

Data Adequacy Supplement

Attachment B

Water Resources

Report of Waste Discharge



APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT



I. FACILITY INFORMATION

A. Facility:

Name: MOJAVE SOLAR PROJECT			
Address: INTERSECTION OF HARPER LAKE ROAD AND LOCKHART RANCH ROAD			
City: UNINCORPORATED COUNTY	County: SBD	State: CA	Zip Code: 92347
Contact Person: EMILIANO GARCIA		Telephone Number: (760) 962-9200	

B. Facility Owner:

Name: MOJAVE SOLAR LLC			Owner Type (Check One) 1. <input type="checkbox"/> Individual 2. <input checked="" type="checkbox"/> Corporation 3. <input type="checkbox"/> Governmental Agency 4. <input type="checkbox"/> Partnership 5. <input type="checkbox"/> Other: _____	
Address: 13911 PARK AVENUE, SUITE 206				
City: VICTORVILLE	State: CA	Zip Code: 92392-2407		
Contact Person: EMILIANO GARCIA		Telephone Number: (760) 962-9200	Federal Tax ID: 87-0786696	

C. Facility Operator (The agency or business, not the person):

Name: MOJAVE SOLAR LLC			Operator Type (Check One) 1. <input type="checkbox"/> Individual 2. <input checked="" type="checkbox"/> Corporation 3. <input type="checkbox"/> Governmental Agency 4. <input type="checkbox"/> Partnership 5. <input type="checkbox"/> Other: _____	
Address: 13911 PARK AVENUE, SUITE 206				
City: VICTORVILLE	State: CA	Zip Code: 92392-2407		
Contact Person: EMILIANO GARCIA		Telephone Number: (760) 962-9200		

D. Owner of the Land:

Name: MOJAVE SOLAR LLC			Owner Type (Check One) 1. <input type="checkbox"/> Individual 2. <input checked="" type="checkbox"/> Corporation 3. <input type="checkbox"/> Governmental Agency 4. <input type="checkbox"/> Partnership 5. <input type="checkbox"/> Other: _____	
Address: 13911 PARK AVENUE, SUITE 206				
City: VICTORVILLE	State: CA	Zip Code: 92392-2407		
Contact Person: EMILIANO GARCIA		Telephone Number: (760) 962-9200		

E. Address Where Legal Notice May Be Served:

Address: 13911 PARK AVENUE, SUITE 206		
City: VICTORVILLE	State: CA	Zip Code: 92392-2407
Contact Person: EMILIANO GARCIA		Telephone Number: (760) 962-9200

F. Billing Address:

Address: 13911 PARK AVENUE, SUITE 206		
City: VICTORVILLE	State: CA	Zip Code: 92392-2407
Contact Person: EMILIANO GARCIA		Telephone Number: (760) 962-9200



APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT



II. TYPE OF DISCHARGE

Check Type of Discharge(s) Described in this Application (A or B):

[X] A. WASTE DISCHARGE TO LAND

[] B. WASTE DISCHARGE TO SURFACE WATER

Check all that apply:

- Domestic/Municipal Wastewater Treatment and Disposal
Cooling Water
Mining
Waste Pile
Wastewater Reclamation
Other, please describe:

- Animal Waste Solids
Land Treatment Unit
Dredge Material Disposal
Surface Impoundment
Industrial Process Wastewater

- Animal or Aquacultural Wastewater
Biosolids/Residual
Hazardous Waste (see instructions)
Landfill (see instructions)
Storm Water

III. LOCATION OF THE FACILITY

Describe the physical location of the facility.

1. Assessor's Parcel Number(s)
Facility: See Attached List
Discharge Point: See Attached List

2. Latitude
Facility: See Attached List
Discharge Point: See Attached

3. Longitude
Facility: See Attached List
Discharge Point: See Attached

IV. REASON FOR FILING

- New Discharge or Facility
Change in Design or Operation
Change in Quantity/Type of Discharge
Changes in Ownership/Operator (see instructions)
Waste Discharge Requirements Update or NPDES Permit Reissuance
Other:

V. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

Name of Lead Agency: CALIFORNIA ENERGY COMMISSION
Has a public agency determined that the proposed project is exempt from CEQA?
Basis for Exemption/Agency:
Has a "Notice of Determination" been filed under CEQA?
Expected CEQA Documents:
Expected CEQA Completion Date: OCTOBER 2010



APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT



VI. OTHER REQUIRED INFORMATION

Please provide a COMPLETE characterization of your discharge. A complete characterization includes, but is not limited to, design and actual flows, a list of constituents and the discharge concentration of each constituent, a list of other appropriate waste discharge characteristics, a description and schematic drawing of all treatment processes, a description of any Best Management Practices (BMPs) used, and a description of disposal methods.

Also include a site map showing the location of the facility and, if you are submitting this application for an NPDES permit, identify the surface water to which you propose to discharge. Please try to limit your maps to a scale of 1:24,000 (7.5' USGS Quadrangle) or a street map, if more appropriate.

VII. OTHER

Attach additional sheets to explain any responses which need clarification. List attachments with titles and dates below:

Figure 1-1 Regional Map Figure 1-2 Vicinity Map Figure 1-3 Site Map Figure 2-3(c) Project Site Map Detail B

Water Treatment - AFC Section 2 4 4 4 to 2 4 4 6 Plant Water Balance Surface Impoundment Waste Stream

Latitude / Longitude List List of Assessor Parcel Numbers (APN's) Appendix I - MSDS - Heat Transfer Fluid

You will be notified by a representative of the RWQCB within 30 days of receipt of your application. The notice will state if your application is complete or if there is additional information you must submit to complete your Application/Report of Waste Discharge, pursuant to Division 7, Section 13260 of the California Water Code.

VIII. CERTIFICATION

"I certify under penalty of law that this document, including all attachments and supplemental information, were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Print Name: _____

Title: _____

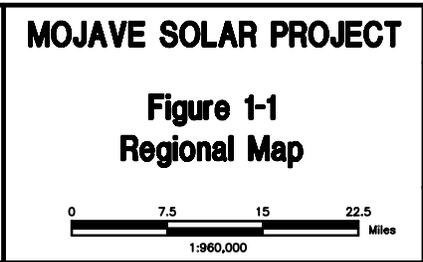
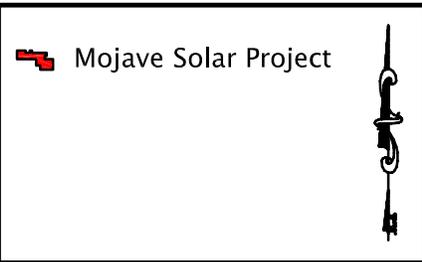
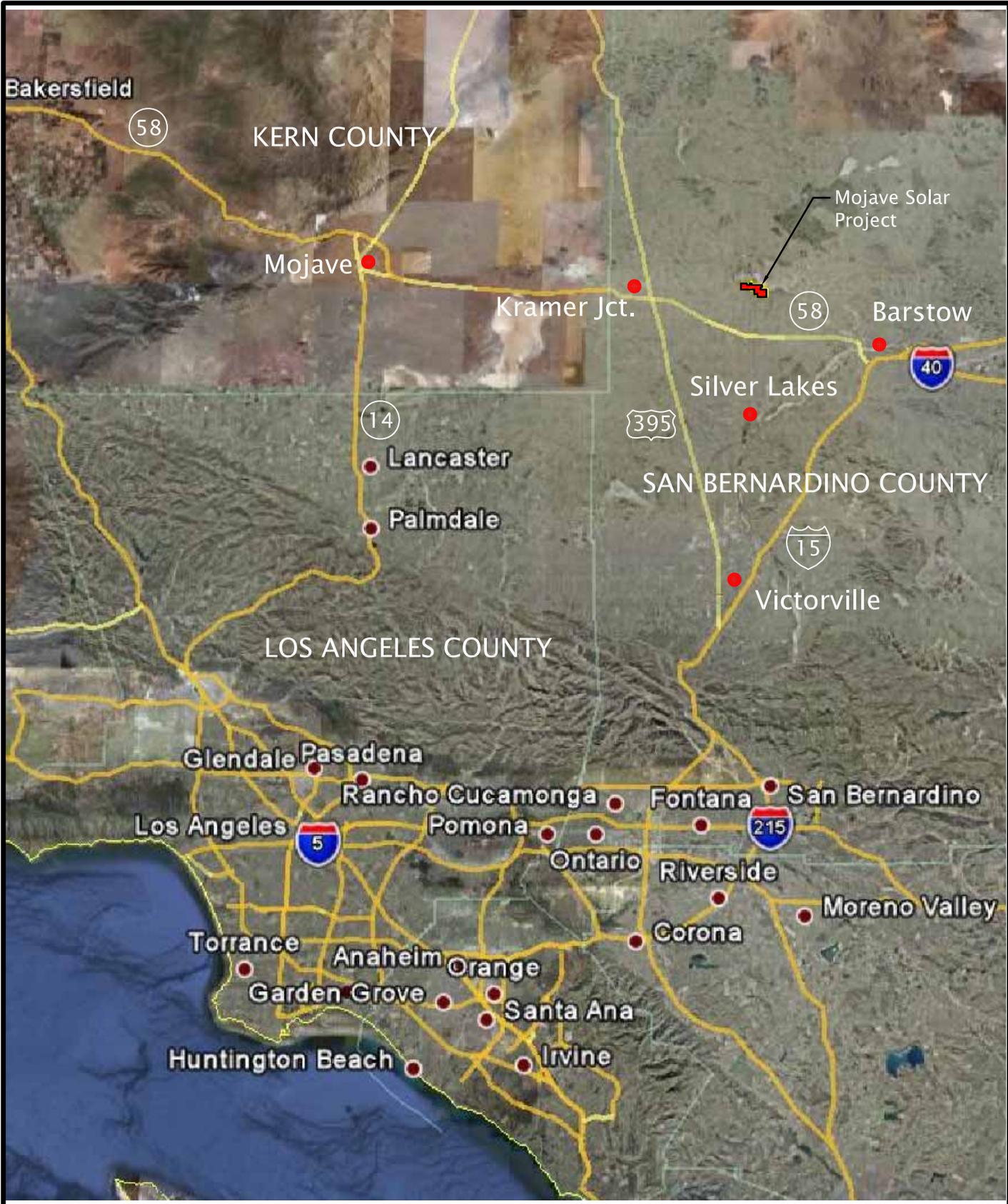
Signature: _____

Date: _____

FOR OFFICE USE ONLY

Table with 4 columns: Date Form 200 Received, Letter to Discharger, Fee Amount Received, Check #

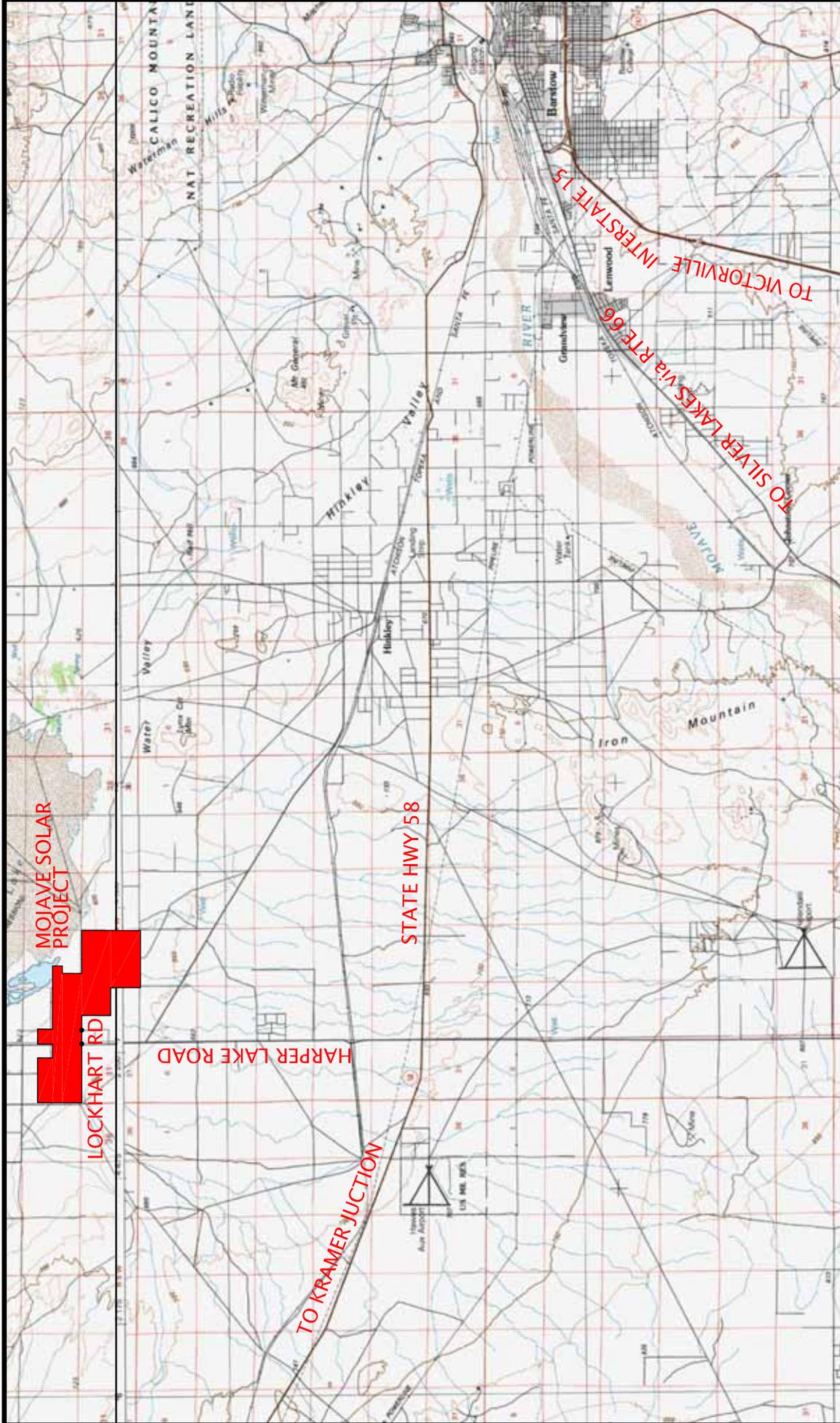
jcumming 11:47am 16 July 2009 P:\3001-4 Harper Lake CEC\1.0-Figure 1-1.dwg - Figure 1-1 Regional and Vicinity - Figure 1-1.dwg - Merrell-Johnson Engineering, Inc.



MOJAVE SOLAR LLC

Merrell-Johnson Engineering, Inc.

PROJECT:
DATE: 07-16-2009



MOJAVE SOLAR PROJECT

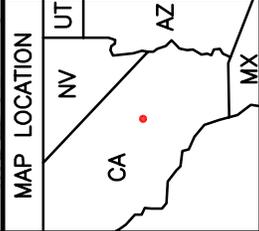
LOCKHART RD

HARPER LAKE ROAD

STATE HWY 58

TO KRAMER JUCTION

TO SILVER LAKES VIA RTE 66
TO VICTORVILLE
INTERSTATE 15



Legend

Plant Site Boundary



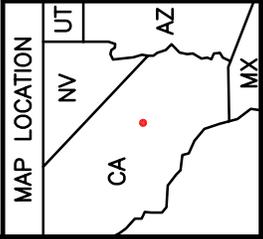
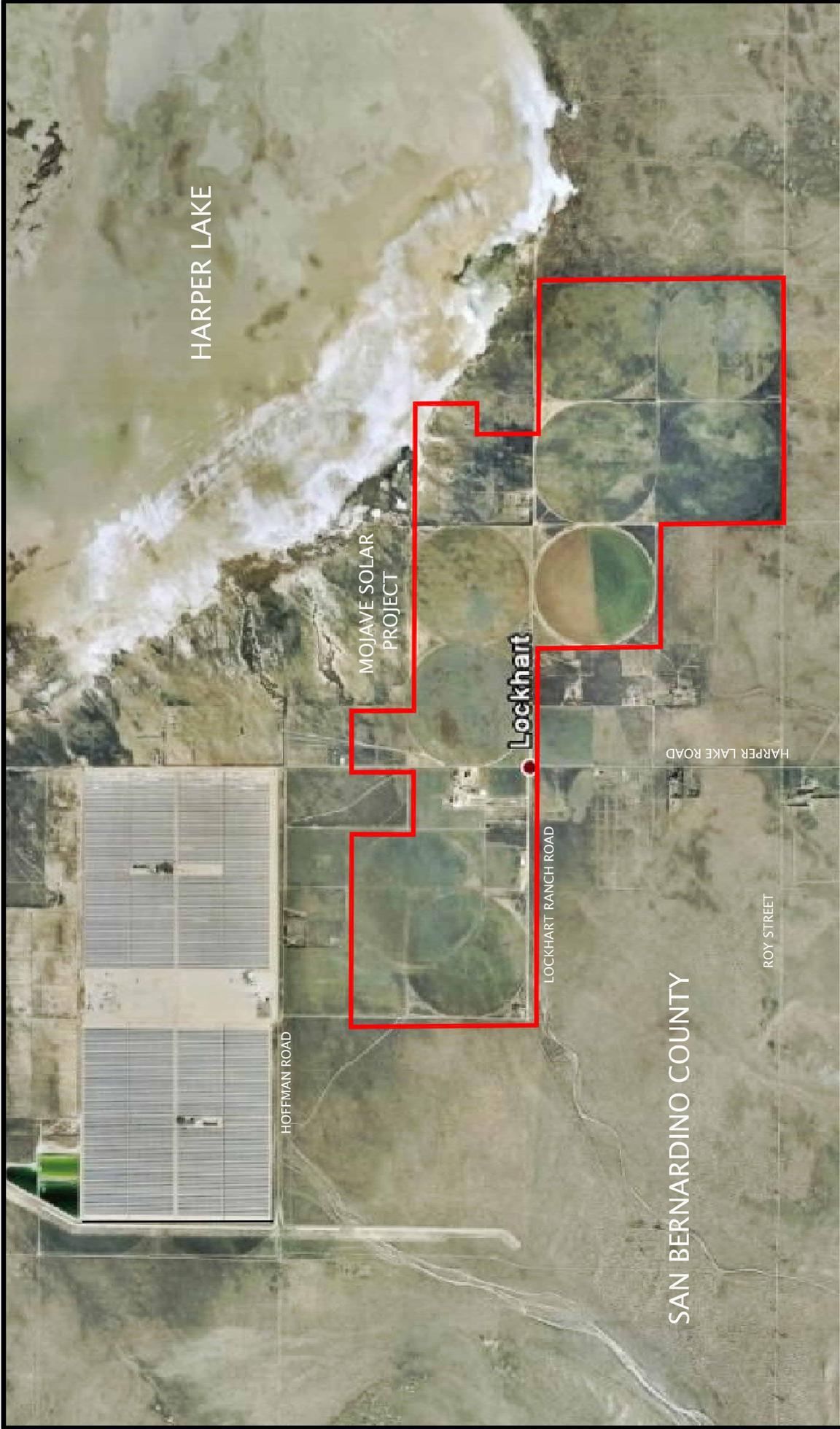
MOJAVE SOLAR PROJECT

**Figure 1-2
Vicinity Map**

MOJAVE SOLAR LLC

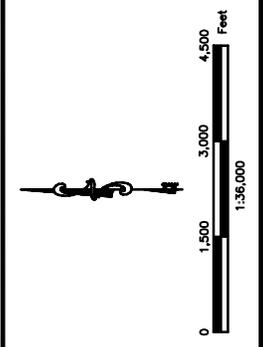


PROJECT:
DATE: 07-16-2009



Legend

Plant Site Boundary



MOJAVE SOLAR PROJECT

Figure 1-3

Site Map

MOJAVE SOLAR LLC

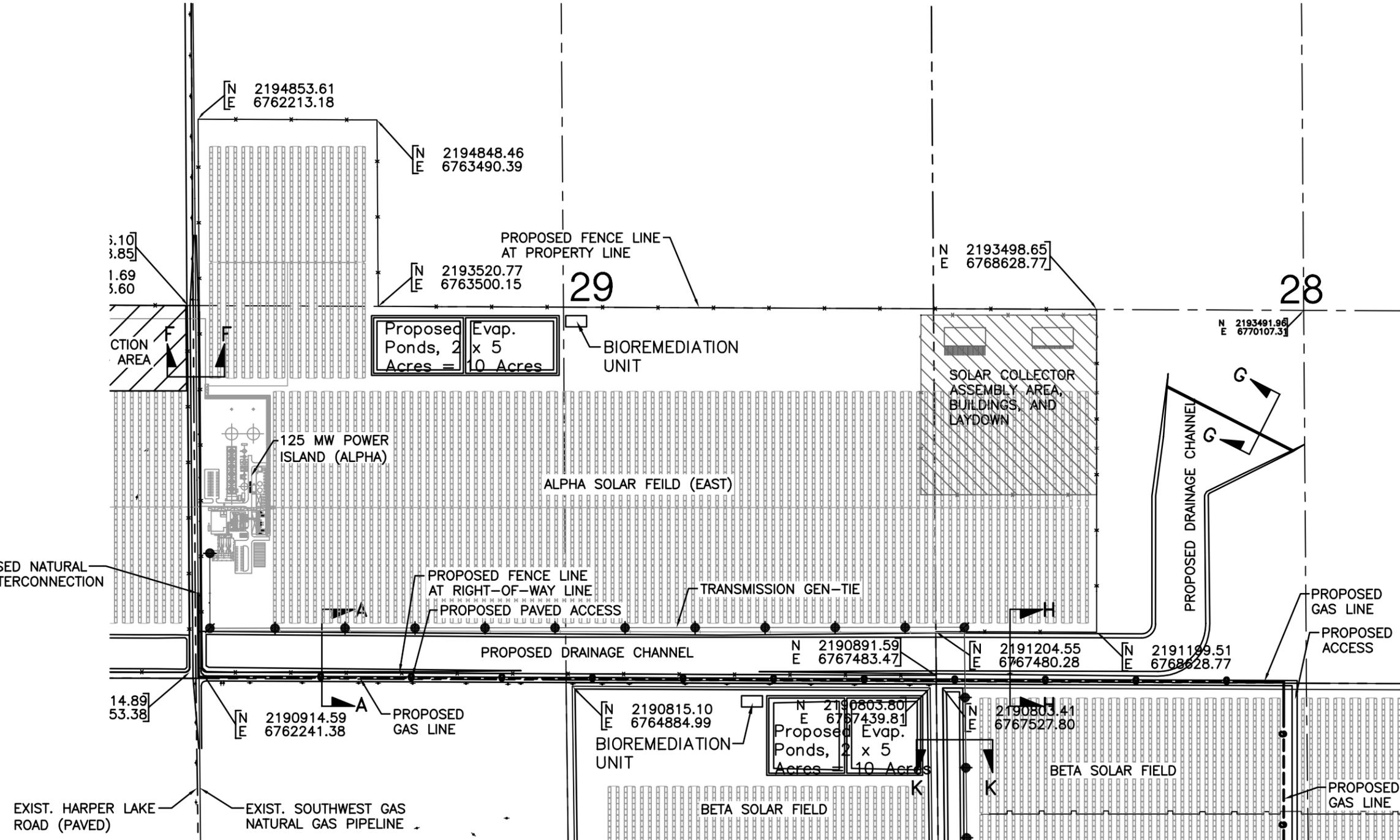


Merrell-Johnson Engineering, Inc.

PROJECT:

DATE: 07-16-2009

Summing 11:28am 21 July 2009 PA_3001-4_Harper Lake GEO PROJECT SITE MAP.dwg - General environment_Alpha East Merrell-Johnson Engineering, Inc.



MOJAVE SOLAR PROJECT
Figure 2-3(c)
PROJECT SITE MAP
DETAIL B

0 400' 800' 1200'
 SCALE: 1" = 800'

MOJAVE SOLAR LLC

 Merrell-Johnson
 Engineering, Inc.

PROJECT:
 DATE: 07/21/09

Table 2-3. Water Quality Data in the Project Area

Parameter	Result ¹
Chloride (Cl)	580-690 milligrams/liter (mg/l)
Total Dissolved Solids (TDS)	1500-1700 parts per million (ppm)

¹ Concentrations based on testing data gathered during a 7-day pumping test and over the months of August to November 2008. Sample well is an existing agricultural well located near the center of the Project area and constructed to a depth similar to that expected for supplying water to the Project.

2.4.4.4 Water Treatment

The design (summer peak) and annual average water balance diagram is presented in Figure 2-8, Water Balance Diagram and shows the proposed power plant's various water uses and water treatment processes. The raw water, circulating water, process water, and SCA washing water all require onsite treatment and this treatment varies according to the quality required for each of these uses.

Groundwater

The groundwater will be pumped to the raw water storage tank and a biocide (sodium hypochlorite) is used to treat the water. When transferred to the service water tank the water is again treated with the biocide if needed. This water is used directly in the cooling tower as make-up water.

To conserve water, the lower TDS reverse osmosis (RO) reject streams will be recycled back to the Service Water storage tank for reuse in the cooling tower. Additionally, a clear well will be used and when the discharge exceeds the treatment system demand, the clear well discharge will be released to the cooling tower to further conserve water.

Circulating Water Treatment

In order to reduce overall water consumption and sizing of evaporation ponds, service water will first be used as makeup to the cooling tower and circulating water system. Water conditioning chemicals may be fed into the makeup water to minimize corrosion and to inhibit mineral scale formation and biofouling. Sulfuric acid will be fed into the circulating water system for alkalinity reduction in order to control the mineral scaling tendency of the circulating water. The sulfuric acid will be fed in an amount required to maintain a pH setpoint in the circulating water makeup flow. The sulfuric acid feed equipment will include a bulk storage tank and two full-capacity metering pumps.

To further inhibit mineral scale formation, an organic phosphate inhibitor solution may be fed into the circulating water system in an amount proportional to the circulating water blowdown flow. The inhibitor solution feed equipment will include a bulk storage tank and two full-capacity metering pumps. To inhibit biofouling, sodium hypochlorite will be

shock-fed into the circulating water system as a biocide. The sodium hypochlorite feed equipment will include a bulk storage tank and two full capacity metering pumps.

The blowdown from the circulating water/cooling tower system will be continually treated by lime-softening clarification (clarifier) and filtration processes, and then delivered to a clearwell. A portion of this stream will then be further treated for various plant uses that require higher purity water, such as SCA cleaning and steam system makeup. This will be a demand-based usage, where any excess flow out of the clearwell is simply recycled back to the cooling tower for further use in the circulating water system. The clarifier will use lime (calcium hydroxide) and soda ash (sodium carbonate) to precipitate hardness and alkalinity from the cooling tower blowdown water. Each of these systems will include a bulk dry storage bin, slurry makeup tank, and two full capacity delivery pumps. The clarifier also will use magnesium hydroxide slurry, a coagulant (ferric chloride), and a flocculent polymer to aid in settling/removing suspended solids in the clarification process. Each of these chemicals will include a bulk storage tank and two full capacity metering pumps.

The clarifier solids will be further concentrated in a thickener. The overflow or clear water from the Thickener will be recycled as makeup to the cooling tower. The thickener solids stream will then be delivered to a mechanical filter press, where remaining water will be removed, again for reuse in the cooling tower. The solid waste discharge from the filter press will be trucked to an appropriate land fill as described in Section 5.16, Waste Management. This process will allow for an efficient use of the water while reducing the capital and operating expense of other processes. This process reduces the metals content in the water prior to use elsewhere in the system along with extracting these prior to discharge in the evaporation ponds.

The overflow water from the clarifier will be delivered to the clarified water tank, and then pumped through a set of pressure filters. The pressure filters contain typical standard sand and anthracite granular media, and will remove the small amount of solids that carry over from the clarifier. The pressure filters will be backwashed periodically to remove accumulated solids. This backwash water will be recycled back to the clarifier for treatment, so that there is no net waste stream from the pressure filters. The pressure filter product stream will then be directed to the clear well tank.

Following the clear well, the water will be treated by the Cooling Tower Reverse Osmosis (CTRO) system, in order to be utilized for other plant requirements. As pre-treatment to the CTRO process, ion-exchange-type softeners will be utilized to remove any dissolved hardness minerals that remain after the clarifier. The softeners will be periodically regenerated using a salt (sodium chloride) solution. The waste from the softeners will be separated so that backwash and rinse water from the softeners will be recycled back to the clarifier for reuse and the brine stream will be delivered to the evaporation ponds.

The product stream from the CTRO is delivered to the RO surge tank. The flow out of the clear well and through the CTRO is demand-based, so that any excess clear well water will be recycled back to the cooling tower for further use. This format will minimize water usage of the Plant.

The CTRO utilizes several stages of reverse osmosis (RO) treatment to remove most of the mineral content of the water. The reject stream from the CTRO process will be brackish

water; and this will be discharged to the evaporation ponds. The CTRO process is designed to minimize the amount of waste water sent to the Ponds.

The RO surge tank water is withdrawn as required, for further treatment and ultimately for use in SCA washing and steam cycle makeup.

Solar Collector Array Washing Water

To facilitate dust and contaminant removal, partially deionized (demineralized) water will be used to clean the SCAs on a periodic basis, determined by the reflectivity monitoring program and other maintenance considerations. Washing the SCA maintains the mirror surface, the HCE, and other components clean and free to operate normally. This operation is generally completed at night and involves a water truck spraying deionized water on the SCAs in a drive-by fashion. The deionized water production facilities, already in place for SSG makeup water, will be sized to accommodate the additional SCA washing demand of about 60 gallons per minute (average) for each Plant site as shown on the water balance diagrams. Water from the SCA washing operation is expected to evaporate on the SCA with minimal water applied to the ground. No site runoff or recharge is anticipated from this process.

The RO surge tank water is further treated with another stage of RO to obtain water with very low mineral content. The product water from this RO stage will be stored in a surge tank, and will then be withdrawn only as needed for SCA cleaning, and for further treatment for steam cycle makeup.

The reject stream from the SCA cleaning RO treatment is recycled back to the raw water tank, where it will be used to supplement groundwater for cooling tower makeup. This method results in no waste stream from the SCA cleaning RO treatment.

Steam Cycle Process Water

Makeup water for the steam cycle must meet ASME Boiler Code for silica and dissolved solids. To meet these specifications, water will be processed through a demineralized water system. This system is anticipated to consist of multiple unit operations, concluding with mixed-bed demineralizers. Water produced by this system will only be used for makeup to the steam cycle.

The demineralized water treatment will consist of a final stage of RO treatment and mixed-bed ion-exchange polishers. The reject stream from the RO treatment is recycled back to the RO surge tank, resulting in no net waste stream. The mixed-bed ion-exchange units are designed for regeneration off-site, and also have no waste stream associated with this process.

Additional conditioning of the condensate and feedwater circulating in the steam cycle will be provided by means of a chemical feed system. To minimize corrosion, an oxygen scavenger for dissolved oxygen control and an alkaline solution for pH control are fed into the condensate. To minimize scale formation in the SSG, a solution of disodium phosphate (DSP) and trisodium phosphate (TSP) may be fed into each feedwater system. The chemical feed systems will include an oxygen scavenger feed tank, an alkaline solution (amine) feed tank, and a phosphate solution feed tank. The feed tanks will be provided with two full-capacity metering pumps.

A steam cycle sampling and analysis system will monitor the water quality at various points in the plant's steam cycle. The water quality data will be used to guide adjustments in water treatment processes and to determine the need for other corrective operational or maintenance measures. Steam and water samples are routed to a sample panel where steam samples are condensed and the pressure and temperature of all samples are reduced as necessary. The samples are then directed to automatic analyzers for continuous monitoring of conductivity and pH. All monitored values are indicated at the sample panel and critical values will be transmitted to the plant control room. Grab samples will be periodically obtained at the sample panel for chemical analyses that provide information on a range of water quality parameters.

Wastewater

The water balance diagram shows the wastewater streams and the disposition of wastewater (water treatment system effluent) discharging to evaporation ponds. As discussed previously, the cooling tower blowdown will be processed with various processes, including clarification and reverse osmosis, prior to reuse to make SCA washing and steam system makeup water. The reject water will be ultimately discharged to evaporation ponds for final dewatering. The residual solids will remain in the pond for the duration of the plant life, as is discussed below in Section 2.4.4.6.

Wastewater sources include the following:

- Reverse Osmosis/Demineralizer system wastewater, and
- General plant drains from the oil water separator.

2.4.4.5 Cooling Systems

Each of the power islands include two cooling systems; 1) the steam cycle heat rejection system (e.g., cooling tower) and, 2) the closed cooling water system (equipment cooling), each of which is discussed in this section.

Steam Cycle Heat Rejection System

The cooling system for heat rejection from the steam cycle consists of a surface condenser, circulating water system, and a wet cooling tower. The surface condenser receives exhaust steam from the low pressure section of the STG and condenses it to liquid for return to the SSG. The surface condenser is a shell-and-tube heat exchanger with wet, saturated steam condensing on the shell side and circulating water flowing through the tubes to provide cooling. The warmed circulating water exits the condenser and flows to the cooling tower to be cooled and reused.

The circulating water is distributed among multiple cells of the counter-flow cooling towers, where it cascades downward through each cell fill and then collects in the cooling tower basin. The mechanical draft cooling tower employs electric motor-driven fans to move air upward through each cooling tower cell fill. The cascading circulating water is partially evaporated, and the evaporated water is dispersed into the atmosphere as part of the moist air leaving each cooling tower cell. As discussed in Section 5.15, Visual Resources, because of climatic conditions at the site, visible moisture plumes are expected

to occur relatively infrequently and mainly in winter months; therefore, no need is expected for a plume-abated cooling tower.

The circulating water is cooled primarily through partial evaporation, and secondarily through heat transfer with the air. The cooled circulating water is pumped from the cooling tower basin back to the surface condenser and auxiliary cooling water system.

Closed Cooling Water System

The closed cooling water system uses water from the cooling tower for the purpose of cooling equipment including the STG lubrication oil cooler, the STG generator cooler, steam cycle sample coolers, large pumps, etc. The water picks up heat from the various equipment items being cooled and rejects the heat to the cooling tower through a closed loop heat exchanger.

2.4.4.6 Waste Generation and Management

Project wastes include industrial wastewater, sanitary wastewater, non-hazardous solid waste, hazardous solid waste, and hazardous liquid waste. Project waste streams and management details are discussed in Section 5.16, Waste Management and Section 5.17, Water Resources.

Evaporation Ponds for Industrial Wastewater

It is expected that each Plant site will have two double-lined evaporation ponds with a nominal surface area of five acres each for a total of ten acres per site or twenty acres for the entire Project. The ponds will be designed in accordance with Lahontan Regional Water Quality Control Board (RWQCB) requirements. Multiple ponds are planned to allow plant operations to continue in event that a pond needs to be taken out of service for some reason, e.g., needed maintenance. Each pond will have enough surface area so that the evaporation rate exceeds the cooling tower blowdown rate at maximum design conditions and at annual average conditions. Pond depth will be selected so that the ponds will not need to have residual solids removed during the life of the plant.

The pond liner system is expected to consist of a 60 mil high density polyethylene (HDPE) inner liner and a 50 mil HDPE outer liner. Between the liners is a synthetic drainage net that is used as part of the leachate collection and removal system (LCRS). Monitoring of the evaporation ponds will be required to detect the presence of liquid and/or constituents of concern. The LCRS will be monitored and a series of monitoring wells will also be used for the evaporation ponds. Based on the power plant process, chemicals used, and water quality, it is expected that the constituents of concern for this monitoring will include chloride, sodium, sulfate, TDS, biphenyl, diphenyl oxide, potassium, selenium, chromium and phosphate. The proposed detection monitoring program for the facility consists of monitoring the LCRS, lysimeters, and monitoring wells for the presence of liquid and/or constituents of concern.

Septic System for Sanitary Wastewater

The Project's sanitary system will collect wastewater from sanitary facilities such as sinks and toilets. This waste stream will be sent to onsite sanitary waste septic systems located at each power island.

On-Site Bioremediation/Land Farm System

The Project will include bioremediation/land farm units to treat soil contaminated with HTF in the event of a leak or spill. The proposed bioremediation and land farm facilities will cover an area of approximately 1.5 acres on each plant site. Appropriate contamination level for bioremediation and land farming of site-specific soils will be determined by Lahontan-approved testing to ensure the adequacy of the bioremediation/land farm unit design for HTF-contaminated soil. Contaminated soil that exceeds this level will be disposed of at an appropriate waste facility.

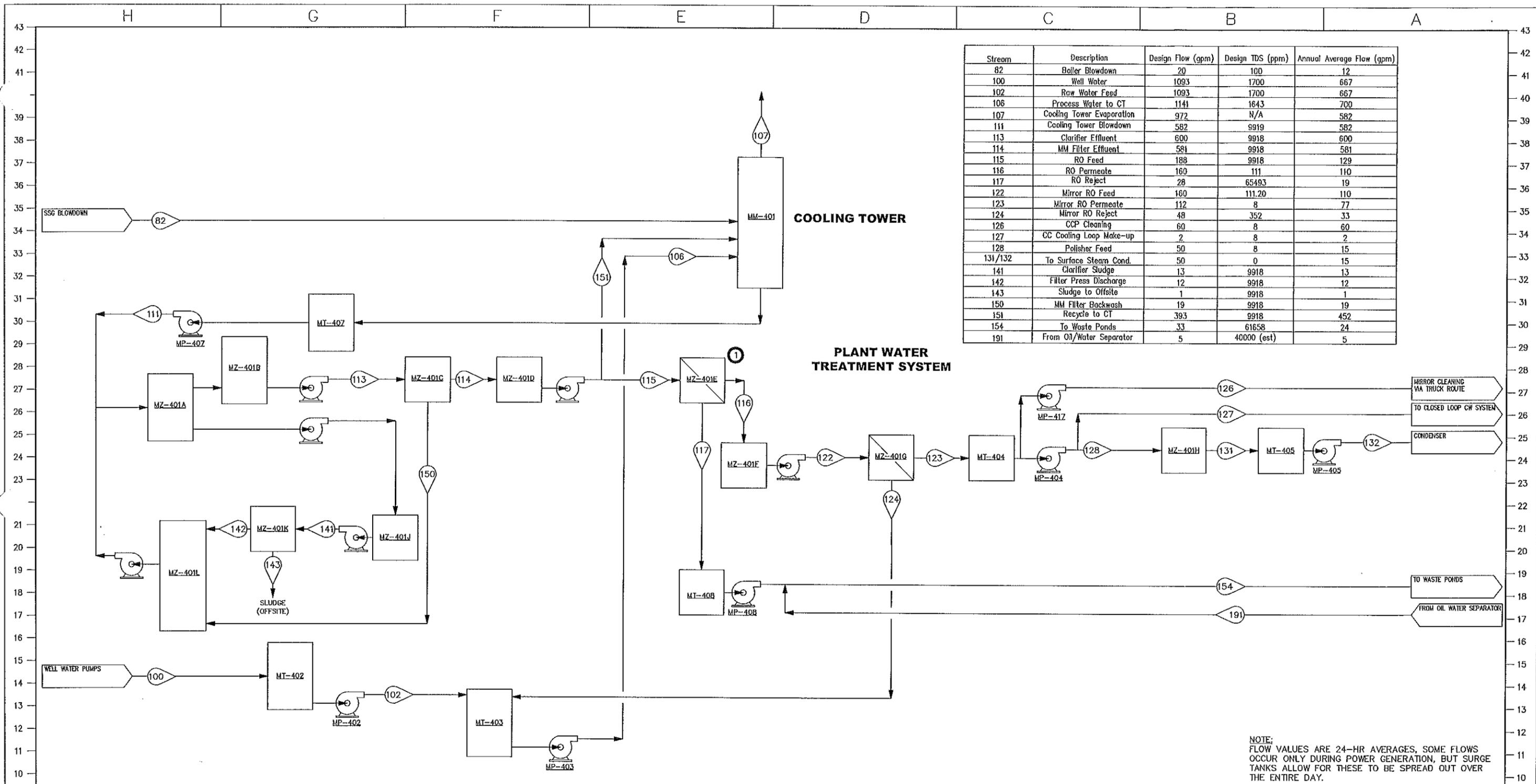
The bioremediation/land farm area will be designed in accordance with Lahontan RWQCB requirements and will include a leak detection system and monitoring wells. Treatment in the bioremediation unit involves the addition of nitrogen and phosphorous (i.e., fertilizers) as nutrients to the HTF-contaminated soil to stimulate consumption of HTF by the indigenous bacteria. The soil will remain in the bioremediation/land farm unit until concentrations are reduced to appropriate levels for use as fill material on the site.

Other Non-Hazardous Solid Waste

Construction, operation and maintenance of the Project will generate non-hazardous solid wastes typical of power generation or other industrial facilities (see Section 5.16, Waste Management). These wastes include scrap metal and plastic, insulation material, paper, glass, empty containers, and other miscellaneous solid wastes. These materials will be disposed of by means of contracted refuse collection and recycling services.

Hazardous Solid and Liquid Waste

Small quantities of hazardous wastes will be generated during Project construction and operation. Hazardous wastes generated during the construction phase include substances such as paint and primer, thinners, and solvents. Hazardous solid and liquid waste streams generated during Project operations include substances such as used HTF, used hydraulic fluids, oils, greases, filters, etc., as well as spent cleaning solutions and spent batteries. To the extent possible, both construction and operation-phase hazardous wastes will be recycled. Tables 5.16-5, Summary of Construction Waste Streams and Management Methods, and 5.16-6, Summary of Operation Waste Streams and Management Methods in Section 5.16, Waste Management summarize Project hazardous waste streams in terms of quantities, origin and composition, and management method(s).



Stream	Description	Design Flow (gpm)	Design TDS (ppm)	Annual Average Flow (gpm)
82	Boiler Blowdown	20	100	12
100	Well Water	1093	1700	667
102	Raw Water Feed	1093	1700	667
106	Process Water to CT	1141	1643	700
107	Cooling Tower Evaporation	972	N/A	582
111	Cooling Tower Blowdown	582	9919	582
113	Clarifier Effluent	600	9918	600
114	MM Filter Effluent	581	9918	581
115	RO Feed	188	9918	129
116	RO Permeate	160	111	110
117	RO Reject	28	65493	19
122	Mirror RO Feed	160	111.20	110
123	Mirror RO Permeate	112	8	77
124	Mirror RO Reject	48	352	33
126	CCP Cleaning	60	8	60
127	CC Cooling Loop Make-up	2	8	2
128	Polisher Feed	50	8	15
131/132	To Surface Steam Cond.	50	0	15
141	Clarifier Sludge	13	9918	13
142	Filter Press Discharge	12	9918	12
143	Sludge to Offsite	1	9918	1
150	MM Filter Backwash	19	9918	19
151	Recycle to CT	393	9918	452
154	To Waste Ponds	33	61658	24
191	From Oil/Water Separator	5	40000 (est)	5

NOTE:
FLOW VALUES ARE 24-HR AVERAGES, SOME FLOWS OCCUR ONLY DURING POWER GENERATION, BUT SURGE TANKS ALLOW FOR THESE TO BE SPREAD OUT OVER THE ENTIRE DAY.

- MZ-401A CLARIFIER
- MZ-401K FILTER PRESS
- MZ-401J SLUDGE TANK
- MZ-401L BACKWASH TANK
- MZ-401B RECARB TANK
- MZ-401C MULTA MEDIA FILTERS
- MZ-401D CLEAR WELL
- MZ-401E PRIMARY RO
- MT-408 REVERSE OSMOSIS REJECT TANK
- MP-408 PUMP TO WASTE PONDS
- MZ-401F RO SURGE TANK
- MZ-401G MIRROR RO
- MT-404 RO WATER TANK
- MP-404 RO WATER PUMPS
- MT-402 RAW WATER TANK
- MP-407 COOLING TOWER BLOWDOWN TANK PUMP
- MT-407 COOLING TOWER BLOWDOWN TANK
- MT-403 PROCESS/FIRE WATER TANK
- MP-403 PROCESS WATER PUMP
- MP-417 RO WATER MIRROR CLEANING PUMPS
- MZ-401H DEMINERALIZING POLISHERS
- MP-405 POLISHED WATER PUMP
- MP-402 RAW WATER TANK PUMPS
- MM-401 COOLING TOWER (6 CELLS)
- MT-405 POLISHED WATER TANK

REVISIONS				REFERENCES			
NO.	DATE	DESCRIPTION	BY	NO.	DATE	DESCRIPTION	BY

THIS DRAWING IS THE PROPERTY OF
ABENCS
Abener Engineering and Construction Services, LLC
INFORMATION AND PROVISIONS HEREON ARE CONFIDENTIAL AND PROPRIETARY AND MAY NOT BE USED, REPRODUCED, OR REVEALED TO OTHERS EXCEPT IN ACCORDANCE WITH THE TERMS OF A CONTRACT WITH OR OTHER WRITTEN PERMISSION OF Abener Engineering and Construction Services, LLC. ANY REPRODUCTION IN WHOLE OR PART INCLUDING SHOP DRAWINGS SHALL BEAR OR REFER TO THIS STAMP.

FOR REVIEW

ISSUE DATE: _____ PURPOSE OF ISSUE: _____

ABENCS
Abener Engineering and Construction Services, LLC
ST. LOUIS, MISSOURI

MOJAVE SOLAR PROJECT

ABENER DRAWING NUMBER
FIGURE 2-8

WATER BALANCE PER PLANT

HARPER LAKE, CA

BY	DATE	APP'D.	DATE	JOB NO.	REVISION
				120010	
				DRAWING NO.	
				MD-F002	1

WET COOLING OPTION

7/1/2009



	IX Softener Regeneration Waste (Brine and SR), as CaCO3 (NOTE 1)	CT RO Concentrator Reject, as CaCO3	RO CIP Waste, as CaCO3 (NOTE 2)	Oil Water Separator, as CaCO3 (NOTE 3)	Total Liquid Waste To Evap Ponds, as CaCO3	Total Liquid Waste To Evap Ponds, as ION	
AVERAGE Flow Rate GPM	0.552	14.2	0	0	14.75	14.75	
AVERAGE Flow Rate GPD	794.88	20448	0	0	21242.88	21242.88	
Calcium	8182.90	1.83	0.00	0.00	307.95	123.18	Calcium
Magnesium	7013.00	1.81	0.00	0.00	264.16	64.12	Magnesium
Sodium	39169.61	70076.01	0.00	0.00	68919.53	31614.47	Sodium
Potassium	7.42	458.20	0.00	0.00	441.33	344.79	Potassium
Ammonia	0.00	0.00	0.00	0.00	0.00	0.00	Ammonia
Barium	0.00	0.000	0.00	0.00	0.00	0.00	Barium
Strontium	0.00	0.00	0.00	0.00	0.00	0.00	Strontium
Zinc	0.00	0.00	0.00	0.00	0.00	0.00	Zinc
Aluminum	0.00	0.00	0.00	0.00	0.00	0.00	Aluminum
Iron	0.00	0.00	0.00	0.00	0.00	0.00	Iron
Manganese	0.00	0.00	0.00	0.00	0.00	0.00	Manganese
Selenium (NOTE 4)	0.0000	0.2616	0.0000	0.0000		0.2518	Selenium (NOTE 4)
Chromium (NOTE 5)	0.0000	0.2371	0.0000	0.0000		0.2282	Chromium (NOTE 5)
Total Cation	54372.93	70538.35	0.00	0.00	69932.98	32147.03	
Hydroxide	0.00	40.00	0.00	0.00	38.50	13.10	Hydroxide
Carbonate	0.17	312.97	0.00	0.00	301.27	180.40	Carbonate
Bicarbonate	0.31	0.07	0.00	0.00	0.08	0.10	Bicarbonate
Sulfate	9.02	22494.76	0.00	0.00	21653.38	20820.55	Sulfate
Chloride	54448.05	47050.54	0.00	0.00	47327.34	33565.49	Chloride ***
Fluoride	0.03	8.99	0.00	0.00	8.66	3.25	Fluoride
Nitrate	7.50	460.24	0.00	0.00	443.30	547.29	Nitrate
Phosphate	0.00	0.00	0.00	0.00	0.00	0.00	Phosphate
Total Anion	54465.07	70367.58	0.00	0.00	69772.53	55130.18	
Arsenic Total	0.00	0.00	0.00	0.00	0.00	0.00	Arsenic Total
Carbon Dioxide	0.00	0.00	0.00	0.00	0.00	0.00	Carbon Dioxide
Silica	0.69	182.87	0.00	0.00	176.05	212.11	Silica
TDS						87489.32	TDS
pH	9.60	10.80	7.35	7.35	10.70	10.70	pH

- NOTES:**
1. CT RO Product Water is utilized for brine dilution. Softener backwash and final rinse volumes are recycled back to inlet of Clarifier.
 2. CIP Waste not defined. Chemicals can include HCl, NaOH, surfactants, citric acid, ammonia, fluorides, and others. Alternatively, waste can be collected and hauled off site separately.
 3. Oil/Water Separator waste not defined. It is assumed that underflow is recycled to inlet of Clarifier. Waste can include raw water, oils, grease, and other items. Alternatively, waste can be collected and hauled off site separately.
 4. Selenium form present is yet to be determined. Selenium will exit treatment system either as RO Reject to Evaporation Ponds, or as Clarifier Sludge as shown above. The above table Selenium value assumes that 0% of the raw water Selenium is removed in the Clarifier and Filter processes and 100% is sent to the Evaporation Ponds in the RO Reject stream. This is the maximum possible contribution to the Ponds. Selenium reported as ion (Se) only.
 5. Chromium form present is yet to be determined. Chromium will exit treatment system either as RO Reject to Evaporation Ponds, or as Clarifier Sludge as shown above. The above table Chromium value assumes that 0% of the raw water Chromium is removed in the Clarifier and Filter processes and 100% is sent to the Evaporation Ponds in the RO Reject stream. This is the maximum possible contribution to the Ponds. Chromium reported as ion (Cr) only.

REPORT OF WASTE DISCHARGE

MOJAVE SOLAR PROJECT

HARPER DRY LAKE, CA

ASSESSOR PARCEL NUMBERS & LATITUDE / LONGITUDE LOCATIONS

Mojave Solar Project – Assessor Parcel No.'s

0490-131-06
0490-131-07
0490-131-08
0490-131-11
0490-131-12
0490-131-13
0490-131-15
0490-131-16

0490-161-08
0490-161-09
0490-161-10
0490-161-11
0490-161-12
0490-161-13

0490-121-42
0490-171-09

Mojave Solar Project – Latitude & Longitude Locations

Alpha Plant Entrance: 35.0144669° N
 117.3304366° W

Alpha Discharge Location: 35.0174321° N
 117.3235780° W

Beta Plant Entrance: 35.0106055° N
 117.3125377° W

Beta Discharge Location: 35.0097093° N
 117.3149632° W

Appendix L

Therminol® VP1 MSDS

<h1>Solutia Inc.</h1> <h2>Material Safety Data Sheet</h2>
--

1. PRODUCT AND COMPANY IDENTIFICATION

Product name: THERMINOL® VP1 Heat transfer fluid

Reference Number: 00000000211 Date: 05/16/2006

Company Information:

United States:

Solutia Inc.
575 Maryville Center Drive, P.O. Box 66760
St. Louis, MO 63166-6760
Emergency telephone: Chemtrec: 1-800-424-9300
International Emergency telephone: Chemtrec: 703-527-3887
Non-Emergency telephone: 1-314-674-6661

Canada:

Solutia Canada Inc.
6800 St. Patrick Street
LaSalle, PQ H8N 2H3
Emergency telephone: CANUTEC: 1-613-996-6666
Non-Emergency telephone: 1-314-674-6661

Mexico:

Solutia MEXICO, S. DE R.L. DE C.V.
Prol. Paseo de la Reforma 2654
Local 501, Piso-5
Col. Lomas Altas
11950 Mexico, D.F.
Emergency telephone: SETIQ: (in Mexico) 01-800-002-1400
Non-Emergency telephone: (in Mexico) 01-55-5259-6800

Brazil:

Solutia Brazil Ltd.
Avenue Carlos Marcondes, 1200
CEP: 12241-420-São José dos Campos/SP-Brazil
Emergency telephone: 55 12 3932 7100 (PABX)
Non-Emergency telephone: 55 11 3365 1800 (PABX)

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Form:	liquid
Colour:	clear to colourless
Odour:	characteristic

WARNING STATEMENTS

WARNING!
Causes eye irritation
Causes skin irritation
Causes respiratory tract irritation
Contains material which can cause liver and nerve damage

POTENTIAL HEALTH EFFECTS

Likely routes of exposure: eye and skin contact
inhalation

Eye contact: Highly irritating to eyes.

Skin contact: Highly irritating to skin.
Prolonged or repeated skin contact may result in irritant dermatitis.

Inhalation: Severely irritating if inhaled.
No more than slightly toxic if inhaled.
Significant adverse health effects are not expected to develop under normal conditions of exposure.

Ingestion: No more than slightly toxic if swallowed.
Significant adverse health effects are not expected to develop if only small amounts (less than a mouthful) are swallowed.

Signs and symptoms of overexposure: headache
fatigue
nausea/vomiting
indigestion
abdominal pain
tremors

Target organs/systems: May cause liver damage
May cause nerve damage

Refer to Section 11 for toxicological information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

<u>Components</u>	<u>CAS No.</u>	<u>Average concentration</u>	<u>Concentration range</u>	<u>Units</u>
diphenyl ether	101-84-8	73.5		%
biphenyl	92-52-4	26.5		%

4. FIRST AID MEASURES

If in eyes: Immediately flush with plenty of water for at least 15 minutes.
If easy to do, remove any contact lenses.
Get medical attention.
Remove material from skin and clothing.

If on skin: Immediately flush the area with plenty of water.
Remove contaminated clothing.
Wash skin gently with soap as soon as it is available.
Get medical attention.
Wash clothing before reuse.

If inhaled: Remove patient to fresh air.
If not breathing, give artificial respiration.
If breathing is difficult give oxygen.
Remove material from eyes, skin and clothing.

If swallowed: Immediate first aid is not likely to be required.
A physician or Poison Control Center can be contacted for advice.
Wash heavily contaminated clothing before reuse.

5. FIRE FIGHTING MEASURES

Fire point: 127 C

Hazardous products of combustion: carbon monoxide (CO); carbon dioxide; hydrocarbons

Extinguishing media: Water spray, foam, dry chemical, or carbon dioxide

Unusual fire and explosion hazards: None known

Fire fighting equipment: Firefighters, and others exposed, wear self-contained breathing apparatus.
Equipment should be thoroughly decontaminated after use.

Miscellaneous advice: This product is not classified as a fire-resistant heat transfer fluid.
Precautions to avoid sources of ignitions should be taken.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Use personal protection recommended in section 8.

Environmental precautions: Keep out of drains and water courses.

Methods for cleaning up: Contain large spills with dikes and transfer the material to appropriate containers for reclamation or disposal. Absorb remaining material or small spills with an inert material and then place in a chemical waste container. Flush spill area with water.

Refer to Section 13 for disposal information and Sections 14 and 15 for reportable quantity information.

7. HANDLING AND STORAGE

Handling

Avoid contact with eyes, skin and clothing.
Avoid breathing vapour or mist.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
Precautions against ignitions and fire should be taken with this product.
Heat transfer fluids are intended for INDIRECT heating purposes ONLY.
This product has not been approved for food grade use.

Emptied containers retain vapour and product residue. Observe all recommended safety precautions until container is cleaned, reconditioned or destroyed. Do not cut, drill, grind or weld on or near this container. The reuse of this material's container for non industrial purposes is prohibited and any reuse must be in consideration of the data provided in this material safety data sheet.

Storage

General: Stable under normal conditions of handling and storage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Airborne exposure limits: (ml/m³ = ppm)

THERMINOL® VP1 No specific occupational exposure limit has been established.

biphenyl ACGIH TLV: 0.2 ml/m³ ; mist ; 8-hr TWA
OSHA PEL: 0.2 ml/m³ ; 1.0 mg/m³ ; ; 8-hr TWA
Mexican OEL: 0.2 ml/m³ ; 1.5 mg/m³ ; ; 8-hr TWA
Mexican OEL: 0.6 ml/m³ ; 4 mg/m³ ; ; 15-min STEL

diphenyl ether ACGIH TLV: 1 ml/m³ ; ; 8-hr TWA
ACGIH TLV: 2 ml/m³ ; ; 15-min STEL
OSHA PEL: 1 ml/m³ ; 7 mg/m³ ; ; 8-hr TWA
Mexican OEL: 1 ml/m³ ; 7 mg/m³ ; ; 8-hr TWA
Mexican OEL: 2 ml/m³ ; 14 mg/m³ ; ; 15-min STEL

Eye protection: Wear safety goggles.
Have eye flushing equipment available.

Hand protection: Wear chemical resistant gloves.
Consult the glove/clothing manufacturer to determine the appropriate type
glove/clothing for a given application.
See Solutia Glove Facts for permeation data.

Body protection: Wear suitable protective clothing.
Consult the glove/clothing manufacturer to determine the appropriate type
glove/clothing for a given application.
Wear full protective clothing if exposed to splashes.
Wash contaminated skin promptly.
Launder contaminated clothing and clean protective equipment before reuse.
Wash thoroughly after handling.
Have safety shower available at locations where skin contact can occur.

Respiratory protection: Avoid breathing vapour or mist.
Use approved respiratory protection equipment (full facepiece recommended) when
airborne exposure limits are exceeded.
If used, full facepiece replaces the need for face shield and/or chemical goggles.
Consult the respirator manufacturer to determine the appropriate type of equipment for
a given application.
Observe respirator use limitations specified by the manufacturer.

Ventilation: Provide natural or mechanical ventilation to control exposure levels below airborne
exposure limits.
If practical, use local mechanical exhaust ventilation at sources of air contamination
such as processing equipment.

Components referred to herein may be regulated by specific Canadian provincial legislation. Please refer to exposure
limits legislated for the province in which the substance will be used.

9. PHYSICAL AND CHEMICAL PROPERTIES

Flash point: 110 C Pensky-Martens closed tester
124 C Cleveland Open Cup

Autoignition temperature: 612 C ASTM D-2155
Density: 1.06 g/cm³ @ 25 C
Boiling point : 257 C
Crystallising point : 12 C
Water solubility: ~25 mg/l

NOTE: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

10. STABILITY AND REACTIVITY

Conditions to avoid: All sources of ignition.
Materials to avoid: Contact with strong oxidizing agents.
Hazardous reactions: Hazardous polymerization does not occur.
Hazardous decomposition products: None known;

11. TOXICOLOGICAL INFORMATION

This product has been tested for toxicity. Results from Solutia sponsored studies or from the available public literature are described below.

Acute animal toxicity data

Oral: LD50 , rat, 2,050 mg/kg , No more than slightly toxic
Dermal: LD50 , rabbit, > 5,010 mg/kg , Practically nontoxic after skin application in animal studies.
Inhalation: LC50 , rat, 2.66 mg/l , 4 h, Toxic based on animal inhalation exposure studies.
Skin irritation: rabbit , Slightly irritating to skin., 24 h
Repeat dose toxicity: rat, , inhalation, 13 weeks, , Produced effects on body weight, serum enzymes and/or organ weights in repeat dose studies.
Repeat dose toxicity: rat, , gavage, 26 weeks, , Produced effects on body weight, serum enzymes and/or organ weights in repeat dose studies. Effects only observed at very high dose levels.
Target organs affected: kidneys, liver, spleen
Repeat dose toxicity: rat, , diet, subchronic, , Repeated oral exposure produced liver and kidney changes in animal models.
Target organs affected: liver, kidneys
Developmental toxicity: rat, gavage, , No effects on offspring observed in laboratory animals in the presence of maternal toxicity.

Mutagenicity: No genetic effects were observed in standard tests using bacterial and animal cells.

Components

Data from Solutia studies and/or the available scientific literature on the components of this material which have been identified as hazardous chemicals under the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200) or the Canadian Hazardous Products Act are discussed below.

biphenyl Chronic exposure has been reported to cause headache, fatigue, nausea, indigestion, abdominal pain, tremor, central and peripheral nerve damage and liver injury.
Slightly toxic following oral administration.
Practically nontoxic after skin application in animal studies.
Practically non irritating to skin (rabbit).
Slightly irritating to eyes (rabbit).
No mortality or signs of toxicity at the highest level achievable.
Irritating to respiratory system in animal models.
Produced effects on body weight, serum enzymes and/or organ weights in repeat dose studies.
Produced no dermal sensitization (guinea pigs).
No effects on offspring observed in laboratory animals in the presence of maternal toxicity.
No genetic effects were observed in standard tests using bacterial and animal cells.

diphenyl ether Predictive patch testing on human volunteers did not produce irritation or sensitization.
Slightly toxic following oral administration.
Practically nontoxic after skin application in animal studies.
Slightly irritating to eyes (rabbit).
Slightly irritating to skin (rabbit).
Repeated exposure produced respiratory tract irritation in animal models.
Repeated exposure produced eye irritation in animal models.
No genetic effects were observed in standard tests using bacterial and animal cells.

12. ECOLOGICAL INFORMATION

Environmental Toxicity

Invertebrates	48 h, EC50	Water flea (<i>Daphnia magna</i>)	2.4 mg/l
Fish:	96 h, LC50	Rainbow trout (<i>Oncorhynchus mykiss</i>)	7.6 mg/l
	96 h, LC50	Fathead minnow (<i>Pimephales promelas</i>)	24 mg/l
Algae:	96 h, EC50	Algae (<i>Selenastrum capricornutum</i>)	1.3 mg/l
Biodegradation	Modified SCAS (OECD 302A) Primary degradation 99 %		

13. DISPOSAL CONSIDERATIONS

US EPA RCRA Status: This material when discarded may be a hazardous waste as that term is defined by the Resource Conservation and Recovery Act (RCRA), 40 CFR 261.24, due to its toxicity characteristic. This material should be analyzed in accordance with Method 1311 for the compound(s) below.

US EPA RCRA D018 Compound/Characteristic: BENZENE

hazardous waste number:

Disposal considerations: Incineration

Miscellaneous advice: This product meets the criteria for a synthetic used oil under the U.S. EPA Standards for the Management of Used Oil (40 CFR 279). Those standards govern recycling and disposal in lieu of 40 CFR 260 -272 of the Federal hazardous waste program in states that have adopted these used oil regulations. Consult your attorney or appropriate regulatory official to be sure these standards have been adopted in your state. Recycle or burn in accordance with the applicable standards.
Solutia operates a used fluid return program for certain fluids under these used oil standards. Contact your Sales Representative for details.
This product should not be dumped, spilled, rinsed or washed into sewers or public waterways.

14. TRANSPORT INFORMATION

The data provided in this section is for information only. Please apply the appropriate regulations to properly classify your shipment for transportation.

US DOT

Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
biphenyl
Hazard Class: 9
Hazard Identification number: UN3082
Packing Group: Packing Group III
Transport label: Class 9
Special provisions: This material meets the definition of a marine pollutant.
Other: Applies ONLY to containers with an RQ or for shipments in bulk via water transportation.

Canadian TDG

Other: Not regulated for transport.

Reportable Quantity/Limit

US DOT RQ 100 lb *biphenyl*
Package size containing reportable amount: 377 lb

ICAO/IATA Class

Other: See DOT Information

15. REGULATORY INFORMATION

All components are in compliance with the following inventories: U.S. TSCA, EU EINECS, Canadian DSL, Australian AICS, Korean, Japanese ENCS, Phillipine PICCS, Chinese

Canadian WHMIS classification: D2(A) - Materials Causing Other Toxic Effects
D2(B) - Materials Causing Other Toxic Effects

SARA Hazard Notification:

Hazard Categories Under Title III Rules (40 CFR 370): Immediate
Delayed

Section 302 Extremely Hazardous Substances: Not applicable

Section 313 Toxic Chemical(s): biphenyl

CERCLA Reportable Quantity:

100 lbs biphenyl

For this/these chemicals, release of more than the Reportable Quantity to the environment in a 24 hour period requires notification to the National Response Center (800-424-8802 or 202-426-2675).

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulation and the MSDS contains all the information required by the Canadian Controlled Products Regulation.

Refer to Section 11 for OSHA/HPA Hazardous Chemical(s) and Section 13 for RCRA classification.

Safety data sheet also created in accordance with Brazilian law NBR 14725

16. OTHER INFORMATION

Product use: Heat transferring agents

Reason for revision: Significant changes to the following section(s):, Section 1

	Health	Fire	Reactivity	Additional Information
Suggested NFPA Rating	2	1	0	
Suggested HMIS Rating:	2	1	0	G

Prepared by the Solutia Hazard Communication Group. Please consult Solutia @ 314-674-6661 if further information is needed.

TM, ® is a registered trademark of Solutia Inc.

SOLUTIA is a trademark of Solutia Inc.

Responsible Care® is a registered trademark of the American Chemistry Council.

Although the information and recommendations set forth herein (hereinafter "Information") are presented in good faith and believed to be correct as of the date hereof, Solutia Inc. makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Solutia Inc. be responsible for damages of any nature whatsoever resulting from the use of or reliance upon Information. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.

Appendix L

L.2 Dowtherm™ A MSDS



Material Safety Data Sheet

The Dow Chemical Company

Product Name: DOWTHERM* A HEAT TRANSFER FLUID

Issue Date: 08/03/2007

Print Date: 06 Aug 2007

The Dow Chemical Company encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. Product and Company Identification

Product Name

DOWTHERM* A HEAT TRANSFER FLUID

COMPANY IDENTIFICATION

The Dow Chemical Company
2030 Willard H. Dow Center
Midland, MI 48674
USA

Customer Information Number: 800-258-2436

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact: 989-636-4400
Local Emergency Contact: 989-636-4400

2. Hazards Identification

Emergency Overview

Color: Colorless to yellow

Physical State: Liquid

Odor: Aromatic

Hazards of product:

CAUTION! May cause skin irritation. May cause respiratory tract irritation. Keep upwind of spill. Highly toxic to fish and/or other aquatic organisms.

OSHA Hazard Communication Standard

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential Health Effects

Eye Contact: May cause pain disproportionate to the level of irritation to eye tissues. May cause slight temporary eye irritation. Vapor may cause eye irritation experienced as mild discomfort and redness.

Skin Contact: Repeated contact may cause skin burns. Symptoms may include pain, severe local redness, swelling, and tissue damage. Prolonged or repeated contact may cause skin irritation.

* Indicates a Trademark

Skin Absorption: Prolonged skin contact is unlikely to result in absorption of harmful amounts.

Inhalation: Excessive exposure may cause irritation to upper respiratory tract (nose and throat) and lungs. May cause headache and nausea due to odor.

Ingestion: Low toxicity if swallowed. Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury. In animals, effects have been reported on the following organs: Kidney. Liver.

Effects of Repeated Exposure: The data presented are for the following material: Diphenyl oxide (vapour): Observations in animals include: Respiratory effects. The data presented are for the following material: (biphenyl) In humans, effects have been reported on the following organs: Central nervous system. Liver. Peripheral nervous system. In animals, effects have been reported on the following organs: Gastrointestinal tract. Kidney. May cause nausea and vomiting. May cause abdominal discomfort or diarrhea.

Cancer Information: Contains component(s) which have caused cancer in laboratory animals. However, the component(s) is/are not genotoxic, and the relevance of cancer to humans is unknown.

Birth Defects/Developmental Effects: Contains component(s) which, in laboratory animals, have been toxic to the fetus only at doses toxic to the mother.

Reproductive Effects: In animal studies on component(s), effects on reproduction were seen only at doses that produced significant toxicity to the parent animals.

3. Composition Information

Component	CAS #	Amount
Diphenyl oxide	101-84-8	73.0 %
Biphenyl	92-52-4	27.0 %

4. First-aid measures

Eye Contact: Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

Skin Contact: Wash skin with plenty of water.

Inhalation: Move person to fresh air; if effects occur, consult a physician.

Ingestion: If swallowed, seek medical attention. Do not induce vomiting unless directed to do so by medical personnel.

Notes to Physician: If burn is present, treat as any thermal burn, after decontamination. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. Fire Fighting Measures

Extinguishing Media: Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Do not use direct water stream. May spread fire. General purpose synthetic foams (including AFFF type) or protein foams are preferred if available. Alcohol resistant foams (ATC type) may function. Water fog, applied gently may be used as a blanket for fire extinguishment.

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Do not use direct water stream. May spread fire. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Water fog, applied gently may be used as a blanket for fire extinguishment. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS.

Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is

not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.

Unusual Fire and Explosion Hazards: Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. Liquid mist of this product can burn. Flammable concentrations of vapor can accumulate at temperatures above flash point; see Section 9. Dense smoke is produced when product burns.

Hazardous Combustion Products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide.

6. Accidental Release Measures

Steps to be Taken if Material is Released or Spilled: Contain spilled material if possible. Collect in suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

Personal Precautions: Keep upwind of spill. Ventilate area of leak or spill. Keep unnecessary and unprotected personnel from entering the area. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection. Refer to Section 7, Handling, for additional precautionary measures.

Environmental Precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information. Spills or discharge to natural waterways is likely to kill aquatic organisms.

7. Handling and Storage

Handling

General Handling: Avoid contact with skin and clothing. Avoid breathing vapor. Wash thoroughly after handling. Use with adequate ventilation. Keep container closed. Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Storage

Store away from incompatible materials. See STABILITY AND REACTIVITY section.

8. Exposure Controls / Personal Protection

Exposure Limits

Component	List	Type	Value
Diphenyl oxide	ACGIH	TWA Vapor.	1 ppm
	ACGIH	STEL Vapor.	2 ppm
	OSHA Table Z-1	PEL Vapor.	7 mg/m ³ 1 ppm
Biphenyl	ACGIH	TWA	0.2 ppm
	OSHA Table Z-1	PEL	1 mg/m ³ 0.2 ppm

Personal Protection

Eye/Face Protection: Use safety glasses. If exposure causes eye discomfort, use a full-face respirator.

Skin Protection: When prolonged or frequently repeated contact could occur, use protective clothing chemically resistant to this material. Selection of specific items such as faceshield, boots, apron, or full-body suit will depend on the task.

Hand protection: Use gloves chemically resistant to this material when prolonged or frequently repeated contact could occur. Examples of preferred glove barrier materials include: Viton. Polyethylene. Polyvinyl chloride ("PVC" or "vinyl"). Styrene/butadiene rubber. Polyvinyl alcohol ("PVA"). Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Butyl rubber. Neoprene. Chlorinated polyethylene. Natural rubber ("latex"). Nitrile/butadiene rubber ("nitrile" or "NBR"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Respiratory Protection: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

Ingestion: Use good personal hygiene. Do not consume or store food in the work area. Wash hands before smoking or eating.

Engineering Controls

Ventilation: Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines.

9. Physical and Chemical Properties

Physical State	Liquid
Color	Colorless to yellow
Odor	Aromatic
Flash Point - Closed Cup	113 °C (235 °F) <i>Closed Cup</i>
Flammable Limits In Air	Lower: 0.8 %(V) <i>Literature</i> Upper: 7.0 %(V) <i>Literature</i>
Autoignition Temperature	599 °C (1,110 °F) <i>Literature</i>
Vapor Pressure	0.025 mmHg @ 25 °C <i>Literature</i>
Boiling Point (760 mmHg)	257 °C (495 °F) <i>Literature</i>
Vapor Density (air = 1)	>1.0 <i>Literature</i>
Specific Gravity (H ₂ O = 1)	1.050 - 1.075 25 °C/25 °C <i>Literature</i>
Freezing Point	12.0 °C (53.6 °F) <i>Literature</i>
Melting Point	12.0 °C (53.6 °F) <i>Literature</i>
Solubility in Water (by weight)	13.8 ppm @ 60 °F <i>Literature</i>
pH	Not applicable
Kinematic Viscosity	3.51 mm ² /s @ 25 °C <i>Literature</i>

10. Stability and Reactivity

Stability/Instability

Thermally stable at typical use temperatures.

Conditions to Avoid: Exposure to elevated temperatures can cause product to decompose.

Incompatible Materials: Avoid contact with oxidizing materials.

Hazardous Polymerization

Will not occur.

Thermal Decomposition

Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include trace amounts of: Benzene. Phenol.

11. Toxicological Information

Acute Toxicity**Ingestion**

LD50, Rat > 2,000 mg/kg

Skin Absorption

The dermal LD50 has not been determined.

Repeated Dose Toxicity

The data presented are for the following material: Diphenyl oxide (vapour): Observations in animals include: Respiratory effects. The data presented are for the following material: (biphenyl) In humans, effects have been reported on the following organs: Central nervous system. Liver. Peripheral nervous system. In animals, effects have been reported on the following organs: Gastrointestinal tract. Kidney. May cause nausea and vomiting. May cause abdominal discomfort or diarrhea.

Chronic Toxicity and Carcinogenicity

Contains component(s) which have caused cancer in laboratory animals. However, the component(s) is/are not genotoxic, and the relevance of cancer to humans is unknown.

Developmental Toxicity

Contains component(s) which, in laboratory animals, have been toxic to the fetus only at doses toxic to the mother. Contains component(s) which did not cause birth defects in laboratory animals.

Reproductive Toxicity

In animal studies on component(s), effects on reproduction were seen only at doses that produced significant toxicity to the parent animals.

Genetic Toxicology

In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

12. Ecological Information

CHEMICAL FATE

Data for Component: Diphenyl oxide

Movement & Partitioning

Bioconcentration potential is moderate (BCF between 100 and 3000 or Log Pow between 3 and 5). Potential for mobility in soil is low (Koc between 500 and 2000).

Henry's Law Constant (H): 2.2E-04 atm*m3/mole; 25 °C Estimated

Partition coefficient, n-octanol/water (log Pow): 4.21 Measured

Partition coefficient, soil organic carbon/water (Koc): 820 - 1,950 Estimated

Bioconcentration Factor (BCF): 196 - 470; fish; Measured

Persistence and Degradability

Biodegradation under aerobic static laboratory conditions is high (BOD20 or BOD28/ThOD > 40%). Material is expected to biodegrade only very slowly (in the environment). Fails to pass OECD/EEC tests for ready biodegradability.

Indirect Photodegradation with OH Radicals

Rate Constant	Atmospheric Half-life	Method
9.84E-12 cm ³ /s	1.1 d	Estimated

OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method
6.3 %	28 d	OECD 301C Test

Biological oxygen demand (BOD):

BOD 5	BOD 10	BOD 20	BOD 28
72 - 76 %	80 - 91 %	82 - 99 %	

Chemical Oxygen Demand: 2.19 mg/mg

Theoretical Oxygen Demand: 2.63 mg/mgData for Component: **Biphenyl****Movement & Partitioning**

Bioconcentration potential is moderate (BCF between 100 and 3000 or Log Pow between 3 and 5). Potential for mobility in soil is low (Koc between 500 and 2000).

Henry's Law Constant (H): 4.08E-4 atm*m3/mole; 25 °C Measured**Partition coefficient, n-octanol/water (log Pow):** 3.98 Measured**Partition coefficient, soil organic carbon/water (Koc):** 500 - 630 Estimated**Bioconcentration Factor (BCF):** 340 - 1,900; fish; Measured**Persistence and Degradability**

Material is readily biodegradable. Passes OECD test(s) for ready biodegradability.

Indirect Photodegradation with OH Radicals

Rate Constant	Atmospheric Half-life	Method
6.77E-12 cm3/s	1.6 d	Estimated

OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method
100 %	28 d	OECD 301D Test

Theoretical Oxygen Demand: 3.01 mg/mg**ECOTOXICITY****Fish Acute & Prolonged Toxicity**LC50, fathead minnow (*Pimephales promelas*), 96 h: 9.6 mg/l**Aquatic Invertebrate Acute Toxicity**LC50, water flea *Daphnia magna*, static, 48 h: 0.29 mg/l**13. Disposal Considerations**

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. DOW HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Incinerator or other thermal destruction device. As a service to its customers, Dow can provide names of information resources to help identify waste management companies and other facilities which recycle, reprocess or manage chemicals or plastics, and that manage used drums. Telephone Dow's Customer Information Group at 1-800-258-2436 or 1-989-832-1556 (U.S.), or 1-800-331-6451 (Canada) for further details.

14. Transport Information**DOT Non-Bulk****Proper Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, NOS**Technical Name:** BIPHENYL**Hazard Class:** 9 **ID Number:** UN3082 **Packing Group:** PG III**DOT Bulk****Proper Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, NOS**Technical Name:** BIPHENYL**Hazard Class:** 9 **ID Number:** UN3082 **Packing Group:** PG III

IMDG

Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, NOS
Technical Name: BIPHENYL
Hazard Class: 9 **ID Number:** UN3082 **Packing Group:** PG III
EMS Number: F-A,S-F
Marine pollutant.: No

ICAO/IATA

Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, NOS
Technical Name: BIPHENYL
Hazard Class: 9 **ID Number:** UN3082 **Packing Group:** PG III
Cargo Packing Instruction: 914
Passenger Packing Instruction: 914

Additional Information

Reportable quantity: 370 lb – BIPHENYL

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. Regulatory Information

OSHA Hazard Communication Standard

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard	Yes
Delayed (Chronic) Health Hazard	Yes
Fire Hazard	No
Reactive Hazard	No
Sudden Release of Pressure Hazard	No

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313

This product contains the following substances which are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and which are listed in 40 CFR 372.

Component	CAS #	Amount
Biphenyl	92-52-4	27.0%

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:

The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

Component	CAS #	Amount
Diphenyl oxide	101-84-8	73.0%
Biphenyl	92-52-4	27.0%

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:

To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)

This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

US. Toxic Substances Control Act

All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30

CEPA - Domestic Substances List (DSL)

All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

16. Other Information

Hazard Rating System

NFPA	Health	Fire	Reactivity
	1	1	0

Recommended Uses and Restrictions

A heat transfer agent - For industrial use. Dow recommends that you use this product in a manner consistent with the listed use. If your intended use is not consistent with Dow's stated use, please contact Dow's Customer Information Group.

Revision

Identification Number: 1007176 / 0000 / Issue Date 08/03/2007 / Version: 1.1

Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation
Action Level	A value set by OSHA that is lower than the PEL which will trigger the need for activities such as exposure monitoring and medical surveillance if exceeded.

The Dow Chemical Company urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

