

US EPA ARCHIVE DOCUMENT

U.S. Environmental Protection Agency, Region 9

UNDERGROUND INJECTION CONTROL (UIC)

INDIVIDUAL PERMIT

Class V Injection

Permit No. HI596002

Issued to: Puna Geothermal Venture (owner and operator)
14-3860 Kapoho Paho Road
Paho, Hawaii 96778

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PART I. JURISDICTION AND AUTHORIZATION TO OPERATE

The U.S. Environmental Protection Agency (EPA) issues its UIC Permit pursuant to its authority under the Safe Drinking Water Act (SDWA), as amended, and implementing regulations at Title 40 of the Code of Federal Regulations, Parts 124, 144, 146, 147, and 148.

Pursuant to its permitting authority, the EPA hereby authorizes

Puna Geothermal Venture (owner and operator)
14-3860 Kapoho Paho Road
Paho, Hawaii 96778

to operate four existing Class V geothermal injection wells (the term "well" shall refer to an injection well unless otherwise stated), known as geothermal wells Kapoho State 1A (KS-1A), Kapoho State 3 (KS-3), Kapoho State 4 (KS-4), and Kapoho State 11 (KS-11):

<u>Injection Well No.</u>	<u>Operational Status</u>	<u>Located on Well Pad</u>	<u>Approximate Well Head Elevation Above Mean Sea Level</u>
KS-1A	Primary Injector	A	618 feet
KS-3	Primary Injector	E	617 feet
KS-4	Primary Injector	E	617 feet
KS-11	Primary Injector	A	618 feet

and having the specifications as listed in Figure No. 1, Figure No. 2, Figure No. 3, and Figure 4, respectively, of Appendix A--Injection Well Schematics; to inject geothermal fluids consisting of geothermal brine, geothermal steam condensate, and geothermal noncondensable gases that are produced during the operation of the well field and power plant; chemical additions for process system and well casing biofouling, corrosion, and scale control; and the intermittent injection of supplement water back into the geothermal reservoir at an interval between the approximate depths of 3,900 feet and 7,300 feet (in reference to the Kelly Bushing, or KB, which is 25 feet above the top of cellar), located at the facility's address of 14-3860 Kapoho Paho Road, Paho, Hawaii, 96778; at Tax Key Number, 3rd Div. 1-4-01:2 and 19; at the approximate well pad coordinates:

Well Pad A: Latitude 19 28' 49" N and
Longitude 154 53' 35" W;

Well Pad E: Latitude 19 28' 41" N and
Longitude 154 53' 40" W;

in accordance with monitoring requirements and other conditions set forth in Parts I, II, III and IV hereof.

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The EPA authorizes the operation of the four (4) existing Class V geothermal injection wells, and the construction and operation of up to six (6) new Class V geothermal injection wells, contingent on the conditions of this permit being met. As specified in Part II.A.2 of this permit, the location of new injection wells will be included in Appendix B--Existing and Proposed Well Locations.

All conditions set forth herein refer to Title 40 Parts 124, 144, 146, and 148 of the Code of Federal Regulations.

This permit consists of 23 pages in addition to appendices and includes all items listed in the Table of Contents. Further, this permit is based upon representations made by the permittee and on other information contained in the administrative record. It is the responsibility of the permittee to read and understand all provisions of this permit.

This permit is issued by the EPA for a period of ten (10) years unless terminated under the conditions set forth in Part III, Section B of this permit.

This permit is issued on _____ and becomes effective on _____.

Alexis Strauss, Director
Water Division, U.S. EPA Region 9

PART II. SPECIFIC PERMIT CONDITIONS

A. LOCATION OF EXISTING AND PROPOSED INJECTION WELLS

1. Existing Injection Well Locations

The permittee currently operates four (4) Class V injection wells known as geothermal wells, Kapoho State 1A (KS-1A), Kapoho State 3 (KS-3), Kapoho State 4 (KS-4), and Kapoho State 11 (KS-11).

Injection Well No.	Status	Located on Well Pad	Approx. Wellhead Elevation Above Mean Sea Level
KS-1A	Primary Injector	A	618 feet
KS-3	Primary Injector	A	618 feet
KS-4	Primary Injector	E	617 feet
KS-11	Primary Injector	E	617 feet

The wells are located at the facility's address of 14-3860 Kapoho Paho Road, Paho, Hawaii 96778; at Tax Key Number, 3rd Div. 1-4-01:2 and 19; at the approximate well pad coordinates:

Well Pad A: Latitude 19° 28' 49" N and
Longitude 154° 53' 35" W;

Well Pad E: Latitude 19° 28' 41" N and
Longitude 154° 53' 40" W;

2. Proposed Injection Well Locations

a. The permittee is authorized by the EPA to operate the four (4) existing geothermal injection wells, and construct and operate up to six (6) new geothermal injection wells, contingent on the conditions of this permit being met. The new wells will be located on the well pads within the property boundary delineated in Appendix B, and will be set back at least 600 feet from the property boundary.

b. At least sixty (60) days prior to spudding a new well, EPA shall receive from the permittee: 1) the latitude and longitude of the new well(s), and 2) a map similar to the one in Appendix B with the location of the existing and new wells.

B. WELL CONSTRUCTION AND RELATED CONDITIONS1. New Wells and Conversions

a. The permittee shall give advance notice of at least sixty (60) days to the EPA prior to spudding a new injection well or non-injection well (e.g. developmental, production, exploration) well. The permittee shall give advance notice of at least sixty (60) days to the EPA of the conversion of a non-injection well to an injection well.

b. A new well or a non-injection well converted to an injection well may not commence injection until: i) construction is complete and the permittee has submitted a notice of completion of construction to the EPA through certified mail; and ii) the EPA has received and reviewed the well information in II.B.1.c and finds it is in compliance with the conditions of the permit. Injection into a new or converted well is prohibited until the permittee shows to the satisfaction of the EPA under §146.8 that the well has mechanical integrity. If the EPA elects to inspect the well, the EPA will notify the permittee of this within 13 days of the date of the notice in II.B.6.b.i, and will include a reasonable time period in which it will inspect the well. Review of the well will be based on the information in II.B.6.c.

c. The permittee shall provide EPA with the following information for new and converted wells:

i. The latitude and longitude and well pad of the well and a map similar to the one in Appendix B with the location of the existing and new wells [for new wells, this information shall be received at least sixty (60) days prior to spudding the well];

ii. A schematic diagram showing the total depth of the well, and the depths of casing, tubing, and slotted liners for Appendix A;

iii. The lithologic log and injectivity test results;

iv. All mechanical integrity test results, including the results of a static temperature test and pressure test; and

v. A plugging and abandonment plan on Form 7520-14 to be included in Appendix I.

d. It is recommended that the permittee notify the emergency responders (County Civil Defense, Fire Department and Police Department) at least fourteen (14) days prior to drilling any new injection or non-injection well. It is also recommended that PGV keep an updated emergency response plan.

2. Casing and Cementing

The specifications in Figures No. 1, No. 2, No. 3 and No. 4 in Appendix A, apply to injection wells KS-1A, KS-3, KS-4, and KS-11, respectively. New injection wells will be drilled according to the construction plans submitted in Attachment L of the application. Changes to the construction plans during construction are considered minor modifications provided that the permittee notifies and receives approval from EPA, and that the changes comply with the requirements of 40 CFR §§144 and 146 (40 CFR §144.41(f)). Within sixty (60) days of completing the construction of a well, the well schematic will be provided to the EPA to be included in Appendix A. All existing and new wells shall be cased and cemented to prevent the movement of fluids behind the casing and the casing shall be maintained until the plugging and abandonment of the well.

3. Tubing Injection tubing (hangdown liner) will be utilized within the longstring casing and will extend to the depths indicated on the well schematics. For existing wells, injection tubing extends to below 3,700 feet (KB). The casing/tubing annulus of all existing and proposed injection wells will be filled with nitrogen gas down to a depth of at least 2,000 feet (KB) or 1,975 (below ground surface or BGS). The depth of the fluid level in the annulus shall be measured using a sonic device.

4. Injection Intervals

For each well, injection into the intended zones will be through the open borehole, with or without a slotted (perforated) liner, below the cemented solid casing. Alteration of the injection perforations and other rework operations must be properly reported using EPA Form 7520-12 in Appendix C--Approved Changes and Workover Plans and Sample Forms. Injection between the outermost casing and the well bore is prohibited. The injection interval of the proposed well will be at a depth so as not to cause the migration of injected fluids into Underground Sources of Drinking Water (USDW).

5. Monitoring Devices

Pursuant to 40 CFR §§144.51(h) and 144.52(a)(9) in order to prevent the migration of injected fluids into a USDW and adequately characterize the injectate, the operator shall maintain, in accurate and good operating condition, the following:

a. A sampling port on the injection line between the injection common header and an active injection well for the purpose of obtaining representative samples of the injected fluids;

- b.i. An injection pressure indicator and a continuously-recording injection pressure recorder on the injectate line immediately upstream of each well;
- ii. a local indicator and a remote pressure transmitter on the combined flow injection line that provides information directly to the control room at the plant; and
- iii. an injection pressure switch that triggers a computer printout in the control room;
- c. A continuously recording pressure recorder at each well to measure annular nitrogen pressure;
- d.i. A flow metering orifice on the injection line immediately upstream of each well;
- ii. a flow transmitter at each well that provides information directly to the control room of the plant;
- iii. a flow totalizer on the injection line immediately upstream of each well; and
- iv. a flow transmitter on the combined flow injection line that provides information directly to the control room of the plant;
- e.i. A temperature indicator located on the injection line immediately upstream of each well; and
- ii. a local indicator and a remote temperature transmitter on the combined flow injection line that provides information directly to the control room at the plant; and
- f. A device on the line between the Emergency Steam Release Facility (ESRF) and the combined flow injection line for measuring the quantity of supplemental water going to the wells.
- g. A sonic device shall be used to measure the fluid level in the annulus of the injection wells.

6. Proposed Changes and Workovers

The permittee shall give advance notice of at least sixty (60) days to the EPA of any significant physical alterations to the wells. Any changes in the well construction will require prior approval of the EPA and either a major or minor permit modification under the requirements of 40 CFR §§144.39 and 144.41. In addition, the permittee shall provide a workover report containing all records of well workovers, or other subsequent test data to the EPA within sixty (60) days of completion of the activity. Appendix C contains a sample of the appropriate reporting form for the workover report. Mechanical integrity testing shall be performed within thirty (30) days of the completion of any workovers or alterations.

Mechanical integrity shall be demonstrated to EPA prior to resuming or commencing injection activities, following in accordance with Part II.D.1 of this permit.

C. CORRECTIVE ACTION

1. Area of Review

a. The area of review (AOR) shall consist of the aggregate of one-fourth (1/4) mile radii that extend beyond the edge of each well pad as identified in Appendix B

b. Unless corrective action has been taken, the construction of a new injection well or conversion to an injection well is prohibited within the area of review until all abandoned, improperly sealed, or improperly completed wells that are located within the AOR and penetrate the injection zone are properly plugged and abandoned by the appropriate party.

2. Corrective Action

a. The drilling of a new injection well or conversion to an injection well is prohibited within a one-fourth (1/4) mile of Scientific Observation Hole #1 (SOH-1) until the internal and external mechanical integrity of SOH-1 has been demonstrated to the EPA by some party.

D. WELL OPERATION

1. Mechanical Integrity

a. All injection wells, including active, temporarily abandoned, and injection wells no longer serving their original function (e.g. injection wells used for monitoring purposes) must have and maintain mechanical integrity consistent with 40 CFR §146.8. The permittee must show that there are no significant leaks in the casing and tubing and that there is no significant fluid movement into a USDW through channels adjacent to the injection wellbore.

b. In addition, an annulus pressure increase or decrease of more than ten (10) percent in five (5) hours constitutes a significant leak, unless it occurs during the normal shut-in of a well for repairs, wellhead changeout, annual maintenance, outage, or other normal operation and maintenance situations. When an annulus pressure increase or decrease of more than ten (10) percent in five (5) hours occurs or at any time the gas/fluid interface cannot be maintained at a depth of at least 2,000 feet KB (1,975 feet BGS), as measured by a sonic device such as an Echo Meter, then the permittee is required to inspect the wellhead for leaks, repair any wellhead leaks found, and resume monitoring. If either one of the aforementioned conditions persists, then the permittee is required to shut in and secure the well, submit an action plan for locating and repairing the leak, repair the leak, and satisfactorily demonstrate to EPA mechanical integrity before

returning to operations. The tests and monitoring data that show that the well has had its mechanical integrity restored shall be sent to the EPA.

c. If a lack of mechanical integrity and/or significant leaks are detected and confirmed in two or more injection wells, flow into these two or more wells will be stopped, and if necessary, the control operator will reduce the incoming flow from the production well(s). If all injection wells incur mechanical integrity failures and/or significant leaks at the same time, all injection wells shall be shut in.

2. Injection Pressure Limitation

a. Injection pressure shall not exceed the fracture pressure of the receiving formation, nor the injection pressures for the individual wells as listed below.

<u>Well</u>	<u>Maximum Injection Wellhead Pressure (psig)</u>
KS-1A	500
KS-3	500
KS-4	500
KS-11	1,040

The permittee shall supply the maximum injection wellhead pressure limitation for a new well to the EPA to be included in Appendix E--Injection Pressure Limitations for New Wells.

b. All piping, valves and facilities associated with injection operations shall meet or exceed API standards for the injection pressure and shall be maintained in a safe and leak-free condition.

3. Injection Rate Limitation

The injection rate shall not cause an exceedance of the injection pressure limitation in Part II.D.2.a. Should the maximum injection rate increase to a point where it appears that the maximum injection pressure limitation will be exceeded, then the EPA will reconsider setting maximum injection rate limitations.

4. Injection Fluid Limitation

a. Injectant in this permit is limited to geothermal fluids, supplemental water, and chemical additions for process system and well casing biofouling, corrosion, and scale control.

b. Geothermal fluids consist of geothermal brine, geothermal steam condensate, and geothermal noncondensable gases.

c. Supplement water may consist of steam turbine seal water, rinsate from the water softener system, sulfatreat heat exchanger cooling water, raw/quench water, production well bleed system, abatement fluids, sulfatreat system vacuum pump

seal water, condensate from the sulfatreat system, periodic produced drilling fluids, and fluids from the plant water storage tank and the emergency steam release facility (ESRF). Some of these fluids may contain the additives listed in Appendix F--Chemical Additives.

d. Chemical additives for process system and well casing biofouling, corrosion, scale control and tracers must be in accordance with the Chemical Additives list in Appendix F. The permittee shall notify the EPA of any new chemical additive prior to its use and shall provide the EPA with a copy of its Material Safety Data Sheet (MSDS).

e. To inject fluids other than those described in paragraphs a-c above, the permittee must receive written approval from the EPA.

5. Upset Conditions

In the event of an upset of facility operations where the injection wells cannot be used, injectate shall not be discharged on the ground. Additionally, there shall be no overflow of fluids from the Emergency Steam Release Facility (ESRF) to the ground. The permittee shall contact the EPA and other appropriate federal, state, and local agencies as specified in this permit (Parts III.E.11 and 13).

E. MONITORING, RECORDKEEPING, AND REPORTING OF RESULTS

1. Hydrologic Monitoring Program

The permittee shall implement the Hydrologic Monitoring Program dated December 2005, in Appendix G, or as modified with the written approval of the EPA.

2. Program for Mechanical Integrity Testing and Monitoring of Injection Wells

a. The permittee shall implement the Program for Mechanical Integrity Testing and Monitoring of Injection Wells, dated July 29, 1996, in Appendix D or as modified with the written approval of the EPA. This program shall be implemented for all injection wells, including active, temporarily abandoned (idle), and injection wells converted to monitoring wells.

b. The permittee shall notify the EPA at least sixty (60) days prior to performing the annual mechanical integrity tests. For mechanical integrity tests resulting from well repair, the permittee will notify the EPA as soon as possible to give the EPA the option of witnessing the mechanical integrity tests.

c. Annual mechanical integrity tests for all wells shall be conducted sequentially within the same test period to enable EPA to witness them.

d. In addition, a continuous recording of the injection wellhead pressure, injection rate, and annulus pressure shall be maintained. Injection wellhead pressure, injection rate and annulus pressure shall be visually checked daily. Pressure recordings shall be documented on a graphical chart, such as a strip chart or circular chart, that shows the relationship between pressure and elapsed time. The pressure recordings shall be maintained whether or not the injection well is in use. The pressure recordings shall distinguish between the time periods of use and nonuse, if any. A summary report that contains the daily maximum injection pressure shall be submitted to the EPA quarterly. Any increase or decrease in the annulus pressure of ten (10) percent or greater over a continuous five (5) hour period or any rise in the gas/brine interface above 2,000 feet KB (1,975 feet BGS) in the tubing/casing annulus shall be reported within twenty-four (24) hours to the EPA, and in the monthly report with an explanation.

3. Injection Fluid Monitoring Program

a. The permittee shall comply with the analytical and reporting conditions of the facility's Chemical and Physical Analysis Plan For Injectate Testing in Appendix H, or as amended with written approval the EPA.

b. The permittee shall utilize the applicable analytical methods described in Tables IA-IE of 40 CFR §136.3, or in Appendix III of 40 CFR §261, or in certain circumstances, other methods that have been approved by the EPA.

c. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. Injectate fluid samples shall be taken at the injection line sampling port between the injection common header and injection well KS-1A or any active injection well. Injectate gas samples shall be taken from the noncondensable gas line prior to mixing with the injectate fluid flow.

d. The following shall be monitored daily: quantity of total injectate, quantity of geofluids, quantity of supplemental water, chemical additions, and injectate temperature.

e. Under applicable conditions, the EPA shall have the right to order and direct the permittee to collect, analyze and report on special or unscheduled samples of the injectate. Applicable conditions consist of, but are not limited to, accidental discharges, malicious discharges, and undefined discharges into the injection well. The permittee is required to maintain records of the sample collection and analysis in conformance with Part II.E.4 of this permit.

4. Monitoring Information

Records of any monitoring activity required under this permit shall include:

- a. The date, exact place, and time of sampling or field measurements;
- b. The name of the individual(s) who performed the sampling or measurements;
- c. The exact sampling method(s) used to take samples;
- d. The date(s) laboratory analyses were performed;
- e. The name of the individual(s) who performed the analyses;
- f. The analytical techniques or methods used by laboratory personnel;
- g. The results of such analyses, including reporting units; and
- h. Chain of custody records.

5. Calibration of Monitoring Equipment

All monitoring and recording equipment shall be calibrated on a regular basis. The permittee shall submit to the EPA a one-time report describing the calibration procedures and the frequency at which the equipment will be calibrated.

6. Automatic Alarms and Shut-Off Devices

- a. Injection pressure shall be monitored in the control room and an automatic computer printout system shall be maintained so as to notify operators when the injection pressure switch in the combined flow injection line has been activated.
- b. The pressure switch on the combined flow injection line and the relief valves on the individual injection wells shall be maintained in good working order and shall be set so as to not cause an exceedance of the maximum injection wellhead pressure limitations for the individual wells in Part II.D.2(a), or the fracture pressure of the formation, whichever is less.
- c. The two manual block valves on each injection and production well shall be maintained in good working order.

7. Recordkeeping

- a. The permittee shall retain records concerning:
 - i. The origin, physical properties, and chemical composition of all injected fluids until three (3) years after the well has been plugged and abandoned in accordance with the Plugging and Abandonment Plans shown in Appendix I; and
 - ii. All monitoring information, including all calibration and maintenance records and recordings used for continuous

monitoring and copies of all reports required by this permit, shall be maintained by the permittee for a period of at least five (5) years from the date of the sample, measurement, or report until the well had been plugged and abandoned.

b. The permittee shall continue to retain such records after the retention periods specified in paragraph (a) unless it delivers the records to the EPA or obtains written approval from the EPA to discard the records.

c. The permittee shall maintain copies (or originals) of all pertinent observation records available for inspection at the facility, unless the permittee has archived the records the EPA or has obtained permission from the EPA to discard the records.

8. Accurate, Current, and Representative Information

The submission of records, analytical results, recorded inspections, status reports, and any other reporting as specified and required by this permit shall be accurate, current, and representative of the activity being monitored within the specified time frame for monitoring. The submission of inaccurate, out-dated, and/or unrepresentative records, results, inspections, reports, and any other required information, or the nonsubmission of the required materials, is a violation of this permit.

9. Reporting

The permittee shall submit the following information to the EPA:

a. Semiannual groundwater monitoring data as required by the Hydrologic Monitoring Program, to be submitted in February and August;

b. Annual mechanical integrity test results and monitoring data as required by the Program for Mechanical Integrity Testing and Monitoring and Part II.E.2 of this permit. Mechanical integrity test results shall be provided to EPA within sixty (60) days of the tests.

c. All records of mechanical integrity test results, monitoring data, workovers, well conversions, logging or other subsequent test data generated by the workover, alteration, or repair of a well as required by Parts II.B.1, II.B.6 and II.D.1.

d. The one-time calibration report describing the calibration procedures and frequency for monitoring equipment as required by Part II.E.5, in addition to calibrations required for the other reports in II.E.9;

e. Quarterly injection well performance status reports (hereto referred to as quarterly reports) shall document the

performance of the injection wells and shall follow the same format that has been used for the DOH's UIC permit. The reports shall be made by a professional consultant, engineer, or geologist proficient in injection well performance. These reports shall include:

- i. Daily maximum and average injection pressures;
 - ii. The average daily minimum annulus pressure and calculated minimum annulus pressure required to depress the nitrogen/brine interface below 2,000 feet;
 - iii. Daily average injection rate;
 - iv. Total daily quantity, including the break down of geofluids and supplemental water quantities;
 - v. Daily temperature;
 - vi. Any increase in pressure that has triggered the pressure switch on the combined flow injection line; and
 - vii. Narrative descriptions and explanations of any incidence of noncompliance that has occurred.
- f. Quarterly reports shall be submitted for the reporting periods by the respective due dates as listed below:

<u>Reporting Period</u>	<u>Report Due</u>
Jan, Feb, Mar	May 1
Apr, May, June	Aug 1
July, Aug, Sept	Nov 1
Oct, Nov, Dec	Feb 1

Copies of the quarterly reports, all other reports, monitoring and test results required by this permit shall be submitted to the following address:

U.S. Environmental Protection Agency
 Ground Water Office (WTR-9)
 75 Hawthorne St.
 San Francisco, CA 94105

10. Modifications to Monitoring and Reporting

This permit herein acknowledges that environmental and facility operating conditions affecting the monitoring and reporting conditions of this permit, including the Hydrologic Monitoring Program and Casing Monitoring Program, could change. This could warrant the EPA's reevaluation of those conditions in order to address changing concerns and to establish relevant analyses. Modifications to the monitoring and reporting conditions, resulting from reevaluations, shall be approved by the EPA.

11. Additional Monitoring and Reporting

If the operation of the injection wells is additionally regulated by other pollution control programs, e.g. Clean Air Act, the adherence to the monitoring and reporting conditions of such other pollution control programs shall not be circumvented by the terms and conditions of this permit.

12. Twenty-Four Hour Reporting

The permittee shall report any noncompliance which may endanger health or the environment, including:

- a. Any monitoring, or other information which indicates that any contaminant may cause an endangerment to a USDW;
- b. Any noncompliance with a permit condition, or malfunction of the injection well system which may cause fluid migration into a USDW or between USDWs;
- c. Any wellhead leaks or overflows from the ESRF pond.

Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written report shall also be provided within five (5) days of the time the permittee becomes aware of the circumstances. The written report shall contain a description of the noncompliance and its cause, the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated length of time that it is expected to continue; and steps taken or planned to reduce, eliminate and prevent the reoccurrence of the noncompliance.

Oral reports to EPA Ground Water Office shall be made to (415)972-3525 or (415) 972-3961. Messages can be left at this number for oral reporting that occurs during evenings, weekends, and holidays.

13. Reporting of Noncompliance of Permit Limitations

The permittee shall notify the EPA of any exceedances of or noncompliance with limitations and contained in this permit. Permit limitations in this permit refer to, and are not limited to, injectate pressure, annulus pressure, physical parameters, chemical additives, and scheduled events such as analyses, evaluations, and reports. The notification shall consist of a report that shall include: a description of the noncompliance and its causes; the period of noncompliance, including exact dates and times; and if the noncompliance has not been corrected, then the anticipated time it is expected to continue and the steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance. The report shall be submitted to the EPA at the time of the next quarterly monitoring report.

F. PLUGGING AND ABANDONMENT1. Notice of Plugging and Abandonment

The permittee shall notify the EPA no later than sixty (60) days before further conversion, workover, or abandonment of a well. The EPA may require that the plugging and abandonment be witnessed by a EPA representative.

2. Plugging and Abandonment Plan

The permittee shall abandon the well according to the Plugging and Abandonment Plan in Appendix I, and must also comply with the abandonment conditions required by the State of Hawaii and the County of Hawaii. The permittee shall submit any proposed revision to the method of plugging reflected in the plan no later than sixty (60) days prior to well plugging and abandonment. The EPA reserves the right to change the manner in which a well will be plugged if the well is modified during its permitted life or if the well is not consistent with EPA requirements for construction or mechanical integrity. The EPA may ask the permittee to estimate and to update the estimated plugging cost periodically. Such estimates shall be based upon costs which a third party would incur to plug the well according to the plan.

3. Plugging and Abandonment Report

Within sixty (60) days after plugging the well, the permittee shall submit a report on Form 7520-14 in Appendix I to the EPA. The report shall be certified as accurate by the person who performed the plugging operation, and the report shall consist of either: (1) a statement that the well was plugged in accordance with the plan, or (2) a statement specifying the different procedures followed where actual plugging differed from the plan.

4. Well Closure

The permittee shall properly plug and abandon, in accordance with the conditions in Part II.F.1-3, any well that is determined to be a threat to a USDW, either voluntarily or thereupon notification by the EPA. Any injection well that is used for monitoring shall be properly plugged and abandoned once the monitoring is completed.

G. FINANCIAL RESPONSIBILITY1. Demonstration of Financial Responsibility

The permittee is required to maintain financial responsibility and resources to close, plug, and abandon all injection wells, including active, temporarily abandoned (idle), and injection wells no longer serving their original function (e.g. injections wells used for monitoring purposes), as provided in the Plugging and Abandonment Plan.

a. The permittee has provided an irrevocable standby letter of credit, No. 00652520001454, dated July 29, 2004, and standby trust agreement for the estimated cost of plugging the four existing injection wells which is \$800,000.

b. Demonstration of financial responsibility must be provided to the EPA when the permit is issued and every year by June 1.

c. The EPA can periodically require the permittee to update the Plugging and Abandonment Plan and/or the cost associated with it. If the updated estimate indicates that the cost of the plugging and abandonment is more than ten (10) percent greater or less than the most recent estimate, the financial assurance mechanism shall be increased or decreased accordingly.

d. Prior to the construction of or conversion to a new injection well, the financial assurance mechanism shall be modified to reflect the cost of plugging the additional well. Should the cost of plugging the well, once it is constructed, vary by more or less than ten (10) percent of the original estimate, then the financial assurance mechanism shall be modified accordingly.

2. Insolvency of Financial Institution

The permittee must submit an instrument of financial responsibility acceptable to the EPA within sixty (60) days after either of the following events occur:

a. The institution issuing the irrevocable standby letter of credit or financial instrument files for bankruptcy; or

b. The authority of the trustee institution to act as trustee, or the authority of the institution issuing the financial instrument is suspended or revoked; or

c. The institution issuing the financial instrument lets it lapse or decides not to extend it.

PART III. GENERAL CONDITIONS

A. EFFECT OF PERMIT

The permittee is allowed to engage in underground injection well operation in accordance with the conditions of this permit. The permittee shall not construct, operate, modify, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR Parts 141 and 142 or may otherwise adversely affect the health of persons. Furthermore, any underground injection activity not specifically authorized in this permit is

prohibited. Compliance with this permit during its term constitutes compliance for purposes of enforcement with Part C of the Safe Drinking Water Act (SDWA). Such compliance does not constitute a defense to any action brought under Section 1431 of the SDWA, or any other common or statutory law other than Part C of the SDWA. Issuance of this permit does not convey property rights of any sort or any exclusive privilege, nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of State or local law or regulations. Nothing in this permit shall be construed to relieve the permittee of any duties under applicable regulations.

If at any time the EPA learns that an injection well may cause a violation of primary drinking water regulations, the EPA shall order the permittee to take such actions as may be necessary to prevent the violation, including, where required, cessation of operation of the injection well. The EPA will issue an order to immediately cease and desist injection upon receipt of factual information that the injection has caused or is likely to cause imminent and substantial danger to the health of a person or persons due to contamination of a public water supply or underground source of drinking water.

B. PERMIT ACTIONS

1. Modification, Revocation, Reissuance, and Termination

The EPA may, for cause or upon request from the permittee or any interested person or upon the EPA's initiative, modify, revoke and reissue, or terminate this permit in accordance with applicable jurisdictions under 40 CFR §§ 124.5, 144.12, 144.39, and 144.40. Also, the permit is subject to minor modifications for cause as specified in 40 CFR § 144.41. The filing of a request for a permit modification, revocation and reissuance, or termination, or the notification of planned changes, or anticipated noncompliance on the part of the permittee does not stay the applicability or enforceability of any permit condition. The EPA may also modify, revoke and reissue, or terminate this permit in accordance with any amendments to the SDWA if the amendments have applicability to this permit.

2. Transfer of Permits

This permit is not transferable to any person except after one of the following actions has occurred at the discretion of the EPA: automatic transfer under 40 CFR §144.38(b); modification under 40 CFR §124.5 and §144.39, including "minor modification" 40 CFR §144.41; or revocation and reissuance of the permit §124.5 and §144.39. To initiate the process, the permittee shall supply written notice to the EPA sixty (60) days in advance of the proposed transfer date and in compliance with the requirements of 40 CFR §144.38. EPA will notify the permittee if a "major modification" or revocation and reissuance of the permit is necessary to to change the

name of the permittee and incorporate such other requirements as may be necessary under 40 CFR §124, §144, and §146.

C. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

D. CONFIDENTIALITY

In accordance with 40 CFR §§2 and 144.5, any information submitted to the EPA pursuant to this permit may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, the EPA may make the information available to the public without further notice.

E. GENERAL DUTIES AND REQUIREMENTS

1. Duty to Comply

The permittee shall comply with all applicable UIC Program regulations and conditions of this permit, except to the extent and for the duration such noncompliance is authorized by an emergency permit issued in accordance with 40 CFR § 144.34. Any permit noncompliance constitutes a violation of the SDWA and is grounds for enforcement action, permit termination, revocation and reissuance, modification, or for denial of a permit renewal application.

2. Penalties for Violations of Permit Conditions

Any person who violates a permit condition is subject to civil penalties, fines, and other enforcement action under the SDWA. Any person who willfully violates permit conditions may be subject to criminal prosecution.

3. Need to Halt or Reduce Activity not a Defense

It shall not be a defense, for the permittee in an enforcement action, that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

4. Duty to Mitigate

The permittee shall take all reasonable steps to minimize and correct any adverse impact on the environment resulting from noncompliance with this permit.

5. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this permit.

6. Duty to Provide Information

The permittee shall furnish to the EPA, within the time specified herein, any information which the EPA may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the EPA, upon request, copies of records required to be kept by this permit.

7. Inspection and Entry

The permittee shall allow the EPA or authorized representatives, upon the presentation of credentials and other documents as may be required by law, to:

- a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this permit;
- b. Have access to and copy, at reasonable times, any records that are kept under the conditions of this permit;
- c. Inspect at reasonable times and photograph any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
- d. Sample or monitor, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the SDWA, any substances or parameters at any location.

8. Records of the Permit Application

The permittee shall maintain records of all data required to complete the permit application and any supplemental information submitted with the permit application for a period of five (5) years for EPA from the effective date of this permit.

9. Availability of Reports

All reports prepared in accordance with the conditions of this permit shall be available for public inspection at appropriate offices of the EPA. Permit applications, permits, and well operation data shall not be considered confidential.

10. Signatory Requirements

All reports or other information requested by the DOH and/or EPA shall be signed and certified by a responsible corporate officer or duly authorized representative according to 40 CFR § 144.32.

11. Reporting of Changes and Noncompliance

a. Anticipated Changes and Noncompliance

The permittee shall give advance notice, of at least seven (7) days, to the EPA of any planned changes in the permitted facility or activity which may significantly change any injection well operating characteristics or injection well specifications; or which may result in noncompliance with permit requirements. Changes, modifications or revisions in the operation characteristics or specifications of the injection wells shall not be implemented unless otherwise approved by the EPA.

b. Other Noncompliance

The permittee shall report all other instances of noncompliance not otherwise reported at the time monitoring reports are submitted. The reports shall contain the information listed in Part II. E. of this permit.

c. Other Information

Where the permittee becomes aware that it failed to submit all relevant facts in permit application, or submitted incorrect information in a permit application or in any report to the EPA, the permittee shall submit such facts or information within two (2) weeks of the time such information becomes known.

12. Continuation of Expiring Permits

a. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must submit a complete application for a new permit to the EPA at least one hundred eighty (180) days before this permit expires.

b. Permit Extensions

The conditions of an expired permit may continue in force in accordance with 5 United States Code (U.S.C.) 558(c) until the effective date of a new permit, if:

- i. The permittee has submitted a timely application which is a complete application for a new permit; and
- ii. The EPA, through no fault of the permittee, does not issue a new permit with an effective date on or before the expiration date of the previous permit.

13. Required Immediate and Followup Notifications of Non-permitted Releases

a. Pursuant to the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Section 103 and/or the Emergency Planning and Community Right To Know Act (EPCRA) Section 304, the permittee will immediately notify the National Response Center (NRC) at (800)424-8802, the Hawaii State Emergency Response Commission (SERC) and the Hawaii County Local Emergency Planning Committee (LEPC) as soon as it has knowledge that there has been a release into the environment of a reportable quantity of a hazardous or extremely hazardous substance.

b. As soon as practicable following a reportable release under EPCRA Section 304, the permittee will submit a written followup report to the SERC and LEPC which conforms to the requirements of that section.

PART IV. APPENDICES

APPENDIX A
INJECTION WELL SCHEMATICS

APPENDIX B

EXISTING AND PROPOSED WELL PAD LOCATIONS

APPENDIX C
APPROVED CHANGES AND WORKOVERS

APPENDIX D
CASING MONITORING PROGRAM

APPENDIX E

INJECTION PRESSURE LIMITATIONS FOR NEW WELLS

APPENDIX F

CHEMICAL ADDITIVES

Note: Some of these products may not currently be used, but are approved for use.

<u>Product Name and Function</u>	<u>Chemical Ingredient</u>
Amersite (R)2 Corrosion Inhibitor	Sodium Bisulfite
Wrico Oxy 11 Corrosion Inhibitor	Sodium Sulfite Ethylannediamine Tetraacetic Acid Sodium Salt
WPD 11-306 (Tm) Corrosion Inhibitor	Dimethyldioctylammnonium Chloride Soya Amine Polyethoxylate Cyclohexylamine
West R-322 Corrosion Inhibitor	Polyamideamine Acetate POE (15) Tallow Amine
Midland 203 Oxygen Scavenger	Sodium Metabisulfite Colbalt Compounds
Millspere (R) 802 Anti-scalant	Poly (Maleic Acid)
Sodium Hydroxide pH Adjustor and H2S Abator	Sodium Hydroxide
Drew 11-480, Corrosion Inhibitor	Soya Amine Poly
Royal Purple Barrier Fluid	Synthetic Lubricant
Catalyzed Sulfite Oxygen Scavenger	Sodium Sulfite, Benzoic Acid
Drew 11-575 Anti-Scalant	Sodium Chloride Phosphoric Acid Derivative
Biosperse 250, Microbiocide	Magnesium Nitrate, Cupric Nitrate Magnesium Chloride 2-Methyl-4-Isothiazolin-3-One 5-Chloro-2-Methyl-Isothiazolin-3-One
Sulfuric Acid Anti-Scalant	Sulfuric Acid

APPENDIX G
HYDROLOGIC MONITORING PROGRAM

PUNA GEOTHERMAL VENTURE
HYDROLOGIC MONITORING PROGRAM

December 2005

Sampling Locations: The following wells will be monitored.

<u>Well Name</u>	<u>Elevation (MSL)</u>	<u>Completion Depth (MSL)</u>
MW-1	610	-46
MW-2	588	-2
MW-3 (standby)		

Frequency: Regular sampling shall occur twice a year, once in January and once in July.

Water Level Measurements: Prior to bailing or pumping the well and sampling, water level measurements will be taken and recorded. The permittee can use an Echo Meter or similar device, or an electronic direct contact detection probe with a calibrated cable/tape for direct measurement at the top of the well casing. Calibrated cable/tape length shall be sufficient to measure water levels in the deepest wells. The metering device shall be equipped with an audible signal and light to indicate water level contact.

Quality Assurance/Quality Control: Quality assurance/quality control procedures will be in compliance with standards of practice for similar programs relative to the acquisition, reduction, verification, and validation of the site data. At each location, standardized equipment cleaning will be conducted prior to obtaining each sample.

Prior to ground water sampling, the well will be bailed or pumped at least three times the wellbore volume.

All samples will be taken and field analyses conducted in accordance with standard protocols approved by the EPA. An EPA or State of Hawaii certified laboratory will be used to conduct the analyses for samples submitted. Samples will be transferred from the sampling device directly to appropriately prepared containers supplied by the laboratory. Samples will be labeled, stored and transported in a chilled state in insulated containers to the laboratory.

In the analyses, detection limits will be used that are below maximum contaminant levels. If they are not, the sampling and analyses will be repeated using the proper detection limits.

The contractor will provide a copy of their Quality Assurance program to DOH and EPA for review and approval.

Physical and Chemical Parameters: Field analyses will include:

- pH
- temperature
- conductivity
- salinity
- chloride concentration
- water level

These measurements will be obtained by using calibrated instruments specifically designed to directly measure these physical and chemical parameters within the operational constraints

dictated by site conditions.

The inorganic (Type I) and organic (Type II and IV) constituents that are to be sampled for are specified in Appendix H.

Reporting: Sampling results and measurements will be submitted during the February following the January sampling, and the August following the July sampling. Original laboratory reports will be included with a cover letter. Reporting units shall be specified. The laboratory shall not use text descriptions, such as “Below Regulatory Limits” or “BRL”, in its reporting, but rather, the actual numerical results will be reported. If the actual numerical results are not reported, the sampling and analysis will be redone until numerical results are reported.

Further Monitoring: If leakage of the injectate into the USDW is suspected, the ground water sampling may be modified. Depending on the situation, this could include sampling from Malama Ki and GTW-III, sampling for certain analytes and more frequent sampling.

CHEMICAL AND PHYSICAL ANALYSIS PLAN FOR INJECTATE TESTING

Type I samples will be collected once every two months starting in January, and Types III and VI samples will be collected twice a year, once in January and once in July. A cooling coil shall be used to properly cool the samples during collection.

PLUGGING AND ABANDONMENT PLAN

Upon completion of injection activities the well will be abandoned according to Federal, State and County regulations to ensure protection of Underground Sources of Drinking Water (USDW).

DEFINITIONS

- (a) "Facility or activity" means any UIC "injection well" or any other facility or activity that is subject to regulation under UIC rules.
- (b) "Fluid" means any material or substance which flows or moves whether in a semisolid, liquid, sludge, gas or any other form or state.
- (c) "Injection Pressure" means gauge pressure measured at the wellhead.
- (d) "Injection Well" means a well into which subsurface disposal of fluid or fluids occurs or is intended to occur by means of injection.
- (e) "Rework" means any recompletion of a well, deepening or redrilling (side-tracking) of a well, or other repairs, maintenance or modifications. Such activities commonly include a drilling rig.
- (f) "USDW" means "underground source of drinking water" as defined in 40 CFR, Part 144.3.
- (g) "Well" means a bored, drilled or driven shaft, or a dug hole, whose depth is greater than its widest surface dimension.

APPENDIX K

MODIFICATIONS