APPENDIX F

PLUGGING AND ABANDONMENT PLANS
Detailed Plan of Procedure for Plugging and Abandoning Injection Wells at the Puna Geothermal Facility
Mlk 16Jun09

Assumptions:
• All four (4) injection wells would be abandoned at the same time. Work would be performed in series, one well at a time.
• Work would be accomplished utilizing a third party Drilling Rig (Water Resources, Inc.)

Procedure for each individual well:

1. Mobilize third party Rig to location, in parallel with site preparation.
3. If needed, kill well with plant water.
4. Pull and remove hangdown liner.
5. Pick up drill pipe and run in hole to set bottom plug.
6. Set plugs as per EPA Plugging and Abandonment Plan Form 7520-14.
7. Salvage surface equipment, primarily wellhead components.
8. Cut off casing.
9. Reclaim and restore location.
10. Move to next well.
11. Demobe Rig after completion of last well to be plugged and abandoned.
PLUGGING AND ABANDONMENT PLAN

Name and Address of Facility
Puna Geothermal Venture
14-3860 Kapoho Pahoa Road, Pahoa, HI 96778

Name and Address of Owner/Operator
Puna Geothermal Venture
PO Box 30, Pahoa, HI 96778

Location of Well and Outline Unit on Section Plat - 640 Acres

Locate well in two directions from nearest lines of quarter section and drilling unit
Surface 8902.9 ft. N and 9919.0 ft E of Kaliu Benchmark
Location ft. from (N/S) Line of quarter section and ft. from (E/W) Line of quarter section.

Type of Authorization
✓ Individual Permit
✓ Area Permit
✓ Rule

Number of Wells

WELL ACTIVITY
✓ CLASS I
✓ CLASS II
✓ Brine Disposal
✓ Enhanced Recovery
✓ Hydrocarbon Storage
✓ CLASS V
✓ D Brine Disposal
✓ Enhanced Recovery
✓ Hydrocarbon Storage

CASING AND TUBING RECORD AFTER PLUGGING
SIZE WT (LB/FT) TO BE PUT IN WELL (FT) TO BE LEFT IN WELL (FT) HOLE SIZE
20 94 0-1376 26
13 3/8 63 0-2400 171/2
9 5/8 42 0-4061 121/4
7 28 & 29 3895-6505 0-3510 81/2

CEMENTING TO PLUG AND ABANDON DATA:

PLUG #1 PLUG #2 PLUG #3 PLUG #4 PLUG #5 PLUG #6 PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inches) 81/2 81/2 61/2 61/2 61/2 61/2 61/2
Depth to Bottom of Tubing or Drill Pipe (ft) 4430 3610 3010 2300 1550 1170
Sacks of Cement To Be Used (each plug) 155 155 155 155 155 155 155
Slurry Volume To Be Pumped (cu. ft) 261 68 85 46 63 39
Calculated Top of Plug (ft) 3795 3410 2640 2100 1776 0
Measured Top of Plug (if tagged ft) 15.6 15.6 15.6 15.6 15.6 15.6
Slurry Wt. (Lb./Gal) 11.6 11.6 11.6 11.6 11.6 11.6
Type Cement or Other Material (Class III) Type I-II w/30% silica flour 10% silica flour

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED (if any)
From To From To
4061 6505

Estimated Cost to Plug Wells $303,500

Certification
I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

Name and Official Title (Please type or print)
Michael L. Kaleikini, Plant Manager

Signature

Date Signed

EPA Form 7520-14 (Rev. 12-08)

*Depth of first plug may be revised if wellbore is obstructed
**Range of costs is a function of rig usage
LOCATE WELL AND OUTLINE UNIT ON SECTION PLAT - 640 ACRES

Locate well in two directions from nearest lines of quarter section and drilling unit
Surface Location Description

**Surface:** 8317.9 ft. N and 9430.2 ft E of Kaliu Surface Location

**Location:** ft. from (N/S) Line of quarter section
and ft. from (E/W) Line of quarter section.

TYPE OF AUTHORIZATION

- Individual Permit
- Area Permit
- Rule

NUMBER OF WELLS

WELL ACTIVITY

- CLASS I
- CLASS II
- Brine Disposal
- Enhanced Recovery
- Hydrocarbon Storage
- CLASS V

WELL NUMBER

CASING AND TUBING RECORD AFTER PLUGGING

<table>
<thead>
<tr>
<th>SIZE (IN)</th>
<th>WT (LB/FT)</th>
<th>TO BE PUT IN WELL (FT)</th>
<th>TO BE LEFT IN WELL (FT)</th>
<th>HOLE SIZE</th>
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<tbody>
<tr>
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<td>0.1030</td>
<td>0.1030</td>
<td>0.1030</td>
<td>12/16</td>
</tr>
<tr>
<td>13 3/8</td>
<td>0.2109</td>
<td>0.2109</td>
<td>0.2109</td>
<td>12/16</td>
</tr>
<tr>
<td>9 5/8</td>
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<td>0.3897</td>
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<tr>
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<td>0.3724</td>
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<td>0.3724</td>
<td>12/16</td>
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Cementing to Plug and Abandon Data:

<table>
<thead>
<tr>
<th>PLUG #1</th>
<th>PLUG #2</th>
<th>PLUG #3</th>
<th>PLUG #4</th>
<th>PLUG #5</th>
<th>PLUG #6</th>
<th>PLUG #7</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 1/2</td>
<td>6 1/2</td>
<td>6 1/2</td>
<td>6 1/2</td>
<td>6 1/2</td>
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<tr>
<td>1998</td>
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<td>2309</td>
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<tr>
<td>400</td>
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<td>28</td>
<td>24</td>
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<tr>
<td>744</td>
<td>64</td>
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<td>39</td>
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<td>352</td>
<td>2380</td>
<td>1850</td>
<td>930</td>
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<tr>
<td>15.6</td>
<td>15.6</td>
<td>15.6</td>
<td>15.6</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Type Cement or Other Material (Class III)

- Type III w/30% Silica Flour 10% Silica Flour

List All Open Hole and/or Perforated Intervals and Intervals Where Casing Will be Varied (if any)

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>3897</td>
<td></td>
<td>7406</td>
<td></td>
</tr>
</tbody>
</table>

Estimated Cost to Plug Wells: $334,000

Certification

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

Name and Official Title (Please type or print)

Signature

Date Signed

EPA Form 7520-14 (Rev. 12-88)
# PLUGGING AND ABANDONMENT PLAN

## Name and Address of Facility
Puna Geothermal Venture
14-3860 Kapoho Pahoa Road, Pahoa, HI 96778

## Rent and Address of Owner/Operator
Puna Geothermal Venture
PO Box 30, Pahoa, HI 96778

## Locate Well and Outline Unit on Section Plat - 640 Acres

![Section Plat Diagram]

**N**

**S**

**E**

**W**

## Surface Location Description

- 1/4 of N/S line of quarter section
- 1/4 of E/W line of quarter section
- Section
- Township
- Range

Locate well in two directions from nearest lines of quarter section and drilling unit:
- From Kaliu Surface Location:
  - 8879.72 ft. N and 9601.32 ft E

## Well Activity

- CLASS I
- CLASS II
- Brine Disposal
- Enhanced Recovery
- Hydrocarbon Storage
- CLASS V

## Well Number

Kapoho State Lease Name

## Casing and Tubing Record After Plugging

<table>
<thead>
<tr>
<th>Size</th>
<th>WT (lb/ft)</th>
<th>To Be Put in Well (ft)</th>
<th>To Be Left in Well (ft)</th>
<th>Hole Size</th>
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<tbody>
<tr>
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<td>106.5</td>
<td>10,065</td>
<td>10,065</td>
<td>6</td>
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<tr>
<td>16</td>
<td>97</td>
<td>2,112</td>
<td>2,112</td>
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<tr>
<td>11 3/4</td>
<td>65</td>
<td>4,367</td>
<td>4,367</td>
<td>14 3/4</td>
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<tr>
<td>9 5/8</td>
<td>42</td>
<td>3,790</td>
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## Cementing to Plug and Abandon Data

<table>
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<tr>
<th>Size of Hole or Pipe in which Plug Will Be Placed (inches)</th>
<th>PLUG #1</th>
<th>PLUG #2</th>
<th>PLUG #3</th>
<th>PLUG #4</th>
<th>PLUG #5</th>
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<td>10.625</td>
<td>8.68</td>
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<td>4467</td>
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<td>15.6</td>
<td>15.6</td>
<td>15.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Certification

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**Name and Official Title (Please type or print)**
Michael L. Kaleikini, Plant Manager

**Signature**

**Date Signed**

---

*Depth of first plug may be revised if wellbore is obstructed

**Range of costs is a function of rig usage
PLUGGING AND ABANDONMENT PLAN

Name and Address of Facility
Puna Geothermal Venture
14-3860 Kapoho Pahoa Road, Pahoa, HI 96778

Name and Address of Owner/Operator
Puna Geothermal Venture
PO Box 30, Pahoa, HI 96778

Locate Well and Outline Unit on
Section Plat - 840 Acres

Surface Location Description
1/4 of N/S 1/4 of W/E 1/4 of N/S 1/4 of W/E 1/4 of Section Township Range

STATE: HI
COUNTY: Hawaii

TYPE OF AUTHORIZATION
☑ Individual Permit
☐ Area Permit
☐ Rule

NUMBER OF WELLS:

WELL ACTIVITY
☐ CLASS I
☐ CLASS II
☐ Brine Disposal
☐ Enhanced Recovery
☐ Hydrocarbon Storage
☐ CLASS V

CASING AND TUBING RECORD AFTER PLUGGING

<table>
<thead>
<tr>
<th>SIZE</th>
<th>WT (LB/FT)</th>
<th>TO BE PUT IN WELL (FT)</th>
<th>TO BE LEFT IN WELL (FT)</th>
<th>HOLE SIZE</th>
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<tbody>
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<tr>
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<td>14 3/4</td>
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<td>44</td>
<td>464.7-6970</td>
<td>10 9/16</td>
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CEMENTING TO PLUG AND ABANDON DATA:

<table>
<thead>
<tr>
<th>PLUG #1</th>
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<th>PLUG #3</th>
<th>PLUG #4</th>
<th>PLUG #5</th>
<th>PLUG #6</th>
<th>PLUG #7</th>
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</thead>
<tbody>
<tr>
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<td>10 9/16</td>
<td>10.6</td>
<td>10 9/16</td>
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<td>2175</td>
<td>1054</td>
<td>170</td>
<td></td>
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<td>80</td>
<td>65</td>
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<td></td>
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<td>227</td>
<td>130</td>
<td>105</td>
<td></td>
<td></td>
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<td>4600</td>
<td>1975</td>
<td>854</td>
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<tr>
<td>Slurry</td>
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<td>15.6</td>
<td>15.6</td>
<td>15.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED (if any)

From | To | From | To
---- |---- |---- |----
4885 | 8263 |

Estimated Cost to Plug Wells
$399,000

Certification

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

Name and Official Title (Please type or print) Michael L. Kaleikini, Plant Manager
Signature
Date Signed

*Depth of first plug may be revised if wellbore is obstructed
**Range of costs is a function of rig usage
**PLUGGING AND ABANDONMENT PLAN**

**Location and Address of Facility:**
Puna Geothermal Venture
14-3860 Kapoho Pahoa Road, Pahoa, HI 96778

**State:** HI  
**County:** Hawaii  
**Permit Number:**

**Source Location:**
N/A

**Surface Location Description:**
1/4 of n/a, 1/4 of n/a, 1/4 of n/a, 1/4 of n/a  
Section n/a, Township n/a, Range n/a

**Locate well in two directions from nearest lines of quarter section and drilling unit:**
96°38'N 110°61'E of Kaliu Benchmark

**Location**

**N in ft from (N/S) Line of quarter section**

**E in ft from (E/W) Line of quarter section.**

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**TYPE OF AUTHORIZATION**

- [ ] Individual Permit
- [ ] Area Permit
- [ ] Rule
- [ ] Number of Wells

**WELL ACTIVITY**

- [ ] CLASS I
- [ ] CLASS II
- [ ] Brine Disposal
- [ ] Enhanced Recovery
- [ ] Hydrocarbon Storage
- [ ] CLASS III X Class V

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**CASING AND TUBING RECORD AFTER PLUGGING**

<table>
<thead>
<tr>
<th>SIZE</th>
<th>WT (LB/FT)</th>
<th>TO BE PUT IN WELL (FT)</th>
<th>TO BE LEFT IN WELL (FT)</th>
<th>HOLE SIZE</th>
</tr>
</thead>
<tbody>
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<td>26&quot;</td>
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</tr>
<tr>
<td>16&quot;</td>
<td>84</td>
<td>0-2292</td>
<td>20&quot;</td>
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</tr>
<tr>
<td>11-3/4</td>
<td>65</td>
<td>0-4705 (milled window)</td>
<td>14-3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>8-5/8&quot;</td>
<td>36</td>
<td>2789-3901</td>
<td>10-5/8&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**CEMENTING TO PLUG AND ABANDONMENT DATA:**

**PLUG #1**

- Size of Hole or Pipe in which Plug Will Be Placed (Inches): 7.625
- Depth to Bottom of Tubing or Drill Pipe (ft): 5182
- Sacks of Cement To Be Used (each plug): 280
- Slurry Volume To Be Pumped (cu. ft.): 450
- Calculated Top of Plug (ft.): 3801
- Measured Top of Plug (if tagged ft.): 15.6

**PLUG #2**

- Type I-II with 40% Silica Flour

**PLUG #3**

- Type Unspecified

**PLUG #4**

- Type Unspecified

**PLUG #5**

- Type Unspecified

**PLUG #6**

- Type Unspecified

**PLUG #7**

- Type Unspecified

**LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED (If any)**

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>3901'</td>
<td>5182'</td>
</tr>
</tbody>
</table>

**Estimated Cost to Plug Wells:**

$408,825

---

**Certification**

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.33)

**Name and Official Title:** Keoki Wells EHS coordinator  
**Signature:** [Signature]  
**Date Signed:** 07/14/2015

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EPA Form 7520-14 (Rev. 12-11)