTF Ullage System	2.20	0.023	2.086	0.0744	0.0135	8.44E-04	2.182
HTF System Equipment Leaks	18.96	4.70	2.41	0.251	1.20	0.529	8.325
Total Annual Emissions	24.32	4.72	4.50	0.329	1.217	0.530	10.93
PTE using Actual and Projected Emissions from the HTF System Due to Current Upset Conditions							
Fuel Combustion Sources	3.16	0	7.00E-03	3.17E-03	0	0	0.421
HTF Ullage System	10.58	0.437	8.665	0.219	0.0347	6.37E-03	9.362
HTF System Equipment Leaks	18.96	4.92	0.229	0.0169	0.0712	0.0915	5.33
Total Annual Emissions	32.69	5.35	8.90	0.239	0.106	0.0979	15.11

[a] The increase in the facility-wide PTE of VOCs, total HAPs, and a single HAP is equal to the proposed increase of the allowable emission limits for the HTF System, shown in Table 2.1. The shaded/highlighted cells show the increase in emissions of VOCs, total HAPs, and a single HAP from the corrected PTE of the facility and the estimated maximum emissions due to the current upset conditions at the facility.

The "corrected PTE" presented in Table 3.1 reflects the worst-case scenarios for a single HAP (biphenyl) and total HAP emissions (degradation by-products) under normal operation. The worst-case single HAP emissions are based on the projected Year 1 composition of the HTF in the system. The previous worst-case scenario (presented in the Notification of a Non-Minor Permit Revision Application dated 2/21/2012) was based upon an earlier design flow rate and HAP composition. The revised analysis shows that higher HAP emissions may be produced. Worst-case total HAP emissions are based on the worst-case scenario buildup of HAP byproducts from the degradation of the HTF over time. The highest annual single HAP emissions will not occur in the same time period as the highest total HAP emissions due to degradation of the HTF.

The "corrected PTE" of single and total HAPs from the HTF System (Ullage System and equipment leaks) is based on the composition of the outlet streams from the Carbon Adsorption System and the expansion vessels obtained from most recent ASPEN engineering simulation, which was

based on worst-case degradation HAP byproduct concentrations. The outlet stream (ullage gases) from the expansion vessels provides the best estimate of the individual HAP concentrations for volatile fugitive emissions from the HTF system components. The composition of the outlet stream from the expansion vessels was adjusted based on the projected Year 1 composition of the HTF in the system to estimate worst-case single HAP (biphenyl) fugitive emissions from equipment leaks. The PTE of HAPs from fuel combustion sources was also corrected to include HAP emissions from propane combustion in the rental boiler.

The calculation methodology for calculating the potential to emit is provided in the following sections. A complete emissions inventory for facility-wide VOC and HAP emissions is provided in Appendix A.

3.1 HTF SYSTEM

Potential emissions from the HTF System include emissions from the Ullage System and fugitive emissions from equipment leaks.

3.1.1 Ullage System

The Ullage System controls ullage gases vented from the HTF expansion vessels and overflow tanks, comprised of nitrogen, HTF, and degradation byproducts, by cooling, condensing, and recovering a large portion of the HTF and degradation byproducts. The remaining gases are vented to the Carbon Adsorption System.

Potential emissions from the Ullage System were presented in the notification of a non-minor permit revision application submitted on February 21, 2012. The PTE of VOCs and HAPs were based on maximum design flows for the outlet streams from the overflow tanks and expansion vessels and HAP composition of the inlet streams to the Carbon Adsorption System obtained from engineering design simulations. The PTE of the Ullage System has been adjusted slightly using the HAP composition of outlet stream from the Carbon Adsorption System obtained from most recent ASPEN engineering simulation. Potential emissions have been calculated as described in Section 3.1.1.1.

Due to the presence of water in the HTF, the Ullage System has not been operating as designed, and consequently, actual emissions from the Ullage System are greater than anticipated. Actual emissions from commencement of operation of the Ullage System (August 13, 2013) through May 31, 2014 have been calculated as described in Section 3.1.1.2.

The presence of water in the HTF has also affected the control efficiency of the Carbon Adsorption System requiring revisions to the threshold value in the O&M plan for VOC breakthrough. In order to demonstrate that emissions of VOC and HAPs remain below the Title V thresholds, projected potential emissions from the Ullage System through October 2014 have been calculated as described in Section 3.1.1.3.

3.1.1.1 Potential Emissions

Flow rates and chemical composition of the outlet streams from the HTF recovery system were obtained from engineering simulation software used to design the HTF system, assuming worst-case degradation by-product concentrations in the HTF system.

Emissions from the HTF venting process exiting the carbon adsorption system were calculated using flow rates and the concentration of VOC in the inlet streams to the carbon adsorption system (outlet streams from the HTF recovery system) and applying an overall VOC control efficiency of 95%. The flow rates are given on lbs/min basis. Venting of the Expansion Vessels is expected to take 45 minutes per day at a maximum design flow rate of 516 lb/min. Venting of the Overflow Tanks is expected to take 20 minutes per day at a maximum design flow rate of 65 lb/min.

Annual VOC emissions are calculated based on the maximum annual expected venting of the HTF Expansion Vessels (274 hours/year) and HTF Overflow Tanks (122 hours/year).

For the February 21, 2012 application, individual HAP emissions were subsequently calculated by multiplying the total VOC emissions from the Carbon Adsorption System (based on an overall VOC control efficiency of 95%) by the individual HAP composition (percentage of total VOC) of the inlet streams to the Carbon Adsorption System, which was obtained from engineering simulation. The actual control efficiency of the carbon adsorption system for the individual HAPs will vary; however, control efficiency for the more volatile and more prevalent HAPs in the inlet stream, benzene and toluene, will be greater than 95%.

The corrected PTE of HAPs was calculated using individual HAP composition (percentage of total VOC) of the outlet stream from the carbon adsorption system, which was obtained from most recent ASPEN engineering simulation.

ASPEN simulation was based on worst-case degradation HAP byproduct concentrations estimated using HTF thermal degradation data obtained from Solutia, the HTF supplier.

3.1.1.2 Actual Emissions

Actual emissions from the Ullage System are based on venting times from the overflow tank and the expansion vessel, the maximum design flow rate for the overflow and expansion vessel tank vents (65 lb/min and 516 lb/min, respectively), the vent valve position, and measured VOC readings at the outlet of the carbon adsorption system. The venting times and vent valve position are determined by a 15 minute sampling of the vent valve.

VOC emissions were calculated using the actual vent flow rates, daily VOC concentrations, and assuming the vent vapor is composed of 50% benzene and 50% HTF (with a molecular weight of 166 lb/lbmol). Daily VOC concentrations were estimated based on the weekly measurement or last measurement taken and assuming a linear progression, as a worst-case assumption. When

the carbon beds were changed, it was assumed that the VOC concentration was reset to 0 ppm for that day.

Emissions of individual HAPs were calculated based on the VOC emission rate and the individual HAP composition of the carbon adsorption system outlet stream, which was obtained from ASPEN engineering simulation, based on worst-case degradation of the HTF, corrected based on the sample data for the composition of the HTF currently in the system. The HTF sampling results found the composition of the liquid HTF in the HTF system to be 0.2% low boilers (consisting of 45% phenol, 50% benzene, and 5% toluene) and 0.84% high boilers. The remaining portion of the HTF sample is calculated based on the initial composition of the HTF, 73.5% diphenyl ether and 26.2% biphenyl. A summary of the current and worst-case degradation compositions of the liquid HTF in the HTF System and the Carbon Adsorption System outlet stream is presented in Table 3.2.

Table 3.2 Summary of Worst-Case Degradation and Current HTF Compositions of the Liquid HTF in the System and the Carbon Adsorption System Outlet Stream

Constituent	Composition of Liquid HTF in the System (%)		Composition of Carbon Adsorption System Outlet Stream (%)	
	Worst-Case Degradation	Based on Current Sampling Data	Worst-Case Degradation	Based on Current Sampling Data
Diphenyl Ether	66.52	72.74	0.98	11.47
Biphenyl	24.6	26.22	0.36	4.14
Benzene	1.23	0.10	94.6	81.93
Toluene	0.17	0.01	3.78	2.07
Phenol	1.78	0.09	0.61	0.33
High Boliers	5.69	0.84	0.038	0.06

3.1.1.3 Projected Emissions

Projected VOC emissions from the Ullage System for the next 5 months (June 2014 – October 2014) are based on anticipated venting times from the overflow tanks and expansion vessels, the maximum design flow rate for the overflow and expansion vessel tank vents, and a constant VOC concentration of 243 ppm. A steady-state VOC concentration of 243 ppm is used in conjunction with the assumption that full venting at the designed maximum flow rates for the anticipated daily venting times of the Ullage System will occur over the next 5 months, resulting in emissions at 90% of the single HAP Title V threshold. However, based on data from the HTF Ullage System, the overflow and expansion vessel tank vents have not fully vented, on average, during the daily venting periods. Consequently, higher actual VOC concentrations will not result in exceedances of the proposed emission limits or the single HAP Title V threshold. In addition, the overflow tank VOC concentration is not the same as the VOC concentration from the expansion vessels, but emissions from both were calculated using the same value.

The Individual HAP emissions are calculated as described in Section 3.1.1.2.

3.1.2 Fugitive Emissions from Equipment Leaks

3.1.2.1 HTF System

Fugitive emissions from the HTF System components were calculated using emission factors obtained from Kern County Air Pollution Control District (APCD) Determination of Compliance Engineering Evaluation for Beacon Solar power plant. The Beacon Solar plant proposed to use the same HTF, Solutia Therminol™ VP-1. Emission factors are given in Table 3.3 on a lb/hr per unit basis.

Table 3.3 Emission Factors for Leaks from HTF System Components

Equipment Type	Emission Factor (lb/hr/source)
Valves	0.00025169
Pump Seals	0.0008448
Connectors	0.0000165
Pressure Relief Valves	0.098546

Annual VOC emissions are calculated by multiplying the emission factors by the number of sources/units in the HTF System (8,321 valves, 50 pump seals, 1,968 connectors, and 10 pressure relief valves), and assuming continuous contact of the HTF with the components in system (8,760 hours/year). Although HTF is in continuous contact with the components in the system, the various portions of the system are only pressurized for a portion of the day (16 hours/day for valves, pumps, and connectors, and 8 hours/day for pressure relief valves). Emission rates from system components during periods when the system is not pressurized will be much less than the emission rates given for the components under pressurized conditions. Consequently, the calculated fugitive emissions represent worst-case emissions from the system components, and actual emission will be much less.

For the February 21, 2012 application, individual HAP emissions were subsequently calculated by multiplying the total fugitive VOC emissions by the individual HAP composition of the outlet stream from the expansion vessels, obtained from design/engineering simulation.

The corrected PTE of single HAP (biphenyl) was calculated based on the composition of the outlet stream from the expansion vessels adjusted based on the projected Year 1 composition of the HTF in the system.

The current fugitive HAP emissions from the HTF system were calculated based on sample data for the composition of the HTF currently in the system. A summary of the current, Year 1, and worst-case degradation compositions of the liquid HTF in the HTF System and the expansion vessels outlet stream is presented in Table 3.4.

Table 3.4 Summary of Current, Year 1, and Worst-Case Degradation Compositions of the Liquid HTF in the System and the Expansion Vessels Outlet Stream

Constituent	Composition of Liquid HTF (%)			Composition of Expansion Vessel Outlet Stream (%)		
	Worst-Case Degradation	Year 1 Degradation	Current Sampling Data	Worst-Case Degradation	Year 1 Degradation	Current Sampling Data
Diphenyl Ether	66.52	71.27	72.74	56.10	67.01	71.92
Biphenyl	24.6	26.36	26.22	20.75	24.78	25.93
Benzene	1.23	0.46	0.10	12.70	5.251	1.209
Toluene	0.17	0.05	0.01	1.324	0.417	0.089
Phenol	1.78	0.45	0.09	6.349	1.767	0.376
High Boilers	5.69	1.42	0.84	2.789	0.778	0.483

3.1.2.2 Thermal Energy Storage (TES) System

Leaks of HTF will also occur within the Thermal Energy Storage (TES) System heat exchangers during charging and discharging of thermal energy. These leaks are transmitted by the salt to the TES Salt Tanks and vented from the tanks. VOC and HAP emissions due to leaks within the heat exchangers were calculated using a leak rate of 1.0e-07 (dimensionless) obtained from the manufacturer (Alfa-Laval). The leak rate specified for the heat exchangers by the vendor was based on the sensitivity of the measuring device used and provides a very conservative leak rate for the equipment.

Maximum annual VOC emissions are calculated by multiplying the flow rate of HTF within the heat exchangers (60,500 gallons per min, 3,630,000 gallons per hour) by the average density of the HTF (6.47 lb/gal), the manufacturer's leak rate, and the charging and discharging time (4,380 hours/year). Individual HAP emissions are calculated as described in Section 3.1.2.1 above.

3.2 FUEL COMBUSTION SOURCES

The only other sources of VOC and HAP emissions at the Solana Facility are the propane-fired Rental Heater and the diesel-fired engines associated with the emergency generators and fire pump. Potential to Emit of the fuel combustion sources at the facility is calculated using maximum rated capacities, hours of operation limits in the current permit, and emission factors from: (a) applicable emission standards; (b) manufacturer information; (c) the *Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources,* Fifth Edition (AP-42), U.S. EPA; and (d) reference documents.

3.2.1 Rental Boiler

The annual process rate for the Rental Boiler was calculated based on an average fuel usage rate of 50 MMBtu/hr and the hours of operation limit in the current permit of 8,760 hours.

VOC emissions were calculated using an emission factor for total organic compounds (TOC) from propane combustion given in AP-42, Section 1.5 Liquefied Petroleum Gas Combustion (07/08), Table 1.5-1. The emission factor is converted from units of lb/103 gallons to units of lb/MMBtu by assuming a propane heating value of 91.5 MMBtu/103 gal (From AP-42, Section 1.5.3.1).

Uncontrolled HAP emissions from the Rental Boiler are calculated using the emission factors from AP-42, Tables 1.4-2, 1.4-3, and 1.4-4 (07/98) for natural gas combustion. AP-42, Table 1.5-1 (07/08), footnote "a" states that emissions from propane combustion can be assumed to equal emissions from natural gas combustion on a heat input basis, when emission factors for propane combustion are not available. The emission factors are converted from units of lb/MMscf to units of lb/MMBtu by assuming a natural gas heating value of 1,020 Btu/scf.

3.2.2 Emergency Generators

The 3.1 MW Emergency Generators are used only to provide backup power to essential facilities during power failures. The annual process rates for the diesel emergency generators are based on the maximum power rating (4,376 hp) or fuel consumption rate (213.2 gallons/hour) of the engines and the combined annual hours of operation limit of 500 hours/year for both generators.

The 3.1 MW Emergency Generators include 4,376 hp diesel engines that will be certified to meet emission standards in 40 CFR 60, Subpart IIII, Table 1 or better. Therefore, VOC emissions resulting from the use of the emergency generators are calculated using the emission standards specified in Table 1 of 40 CFR 60, Subpart IIII for engines rated greater than 560 kW (750 hp).

The NSPS emission standards include a combined emission standard for NO_X and non-methane hydrocarbons (NMHC). To estimate NMHC (VOC) emissions from the new generator engines, pollutant-specific emission factor for NMHC from EPA technical report titled *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling--Compression-Ignition, NR-009d*, EPA-420-R-10-018, dated July 2010, was used. The technical report summarizes the emission factors used for EPA's NONROAD2008a emission inventory model. The NONROAD model takes into account both pre-control engines and the effect of federal emission standards. In order to develop the emission inventories, the combined Tier 2 and Tier 3 federal standards for NMHC and NO_X were split into pollutant-specific emission factors.

Emissions of HAPs are calculated using data from AP-42, Section 3.4 Large Stationary Diesel and All Stationary Duel Fuel Engines (10/96). Emission factors given in Section 3.4 of AP-42 are for calculating emissions from diesel and dual-fuel engines rated greater 600 hp.

The potential to emit of HAPs are calculated by using the emission factors from AP-42, Tables 3.4-3 and 3.4-4. The emission factors are given in units of pounds per MMBtu of fuel input. A diesel heating value of 19,300 Btu/lb and a density for diesel fuel of 7.1 lb/gal were used to convert the emission factors from units of lb/MMBtu to lb/gal.

3.2.3 Fire Pump

The annual process rate for the Clark Fire Pump is based on the maximum power rating (575 hp) or fuel consumption rate (27.7 gallons/hour) of the associated John Deere diesel-fired engine and the annual hours of operation limit for the fire pump of 500 hours/year.

The emission rate for VOCs (HCs) was provided by the manufacturer. The potential to emit of HAPs are calculated by using the emission factors from AP-42, Table 3.3-2. The emission factors are given in units of pounds per MMBtu of fuel input. The emission factors are converted from units of lb/MMBtu to lb/gal in the same manner as in section 3.2.2 for the emergency generators.

4.0 APPLICABILITY OF MCAPCR RULE 310

MCAQD rule 310 pertains to fugitive dust generating operations and the requirements for dust control plans. No new or modified processes are proposed in this permit revision. Therefore, a new dust control plan is not required.

5.0 APPLICABILITY OF MCAPCR RULE 372

MCAPR rule 372 pertains to the Maricopa County hazardous air pollutant (HAP) program and is applicable to major sources of HAPs (i.e., facilities with a potential to emit of 25 tpy or more of total HAPs or 10 tpy or more of an individual HAP). The proposed applicable emission limits for the HTF System will ensure that HAP emissions will remain below the major HAP source thresholds.

6.0 APPLICABILITY OF MCAPCR RULE 241

MCAPCR rule 241 requires application of Best Available Control Technology (BACT) to processes that emit air pollutants. Any new or modified stationary source must apply BACT if the new or modified source emits or causes an increase in emissions more than 150 lbs/day or 25 tpy of VOCs, NO_X, or SO_2; more than 85 lbs/day or 15 tpy of PM_{10}; or more than 550 lbs/day or 100 tpy of CO. No new or modified processes are proposed in this permit revision. Furthermore, a BACT analysis was previously conducted and the ullage system, which includes heat exchangers, wet scrubbers, a condensate receiver vessel, and carbon adsorption system, was determined to be BACT for the HTF tank venting process.

Appendix A EMISSION INVENTORY TABLES FOR PTE CALCULATIONS

Table A.1 VOC and HAP Emission Factors											
Process Code	Emission Source	VOC EF	HAP EFs						Units	Prod Rate Units	Reference
			Biphenyl	Benzene	Toluene	Phenol	Hi Boilers (Dibenzofuran)	Total HAPs			
Heater	HTF Heater	1.09E-02	0	2.06E-06	3.33E-06	0	0	1.85E-03	lb/MMBtu	MMBtu	AP-42, Section 1.5, Table 1.5-1; propane heating value of 91.5 MMBtu/10^3 gal; AP-42, Tables 1.4-2, 1.4-3, and 1.4-4 (07/98) and 1,020 Btu/scf
EGen	Emergency Generators	0.30							g/hp-hr	hp-hr	40 CFR 89.112, Tier 2 Standards; Pollutant-Specific Emission Standards for NOx and HC from EPA Technical Report 420-P-04-009, Exhaust and Crankcase Emission Factors for NonRoad Engine Modeling--Compression-Ignition
			0	7.76E-04	2.81E-04	0	0	1.57E-03	lb/MMBtu	MMBtu	AP-42, Tables 3.4-3 and 3.4-4 (10/96)
FirePump	Emergency Fire Pump Engine	0.10							g/hp-hr	hp-hr	Manufacturer's Data
			0	9.33E-04	4.09E-04	0	0	3.87E-03	lb/MMBtu	MMBtu	AP-42, Table 3.3-2 (10/96)
HTFExpansionApp	HTF System - Expansion Vessel Vents (from 2/21/2012 Application)	0.65978	--	--	--	--	--	--	%	lb/min	Engineering Simulation
HTFOverflowApp	HTF System - Overflow Tank Vents (from 2/21/2012 Application)	6.81344	--	--	--	--	--	--	%	lb/min	Engineering Simulation
HTFExpansionUpd	HTF System - Expansion Vessel Vents (Updated)	0.65977	--	--	--	--	--	--	%	lb/min	Most recent ASPEN engineering simulation
HTFOverfloUpd	HTF System - Overflow Tank Vents (Updated	6.81303	--	--	--	--	--	--	%	lb/min	Most recent ASPEN engineering simulation
HTFUllage	HTF Ullage System (Actual + Projected Emissions)	10.6	--	--	--	--	--	--	tons		Based on actual and project emissions calculated for the 12-month period November 2013 - October 2014 (See Table A.3)
TESHTF	TES System Vents - HTF Leaks from Heat Exchangers	1.00E-07	--	--	--	--	--	--		gal	Manufacturer's measured leak rate - dimensionless (Alfa-Laval)
HTFValve	HTF System Valves	2.52E-04	--	--	--	--	--	--	lb/hr/unit	unit-hr	Beacon Hill Solar, August 2009
HTFPump	HTF System Pump Seals	8.45E-04	--	--	--	--	--	--	lb/hr/unit	unit-hr	Beacon Hill Solar, August 2009
HTFFlange	HTF System Flanges/Connectors	1.65E-05	--	--	--	--	--	--	lb/hr/unit	unit-hr	Beacon Hill Solar, August 2009
HTFPRV	HTF System Pressure Relief Valves	9.85E-02	--	--	--	--	--	--	lb/hr/unit	unit-hr	Beacon Hill Solar, August 2009
HTFExpansionComp	HTF System - Expansion Vessel Vents (following HTF Recovery)	--	0.3761	94.623	3.297	0.6170	0.04113	98.95	%		Percentage of Total VOC obtained from design/engineering simulation: Inlet stream for Expansion Vessels to Carbon Adsorption System based on worst-case scenario buildup of HAP by products (from 2/21/2012 Application).
HTFOverflowComp	HTF System - Overflow Tank Vents (following HTF Recovery)	--	0.3236	94.635	3.514	0.5974	0.03394	99.10	%		Percentage of Total VOC obtained from design/engineering simulation: Inlet stream for Overflow Tanks to Carbon Adsorption System based on worst-case scenario buildup of HAP by products (from 2/21/2012 Application).
HTFCarbonAdsWtC	HTF System - Outlet of Carbon Adsorption System (Worst-case)	--	0.3641	94.627	3.3762	0.6103	0.03829	99.02	%		Percentage of Total VOC obtained from ASPEN engineering simulation: Outlet stream from Carbon Adsorption System based on worst-case scenario buildup of HAP by products (See Tables A.2 and A.3).
HTFCarbonAdsYr1	HTF System - Outlet of Carbon Adsorption System (Year 1)	--	1.0356	93.203	2.5310	0.4045	0.02542	97.20	%		Percentage of Total VOC obtained from ASPEN engineering simulation: Outlet stream from Carbon Adsorption System based on worst-case scenario buildup of HAP by products adjusted to reflect the projected Year 1 composition of liquid HTF in the system (See Table A.2).
HTFCarbonAdsCur	HTF System - Outlet of Carbon Adsorption System (Current)	--	4.136	81.932	2.071	0.328	0.060	88.53	%		Percentage of Total VOC obtained from ASPEN engineering simulation: Outlet stream from Carbon Adsorption System based on worst-case scenario buildup of HAP by products adjusted to reflect current composition of liquid HTF in the system (See Table A.3).
HTFSystemApp	Emissions from HTF System Components (from 2/21/2012 Application)	--	22.318	7.936	0.7727	5.495	3.221	39.74	%		Percentage of Total VOC obtained from engineering design: Outlet stream from Expansion Vessel vents (prior to HTF Recovery).
HTFSystemWtC	Emissions from HTF System Components (Worst-case)	--	20.747	12.695	1.3243	6.349	2.789	43.90	%		Percentage of Total VOC obtained from ASPEN engineering simulation: Outlet stream from Expansion Vessel vents (prior to HTF Recovery) based on worst-case scenario buildup of HAP by products (See Tables A.2 and A.3).
HTFSystemYr1	Emissions from HTF System Components (based on Year 1 liquid HTF Composition)	--	24.782	5.251	0.4169	1.767	0.7776	32.99	%		Percentage of Total VOC obtained from ASPEN engineering simulation: Outlet stream from Expansion Vessel vents (prior to HTF Recovery) based on worst-case scenario buildup of HAP by products adjusted to reflect the projected Year 1 composition of liquid HTF in the system (See Table A.2).
HTFSystemAct	Emissions from HTF System Components (based on actual liquid HTF Composition)	--	25.928	1.209	0.0894	0.3755	0.4827	28.09	%		Percentage of Total VOC obtained from ASPEN engineering simulation: Outlet stream from Expansion Vessel vents (prior to HTF Recovery) based on worst-case scenario buildup of HAP by products adjusted to reflect current composition of liquid HTF in the system (See Table A.3).

Table A.2 Composition of Outlet Streams from Expansion Vessels and Carbon Adsorption System Based on Projected Year 1 Composition of Liquid HTF in the System

Constituent	From Aspen File 5/24/2012						Based on Projected Year 1 HTF Composition					
	HTF System		Outlet Stream from Expansion Vessels (Stream 1)		Outlet Stream from Carbon Adsorption System (Stream 20)		HTF System		Fugitive Emissions Composition		Outlet Stream from Carbon Adsorption System	
	total liquid composition	% of VOC constituent	vapor composition of system	% of VOC constituent	Ullage vapor composition	% of VOC constituent	total liquid composition based on Year 1	% of VOC constituent	vapor composition of system	% of VOC constituent	ullage composition based on Year 1	% of VOC constituents
	total lbs	%	lbs/day	%	lbs/day	%	total lbs	%	total lbs	%	total lbs	%
Diphenyl Ether	17625631.00	66.52	24353.76	56.10	0.1189	0.98	18883000.00	71.27	26091.10	67.01	0.1273734	2.80
Biphenyl	6519069.00	24.60	9007.55	20.75	0.0440	0.36	6984000.00	26.36	9649.96	24.78	0.0471099	1.04
Benzene	326162.00	1.23	5511.68	12.70	11.4284	94.63	121000.00	0.46	2044.73	5.251	4.2397163	93.20
Toluene	46039.90	0.17	574.96	1.32	0.4077	3.38	13000.00	0.05	162.35	0.417	0.1151336	2.53
Phenol	472675.00	1.78	2756.28	6.35	0.0737	0.61	118000.00	0.45	688.09	1.767	0.0184001	0.40
High Blrs	1507800.00	5.69	1210.94	2.79	0.0046	0.04	377000.00	1.42	302.78	0.778	0.0011561	0.03
VOCs	26497376.90	100.00	43415.17	100.00	12.08	100.00	26496000.00	100.00	38938.99	100.00	4.5488893	100.00
HAPs			19061.41		11.96							
Nitrogen	2600.00		23290.46		24269.79		3000.00					
Total	26499976.90						26499000.00					

Table A.3 Composition of Outlet Streams from Expansion Vessels and Carbon Adsorption System Based on Current Sample Data for Liquid HTF in the System

Constituent	From Aspen File 5/24/2012						Based on Current Sampling Data					
	HTF System		Outlet Stream from Expansion Vessels (Stream 1)		Outlet Stream from Carbon Adsorption System (Stream 20)		HTF System		Fugitive Emissions Composition		Outlet Stream from Carbon Adsorption System	
	total liquid composition	% of VOC constituent	vapor composition of system	% of VOC constituent	Ullage vapor composition	% of VOC constituent	current composition based on sampling	total liquid composition based on sampling	total vapor composition	% of VOC constituent	ullage composition based on sampling	% of VOC constituents
	total lbs	%	lbs/day	%	lbs/day	%	%	total lbs	total lbs	%	total lbs	%
Diphenyl Ether	17625631.00	66.52	24353.76	56.10	0.12	0.98	72.74	19273026.07	26630.01	71.91	0.1300043	11.47
Biphenyl	6519069.00	24.60	9007.55	20.75	0.04	0.364	26.22	6948778.11	9601.29	25.93	0.0468723	4.14
Benzene	326162.00	1.23	5511.68	12.70	11.43	94.63	0.10	26497.38	447.77	1.21	0.9284410	81.93
Toluene	46039.90	0.17	574.96	1.32	0.41	3.38	0.01	2649.74	33.09	0.09	0.0234672	2.07
Phenol	472675.00	1.78	2756.28	6.35	0.07	0.61	0.09	23847.64	139.06	0.38	0.0037186	0.33
High Blrs	1507800.00	5.69	1210.94	2.79	0.00	0.04	0.84	222577.97	178.76	0.48	0.0006826	0.06
VOCs	26497376.90	100.00	43415.17		12.08	100.00			37029.97	100.00	1.1331860	100.00
HAPs			19061.41		11.96							
Nitrogen	2600.00		23290.46		24269.79							
Total	26499976.90											

Table A.4 Actual and Projected VOC Emissions from Ullage System During Upset Conditions								
Month	Year	Overflow Tanks		Expansion Vessels		Total Monthly Emissions	12-Month Rolling Total VOC Emissions	
		Venting Hours	VOC Emissions	Venting Hours	VOC Emissions			
			(lbs)		(lbs)	(lbs)	(lbs)	(tons)
Actual Emissions								
August	2013	35	15.41	16	10.81	26.22	--	--
September	2013	106	71.99	87.25	84.61	156.60	--	--
October	2013	201.25	187.82	76.75	94.64	282.46	--	--
November	2013	308.75	999.41	68	136.58	1136.00	--	--
December	2013	334.5	669.67	87.5	130.06	799.73	--	--
January	2014	139.5	310.23	50.25	84.80	395.02	--	--
February	2014	214.75	907.82	34	114.54	1022.36	--	--
March	2014	285.5	993.79	48	218.67	1212.46	--	--
April	2014	346.25	1028.28	79.5	276.4928	1304.77	--	--
May	2014	248.25	1051.99	88.75	411.12812	1463.11	--	--
Projected Emissions								
June	2014	22.5	117.1	62.8	2592.2	2709.29	--	--
July	2014	23.3	121.0	64.9	2678.6	2799.60	13307.63	6.65
August	2014	23.3	121.0	64.9	2678.6	2799.60	16081.01	8.04
September	2014	22.5	117.1	62.8	2592.2	2709.29	18633.70	9.32
October	2014	23.3	121.0	64.9	2678.6	2799.60	21150.85	10.58

Table A.5 Annual VOC and HAPs Presented in the Notification of a Non-Minor Permit Revision Dated 2/21/2012 [a]

Process Code	Process Description	Max. Capacity	Prod Rate Units	Hours of Operation	VOC Emissions			HAP Emissions												
					EF	EF Units	Annual Emissions (tpy)	EF						EF Units	Annual Emissions (tpy)					
								Biphenyl	Benzene	Toluene	Phenol	Hi Boilers (Dibenzofuran)	Total HAPs		Biphenyl	Benzene	Toluene	Phenol	Hi Boilers (Dibenzofuran)	Total HAPs
Heater	HTF Heater	50	MMBtu/hr	8760	1.09E-02	lb/MMBtu	2.39	--	--	--	--	--	0.00	lb/MMBtu	--	--	--	--	--	0.00
EGen	Emergency Generators	4423	hp	500	3.00E-01	g/hp-hr	0.73							g/hp-hr						
		213.2	gal/hr					0	7.76E-04	2.81E-04	0	0	1.57E-03	lb/MMBtu	0.00	5.67E-03	2.05E-03	0.00	0.00	0.0115
FirePump	Emergency Fire Pump Engine	575	hp	500	1.00E-01	g/hp-hr	0.0317							g/hp-hr						
		27.7	gal/hr					0	9.33E-04	4.09E-04	0	0	3.87E-03	lb/MMBtu	0.00	8.85E-04	3.88E-04	0.00	0.00	3.68E-03
Total Emission from Fuel Combustion Sources							**3.156**								**0.00**	**6.55E-03**	**2.44E-03**	**0.00**	**0.00**	**0.0152**
HTFExpansionComp	HTF System - Expansion Vessel Vents	516	lb/min	273.75	0.65978	%	1.398	0.376	94.623	3.297	0.617	0.041	98.954	%	5.26E-03	1.322	0.0461	8.62E-03	5.75E-04	1.383
HTFOverflowComp	HTF System - Overflow Tank Vents	65	lb/min	121.67	6.8134	%	0.807	0.324	94.635	3.514	0.597	0.034	99.104	%	2.61E-03	0.763	0.0283	4.82E-03	2.74E-04	0.799
Total Emission from HTF Ullage System							**2.204**								**7.87E-03**	**2.086**	**0.0744**	**0.0134**	**8.49E-04**	**2.182**
TESHTF	TES System Vents - HTF Leaks from Heat Exchanger	3,630,000	gal/hr	4380	1.00E-07		5.14	22.32	7.94	0.7727	5.495	3.221	39.742	%	1.148	0.408	0.040	0.283	0.166	2.044
HTFValve	HTF System Valves	8,321	# of Units	8760	0.0002517	lb/hr/unit	9.17	22.32	7.94	0.7727	5.495	3.221	39.742	%	2.047	0.728	0.071	0.504	0.295	3.646
HTFPump	HTF System Pump Seals	50	# of Units	8760	0.0008448	lb/hr/unit	0.185	22.32	7.94	0.7727	5.495	3.221	39.742	%	0.041	0.0147	1.43E-03	1.02E-02	5.96E-03	0.074
HTFFlange	HTF System Flanges/Connectors	1,968	# of Units	8760	0.0000165	lb/hr/unit	0.1422	22.32	7.94	0.7727	5.495	3.221	39.742	%	0.032	0.0113	1.10E-03	7.81E-03	4.58E-03	0.057
HTFPRV	HTF System Pressure Relief Valves	10	# of Units	8760	0.098546	lb/hr/unit	4.32	22.32	7.94	0.7727	5.495	3.221	39.742	%	0.963	0.3425	0.033	0.237	0.1390	1.715
Total Emission from HTF System Equipment Leaks							**18.96**								**4.232**	**1.505**	**0.146**	**1.042**	**0.611**	**7.535**
Total Annual Emissions							**24.32**								**4.239**	**3.597**	**0.223**	**1.055**	**0.612**	**9.733**

[a] The facility-wide PTE presented in the Notification of a Non-Minor Permit Revision submitted to MCAQD on February 21, 2012 are trhe most recent PTE values presented to MCAQD and are the basis for the allowable emission limits in the current permit.

Table A.6 Annual VOC and HAP Emissions Under Worst-Case Scenario for Single HAP Emissions [a]

Process Code	Process Description	Max. Capacity	Prod Rate Units	Hours of Operation	VOC Emissions			HAP Emissions												
								EF						EF Units	Annual Emissions (tpy)					
					EF	EF Units	Annual Emissions (tpy)	Biphenyl	Benzene	Toluene	Phenol	Hi Boilers (Dibenzofuran)	Total HAPs		Biphenyl	Benzene	Toluene	Phenol	Hi Boilers (Dibenzofuran)	Total HAPs
Heater	HTF Heater	50	MMBtu/hr	8760	1.09E-02	lb/MMBtu	2.39	0	2.06E-06	3.33E-06	0	0	1.85E-03	lb/MMBtu	0.00	4.51E-04	7.30E-04	0.00	0.00	0.405
EGen	Emergency Generators	4423	hp	500	3.00E-01	g/hp-hr	0.73													
		213.2	gal/hr					0	7.76E-04	2.81E-04	0	0	1.57E-03	lb/MMBtu	0.00	5.67E-03	2.05E-03	0.00	0.00	0.0115
FirePump	Emergency Fire Pump Engine	575	hp	500	1.00E-01	g/hp-hr	0.0317													
		27.7	gal/hr					0	9.33E-04	4.09E-04	0	0	3.87E-03	lb/MMBtu	0.00	8.85E-04	3.88E-04	0.00	0.00	3.68E-03
Total Emission from Fuel Combustion Sources							**3.156**								**0.000**	**7.00E-03**	**3.17E-03**	**0.00**	**0.00**	**0.421**
HTFCarbonAdsYr1	HTF System - Expansion Vessel Vents	516	lb/min	273.75	0.6598	%	1.398	1.036	93.203	2.531	0.404	0.025	97.200	%	0.014	1.303	0.035	0.006	3.55E-04	1.358
HTFCarbonAdsYr1	HTF System - Overflow Tank Vents	65	lb/min	121.67	6.8130	%	0.806	1.036	93.203	2.531	0.404	0.025	97.200	%	0.008	0.752	0.020	0.003	2.05E-04	0.784
Total Emission from HTF Ullage System							**2.204**								**0.023**	**2.054**	**0.056**	**8.92E-03**	**5.60E-04**	**2.142**
TESHTF	TES System Vents - HTF Leaks from Heat Exchanger	3,630,000	gal/hr	4380	1.00E-07		5.14	24.78	5.251	0.417	1.767	0.778	32.995	%	1.275	0.270	0.021	0.091	0.040	1.697
HTFValve	HTF System Valves	8,321	# of Units	8760	0.0002517	lb/hr/unit	9.17	24.78	5.251	0.417	1.767	0.778	32.995	%	2.273	0.482	0.038	0.162	0.071	3.027
HTFPump	HTF System Pump Seals	50	# of Units	8760	0.0008448	lb/hr/unit	0.185	24.78	5.251	0.417	1.767	0.778	32.995	%	0.046	0.0097	0.0008	0.0033	0.0014	0.061
HTFFlange	HTF System Flanges/Connectors	1,968	# of Units	8760	0.0000165	lb/hr/unit	0.1422	24.78	5.251	0.417	1.767	0.778	32.995	%	0.035	0.0075	0.0006	0.0025	0.0011	0.047
HTFPRV	HTF System Pressure Relief Valves	10	# of Units	8760	0.098546	lb/hr/unit	4.32	24.78	5.251	0.417	1.767	0.778	32.995	%	1.070	0.2267	0.0180	0.0763	0.0336	1.424
Total Emission from HTF System Equipment Leaks							**18.96**								**4.70**	**0.996**	**0.079**	**0.335**	**0.147**	**6.26**
Total Annual Emissions							**24.32**								**4.72**	**3.06**	**0.138**	**0.344**	**0.148**	**8.82**

[a] The worst-case single HAP (biphenyl) emissions are based on the projected Year 1 composition of the HTF in the system, prior to buildup of degradation byproducts (benzene, toluene, phenol, and high boilers). Biphenyl is more prevalant in fugitive emissions from equipment leaks, which are a significant portion of the total VOC and HAP emissions from the HTF system, than emissions from the Ullage System.

Table A.7 Annual VOC and HAP Emissions Under Worst-Case Scenario for Total HAP Emissions [a]

Process Code	Process Description	Max. Capacity	Prod Rate Units	Hours of Operation	VOC Emissions			HAP Emissions												
								EF						EF Units	Annual Emissions (tpy)					
					EF	EF Units	Annual Emissions (tpy)	Biphenyl	Benzene	Toluene	Phenol	Hi Boilers (Dibenzofuran)	Total HAPs		Biphenyl	Benzene	Toluene	Phenol	Hi Boilers (Dibenzofuran)	Total HAPs
Heater	HTF Heater	50	MMBtu/hr	8760	1.09E-02	lb/MMBtu	2.39	0	2.06E-06	3.33E-06	0	0	1.85E-03	lb/MMBtu	0.00	4.51E-04	7.30E-04	0.00	0.00	0.405
EGen	Emergency Generators	4423	hp	500	3.00E-01	g/hp-hr	0.73							g/hp-hr						
		213.2	gal/hr					0	7.76E-04	2.81E-04	0	0	1.57E-03	lb/MMBtu	0.00	5.67E-03	2.05E-03	0.00	0.00	0.0115
FirePump	Emergency Fire Pump Engine	575	hp	500	1.00E-01	g/hp-hr	0.0317							g/hp-hr						
		27.7	gal/hr					0	9.33E-04	4.09E-04	0	0	3.87E-03	lb/MMBtu	0.00	8.85E-04	3.88E-04	0.00	0.00	3.68E-03
Total Emission from Fuel Combustion Sources							**3.156**								**0.00**	**7.00E-03**	**3.17E-03**	**0.00**	**0.00**	**0.4206**
HTFCarbonAdsWtC	HTF System - Expansion Vessel Vents	516	lb/min	273.75	0.6598	%	1.398	0.364	94.627	3.376	0.610	0.038	99.016	%	5.09E-03	1.322	0.047	8.53E-03	5.35E-04	1.384
HTFCarbonAdsWtC	HTF System - Overflow Tank Vents	65	lb/min	121.67	6.8130	%	0.806	0.364	94.627	3.376	0.610	0.038	99.016	%	2.94E-03	0.763	0.027	4.92E-03	3.09E-04	0.799
Total Emission from HTF Ullage System							**2.204**								**0.008**	**2.086**	**0.0744**	**0.0135**	**8.44E-04**	**2.182**
TESHTF	TES System Vents - HTF Leaks from Heat Exchanger	3,630,000	gal/hr	4380	1.00E-07		5.14	20.75	12.70	1.3243	6.349	2.789	43.905	%	1.067	0.653	0.068	0.327	0.143	2.258
HTFValve	HTF System Valves	8,321	# of Units	8760	0.0002517	lb/hr/unit	9.17	20.75	12.70	1.3243	6.349	2.789	43.905	%	1.903	1.165	0.121	0.582	0.256	4.028
HTFPump	HTF System Pump Seals	50	# of Units	8760	0.0008448	lb/hr/unit	0.185	20.75	12.70	1.3243	6.349	2.789	43.905	%	0.038	0.0235	0.0025	0.0117	0.0052	0.081
HTFFlange	HTF System Flanges/Connectors	1,968	# of Units	8760	0.0000165	lb/hr/unit	0.1422	20.75	12.70	1.3243	6.349	2.789	43.905	%	0.030	0.0181	0.0019	0.0090	0.0040	0.062
HTFPRV	HTF System Pressure Relief Valves	10	# of Units	8760	0.098546	lb/hr/unit	4.32	20.75	12.70	1.3243	6.349	2.789	43.905	%	0.896	0.5480	0.0572	0.2740	0.1204	1.895
Total Emission from HTF System Equipment Leaks							**18.96**								**3.934**	**2.407**	**0.251**	**1.204**	**0.529**	**8.325**
Total Annual Emissions							**24.32**								**3.94**	**4.50**	**0.329**	**1.217**	**0.530**	**10.93**

[a] The worst-case total HAP emissionws are based on the worst-case scenario buildup of HAP byproducts (benzene, toluene, phenol, and high boilers) from the degradation of the HTF that occurs over time.

Table A.8 Maximum Annual VOC and HAP Emissions (Actual and Projected Emissions) During Upset Conditions [a]

Process Code	Process Description	Max. Capacity	Prod Rate Units	Hours of Operation	VOC Emissions			HAP Emissions											
					EF	EF Units	Annual Emissions [b]	EF						EF Units	Annual Emissions (tpy)				
								Biphenyl	Benzene	Toluene	Phenol	Hi Boilers (Dibenzofuran)	Total HAPs		Biphenyl	Benzene	Toluene	Phenol	Hi Boilers (Dibenzofuran)	Total HAPs
Heater	HTF Heater	50	MMBtu/hr	8760	1.09E-02	lb/MMBtu	2.39	0	2.06E-06	3.33E-06	0	0	1.85E-03	lb/MMBtu	0.00	4.51E-04	7.30E-04	0.00	0.00	0.405
EGen	Emergency Generators	4423	hp	500	3.00E-01	g/hp-hr	0.73							g/hp-hr						
		213.2	gal/hr					0	7.76E-04	2.81E-04	0	0	1.57E-03	lb/MMBtu	0.00	5.67E-03	2.05E-03	0.00	0.00	0.0115
FirePump	Emergency Fire Pump Engine	575	hp	500	1.00E-01	g/hp-hr	0.0317							g/hp-hr						
		27.7	gal/hr					0	9.33E-04	4.09E-04	0	0	3.87E-03	lb/MMBtu	0.00	8.85E-04	3.88E-04	0.00	0.00	3.68E-03
Total Emission from Fuel Combustion Sources							**3.156**								**0.00**	**7.00E-03**	**3.17E-03**	**0.00**	**0.00**	**0.421**
HTFUllage	HTF System - Expansion Vessel Vents	516	lb/min	273.75	--	--	10.58	4.136	81.932	2.071	0.328	0.060	88.528	%	0.437	8.665	0.219	0.0347	0.00637	9.362
	HTF System - Overflow Tank Vents	65	lb/min	121.67	--	--														
Total Emission from HTF Ullage System							**10.58**								**0.437**	**8.665**	**0.219**	**0.0347**	**0.00637**	**9.362**
TESHTF	TES System Vents - HTF Leaks from Heat Exchanger	3,630,000	gal/hr	4380	1.00E-07		5.14	25.93	1.209	0.089	0.376	0.483	28.085	%	1.334	0.062	0.005	0.019	0.025	1.445
HTFValve	HTF System Valves	8,321	# of Units	8760	0.0002517	lb/hr/unit	9.17	25.93	1.209	0.089	0.376	0.483	28.085	%	2.379	0.111	0.008	0.034	0.044	2.576
HTFPump	HTF System Pump Seals	50	# of Units	8760	0.0008448	lb/hr/unit	0.185	25.93	1.209	0.089	0.376	0.483	28.085	%	0.048	0.0022	0.0002	0.0007	0.0009	0.052
HTFFlange	HTF System Flanges/Connectors	1,968	# of Units	8760	0.0000165	lb/hr/unit	0.1422	25.93	1.209	0.089	0.376	0.483	28.085	%	0.037	0.0017	0.0001	0.0005	0.0007	0.040
HTFPRV	HTF System Pressure Relief Valves	10	# of Units	8760	0.098546	lb/hr/unit	4.32	25.93	1.209	0.089	0.376	0.483	28.085	%	1.119	0.0522	0.0039	0.0162	0.0208	1.212
Total Emission from HTF System Equipment Leaks							**18.96**								**4.92**	**0.229**	**0.0169**	**0.0712**	**0.0915**	**5.33**
Total Annual Emissions							**32.69**								**5.35**	**8.90**	**0.239**	**0.1059**	**0.0979**	**15.11**

[a] Maximum facility-wide emissions calculated using the actual and potential VOC and HAPs emissions from the HTF System that may result from to the current upset conditions at the facility.
[b] See Table A.4 for the maximum annual actual and projected VOC emissions (November 2013 and October 2014).