



Civil Defense Agency

Larry S. Tanimoto
Mayor

920 Ululani St • Hilo, Hawaii 96720 • (808) 935-0031 • Fax (808) 935-6460

05220

TO: Planning Commission
Planning Department
Department of Health
Office of the Mayor
Ormat Energy Systems

FROM: Harry Kim, Administrator *H.K.*

DATE: August 31, 1990

SUBJECT: EMERGENCY RESPONSE PLAN
VERSION NO. 5

This is to inform you that the Emergency Response Plan (Version No. 5) has been reviewed and meets the emergency response requirements as specified by the Planning Commission. The emergency response requirements coordinate with the standards stated by the Planning Department and the Department of Health as related to this project.

1. Dept. of Health

March 16, 1990

"modification to authority to construct no. A-834-796 25 mw
Geothermal Power Plant"

2. Planning Dept.

Oct. 3, 1989

Geothermal Resource Permit (GRP 87-1)

3. Planning Commission

Oct. 3, 1983

Geothermal Resource Permit (GRP 87-1)

Condition number 26

The following comments and concerns are submitted at this time for consideration and follow up by the appropriate authority.

1. It is assumed that all of the requirements as specified by the Planning Commission and Dept. of Health not related to this plan requirement will be met before permission is granted to Puna Geothermal Venture to proceed.
2. It is assumed that the responsible parties will develop the capabilities to insure that all conditions specified will be continuously monitored to insure compliance. (As per example noise regulation condition #24 - Planning Commission.)

Emergency Response Plan
Revision No. 5
Page 2
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3. It is strongly recommended that noise regulations be developed that reflect the lifestyle of the area and that a time frame be established by the Planning Commission on the development of these noise regulations. It is difficult to understand why standards and regulations have not yet been developed.
(Condition #24 - Planning Commission)
4. It is strongly recommended that this County establish standards of H₂S levels based on the nuisance and not the hazard level. Levels that residents are asked to tolerate should consider not only normal operations but routine and upset conditions as well.

Reference is made to standards established by New Mexico based on the nuisance level and the statements made by the Environmental Impact Analysis of Potential Geothermal Resource Areas - Circular C-106 - 1984.

5. It is strongly recommended that a public education program be conducted to acquaint people with the contents of this plan and an overview of expectations as this geothermal energy is developed. So much of information presented in the past has added or caused many to be even more confused on geothermal energy production and its actual effects on the area.
6. It is recommended that follow up be done of the commitments made for studies to be conducted on effects on the agricultural industry by geothermal production. Time frames should be established for the commencement and completion of those studies.
7. It is assumed that the injection system as proposed by Puna Geothermal Venture has been thoroughly reviewed by the Department of Health and the project satisfies safety concerns. It is requested that the County agency be specified by the Planning Commission as being the responsible agency for the random checks of the ground water samples and that these reports be made available to the Planning Commission on a scheduled basis.

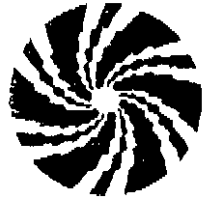
Summary

The County and State governments must insure that violations of any provision that especially affects the health and welfare of the Island's people be dealt with and we do not allow the deplorable conditions and violations of the past Geothermal Project to ever occur again. I feel without any doubt that it was the failure of responsible government agencies to enforce the special conditions

Emergency Response Plan
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specified for HGP-A that have caused so much of the distrust and hostility towards geothermal projects and the capabilities of Government to monitor and enforce regulations.

ayk

ORMAT®

June 19, 1990
Reference No. 90217.021

MEMORANDUM

TO: Susan Labrenz, Hawaii County Managing Director
FROM: Jim Porter, CEO, Ormat Energy Systems, Inc. *JWP*
SUBJECT: Memo of Understanding

The following is considered a proposal by Puna Geothermal Venture (PGV) for your consideration.

PGV is willing to accept the following:

1. The Department of Health (DOH) recommendation by John C. Lewin, Chairman, Hawaii State Emergency Response Commission and Director of Health dated June 7, 1990 (attached) in which 10.0 ppm H₂S and 80 dba were established as emergency levels;
2. The DOH will be responsible for declaring an emergency;
3. The Civil Defense Agency (CDA) will be responsible for actions necessary to protect the public per Condition No. 29 of PGV Geothermal Resource Permit (GRP);
4. PGV is prepared to work diligently with the CDA, DOH, and Hawaii County Planning Department to mechanically incorporate Version No. 2 of the Emergency Response Plan (ERP); and
5. A guarantee not to penetrate the reservoir without a finalized ERP.

For the above, PGV will be granted the followings:

1. An approved ERP;
2. A 30-day period to mechanically incorporate Version No. 2 of the ERP;

PUNA GEOTHERMAL VENTURE

June 19, 1990
Reference No. 90217.021
Page 2

3. A best effort committment by the Hawaii County Planning Commission and the CDA to finalize the ERP; and
4. Approval to proceed with site preparation for drilling and power plant construction, including approval to drill to reservoir depth.

The above condition (No. 4) shall not be an admittance that an emergency level condition is created by penetrating into the geothermal reservoir.

We consider this proposal a fair and generous compromise in its totality. Your consideration will be sincerely appreciated.

Attachments

JOHN WAIKEE
GOVERNOR OF HAWAII



JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH

P. O. BOX 5376
HONOLULU, HAWAII 96801

IN REPLY, PLEASE REFER TO:
HEER OFFICE

7 June 1990

Mr. Harry Kim, Chairman
Hawaii Local Emergency Planning Committee
34-A Rainbow Drive
Hilo, Hawaii 96720

Subject: Review of the Puna Geothermal Venture 25
MW Power Project Emergency Response Plan

Dear Mr. Kim: *Harry* -

Thank you for the opportunity to review the Puna Geothermal Venture 25 MW Power Project Emergency Response Plan. The plan includes a reasonable review of the potential hazards that maybe posed by the project. The following comments and recommendations are offered to improve and enhance the document. If these comments and recommendations are fully implemented on a consistent basis while the facility is constructed and operated, public and private interests should be prepared for the emergencies that may arise or affect the proposed development.

Notification

The 24 hour notification number for the Department of Health Clean Air Branch for emergency response is 247-2191, and should be included in Table 2-1, page 8. Department of Land and Natural Resources should replace Lands and Natural Resources. The National Response Center in Washington D.C., phone number (800) 424-8802, should be included for a federal response. Due to mining exemptions we are unclear if isopentane releases are required to be reported under the federal Superfund law. This should be determined by the applicant and reportable quantities listed at appropriate locations in the plan. If regulated, follow-up written release reporting under Section 304 of Title III is required. If the mining exemption does apply, we recommend requiring notification of releases similar to the federal Superfund in the plan.

Mr. Harry Kim
April 7, 1990
Page 2

Emergency and Nuisance Situations

Under Section 3.1 Emergency conditions, page 11, you have proposed that an emergency condition exists when H₂S levels reach 20 parts per million (ppm) at the property boundary, however this action level is inconsistent with the levels the state is proposing.

The Department of Health has proposed action levels for H₂S including "alert", "warning", and "emergency" levels. The rationale for the establishment of these action levels and actions called for is as follows:

1. The Alert level is that concentration of (H₂S) at which short-term health effects can be expected to occur.

Recommendation: 0.10 ppm (100 parts per billion) H₂S (over a one-hour averaging period).

Rational: In light of the available literature, a maximum ambient standard of H₂S of 0.10 ppm is safe from a toxic effect standpoint. It follows that deleterious physiologic health effects may begin to occur at levels above 0.10 ppm among those most susceptible. This number was based on the lowest level well-documented to be associated with human eye irritation, a short-term effect, with a one hundred-fold safety factor included.

2. The warning level indicates that air quality is continuing to deteriorate and that additional abatement actions are necessary.

Recommendation: 1.00 ppm H₂S (over a one-hour averaging period).

Rational: This level is between that at which short-term health effects can be expected to occur (0.10 ppm H₂S) and that at which a substantial endangerment to human health can be expected (10.0 ppm H₂S).

3. The Emergency level is that level at which a substantial endangerment to human health can be expected.

Recommendation: 10.0 ppm H₂S (over a one-hour averaging period).

Rational: Eye irritation and decreased corneal reflex have been well documented to be associated with levels of exposure above 10.0 ppm H₂S. Lung damage may also be occurring at this level but is difficult to detect.

Mr. Harry Kim
April 7, 1990
Page 3

The U.S. National Institute for Occupational Safety and Health maintains an allowable ceiling concentration of 10.0 ppm for 10-minutes is safe. It may be inferred from this that any exposure above 10.0 ppm is unsafe. Immediate evacuation of a facility is required if the concentration of H_2S at any time exceeds 47 ppm O.S.H.A.

The American Conference of Governmental Industrial Hygienists also recommends the "Threshold Limit Value" to be 10 ppm H_2S . This is the concentration of H_2S to which it is believed nearly all humans may be exposed in the working environment day after day (over an 8-hour exposure period) without adverse health effects. Those who are hypersensitive to H_2S , including the aged, infants, individuals with predisposing eye and respiratory problems, and those who are anemic, may be adversely affected at lower levels.

Thus, in reviewing the literature, it may be concluded that levels of exposure above 10.0 ppm pose a substantial endangerment to human health. The plan should discuss fully the use of these levels and integrate them into the planning and response mechanism of the plan.

Response Facilities

All response and safety facilities, as well as general grading in the area should be constructed to ensure that they will not serve to capture H_2S in a depression and thereby cause a hazard. Table 4-1 indicates that there are 12 "air packs". The type of self contained breathing apparatus and their air capacity should be included. Air monitoring devices should also be listed. Portable real time monitors should be available along with the "air packs" and should be described.

PGV Personnel Training and Emergency Drill

As cited on page 27, OSHA training will be provided. This should be described, and if possible a draft training plan should be attached to the emergency response plan as an appendix or addendum. A description of a "general drill" should be included to provide insight into what such an exercise will provide and its value.

Uncontrolled Steam Releases from the Reservoir

A worst case well blow out has been modeled, "...under any weather conditions typical of the site vicinity." This term should be defined and related to planning for "untypical" weather conditions: a reasonable "worst case scenario" should be included in the risk analysis and should include, but not be limited to methods described in the following guidance:

Mr. Harry Kim
April 7, 1990
Page 4

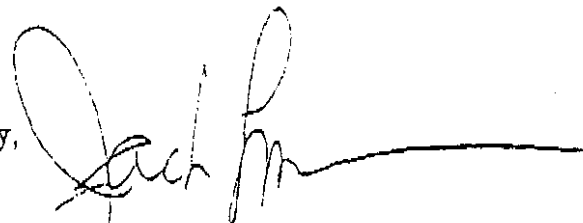
U.S. Environmental Protection Agency, Federal Emergency Management Agency, U.S. Department of Transportation (1987) Technical Guidance for Hazards Analysis: Emergency Planning for Extremely Hazardous Substances.

Federal Emergency Management Agency, U.S. Department of Transportation, U.S. Environmental Protection Agency (1987) Handbook of Chemical Hazard Analysis Procedures.

It is recommended that upon the occurrence of an uncontrolled release, the Hawaii Civil Defense Agency and the Department of Health should be notified immediately and periodically updated. Other reporting requirements are specified in the permits issued by the Department of Health.

We look forward to continued cooperation to improve Hawaii's capability to respond to chemical emergencies. If you have any questions regarding this review, please contact Bruce Anderson, Ph.D., Deputy Director for Environmental Health at 548-4139.

Sincerely,



JOHN C. LEWIN, M.D., Chairman,
Hawaii State Emergency Response
Commission and Director of Health

cc: Samuel Ruben, M.D., District Health Administrative Officer
Hawaii District Health Office.

EMERGENCY RESPONSE ACTION LEVELS ARE NOT ENVIRONMENTAL PERMIT LIMITS

- Environmental permit limits are usually set to prevent undue impacts from the project on the environment and on the project neighbors, including nuisances. To achieve this, environmental permit limits are set very low.
- Emergency response action levels are generally set to ensure that the general population is moved from an area prior to the point at which individuals would be subject to anything other than mild transient adverse health effects from the emergency situation. Emergency response action levels are generally set several orders of magnitude higher than environmental permit limits.
- Ambient conditions created by the permit holder during an upset situation above the set environmental permit limits but below the set emergency response action level would subject the permit holder to the penalties contained in the permit and applicable law, but do not create the need for emergency evacuation because they do not endanger the general population. To prevent any confusion by the general public regarding whether or not an emergency has been declared during an upset situation, PGV has volunteered to notify the Civil Defense Agency anytime any upset of the PGV Project lasts more than 15 minutes, even if no emergency response action level has been reached.

PGV RATIONALE FOR EMERGENCY RESPONSE LIMIT OF 20 PARTS PER MILLION FOR HYDROGEN SULFIDE

- The PGV Project environmental permit limit for off-site ambient hydrogen sulfide is, under most circumstances, 25 parts per billion (equal to 0.025 parts per million). PGV has proposed an emergency response action level of 20 parts per million (20,000 parts per billion).
- The Federal Minerals Management Service action level for hydrogen sulfide (at which an emergency plan is required) is 20 parts per million (20,000 parts per billion). The Federal Environmental Protection Agency lists the level of concern for hydrogen sulfide at 30 parts per million (30,000 parts per billion). The American Petroleum Institute suggest 20 parts per million (20,000 parts per billion) as the recommended level for an emergency plan.

PGV RATIONALE FOR EMERGENCY RESPONSE LIMIT OF 80 dBA FOR NOISE.

- The PGV Project environmental permit limit for off-site ambient (outdoor) noise is, under most circumstances, 50 dBA (decibels). PGV has proposed an emergency response action level of 80 dBA.
- The Federal Occupational Safety and Health Administration has set the permissible noise exposure level for workers for an 8-hour day at 90 dBA. If the 8-hour time-weighted average sound level exceeds the action level of 85 dBA, a company must administer a hearing conservation program and begin a monitoring program, but only noise levels above 80 dBA are considered in the noise measurements. The noise level under which it is believed that nearly all workers may be repeatedly exposed without adverse effect on their ability to hear and understand normal speech is known as the Threshold Limit Value, which for an 8-hour day is 85 dBA, and for a 16-hour day is 80 dBA (which is the lowest noise level for which a limit is set). A noise level of 80 dBA is equivalent to the sound measured in a busy office.

TRANSMITTAL from PUNA GEOTHERMAL VENTURE

101 Aupuni Street Suite 1014-B, Hilo, Hawaii 96720
Telephone: (808) 961-2184 Telefax: (808) 961-3531

Ref/Msg No.: 00992 Date: 18 June 1990 Page 1 of 3

To: Sus Ono From: Maurice Richard
Company: _____ CC: _____

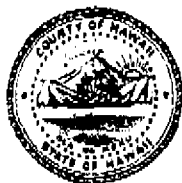
We are sending via mail facsimile other
 attached under separate cover
Priority level: urgent today this week low

for your information/files approval as requested
 review and comments as discussed signature/return
 action by

RE: Harry Kim Letter dated June 14, 1990 (ref. doc0139P)

RECEIVED
JUN 19 1990

GEOTHERMAL/CABLE
PERMIT CENTER



Civil Defense Agency

Larry S. Tanimoto
Mayor

34-A Rainbow Drive • Hilo, Hawaii 96720 • (808) 935-0031 • Fax (808) 935-6460

doc0139P

June 14, 1990

Maurice A. Richard
Hawaii Regional Development Manager
101 Aupuni Street, Suite 1014-B
Hilo, HI 96720

EMERGENCY RESPONSE PLAN, VERSION NUMBER 2

The Hawaii County Civil Defense Agency (HCDA) depended on the pertinent regulations and guidelines of the County Planning Department, the State Department of Health, the State Mediation Report, the County of Hawaii Planning Commission and the County of Hawaii Plan for Emergency Preparedness in the review of this plan.

Version Number 2 of your response plan has been reviewed and listed are concerns and areas that need to be addressed by you.

TABLE 2-1, Page 8

1. COUNTY OF HAWAII: Civil Defense daytime telephone number to read 935-0031.
2. COUNTY OF HAWAII: Planning Department does not have an after hours telephone number.
3. STATE OF HAWAII: Department of Health Clean Air Branch 24-hour phone number for emergency response to read 247-2191.
4. STATE OF HAWAII: "Lands and Natural Resources" to read "Department of Land and Natural Resources."

Page 11 3.1 Emergency Conditions
Paragraph 1.

The Hawaii County Civil Defense, in accordance with applicable regulations and plans, will determine when an emergency or disaster situation exists.

Maurice A. Richa
Page 2
June 14, 1990

Item 1.

The level of H₂S stated by you as the emergency level is not acceptable. It is required that your plan reflects that a potential emergency/disaster situation exists anytime conditions exceed those established by the Department of Health's March 16, 1990, letter on "Modification to Authority to Construct No. A-834-796 25 MW Geothermal Power Plant."

Item 2.

The plan does not address what potential hazards may develop as a result of natural or manmade disasters (e.g. earthquakes, eruptions, magma intrusions) on the well itself. The plan must reflect the potential effects on residents, employees and surrounding property if, in effect, any will be developed.

Item 3.

The noise level stated by you as the emergency or disaster situation is not acceptable. It is required that the plan reflects that a potential emergency/disaster situation exists anytime conditions exceed those specified by the Geothermal Resource Permit (GRP 87-1) October 3, 1989.


Item D. Table 1-1.

The plan does not contain any of the required maps that illustrates the worst-case scenario for any and all of the potential project emergency situations. The plan is required to develop individual descriptions of potential emergency/disaster situations.

Descriptions shall include:

- a. Nature of the hazard.
- b. Affected area and concentration (maps).
- c. Effects on health, environment or socioeconomic effects on residents or surrounding property.

Your revised plan will be submitted to the Department of Health, Planning Department, and the Planning Commission for review opportunity.


HARRY KIM, ADMINISTRATOR

dy

cc Mayor Tanimoto
Planning Director
DOH, Dr. Bruce Anderson
Planning Commission



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96808

WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

LIBERT K. LANDGRAF
DEPUTY

AQUACULTURE DEVELOPMENT
PROGRAM
AQUATIC RESOURCES
CONSERVATION AND
ENVIRONMENTAL AFFAIRS
CONSERVATION AND
RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

JUN 5 1989

Mr. Duane Kanuha
Director
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Kanuha:

Thank you for the opportunity to review and comment on the application for a Geothermal Resource Permit submitted by Puna Geothermal Venture (PGV).

We have no major objections regarding the 25 MW geothermal project proposed for the island of Hawaii, but would like to offer the following comments:

- 1) The PGV application states that up to a maximum of 500 gallons per minute (720,000 gal/day) of water may be required for re-injection operations to maintain injection flow and to provide a sufficient quantity of fluid to absorb the noncondensable gases. It is indicated that this supplemental water may be supplied by one or two wells developed near the plant site.

The applicant (PGV) should be advised that pursuant to the Department of Land and Natural Resources' Administrative Rules, Chapter 13-168, a well construction and pump installation permit, in addition to a well completion report will be required for the construction of any proposed water well. Furthermore, the applicant shall be required to comply with all other applicable regulations identified within that chapter.

- 2) Pursuant to PGV's proposal to re-inject geothermal fluids and noncondensable gases back into the geothermal reservoir, and in response to community concerns regarding potential impacts to the ground water aquifer down gradient from the site, it is recommended that if water wells are to be developed, that they be strategically sited within the project area so that they may serve as monitor wells as well as sources of supplemental water.

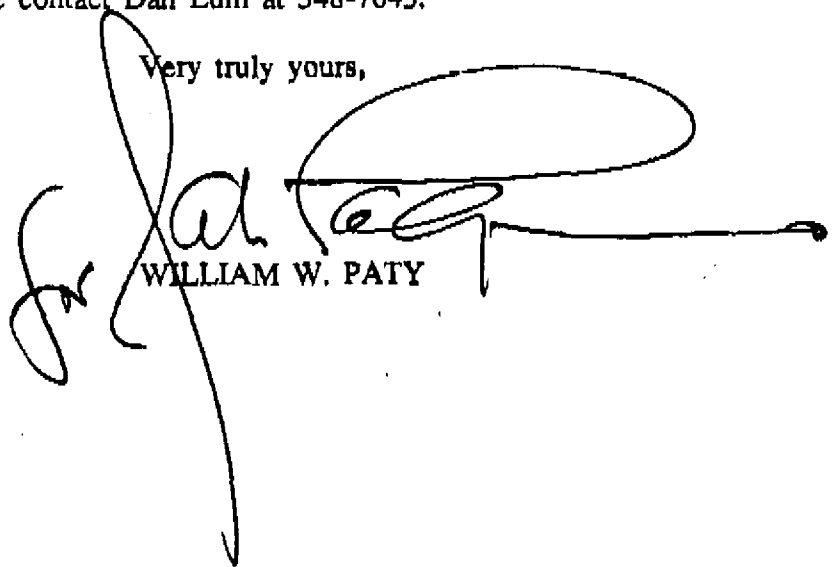
Placement of these supply wells down gradient from the injection well sites will allow for periodic sampling of the existing ground water aquifer and the monitoring of the proposed injection operations.

JUN 5 1989

- 3) It is further recommended that the applicant file monthly reports of re-injection data, including but not limited to, quantity of fluids injected, chemical composition, and any changes in injection pressures which may indicate that the injected fluid is no longer confined to the intended zone of injection.
- 4) All work shall be performed in accordance with the Department of Land and Natural Resources' Administrative Rules (Chapters 13-183 and 13-184), and all other applicable Federal, State, and County laws, ordinances, rules and regulations pertaining to the lands and permittee's operations including, but not limited to, all water and air pollution control laws, and those relating to the environment.
- 5) If any unanticipated sites or remains of historic or prehistoric interest (such as shell, bone, or charcoal deposits, human burials, rock or coral alignments, paving, or walls) are encountered during the applicants operation, the applicant shall stop work and contact the State Historic Preservation Office at 548-7460 or 548-6408 immediately.

Thank you again for the opportunity to comment on the subject application and should you have any questions, please contact Dan Lum at 548-7643.

Very truly yours,



WILLIAM W. PATY

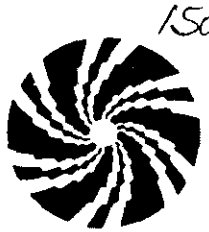
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S. OHN
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RECEIVED

JUN 5 1989 2:35

Handwritten signature

ORMAT®



June 30, 1989
Reference No. 89241

Handwritten mark resembling a stylized 'P' or a loop.

Mr. William W. Paty, Jr.
Chairperson
Board of Land and Natural Resources
State of Hawaii
Department of Land and Natural Resources
Kalanimoku Building
1151 Punchbowl Street
Honolulu, Hawaii 96813

Re: Application for Permit to Drill Geothermal Well Kapoho
State 3 - State Geothermal Mining Lease R-2

Dear Mr. Paty:

In accordance with the Department of Land and Natural Resources Administrative Rules, Title 13, Chapter 183-65, Puna Geothermal Venture hereby submits the enclosed application for a permit to drill geothermal well Kapoho State 3, to be drilled from proposed wellpad E of the Puna Geothermal Venture Project, as approved in the Plan of Operation on March 10, 1989 by the Board of Land and Natural Resources.

Your timely consideration and approval of this application would be appreciated. Please do not hesitate to contact this office if you have any questions, or desire any additional information, regarding this request.

Sincerely,

Handwritten signature of Maurice A. Richard

Maurice A. Richard
Hawaii Regional
Development Manager

Enclosure

cc:
D. Carey, EMA w/enclosure

PUNA GEOTHERMAL VENTURE

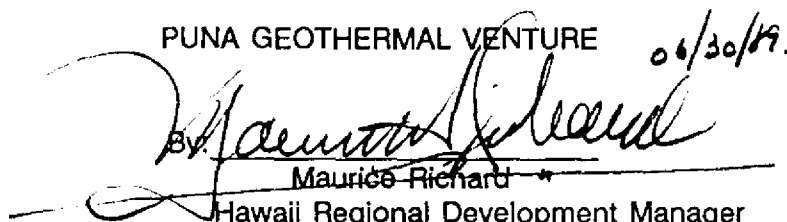
- 101 Aupuni Street Suite 1014-B, Hilo, Hawaii 96720
- 610 East Glendale Ave., Sparks, Nevada 89431-5811
- Telephone (808) 961-2184
- Telephone (702) 356-9111
- Facsimile (808) 961-3531
- Facsimile (702) 356-9125

**APPLICATION FOR PERMIT TO DRILL PROPOSED GEOTHERMAL WELL
KAPOHO STATE 3 ON RESERVED LANDS, KAPOHO, PUNA, HAWAII**

Complying with Department of Land and Natural Resources (DLNR) Administrative Rule, Title 13, Chapter 183, Subchapter 65, Puna Geothermal Venture (PGV) herewith makes application for Permit to Drill for approval by the Hawaii Board of Land and Natural Resources.

1. Applicant:

Puna Geothermal Venture
101 Aupuni Street
Suite 1014-B
Hilo, Hawaii 96720
(808) 961-2184

PUNA GEOTHERMAL VENTURE *06/30/19.*

By: Maurice Richard
Hawaii Regional Development Manager
Puna Geothermal Venture

Owner of Mining Rights:

Kapoho Land Partnership

Land Owner:

Kapoho Land and Development Company, Limited

2. Proposed well designation: Kapoho State 3 (KS-3) off Wellpad E.
3. The enclosed tax key map, Attachment I, designates the approximate location of the drillsite for KS-3 off Wellpad E located on State Geothermal Mining Lease R-2. The elevation at Wellpad E is approximately 620 feet above mean sea level. A survey of the wellpads for the PGV Project is being prepared at this time. The survey data will be submitted when it becomes available.
4. The proposed PGV Project geothermal well KS-3 has been designed to maximize the possibility of intersecting, below approximately 4,000 feet, near-vertical fractures which are generally aligned along the axis of the Lower East Rift Zone (LERZ) and

Application for Permit to Drill
Kapoho State 3 Well
June 29, 1989

which carry geothermal fluids for the purpose of providing geothermal resources to power the PGV Project power plant, previously approved in the Plan of Operation approved March 10, 1988, by the Board of Lands and Natural Resources.

5. A detailed Well Drilling and Completion Program, a Drillsite Plan, and a Vertical Section of the Well for the KS-3 well are contained in Attachments II, III, and IV, respectively.
6. A multi-well drilling bond (\$250,000) has previously been filed with the State of Hawaii.
7. Puna Geothermal Venture agrees to perform such drilling as outlined in this application and agrees to maintain the well in accordance with Title 13, Chapter 183, State of Hawaii, and all Federal and County geothermal regulations.

Attachment II - Well Drilling and Completion Program

1. Well Design

The planned production well design is shown in Attachment IV.

2. Drilling Program

- 2.1 Prepare 10 ft. x 10 ft. x 8 ft. deep cement-rebar wellhead cellar on existing location. Set 30-inch conductor pipe through cellar floor.
- 2.2 Move in Drilling Contractor's rig; drill and set rathole.
 - (a) Notify Hawaii Board of Land and Natural Resources (BLNR) 24 hours prior to commencement of drilling.
 - (b) Confirm compliance with all permit requirements.
- 2.3 Spud hole with 17½ inch bit and mud drilling fluid; drill into top 20 feet of ground water zone. Stop and sample ground water.
- 2.4 Drill ahead to 800 foot depth. Open hole to 26 inch. Control loss of circulation (LOC) with loss circulation material (LCM); cement severe lost circulation zones if required.
- 2.5 Run 20 inch, 94 pound K-55 Buttress coupled casing to 1000 feet. Single stage cement with 40 percent silica flour; use appropriate excess slurry. Be prepared to cement the 20-30 inch annulus with from the surface. Hold casing in tension during annular cement job. Wait on cement (WOC) 8 hours.

ATTACHMENT II
Kapoho State 3
June 29, 1989

- 2.6 Install 20 inch blow-out prevention equipment (BOPE) consisting of 20" casing head flange with 2 each 3" outlets for kill line and blow down line, 20" annular preventer and top mating flange and pitcher nipple assembly. Notify the Chairman of the BLNR in advance of the BOP test so that a designated representative can witness the test.

Test BOP assembly to 500 psig. Enter test results on contractor and operator daily reports.

- 2.7 Install mud logging service before drilling out 20" casing. Record: continuous mud in and out temperatures, H₂S, CH₄, CO₂, lithology, and drilling rate. Have pit level indicator and intercom to driller stations. Catch four sets of 50 gram dry sample every 20 feet. Make daily copies of the mud log, keeping one copy up to date and available on site.
- 2.8 Drill 17½ inch hole to 2200 foot depth with mud drilling fluid. Survey wellbore every 200 feet, or on bit change. Use LCM or cement to control LOC as necessary.
- 2.9 Run 13 3/8 inch, 61 pound K-55 NEW VAM casing to 2200 feet. Cement with 2200 cubic feet cement mixed 1:1 perlite, 40% silica flour, followed by 320 cubic feet cement mixed with 40% silica flour (note; provides for 100% excess). WOC 12 hours. If annular cement placement (top job) is needed hold casing in tension until final WOC is finished (i.e. do not release casing until cement is set at surface).
- 2.10 Install 13 5/8 inch BOPE consisting of the following items: 13 3/8" 900# casing head flange, 13 5/8" 3000 psi double gate BOP, 3000 psi double gate BOP, 3000 psi annular preventer, mating flange and riser with pitcher nipple.

Hook up kill lines and blow down lines. Casing head welding to be performed with pre- and post-flange heating by a certified welder.

Notify the Chairman of the BLNR in advance of BOP test so that a designated representative can witness the test.

Pressure test BOP assembly to 1000 psig. Record results on contractor and operator's daily reports.

Confirm drill site location and operation of all H₂S safety equipment. Put all drill site personnel through H₂S safety review including equipment downing by each person.

- 2.11 Drill out cement with 12¼ inch mill tooth bit. Pull out of hole, pick up button bit and drill 12¼ inch hole to 2500 feet with mud. Run deviation survey every 200 feet.
- 2.12 Pull out of hole and pick up 12¼ inch directional type button bit, mud motor, 4° bent sub, monel drill collar and additional collars and drill pipe as needed. Build angle at 2-3° per 100 feet in desired direction for approximately 100 - 200 feet with mud motor. Pull out of hole and pick up bottom hole assembly with 12¼ inch button bit, near bit reamer, 2 each 9" drill collars, string stabilizer, shock sub, additional 9" and 8" drill collars, heavy weight drill pipe as needed. Build hole angle to 16° and hold to 4000 feet TVD. Run deviation and direction surveys as necessary (every 20 to 100 feet). Keep mud motor on location and use as necessary to maintain angle and hole direction. Maximum dog leg to be 2°/100 feet. Use soft banded drill pipe for drill pipe that is located inside the 13 3/8 inch casing. Ream hole as necessary as judged by several short trips and deviation data. Use LCM or cement to control LOC as necessary.

2.13 Run 9 5/8 inch, 47 pound, C-90, VAM-AF (or equivalent) casing to bottom of 12¼ inch hole (\pm 4000ft). Use centralizers every 120 feet through deviated portion of hole. Cement with 1850 cubic feet cement mixed with 1:1 perlite, 40% silica flour followed by 100 cubic feet cement mixed with 40% silica flour (provides for 100% excess). Wait on cement 12 hours. If annular (top) job is needed, hold casing tension until cement is set to surface.

2.14 Install wellhead assembly and BOPE.

If aerated mud or aerated water drilling is planned, wellhead and BOP will consist of 13 3/8" x 9 5/8", 900# WKM type S expansion spool (or equivalent), 10" 900# gate valve, 10" 3000 psi single gate BOP with steel pipe ram, 10" 3000 psi banjo box with 10" 3000 psi hydraulically actuated throttle valve on banjo box side outlet, 10" 3000 psi x 13 3/8" 3000 psi spool, 13 3/8" 3000 psi double gate BOP with steel pipe ram and blind ram, 13 3/8" 3000 psi annular preventer, and rotating head on top.

If mud or water drilling is planned, assembly will consist of 13 5/8" x 9 5/8" expansion spool, 10" valve as above, 10" x 13 3/8" spool and 13 3/8" double gate BOP and 13 3/8" annular preventer, mating flange and riser with pitcher nipple.

Notify the BLNR and test BOP.

2.15 Pick up 8½" mill tooth bit and drill out cement from casing. Pull out of hole, pick up bottom hole drilling assembly. Drill 8½" hole with aerated mud or aerated water (or mud/water) to \pm 7000 feet. Take directional surveys

ATTACHMENT II
Kapoho State 3
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approximately every 100-150 feet. Condition hole and make several short trips to insure no fill on bottom of hole.

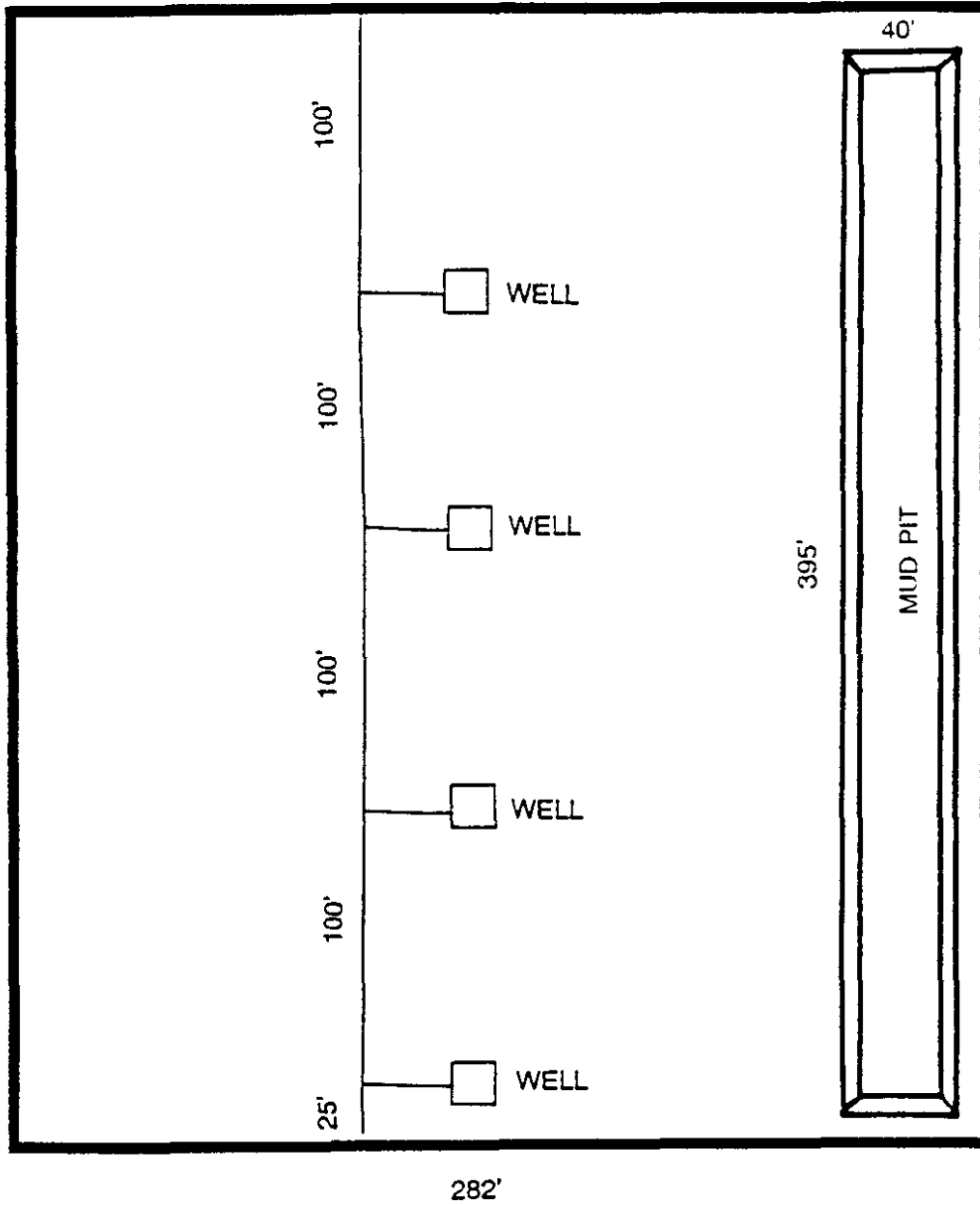
- 2.16 Pull out of hole and pick up ± 3070 feet of 7" 29#/ft-L80 BT&C slotted casing with double slip liner hanger and 7" tieback set on top, and 7" guide shoe on bottom. Casing to be slotted from 4000'- 6950'. Set liner hanger at ± 3880 feet (120' above bottom of 9 5/8" casing). Leave approximately 50' of open hole below bottom of casing for thermal expansion and debris.
- 2.17 Run in hole with 3 1/2" drill-pipe and circulate out mud with water.
- 2.18 Rig down BOP and nipple up wellhead consisting of [expansion spool and one 900# 10" gate valve were attached in (2.14) above] 1 additional 900# 10" gate valve, 10" 900# flow tee with 900# 10" gate valve on side outlet and 3" 900# swab valve on top of tee.

ENVIRONMENTAL MANAGEMENT ASSOCIATES

TITLE: Wellsite Plan

DATE: 06-28-89

ATTACHMENT III



ENVIRONMENTAL MANAGEMENT ASSOCIATES

TITLE: Vertical Section of the Well

DATE: 06-28-89

ATTACHMENT IV

