MASTER

USE OF GEOTHERMAL HEAT FOR SUGAR REFINING IN IMPERIAL COUNTY

ENVIRONMENTAL ASSESSMENT AND MONITORING PLAN

DECEMBER 1979

DOE Contract No. DE-AC 03/79 ET 27039

Prepared for :

U. S. DEPARTMENT OF ENERGY

ENVIRONMENTAL DATA PREPARED AND SUBMITTED BY:

TRW
ENERGY SYSTEMS GROUP

One Space Park • Redondo Beach • California 90278

950 6422
DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

TRW

79.1455.JJS-2268
11 December 1979

Ms. Hilary Sullivan, Program Coordinator
Geothermal Energy Division
Department of Energy
San Francisco Operations Office
1333 Broadway
Oakland, CA 94612

Dear Ms. Sullivan:

Topical Report No. 3
Environmental Assessment
and
Monitoring Plan
Contract No. DE-AC 03/79 ET 27039

In accordance with the referenced contract, I am submitting five copies of the "Environmental Assessment and Monitoring Plan" as Topical Report No. 3. I am also forwarding one copy to the Engineering & Facilities Management Division, one copy to ETEC and one copy to Morris Skalka, DOE/HQ.

Sincerely,

Jay Seidman
Project Manager

JS:bjl
Enclosure

cc: (as specified in Exhibit II)

USE OF GEOTHERMAL HEAT FOR SUGAR REFINING IN IMPERIAL COUNTY:

ENVIRONMENTAL ASSESSMENT AND MONITORING PLAN

✓ DECEMBER 1979

DOE Contract No. DE-AC 03/79 ET 27039

DISCLAIMER

This book was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Prepared for :

U. S. DEPARTMENT OF ENERGY

ENVIRONMENTAL DATA PREPARED AND SUBMITTED BY:

TRW ENERGY SYSTEMS GROUP

One Space Park • Redondo Beach • California 90278

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

1.0 INTRODUCTION AND SUMMARY

This environmental monitoring and reporting plan is based on requirements set by the State of California, Water Quality Control Board, and the Division of Oil and Gas as well as special requirements by the County of Imperial, Air Pollution Control Board and other county offices. This plan addresses all of the applicable environmental impacts identified in the Final Environmental Report prepared by the Imperial County Planning Department and the Final Environmental Report submitted to DOE by TRW in compliance with requirements of DOE Contract No. DE-AC 03/79 ET 27039.

In Section 2 each item of the environmental monitoring and reporting requirements is addressed in terms of a) impact, b) mitigation measures and/or engineering practices and c) monitoring and reporting requirements. An overall summary of all of the reporting requirements is contained in Section 3.

2.0 ENVIRONMENTAL IMPACT, MITIGATION MEASURES/ENGINEERING PRACTICES, AND MONITORING AND REPORTING PROCEDURES

2.1 GROUNDWATER IMPACTS

2.1.1 Impact - Seepage

Groundwater contamination may occur due to seepage of wastes from a reserve pit or mud sump if proper controls are not implemented.

2.1.1.1 Mitigation Measures/Engineering Practices

Mitigation measures and/or engineering practices to insure protection of the groundwater environment will be of major concern during Phase II of the project.

An impermeable mud sump, 125 feet by 80 feet by 7 feet with a capacity of approximately 525,000 gallons will be constructed at the well site. The site will use about 1.5 acres of surface area. TRW proposes to discharge into the mud sump a maximum of drilling mud and a minimal quantity of well clean out water (total not to exceed 450,000 gallons). This will allow a minimum free board of at least one foot to be maintained in the mud sump. Following some evaporation, the residual mud will be removed from the sump and discharged at a solid waste disposal site approved by the Regional Water Control Board.

Sump and reserve pit lining material will be selected with care. The desirability of lining the sump and pits (beneath the clay) with plastic sheeting was investigated as a measure to prevent pollutant seepage. It was found to be costly, unnecessary and not a usual practice in the Imperial Valley. Permeability of the materials at the bottom of the sump depends not only on the character of the lining materials (clays or bentonite), but on the character of the liquid deposited in the holding sump. This in turn depends somewhat on the temperature and chemical composition of the geothermal fluids produced. In general, high temperature and saline brines may affect

permeability of the compacted clays or/and bentonite, thus increasing groundwater pollution.

The drilling components which may be used are:

Magcogel (Bentonite)	Geo-Gel (Sepiolite)*
Tannathin (Lignite)	WL-100 (Sodium Polyacrylate)
Caustic Soda (NaOH)	Drilling Detergent (Soap)
Barite (Barium Sulfate)	Lost Circulation Material
Bicarbonate of Soda	(Cottonseed hulls, fibers,
Soda Phosphate	mica flakes, cellophane)
Soda Ash	Cement

Bentonite, Lignite and Sepiolite are the main drilling components; the other substances are additives and may or may not be used depending on the particular drilling conditions.

*Sepiolite - A clay-based mud, mined near Latrop Wells, NV.

2.1.1.2 Monitoring and/or Reporting Procedures

TRW shall submit to the Regional Water Quality Control Board, a technical report (No. 1) detailing the sump construction prior to discharge of any wastes and a certificate signed by a California Registered Civil Engineer (No. 2) stating that the sump and attendant facilities are constructed to meet the requirements of the Regional Water Quality Order (number 79-101).

The reporting and monitoring program shall be implemented at commencement of discharge at the site and will be in accordance to the Regional Water Quality Control Board schedule as follows:

<u>Constituents</u>	<u>Units</u>	<u>Reporting Frequencies</u>
1. Volume of geothermal wastes discharged to mud sump (No. 3)	gallons	monthly
2. Volume contained in mud sump (No. 3)	gallons	monthly
3. Total dissolved solids content of waste fluid contained in the mud sump (No. 3)	mg/l	monthly

<u>Constituents</u>	<u>Units</u>	<u>Reporting Frequencies</u>
4. Calibrated electrical conductivity of flow from the tile drain system underlying the area of mud sump (There is <u>no</u> tile drain system within 500 ft. of the site or less than 750 ft. from the sump. No electrical conductivity measurements will be taken unless the site plan is altered.)	micromhos/cm	
5. Report (No. 4) on complete disposal of the geothermal wastes from the mud sump will be submitted within one week following completion of work		
6. At least 10 days prior to rehabilitation of any mud sump area. TRW shall request a Regional Water Quality Control Board Staff inspection and approval of the clean up procedures. (No. 5)		

The monthly reports shall be submitted to the Regional Board by the 15th day of the following month. Within 10 days after the initial geothermal fluids are discharged from the well, TRW shall report the discharge to the Regional Quality Control Board (No. 6).

The mud sump will be visually inspected on a daily basis for erosion or other damage. Necessary maintenance for preventing spillage or release of waste materials will be implemented, until well drilling, well cleanout and flow test materials are removed. If any spillage or release of waste materials from the mud sump accidentally occurs, immediate measures will be taken to limit areal extent and detrimental effects.

TRW will estimate and report (No. 7) to the Water Quality Control Board the total amount (tons) of saline drilling muds and salts as well as brine waste hauled to a Class I or Class II-1 solid waste disposal site upon the completion of the haul.

TRW will also estimate and report (No. 8) the total amount (tons) of nonsaline drilling muds hauled to a Class II-2 solid waste disposal site upon completion of operations. The estimates will be included in the final monitoring report.

2.1.2 Impact - Improper Storage

Improper temporary storage of fluids from well drilling and the geothermal reservoir could result in leaching and infiltration of potential pollutants into groundwater aquifer.

2.1.2.1 Mitigation Measures/Engineering Practices

Mitigation measures and/or engineering practices to insure minimal groundwater aquifer contamination through improper storage will be assured by discharging the 180,000 to 720,000 gallons of the geothermal flow test fluid from the production wells into Baker tanks or similar containers. The fluids will be hauled to a site approved by the Board for such wastes. The containers, if not of the Baker Tank Type, will not have a permeability greater than 1×10^{-6} cm/sec.

2.1.2.2 Monitoring and Reporting Procedures

1. TRW will report (No. 9) to the Water Quality Control Board immediately any accidental spillage or release of waste material and submit plans for immediate measures to correct the problem and limit detrimental effects.

2. TRW will estimate and report (No. 7) to the Water Quality Control Board the total amount (tons) of saline drilling muds and salt and brine waste hauled to a Class I or Class II-1 solid waste disposal site upon the completion of the haul.

3. TRW will estimate and report (No. 8) the total amount (tons) of nonsaline drilling muds hauled to a Class II-2 solid waste disposal site upon completion of operations. This will be reported in the final monitoring report.

2.1.3 Impact - Improper Cementing, Blow Out, Natural Disaster

The upward migration of geothermal fluids could result in an adverse impact to groundwater in shallow aquifers if a "blow out" or improper cementing of production and/or injection wells were to occur.

2.1.3.1 Mitigation Measures/Engineering Procedure

Drilling and testing operations will be conducted only when approved and operationally tested rams are in place. This will prevent unexpected "blow-outs" or other accidental release of fluids. To insure complete and thorough cementing of casing and protection against vertical migration of formation fluids a 75 to 100% excess of cement will be required for each cementing operation. Cement will be forced into the zone being cemented until a good cement job is assured. The quantities of cement required will be obtained from four arm caliper logs run prior to setting the casing. If the volume accepted is less than the calculated volume required, cement bonding logs will be run to assure a good and sufficient cement job.

2.1.3.2 Monitoring and Reporting Procedures

The Division of Oil and Gas (DOG) and the County of Imperial will be notified (No. 10) to witness or inspect all operations and tests performed on the well. This will include inspection of and testing of blow-out prevention equipment, water shut-off capabilities and plugging operations.

Duplicate copies (No. 11) of all electrical physical and chemical logs tests or surveys will be filed with the Division of Oil and Gas within 60 days after a well has been completed, abandoned or operations suspended. In addition, the following records will be submitted to the DOG:

1. Well Summary Report;
2. Well Log and Core Record; and
3. Well History describing all well operations during drilling, plugging or abandonment of a well.

TRW will also submit to the DOG a monthly geothermal resources report and injection report (No. 12) on or before the 30th day of the month following the report month for any active or shut in geothermal well it has on the Holly Sugar Property.

If a blow out were to occur, any accidental spillage or release of waste material would be reported to the Regional Water Quality Control Board. Immediate measures would be taken to drain excess fluid into the Holly Sugar Waste Water disposal area which has a large holding capacity, prior to hauling to an appropriate disposal area.

2.1.4 Impact - Weak Borehole Formation

Contamination of shallow aquifers due to loss of drilling or geothermal fluids through a weak formation in the borehole could occur.

2.1.4.1 Mitigation Measures Engineering Practices

Mitigation measures or engineering practices to insure against contamination of shallow aquifers from loss of drilling or geothermal fluids through a weak formation include maintaining proper mud pressure, weight, and chemistry before the casing is set.

2.1.4.2 Monitoring and Reporting Procedures

Monitoring of mud pressure, mud weight, mud volume and chemistry will be continuous after spudding. Mud pressure volume and weight data will be recorded on well logs and submitted to the Division of Oil and Gas (No. 11) as required by the State of California. Mud level records will be in operation at all times to determine quantities of fluids that may be lost to punctured beds.

2.1.5 Impact - Subsurface Reinjection Flow

Contamination may occur due to the flow testing fluids injected into subsurface through the completed injection well.

2.1.5.1 Mitigation Measures/Engineering Practices

To prevent groundwater contamination due to subsurface reinjection, fluids discharged by subsurface injection shall not be discharged into any subsurface zone which has a total dissolved solids concentration of less than 10,000 mg/l, unless the quality of injection water is comparable to that of the receiving water, as required by the Regional Water Quality Control Board.

2.1.5.2 Monitoring and Reporting Procedures

TRW shall report monitoring data to the Regional Board in accordance with the following schedule:

1. Volume of wastes directly reinjected to the subsurface strata from the production well will be reported monthly in gallon units (No. 13),
2. Total dissolved solids of the waste fluid injected into the injection well will be reported in mg/liter each month (No. 13).
3. At least 10 days prior to the commencement of injection, the total dissolved solids concentration of ground water contained in the strata receiving waste fluid injection will be reported. (No. 14)
4. At least 10 days prior to commencement of injection the depth of the injection well will be reported (No. 14).

2.2 SURFACE WATER AND WATER USE IMPACTS

2.2.1 Impact - Water Consumption

Consumptive use of water will occur during the drilling operations.

2.2.1.1 Mitigation Measures/Engineering Practices

It is estimated that 180,000 gal (680 m³) of water will be required for each well drilled. Water will be required for drilling mud which is used to cool and lubricate the drill bit; balance subsurface pressure; prevent well walls from caving in; and buoy the weight of the drill string and casing. Consumptive water uses also include water for fire protection, washing tools, and possibly

sanitary uses. Holly Sugar currently purchases bulk water for drinking from the AAA Water Company. The added working personnel (15 - 20) will not affect the overall drinking water requirements.

Normally, daily diversions to the Imperial Valley are based on requests submitted to the U.S. Bureau of Reclamation by the IID. These requests are made one week in advance of the actual diversion and are based on the anticipated water use in the valley for the week. When the water arrives in the All-American Canal, its distribution to the various users is governed by water requisitions submitted to IID three days prior to delivery.

At present, the Holly Sugar plant obtains its water supply from the Newside Canal at a rate of 2 cfs (56.1/s) during the campaign season. The added use of water from the Phase II activity will be a maximum of 125 gpm (7.9 l/s). This water is to be used for: 1) normal supply of 20 additional people; 2) fire protection; 3) drilling purposes; and 4) dust control and road maintenance. This is about 14% of the normal water allocated to Holly Sugar by the IID during the campaign season. The present schedule calls for drilling wells prior to starting a campaign.

2.2.1.2 Monitoring and/or Reporting Procedures

Since anticipated consumptive water requirements are requested one week in advance from the U.S. Bureau of Reclamation by the IID, and since water requirements for this project represent at most, 14% of the normal water allocated to Holly Sugar during a campaign, and since the well drilling will be concluded prior to the sugar campaign, no monitoring or reporting procedures are planned.

2.2.2 Impact - Uncontrolled Spills

Pollution of surface waters could occur if a large spill of geothermal brine were to occur as a result of either well blow-out or a natural disaster. Uncontrolled discharges of geothermal fluids could flow into irrigation canals or ditches and be carried to either the New Alamo or the Alamo Rivers. Should very large

volume spills occur, the carrying capacity of the canals would be exceeded causing an overflow onto agricultural land.

2.2.2.1 Mitigation Measures/Engineering Practices

Measures and practices relative to well blow-out have been discussed in section 1.1.3.1. In the event of a natural disaster every effort will be expended to contain the geothermal fluids in the existing sumps and available Holly Sugar ponds. Diversions, depending on the magnitude of the disaster, would then be directed toward non-desirable land masses.

2.2.2.2 Monitoring and Reporting Procedures

The monitoring and Reporting Procedures are contained in Section 2.1.3.2.

2.3 GEOLOGICAL IMPACTS

2.3.1 Impact - Induced Seismicity

Removal of geothermal fluids may result in induced seismicity due to the removal of heat from the reservoir, thus, increasing thermal strain. Seismicity can also be increased by the redistribution of fluid pressure created by extraction and injection of geothermal fluids. High pressure injection of fluids will increase fluid pore pressures within the rocks of the injection zone. Induced seismicity has resulted from very high pressure injection of fluids at the Rangely Oil Field in northwestern Colorado and the Rocky Mountain Arsenal near Denver.

2.3.1.1 Mitigation Measures/Engineering Practices

TRW's withdrawal and injection plan will minimize volumes of geothermal fluids handled during well testing operations. Increased seismic activity is not expected to occur because of the anticipated Phase II production near the terminus of the Imperial Fault. Injection will not use "very high" pressures. The pressures used will not exceed 50% of the value for overburden fracture.

2.3.1.2 Monitoring and Reporting Procedures

After the injection well is completed, TRW will install three portable seismometers to monitor seismic activity from the anticipated production/injection provinces.

The frequency and magnitude of seismic events will be correlated with the amount and rate of injection, or production and known regional and/or area tectonic activity. Data will be analyzed and reported on in Phase III.

2.3.2 Impact - Subsidence

Significant induced subsidence is not anticipated as a result of Phase II test well operations. The relatively small quantities of geothermal fluids to be extracted during flow and operational testing in Phase II will not be sufficient to cause subsidence. Subsidence caused by extraction of large volumes of geothermal fluids has been experienced at Wairakei, New Zealand and Cerro Prieto, Mexico. Short-term extraction of geothermal fluid during Holly Sugar well testing procedures will not significantly reduce reservoir pressure. However, completion of full retrofit and Phase III production will require a complete analysis of the effects of subsidence.

2.3.2.1 Mitigation Measures/Engineering Practices

As part of drill pad and access road construction, a first order elevational survey will be conducted around the drill site. This survey will be tied into the northeast corner of Section 29 T 14S, R 14E. The survey data will be provided to the U.S. Geological Survey for inclusion in their program to measure subsidence in the Imperial Valley.

2.3.2.2 Monitoring and Reporting Procedures

Upon completion of the Phase II well operations, the results of this survey may be compared by the USGS to the data obtained during their extensive leveling survey now in progress. This will allow

significant changes to be identified and reported by the USGS.

2.3.3 Impact - Erosion

Disturbance of the existing topography could reverse the likelihood of erosion, especially where the access road is built.

2.3.3.1 Mitigation Measures/Engineering Procedures

To prevent access road erosion near construction site, a drainage ditch will be built along the road to channel all surface flows and re-route the natural runoff to irrigation runoff ditches. Surface water contamination will be minimized by grading the operational area and diverting all runoffs to road ditch.

2.3.3.2 Monitoring and Reporting Procedures

Monitoring procedures for erosion control includes frequent visual inspection and maintenance and repair of the drainage system where necessary. Any excessive erosion will be repaired and reported.

2.4 AIR QUALITY

2.4.1 Impact - Dust

Fugitive dust emissions will be generated by grading and compaction activities associated with the construction of access roads, drill pads, sump and berms. These emissions will have a significant short term impact on the air quality in the immediate vicinity of the test well construction site. However, fugitive dust emissions from site preparation activities will not have an impact on the air quality of the Imperial Valley due to the large fugitive dust concentration caused by agricultural activities.

2.4.1.1 Mitigation Measures/Engineering Practices

Fugitive dust emissions created by grading and compaction activities and vehicle movement on dirt access roads should be controlled by water spraying, or use of soil stabilizing chemicals. The Imperial Valley is an extremely arid region with high levels of solar radiation. Frequent water spraying will be required of the construction

areas and access roads. Thus, nuisance or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health or safety of any person or the public or which cause or have a natural tendency to cause injury to business or property will be avoided.

2.4.1.2 Monitoring and Reporting Procedures

No monitoring or reporting of dust is contemplated.

2.4.2 Impact - Gases Emitted During Well Tests

Prior to the availability of the reinjection well some gases will be emitted during the production well tests.

2.4.2.1 Mitigation Measures/Engineering Practices

Potential air quality impacts will be minimized by limiting test activities to short periods of time prior to the availability of the injection well. Small quantities of noncondensable gases with some H_2S may be emitted during drill stem testing. These tests will last a maximum of 3 to 4 hours, exposing geothermal fluids to the atmosphere. Due to the short duration of these tests, significant impacts will not result. H_2S contained in the geothermal fluid may be detected in the immediate area during drill stem testing operations. A mud logging unit capable of detecting H_2S will be continuously in use. If excessive H_2S is encountered the well will be shut in for appropriate actions.

If a geothermal resource is indicated by drill stem testing or well log analysis, a second well shall be drilled to serve as a geothermal injection well. Extensive testing of the production well will be accomplished using a closed loop (production/injection) well system. Geothermal fluid will not be exposed to the atmosphere during these tests and air quality impacts will not result.

2.4.2.2 Monitoring and/or Reporting Procedures

No monitoring of air quality for gases emitted during well tests is planned during Phase II.

Prior to drill stem testing, TRW will notify the Air Pollution Control District of Imperial County of the tests (No. 15).

2.4.3 Impact - Gases Emitted During Drilling

Noncondensable gases may be discharged to the atmosphere as small quantities of geothermal fluid may become entrained in the drilling mud and exposed to the atmosphere during drilling operations. These gases would be discharged at the mud screen, cooling tower and reserve pits. The odor of H_2S may be detectable in the vicinity of the drill site.

2.4.3.1 Mitigation Measures/Engineering Practices

The release of noncondensable gases (possibly H_2S) during well drilling operations shall be avoided by utilizing proper procedures insuring that the drill mud static head is greater than anticipated reservoir pressure. This will minimize the quantity of geothermal fluid reaching the surface.

2.4.3.2 Monitoring and/or Reporting Procedures

TRW will monitor non-condensable gases continuously from the start of drilling operations. A report, detailing types and amounts of non-condensable gases will be submitted to the Air Pollution Control Board in Imperial County as required after drilling and testing have been completed (No. 16).

2.5 ARCHEOLOGICAL IMPACTS

2.5.1 Impacts - Disturbances of Sensitive Archeological Sites

Disturbance of Sensitive Archeological Areas could occur if special precautions to avoid these areas are not made.

2.5.1.1 Mitigation Measures/Engineering Practices

The unique character of the archeological area reported to exist on the property requires special attention. Present plans are to completely avoid any activities on the native ground described in the archeological report. This will require whipstock or dynadrilling of all wells which may have bottom hole location beneath the archeological areas. These directional (slant drilling) techniques will permit complete avoidance of the significant area. Access roads or travel across the archeological site will be prohibited. During Phase II and III drilling operations the area will be staked and flagged as a non-entry area.

2.5.1.2 Monitoring and/or Reporting Procedures

Prior to any grading and compaction activities associated with the construction of access roads, drill pads, sump, and berms, the archeologic sensitive area will be staked and flagged (No. 17). Visual inspection maintenance of the staked and flagged area will occur throughout the entire period of drilling and testing (No. 18).

2.6 OTHER

TRW recognizes that noise, biological and socioeconomic impacts are associated with Phase II of the Holly Sugar Project. These impacts are minimal or positive so monitoring and reporting will not be implemented in these cases.

STATE OF CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
 COLORADO RIVER BASIN REGION

Subject Monitored	<u>Frequencies of Reporting/Notification</u>		
	Monthly	One Time	Periodically where necessary
1. Technical Report detailing sump construction		One time prior to waste discharge	
2. Certificate stating that sump and attendant facilities meet requirements		"	
3. Volume of geothermal wastes discharged to the mud sump	On the 15th of month following report month		
3a. Volume contained in the mud sump	"		
3b. TDS content of waste fluid contained in mud sum;	"		
4. Report on complete disposal of all geothermal wastes from mud sumps - reported within one week following completion of work		One Time	
5. At least 10 days prior to rehabilitation of any mud sump area the discharger shall request a Regional Board Staff inspection and approval of the cleanup procedure.		One Time	

STATE OF CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION

Subject Monitored	Frequencies of Reporting/Notification		
	Monthly	One Time	Periodically where Necessary
6. Within 10 days after the initial discharge of any geothermal fluids from a well, the discharger shall report said initial discharge to the Board		One Time	
7. Estimate of total amount (tons) of saline drilling muds and salt and brine waste hauled to Class I or Class II-1 solid waste disposal site upon completion of haul			Periodically where necessary
8. Estimate of total amounts (tons) of non-saline drilling muds hauled to a Class II-2 solid waste disposal site upon completion of operations reported in final monitoring report			"
9. Immediate reporting of any accidental spillage or release of waste material and plan for immediate measures being taken to correct same and to limit detrimental effects			"

CALIFORNIA DIVISION OF OIL AND GAS

Subject Monitored	Frequencies of Reporting/Notification		
	Monthly	One Time	Periodically where necessary
10. Witness field testing and inspection of blowout prevention equipment, cementing and plugging operators, water shutoff			24 hours prior to test
11. Well testing and logging data Well Summary Report Well Log and Core Record Well History		Within 60 days after well completion, abandonment or suspension of operation	
12. Geothermal Resources Report and Inspection Report	On or before the 30th day of the month following the report month		

STATE OF CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

COLORADO RIVER BASIN REGION

Subject Monitored	Frequencies of Reporting/Notification		
	Monthly	One Time	Periodically where necessary
13. Volume directly reinjected to subsurface strata from the production well	On the 15th of month following report month		
13a. TDS concentration of waste fluid injected into injection well	"		
14. TDS concentration of ground water contained in strata receiving waste fluids	10 days prior to commencement of injection		
20 14a. Depth of the injection well	"		

COUNTY OF IMPERIAL AIR POLLUTION CONTROL BOARD

Frequencies of Reporting/Notification

Subject Monitored	Monthly	One Time	Periodically where necessary
15. Well testing			24 hours prior to testing
16. Non-condensable gas analysis			Report submitted after testing and drilling operations

OTHER

Frequencies of Reporting/Notification

Subject Monitored	Monthly	One Time	Periodically where necessary
17. Archeologic sensitive site flagged and staked		" (Inspection Only)	
18. Mud Sump Berm			" (Visual Only)