

RECEIVED

FORM 202 - Rev. 09/16

OCT 20 2016

WATER RESOURCES
WESTERN REGION

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
APPLICATION FOR PERMIT
To appropriate the public waters of the State of Idaho

Ident. No. 63-34298

1. Name of applicant(s) Independent School District of Boise City Phone 208-854-4040
 Name connector (check one): ☐ and ☐ or ☐ and/or
 Mailing address 8169 W. Victory Rd City Boise
 State ID ZIP 83709-4164 Email tom.willis@boiseschools.org
2. Name of representative, if any SPF Water Engineering Phone 208-383-4140
 Mailing address 300 E. Mallard Dr., Ste. 350 City Boise
 State ID ZIP 83706 Email lgraves@spfwater.com
- a. ☐ Send all correspondence for this application to the representative and not to the applicant OR
☒ Send original correspondence to the applicant and copies to the representative.
- b. ☒ The representative may submit information for the applicant but is not authorized to sign for the applicant OR
☐ The representative is authorized to sign for the applicant. Attach a Power of Attorney or other documentation.
3. Source of water supply Ground Water which is a tributary of _____
4. Location of point(s) of diversion:

Twp	Rge	Sec	Govt Lot	1/4	1/4	1/4	County	Source	Local name or tag #
3N	2E	11			NW	NW	Ada	Ground Water	

5. Water will be used for the following purposes:
- Amount 0.60 for Irrigation purposes from 3/1 to 11/15 (both dates inclusive)
 (cfs or acre-feet per year)
- Amount _____ for _____ purposes from _____ to _____ (both dates inclusive)
 (cfs or acre-feet per year)
- Amount _____ for _____ purposes from _____ to _____ (both dates inclusive)
 (cfs or acre-feet per year)
- Amount _____ for _____ purposes from _____ to _____ (both dates inclusive)
 (cfs or acre-feet per year)
6. Total quantity to be appropriated is (a) 0.60 cubic feet per second (cfs) and/or (b) _____ acre-feet per year (af).
7. Proposed diverting works:
- a. Describe type and size of devices used to divert water from the source. Well, pump, pressurized irrigation system
- b. Height of storage dam _____ feet; active reservoir capacity _____ acre-feet; total reservoir capacity _____ acre-feet. If the reservoir will be filled more than once each year, describe the refill plan in item 12. For dams 10 feet or more in height AND having a storage capacity of 50 acre-feet or more, submit a separate Application for Construction or Enlargement of a New or Existing Dam. Application required? ☐ Yes ☐ No
- c. Proposed well diameter is 8 - 10 inches; proposed depth of well is 400 feet.
- d. Is ground water with a temperature of greater than 85°F being sought? ☐ Yes ☒ No
- e. If well is already drilled, when? _____; drilling firm _____;
 well was drilled for (well owner) _____; Drilling Permit No. _____

For Department Use

Received by RN Date 10/20/16 Time 1:39 PM Preliminary check by [Signature]
 Fee \$ 250.00 Received by RN Receipt No. W044737 Date _____

63-34298

8. Description of proposed uses (if irrigation only, go to item 9):
- Hydropower; show total feet of head and proposed capacity in kW. _____
 - Stockwatering; list number and kind of livestock. _____
 - Municipal; must complete and attach the Municipal Water Right Application Checklist.
 - Domestic; show number of households _____
 - Other; describe fully. _____
9. Description of place of use:
- If water is for irrigation, indicate acreage in each subdivision in the tabulation below.
 - If water is used for other purposes, place a symbol of the use (example: D for Domestic) in the corresponding place of use below. See instructions for standard symbols.

TWP	RGE	SEC	NE				NW				SW				SE				TOTALS
			NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
3N	2E	2											1						1
		10	1																1
		11						15											15

Total number of acres to be irrigated: 10 acres within a 17-acre permissible place of use (PPU)

10. Describe any other water rights used for the same purposes as described above. Include water delivered by a municipality, canal company, or irrigation district. If this application is for domestic purposes, do you intend to use this water, water from another source, or both, to irrigate your lawn, garden, and/or landscaping? Municipal water is currently used for irrigation of the existing school grounds. Upon application approval and completion of the proposed well, municipal water will only be used for public drinking water and internal domestic uses.
11. a. Who owns the property at the point of diversion? Applicant
- b. Who owns the land to be irrigated or place of use? Applicant
- c. If the property is owned by a person other than the applicant, describe the arrangement enabling the applicant to make this filing: _____
12. Describe your proposal in narrative form, and provide additional explanation for any of the items above. Attach additional pages if necessary. Applicants propose a new well for diversion of primary ground water for irrigation within a future athletic complex. A diversion rate of 0.06 cfs/acre is proposed to allow irrigation within an 8-hour period to avoid interference with student and athletic activities. Water bearing zone to be appropriated is from 200 to 400 feet. The proposed PPU is part of Special Survey Nos. S1 through S3 and the proposed POD is part of Special Survey No. S3.
13. Time required for completion of works and application of water to proposed beneficial use is 5 years (minimum 1 year).
14. **MAP OF PROPOSED PROJECT REQUIRED** - Attach an 8½" x 11" map or maps clearly identifying the proposed point of diversion, place of use, section #, township & range. The map scale shall not be less than two (2) inches equal to one (1) mile.

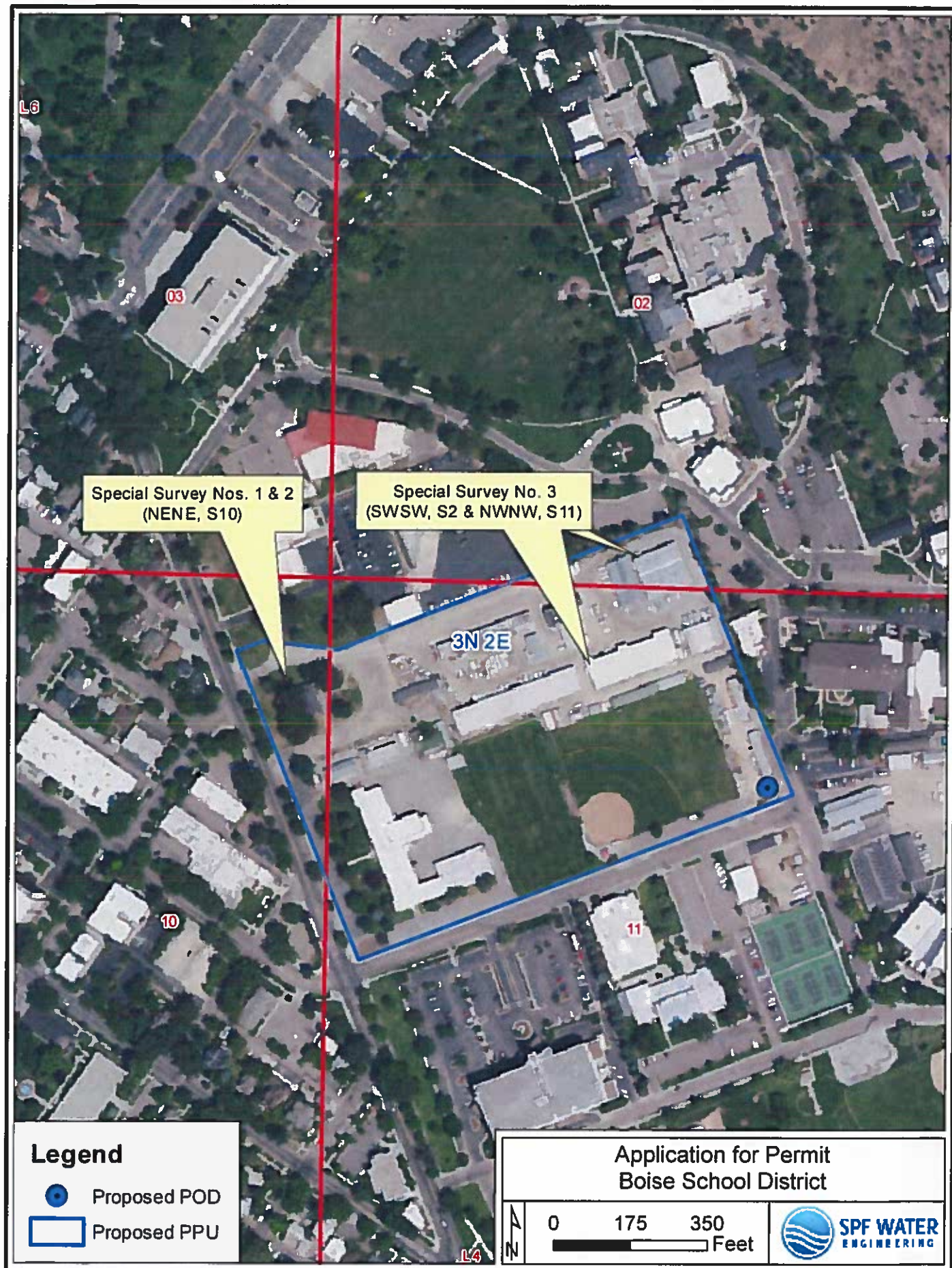
The information contained in this application is true to the best of my knowledge. I understand that any willful misrepresentations made in this application may result in rejection of the application or cancellation of an approval.

Signature of Applicant

Signature of Applicant

Print Name (and title, if applicable)

Print Name (and title, if applicable)



Legend

-  Proposed POD
-  Proposed PPU

Application for Permit
Boise School District



0 175 350
Feet



SPF WATER
ENGINEERING



State of Idaho

DEPARTMENT OF WATER RESOURCES

Western Region, 2735 Airport Way • Boise, Idaho 83705-5082

Phone: (208) 334-2190 • Fax: (208) 334-2348 • Web Site: www.idwr.idaho.gov

C. L. "BUTCH" OTTER
Governor

GARY SPACKMAN
Director

January 12, 2017

INDEPENDENT SCHOOL DISTRICT OF BOISE CITY
8169 W VICTORY RD
BOISE, ID 83709

Application for Permit No. 63-34298

Dear Applicant(s):

The Department of Water Resources has received your water right application. Please refer to the number referenced above in all future correspondence regarding this application.

A legal notice of the application has been prepared and is scheduled for publication in the IDAHO STATESMAN on 1/19/2017 and 1/26/2017. Protests to this application may be submitted for a period ending ten (10) days after the second publication.

If the application is protested, you will be sent a copy of each protest. All protests must be resolved before the application can be considered for approval. If the protest(s) cannot be resolved voluntarily, the Department will conduct a conference and/or hearing on the matter.

If the application is not protested, the Department will process your application and notify you of any action taken on the application. If your application is approved, the Department will send you a copy of the permit.

Please contact this office if you have any questions regarding the application.

Sincerely,

Rachel Neely
Administrative Assistant

CC:

SPF WATER ENGINEERING LLC
C/O LORI GRAVES
300 E MALLARD DR STE 350
BOISE, ID 83706

Neely, Rachel

From: Neely, Rachel
Sent: Thursday, January 12, 2017 10:16 AM
To: 'BOI Legals'
Subject: Ada Legal Ads
Attachments: Ada Cover Letter.docx; Ada Legal Ad.docx

Good Morning Legal Clerk,

Please see the attached ads for publication on 1/19/17 & 1/26/17.

Please confirm these are okay to publish as shown.

Thank you,

Rachel Neely

Administrative Assistant I
IDWR-Western Region
2735 Airport Way Boise, ID 83705
Rachel.Neely@idwr.idaho.gov

January 12, 2017

LEGAL NOTICE DEPARTMENT
IDAHO STATESMAN
PO BOX 40
BOISE, ID 83707

RE: Application for Permit No. 63-34260
 Application for Permit No. 63-34266
 Application for Permit No. 63-34279
 Application for Permit No. 63-34298
 Application for Permit No. 63-34299
 Application for Permit No. 63-34301
 Application for Permit No. 63-34314
 Application for Permit No. 63-34315
 Application for Permit No. 63-34316
 Application for Permit No. 63-34317
 Application for Permit No. 63-34322

Dear Legal Notice Department:

Please publish the enclosed legal notices on the dates indicated (once a week for two consecutive weekly issues). If you cannot publish the notices on the proposed dates, please contact us immediately.

An affidavit of publication must be submitted to the Department along with the publication bill. Please send the affidavit and bill to this office before 2/6/2017. Your cooperation is appreciated.

Sincerely,

Rachel Neely
Administrative Assistant

Enclosure(s)

The following applications have been filed to appropriate the public waters of the State of Idaho:

63-34260

PHILIP M KRUEGER

1311 E WARM SPRINGS AVE

BOISE, ID 83712

Point of Diversion NESW S2 T02N R03E ADA County Source GROUND WATER Tributary BOISE RIVER

Use: DOMESTIC 01/01 to 12/31 0.04 CFS

Total Diversion: 0.04 CFS

Date Filed: 8/9/2016

Place of Use: DOMESTIC

T02N R03E S11 L1(NWNE) L2(NENW)

Water bearing zone to be appropriated is from 28 to 488 feet.

63-34266

DON DEWEY

1400 FALCON DR.

ONTARIO, OR 97914

PAUL D AND RAE LEVIE TRUST

PO BOX 350

CHINO VALLEY, AZ 86323

Points of Diversion NWSW NESW S3 T01N R03E ADA County Source GROUND WATER

Use: IRRIGATION 03/15 to 11/15 1.6 CFS

Total Diversion: 1.6 CFS

Date Filed: 9/7/2016

Place of Use: IRRIGATION

T01N R03E S3 NESW NWSW

Total Acres: 80

Water bearing zone to be appropriated is from 100 to 900 feet.

63-34279

BRIARHILL HOA

C/O SENTRY MANAGEMENT INC

6149 N MEEKER PL STE 150

BOISE, ID 83713

Point of Diversion NESESW S20 T04N R02E ADA County Source SPRING Tributary SINKS

Use: IRRIGATION 03/01 to 11/15 0.02 CFS

Total Diversion: 0.02 CFS

Date Filed: 9/19/2016

Place of Use: IRRIGATION

T04N R02E S20 NESW SESW

Total Acres: 0.5

63-34298

INDEPENDENT SCHOOL DISTRICT OF BOISE CITY

8169 W VICTORY RD

BOISE, ID 83709

Point of Diversion NWNW S11 T03N R02E ADA County Source GROUND WATER

Use: IRRIGATION 03/01 to 11/15 0.6 CFS

Total Diversion: 0.6 CFS

Date Filed: 10/20/2016

Place of Use: IRRIGATION

T03N R02E S2 SWSW

T03N R02E S10 NENE

T03N R02E S11 NWNW

Total Acres: 17

Water bearing zone to be appropriated is from 200 to 400 feet.

Applicant proposes irrigation of 10 acres within a 17-acre permissible place of use.

63-34299

SUNROC CORPORATION

730 N 1500 W

OREM, UT 84057

Point of Diversion NWSW S21 T02N R02E ADA County Source GROUND WATER

Use: COMMERCIAL 01/01 to 12/31 2.23 CFS

Total Diversion: 2.23 CFS

Date Filed: 10/19/2016

Place of Use: COMMERCIAL

T02N R02E S20 NESW NWSW NESE NWSE

T02N R02E S21 NWNE SWNE NW(ALL) NWSW

Water bearing zone to be appropriated is from 540 to 800 feet.

63-34301

DAVID BENSINGER

DEBORAH BENSINGER

7258 N SPRINGCREST PL

MERIDIAN, ID 83646

Points of Diversion SE(ALL)S9 T05N R01W ADA County Source GROUND WATER

Use: IRRIGATION 03/01 to 11/15 2.2 CFS
Use: STOCKWATER 01/01 to 12/31 0.03 CFS
Total Diversion: 2.23 CFS
Date Filed: 10/28/2016
Places of Use: IRRIGATION, STOCKWATER
T05N R01W S9 SE(ALL)
Total Acres: 152
Water bearing zone to be appropriated is from 300 to 1000 feet.

63-34314

GARY W HEIKES
LINDA HEIKES
KOZETTE HOLLEY
4305 N WILLOW CREEK RD
EAGLE, ID 83616
Point of Diversion NWNE S32 T05N R01E ADA County Source GROUND WATER
Use: DOMESTIC 01/01 to 12/31 0.04 CFS
Use: IRRIGATION 03/01 to 11/15 0.1 CFS
Use: STOCKWATER 01/01 to 12/31 0.02 CFS
Total Diversion: 0.16 CFS
Date Filed: 11/8/2016
Places of Use: IRRIGATION, STOCKWATER, DOMESTIC
T05N R01E S32 NWNE
Total Acres: 5
Water bearing zone to be appropriated is from 200 to 400 feet.

63-34315

GARY W HEIKES
LINDA HEIKES
KOZETTE HOLLEY
4305 N WILLOW CREEK RD
EAGLE, ID 83616
Point of Diversion NENW S32 T05N R01E ADA County Source GROUND WATER
Use: DOMESTIC 01/01 to 12/31 0.04 CFS
Use: IRRIGATION 03/01 to 11/15 0.1 CFS
Use: STOCKWATER 01/01 to 12/31 0.02 CFS
Total Diversion: 0.16 CFS
Date Filed: 11/8/2016
Places of Use: IRRIGATION, STOCKWATER, DOMESTIC
T05N R01E S32 NENW
Total Acres: 5
Water bearing zone to be appropriated is from 200 to 400 feet.

63-34316

GARY W HEIKES
LINDA HEIKES
KOZETTE HOLLEY
4305 N WILLOW CREEK RD
EAGLE, ID 83616
Point of Diversion NENW S32 T05N R01E ADA County Source GROUND WATER
Use: DOMESTIC 01/01 to 12/31 0.04 CFS
Use: IRRIGATION 03/01 to 11/15 0.1 CFS
Use: STOCKWATER 01/01 to 12/31 0.02 CFS
Total Diversion: 0.16 CFS
Date Filed: 11/8/2016
Places of Use: IRRIGATION, STOCKWATER, DOMESTIC
T05N R01E S32 NENW
Total Acres: 5
Water bearing zone to be appropriated is from 200 to 400 feet.

63-34317

GARY W HEIKES
LINDA HEIKES
KOZETTE HOLLEY
4305 N WILLOW CREEK RD
EAGLE, ID 83616
Point of Diversion NENW S32 T05N R01E ADA County Source GROUND WATER
Use: DOMESTIC 01/01 to 12/31 0.04 CFS
Use: IRRIGATION 03/01 to 11/15 0.1 CFS
Use: STOCKWATER 01/01 to 12/31 0.02 CFS
Total Diversion: 0.16 CFS
Date Filed: 11/8/2016
Places of Use: IRRIGATION, STOCKWATER, DOMESTIC
T05N R01E S32 NENW
Total Acres: 5
Water bearing zone to be appropriated is from 200 to 400 feet.

63-34322

JON SCOTT

3353 HOLL DR

EAGLE, ID 83616

Point of Diversion NESE S33 T05N R01E ADA County Source GROUND WATER

Use: AESTHETIC STORAGE 01/01 to 12/31 0.8 AF

Use: DIVERSION TO STORAGE 01/01 to 12/31 0.15 CFS

Total Diversion: 0.15 CFS 0.8 AF

Date Filed: 11/25/2016

Place of Use: AESTHETIC STORAGE

T05N R01E S33 NESE

Water bearing zone to be appropriated is from 200 to 400 feet.

Permits will be subject to all prior water rights. For additional information concerning the property location, contact Western Region office at (208) 334-2190; or for a full description of the right(s), please see www.idwr.idaho.gov/WaterManagement/WaterRights. Protests may be submitted based on the criteria of Idaho Code § 42-203A. Any protest against the approval of the application(s) must be filed with the Director, Dept. of Water Resources, Western Region, 2735 Airport Way, Boise ID 83705 together with a protest fee of \$25.00 for each application on or before 2/6/2017. The protestant must also send a copy of the protest to the applicant.

GARY SPACKMAN, Director

Published on 1/19/2017 and 1/26/2017

MEMORANDUM

Date: December 09, 2016
To: Water Right File 63-34298
From: Justin Shearer
Re: Proof of No Injury to Boise Front GWMA

Received Proof of No Injury to Boise Front GWMA/Moratorium Area in regards to Low Temperature Geothermal (LTG) water 12/1/2016. SPF Water Engineering, on behalf of the Independent School District of Boise City, submitted a brief analysis of the groundwater in the surrounding area of the proposed well site for WR 63-34298. In their investigation, they compare and contrast the depths and temperatures of 12 wells with differing depths to determine whether or not LTG water would be encountered in the proposed water bearing zone between 200 and 400 feet. In summary, it was determined that their analysis supports the claim that a productive cold-water aquifer can be penetrated and developed by the well within the proposed water bearing zone without encountering LTG water and causing injury to the Boise Front GWMA LTG water. Application is cleared to proceed to advertising.



November 29, 2016

Justin Shearer
Water Resource Agent
IDWR Western Region Office
2735 Airport Way
Boise, ID 83705

RECEIVED
DEC 01 2016
WATER RESOURCES
WESTERN REGION

Subject: 63-34298 Application for Permit

Dear Justin,

As requested by your email dated November 18, 2016, SPF Water Engineering has briefly investigated the potential for encountering low-temperature geothermal groundwater during drilling of the proposed cold-water irrigation well to serve Boise School District's Fort Boise Athletic Complex.

Background

Water right application 63-34298 proposes diversion of 0.60 cfs (270 gpm) of ground water for irrigation of 10 acres within the complex. The proposed well is to be located at 300 West Fort Street, approximately 650 feet west of the Fort Boise Alternative School building at an elevation of approximately 2740 feet. The proposed water-bearing zone is from 200 to 400 feet in hopes that a productive cold-water aquifer can be penetrated and developed by the well within this interval.

The proposed well site is located within the Boise Front Low-Temperature Geothermal Resource Ground Water Management Area (GWMA). The area was established to protect existing water rights that tap the low-temperature geothermal aquifer for heating purposes. Your email of November 18 noted that the faulted and fractured nature of the subsurface in this area creates zones within the GWMA where the low temperature geothermal source may be interconnected with overlying cold water sources. The extent and location of these interconnected zones is not precisely known but is assumed to most commonly occur for wells 300 feet or more in depth.

Your email of November 18 also states "*Therefore, the order establishing the GWMA included all ground water with a temperature greater than 85°F plus colder ground water 300 feet or more below land surface.*" We cannot find information in the GWMA order that includes cold groundwater below 300 feet, and therefore assume that groundwater less than 85°F within the GWMA is not included in the GWMA restrictions.

We note that the June 3, 1988 management plan for the GWMA does require a prospectus for wells that exceed 300 feet in depth. Because total depth listed for the proposed well is up to 400 feet, your concern that low-temperature geothermal groundwater will be encountered below 300 feet is reasonable. Your email of November 18 specifically requested information demonstrating the degree of interconnection, or lack thereof, between the cold water being sought and the protected low temperature geothermal source in the specific area from which ground water is to be diverted. The following information is in response to that request and supports Department approval of application 63-34298 with respect to GWMA criteria.

Description of Existing Wells

Recorded well driller reports for wells greater than 300 feet deep located within ½-mile radius of the proposed well site were reviewed to better understand local hydrogeology and geothermal water occurrence. Any recorded wells that appeared mis-located based on the property address listed on the report were not included. The eleven nearby wells that were evaluated are shown on Figure 1. A summary table and copies of well driller reports are provided as Attachment A. Considerations in the well evaluations included elevation, well depth, depth to water, temperature, and geology. Temperatures were found listed on 3 of the 11 well reports in Attachment A. Topographic maps were used in estimating well elevations. Well depth, depth to water, temperature and subsurface geology were described on the well driller reports. Surface geology was adapted from Othberg and Stanford, 1992 and is shown on Figure 2.

- Well 1 is approximately 2200 feet northwest from the proposed well site. Estimated elevation for Well 1 is 2723 feet, approximately 17 feet lower than the proposed well. The well is 1840 feet deep and flowing at the time of drilling. The borehole penetrated sediments (sand, gravel and clay) to 547 feet, along with volcanic rock and sediments below 547 feet. Water temperature was not recorded. The well was drilled as a geothermal test well for future injection use by the Veterans Administration.
- Well 2 is approximately 2315 feet north from the proposed well site. Estimated elevation for Well 2 is 2760 feet, approximately 20 feet higher than the proposed well. The well is 635 feet deep and has a static water level of 64 feet (approximate water surface elevation 2696 feet). The borehole penetrated sediments (sand, shale and clay) to 620 feet, along with volcanic rock (magnetite) below 620 feet. Water temperature was recorded at 84°F.
- Well 3 is approximately 1960 feet northwest from the proposed well site. Estimated elevation for Well 3 is 2725 feet, approximately 15 feet lower than the proposed well. The well is 474 feet deep and has a static water level of 31 feet (approximate water surface elevation 2694 feet). The well is screened from 428 feet to 454 feet. The borehole penetrated sediments (sand, gravel, shale and clay) the full length of the well. Water temperature was not recorded.

- Well 4 is approximately 1025 feet northeast from the proposed well site. Estimated elevation for Well 4 is 2770 feet, approximately 30 feet higher than the proposed well. The well is 1666 feet deep and has a static water level of 6 feet (approximate water surface elevation 2764 feet). The borehole penetrated sediments (sand and clay) to 510 feet, along with volcanic rock and sediments below 510 feet. Water temperature was not recorded. The well is the production well for the Veterans Administration geothermal well system. Water temperature was not recorded on the well driller's report, but the well is known to produce water with a temperature of approximately 160°F.
- Well 5 is approximately 2520 feet west from the proposed well site. Estimated elevation for Well 5 is 2711 feet, approximately 29 feet lower than the proposed well. The well is 1075 feet deep and has a static water level of 6 feet (approximate water surface elevation 2705 feet). The borehole penetrated sediments (sand, gravel, shale and clay) to 862 feet, along with volcanic rock and sediments below 862 feet. Water temperature was recorded at 102°F.
- Well 6 is approximately 1360 feet west from the proposed well site. Estimated elevation for Well 6 is 2726 feet, approximately 14 feet lower than the proposed well. The well is 2152 feet deep and has a static water level of 40 feet (approximate water surface elevation 2685 feet). The borehole penetrated sediments (sand and clay) to 735 feet, along with volcanic rock and sediments below 735 feet. Drilling 2112 feet below the water table resulted in a water temperature of 153°F; 68°F above the low-temperature geothermal threshold. The well report for well 6 was not located in the Department's on-line well database. A copy of the Drilling and Completion Report submitted to the Department in April, 1981 is included as Attachment B. Worth noting is the temperature log included as report Figure 4, page 12, indicates water temperature 85°F or greater was first encountered around 1200 feet, which is 800 feet lower than the School District's proposed well depth of 400 feet.
- Well 7 is approximately 2255 feet west from the proposed well site. Estimated elevation for Well 7 is 2715 feet, approximately 25 feet lower than the proposed well. The well is 3030 feet deep and flowing at the time of drilling. The borehole penetrated sediments (sand, gravel, shale and clay) to 764 feet, along with volcanic rock and sediments below 764 feet. The well is the production well for the State of Idaho geothermal well system. Water temperature was not recorded on the well driller's report, but the well is known to produce water at approximately 155 F.
- Well 8 is approximately 1300 feet east from the proposed well site. Estimated elevation for Well 8 is 2780 feet, approximately 40 feet higher than the proposed well. The well is 1897 feet deep and flowing at the time of drilling. The borehole penetrated sediments (sand, gravel, shale and clay) to 275 feet, along with volcanic rock and sediments below 275 feet. The well is part of the City of Boise geothermal well field. Water temperature was not recorded on the well driller's report, but the City well field generally produces water with a temperature of approximately 175 F.

- Well 9 is approximately 1980 feet southeast from the proposed well site. Estimated elevation for Well 9 is 2760 feet, approximately 20 feet higher than the proposed well. The well is 2008 feet deep and flowing at the time of drilling. The borehole penetrated sediments (sand, gravel, shale and clay) to 265 feet, along with volcanic rock and sediments below 265 feet. The well is part of the City of Boise geothermal well field. Water temperature was not recorded on the well driller's report, but the City well field generally produces water with a temperature of approximately 175 F.
- Well 10 is approximately 1575 feet east from the proposed well site. Estimated elevation for Well 10 is 2760 feet, approximately 20 feet higher than the proposed well. The well is 880 feet deep and flowing at the time of drilling. The borehole penetrated sediments (sand, gravel, shale and clay) to 360 feet, along with volcanic rock and sediments below 360 feet. The well is part of the City of Boise geothermal well field. Water temperature was not recorded on the well driller's report, but the City well field generally produces water with a temperature of approximately 175 F.
- Well 11 is approximately 1845 feet southeast from the proposed well site. Estimated elevation for Well 11 is 2760 feet, approximately 20 feet higher than the proposed well. The well is 1103 feet deep and flowing at the time of drilling. The borehole penetrated sediments (sand, gravel, shale and clay) to 145 feet, along with volcanic rock and sediments below 145 feet. The well is part of the City of Boise geothermal well field. Water temperature was not recorded on the well driller's report, but the City well field generally produces water with a temperature of approximately 175 F.
- Well 12 is the irrigation well for Fort Boise Park located about 540 feet south of the proposed well site. Estimated elevation for Well 12 is 2737 feet, approximately 17 feet higher than the proposed well. The well log incorrectly lists a location in Section 14 rather than in Section 11. The well was drilled to a depth of 385 feet in 1953, is cased with 8-inch pipe to 256 feet, and draws water through 6-inch perforated casing from 256 to 385 feet. The borehole penetrated clay, shale, gravel, and sand to total depth. Water temperature was not recorded on the well driller's report.

Well 1 and Wells 4 through 11 were drilled expressly for geothermal heating purposes. Well 2 was likely drilled for heating purposes also, but is not noted on the well report. Wells 3 and 12 are cold water wells constructed for drinking water and irrigation purposes, respectively.

Wells 2, 4, and Wells 8 through 11 were constructed along the Boise Front fault system, and were able to obtain geothermal temperatures at relatively shallow temperatures. The Boise Front faults function as conduits for geothermal fluids. Wells 5, 6, and 7 were drilled further out into the valley, nearly ½ mile from the mapped frontal faults. As a result, these wells were drilled deeper to find geothermal temperatures.

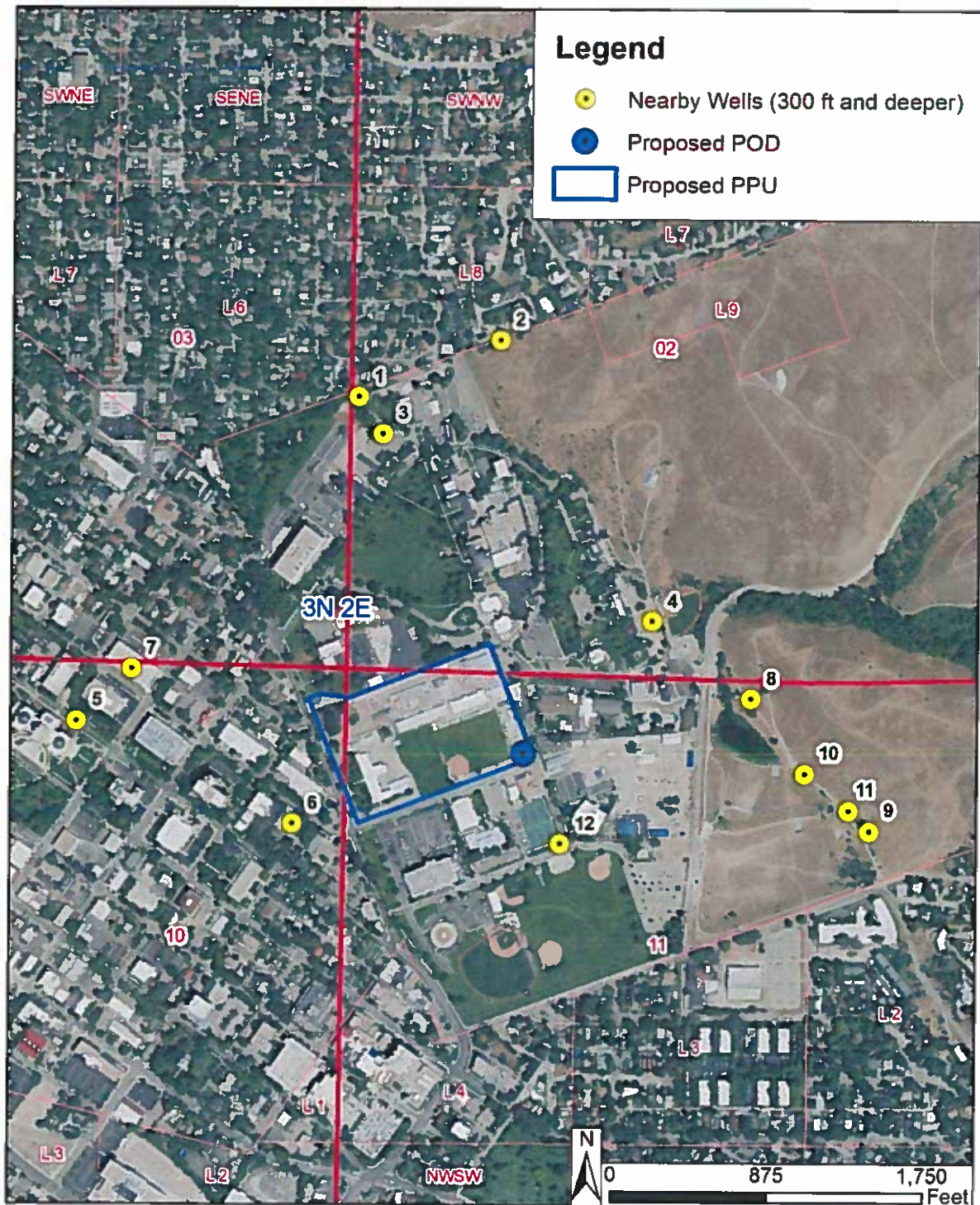


Figure 1. Local Area Well Driller Reports (see Attachment A)

Geology

Surface geology at the proposed well site is shown in Figure 2 as sandy pebble and cobble gravel sediments, described by Othberg and Stanford (1992) as Gravel of the Boise Terrace. At this location, the surface sediments are underlain by sand and clay sediments of the Terteling Springs Formation. The geothermal aquifer in the Boise area is typically found in rhyolite, basalt, and volcanoclastic sediments that underlie the Boise Terrace Formation. Normal faults cut these sediments, and are found to both the east and southwest from the proposed well site.

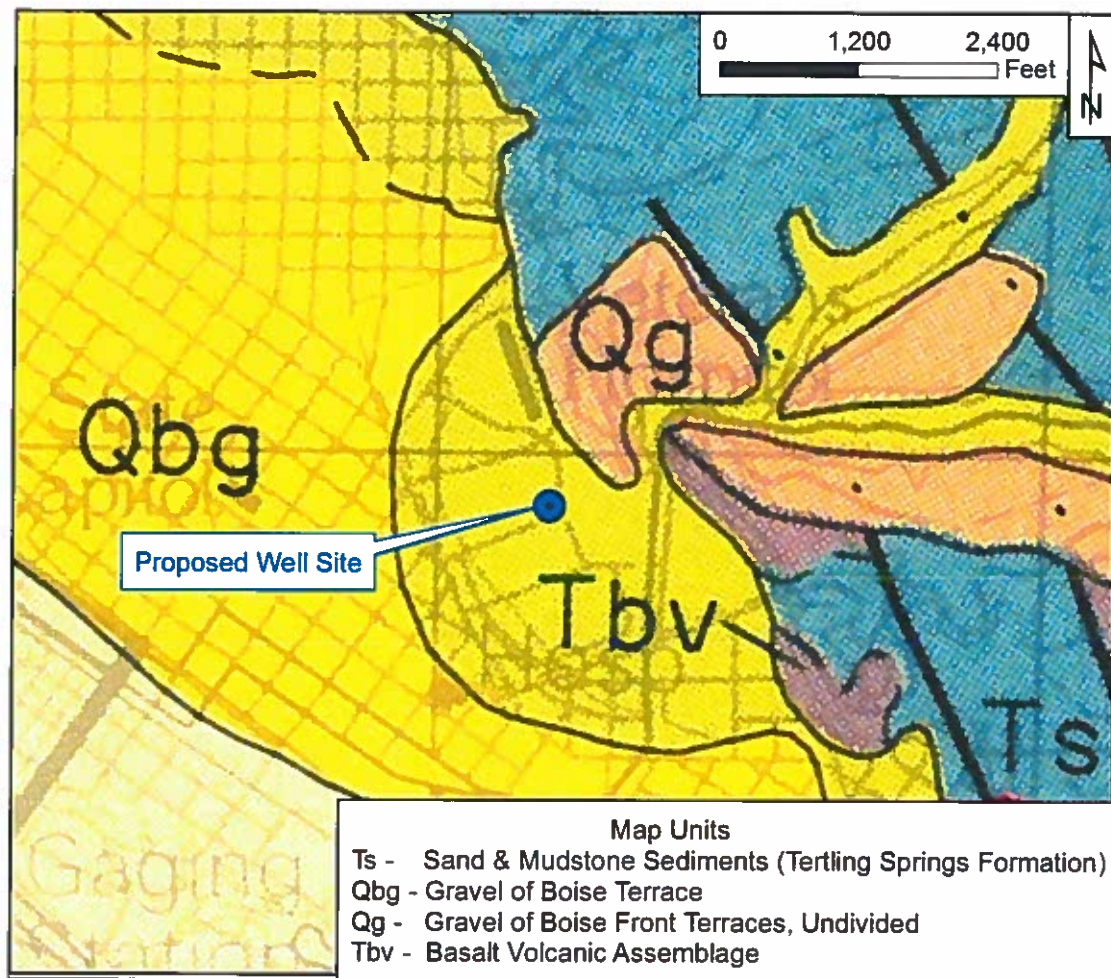


Figure 2. Surface Geology (adapted from Othberg and Stanford, 1992)

Discussion

Based on the information detailed above, it is likely that cold groundwater aquifer zones are present beneath the proposed well site within interbedded clay and sand sediments that overly

volcanic rock (rhyolite, basalt, and volcanoclastic sediments). Based on the lithologic logs for Wells 5, 6, 7, and 12 we anticipate that the volcanic materials will be found at depths below 600 feet. Geothermal groundwater is likely to be found within or beneath the volcanic rock units. Based on the temperature log for Well No. 6, depths to the top of the geothermal water-bearing zones with temperatures 85 degrees or greater will likely occur below 800 feet. Therefore, we do not anticipate encountering warm groundwater within the 200 to 400-foot water-bearing zone proposed for application 63-34298.

Summary

The above analysis supports the likelihood that a productive cold-water aquifer can be penetrated and developed by the well within the proposed water bearing zone of 200 to 400 feet. The upper limit of this water-bearing zone is determined based on current IDWR policy within the Lower Boise River Basin upstream from Star that prohibits approval of new water rights from aquifers above 200 feet depth for consumptive uses. The proposed lower limit is based on the assumption that water-bearing materials adequate to produce 270 gpm will be encountered between 200 and 400 feet. To safeguard the Boise Front low-temperature geothermal ground water resource, applicant will agree to measure bottom-hole temperatures at 100-foot intervals beginning at 300 feet. If volcanic rock types are encountered, bottom-hole temperatures will be measured at 50-foot intervals. Drilling will be suspended if a bottom-hole temperature of 85 degrees or more is encountered.

Please contact us with any questions or comments concerning this analysis. Thanks Justin.

Sincerely,



Lori Graves
Water Rights Specialist



Terry M. Scanlan, P.E., P.G.
Principal Engineer/Hydrogeologist

Cc: Tom Willis

Attachments: Attachment A - Well Driller's Reports
Attachment B - Drilling and Completion Report for Well 6

SPF file number: 474.0200

ATTACHMENT A
NEARBY WELL REPORTS (300 FEET AND DEEPER)

Nearby Wells Greater than 300 Feet Deep

Map No.	Contact	Const. Date	Total Depth	Address	Drilling Co.	Twp	Rng	Sec	Tract	Use	Csg. Dia.	GPM	Static	Temp (deg F)	Elevation (ft)
1	VETERANS ADMIN	9/29/1983	1840		SODA BUTTE SERV	03N	02E	2	NWSW	Inject Test	10	500	Flowing	u/k	2723
2	H F KOCH	7/31/1972	635		RUSSELL COWE	03N	02E	2	NWSW	Domestic	6	80	64	84	2760
3	VETERANS ADMIN	9/30/1974	474		RUSSELL COWE	03N	02E	2	SWSW	Hospital	16	550	31	u/k	2725
4	VETERANS ADMIN	9/12/1983	1666		SODA BUTTE SERV	03N	02E	2	SESW	Heating	16	700	6	u/k	2770
5	STATE OF IDAHO	3/31/1962	1075		LUKEHART DRILLING	03N	02E	10	NWNE	Heating	16	300	6	102	2711
6	STATE OF IDAHO	12/8/1980	2152	Capital Mall (well 1)	HIDDLESTON	03N	02E	10	NENE	Heating	16	750	40?	153	2726
7	STATE OF IDAHO	9/4/1981	3030	Capital Mall (well 2)	HOLMAN DRILLING	03N	02E	10	NENE	Heating	20	0	Flowing	u/k	2715
8	BOISE GEO	6/9/1981	1897	Military Res Park (well 3)	HOLMAN DRILLING	03N	02E	11	NENW	Heating	16	u/k	Flowing	u/k	2780
9	BOISE GEO	4/16/1981	2008	Military Res Park (well 1)	HOLMAN DRILLING	03N	02E	11	NWNE	Heating	16	u/k	Flowing	u/k	2760
10	BOISE GEO	5/8/1981	880	Military Res Park (well 2)	HOLMAN DRILLING	03N	02E	11	NWNE	Heating	16	u/k	Flowing	u/k	2760
11	BOISE GEO	3/1/1982	1103	Military Res Park (well 4)	HOLMAN DRILLING	03N	02E	11	NWNE	Heating	15	u/k	Flowing	u/k	2760
12	BOISE CITY	7/28/1953	385		KENNETH WILT	03N	02E	11	NWNW	Irrigation	8	400	67	u/k	2737

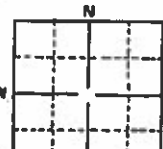
STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORTState law requires that this report be filed with the Director, Department of Water Resources
within 30 days after the completion or abandonment of the well.Well 1
USE TYPEWRITER OR
BALLPOINT PEN

OCT 11 1983

1. WELL OWNER Name <u>Veterans Administration</u> Address <u>Boise, Idaho</u> Owner's Permit No. <u>63-W-15</u>		7. WATER LEVEL Static water level <u>-</u> feet below land surface. Flowing? ☒ Yes ☐ No G.P.M. flow <u>No test</u> Artesian closed in pressure <u>-</u> p.s.i. Controlled by: ☒ Valve ☐ Cap ☐ Plug Temperature <u>-</u> °F. Quality <u>Good</u> <i>Describe artesian or temperature zones below</i>																																																																																																																																																																																																					
2. NATURE OF WORK ☒ New well ☐ Deepened ☐ Replacement ☐ Abandoned (describe abandonment procedures such as materials, plug depths, etc. in lithologic log)		8. WELL TEST DATA ☐ Pump ☐ Baller ☒ Air ☐ Other _____																																																																																																																																																																																																					
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6. LOCATION OF WELL Sketch map location <u>must</u> agree with written location. N W E S Subdivision Name _____ Lot No. _____ Block No. _____ County <u>ADA</u> NW 1/4 SW 1/4 Sec. <u>2</u> T. <u>3N</u> N/S, R. <u>2E</u> E/W.		10. Work started <u>9-20-83</u> finished <u>9-29-83</u>																																																																																																																																																																																																					
11. DRILLERS CERTIFICATION I/We certify that all minimum well construction standards were complied with at the time the rig was removed. Firm Name <u>Water Exploration, Inc.</u> Irfdm No. <u>429</u> Box 500 Address <u>Upton, WY 82730</u> Date <u>10-3-83</u> Signed by (Firm Official) <u>Tim Smith</u> and (Operator) <u>Malcolm L. Doyle</u>																																																																																																																																																																																																							

WELL DRILLER'S REPORT

State law requires that this report be filed with the State Reclamation Engineer
within 30 days after completion or abandonment of the well.

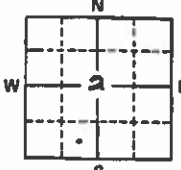
1. WELL OWNER Name <u>H. F. KOCH</u> Address <u>257 Circle Way Drive</u> Owner's Permit No. _____		7. WATER LEVEL <u>64</u> Static water level <u>16</u> feet below land surface Flowing? ☐ Yes ☒ No G.P.M. flow _____ Temperature <u>84</u> ° F. Quality _____ Artesian closed-in pressure _____ p.s.i. Controlled by ☐ Valve ☐ Cap ☐ Plug																																																																																																																																																																																			
2. NATURE OF WORK ☒ New well ☐ Deepened ☒ Replacement ☐ Abandoned (describe method of abandoning) _____		8. WELL TEST DATA ☐ Pump ☐ Bailer ☒ Other <u>air</u> Discharge G.P.M. <u>80</u> Draw Down _____ Hours Pumped _____																																																																																																																																																																																			
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6. LOCATION OF WELL Sketch map location must agree with written location. <u>Page 586</u>  <u>257 Circle Way Drive</u> County <u>Ada</u> <u>72</u> x <u>72</u> Sec <u>42</u> T. <u>3</u> N. R. <u>52</u> E. <u>See same spotted on map</u>		11. DRILLER'S CERTIFICATION This well was drilled under my supervision and this report is true to the best of my knowledge. <u>Russell Crowe</u> <u>65</u> Driller's or Firm's Name Number Address _____ Signed By _____ Date _____																																																																																																																																																																																			

WELL DRILLER'S REPORT

State law requires that this report be filed with the Director, Department of Water Administration within 30 days after the completion or abandonment of the well.

1. WELL OWNER Name <u>Veterans Administration</u> Address _____ Owner's Permit No. _____	7. WATER LEVEL Static water level <u>31</u> feet below land surface Flowing? ☐ Yes ☒ No G.P.M. flow _____ Temperature _____ ° F. Quality _____ Artesian closed-in pressure _____ p.s.i. Controlled by ☐ Valve ☐ Cap ☐ Plug																																																																																																																
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STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORTWell 4
USE TYPEWRITER OR
BALLPOINT PENState law requires that this report be filed with the Director, Department of Water Resources
within 30 days after the completion or abandonment of the well.

1. WELL OWNER Name <u>Veterans Administration</u> Address <u>Boise, Idaho</u> Owner's Permit No. <u>63-9890</u>	7. WATER LEVEL Static water level <u>6</u> feet below land surface. Flowing? ☐ Yes ☒ No G.P.M. flow _____ Artesian closed-in pressure _____ p.s.i. Controlled by: ☒ Valve ☐ Cap ☐ Plug Temperature _____ °F. Quality <u>Good</u> Describe artesian or temperature zones below																																																																																																																																		
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5. WELL CONSTRUCTION Casing schedule: ☒ Steel ☐ Concrete ☐ Other _____ <table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th>Thickness</th><th>Diameter</th><th>From</th><th>To</th></tr></thead><tbody><tr><td>.250 inches</td><td>16 inches</td><td>-6 feet</td><td>140 feet</td></tr><tr><td>.337 inches</td><td>12 inches</td><td>+2 feet</td><td>802 feet</td></tr><tr><td>.250 inches</td><td>8 inches</td><td>780 feet</td><td>1500 feet</td></tr></tbody></table> Was casing drive shoe used? ☐ Yes ☒ No Was a packer or seal used? ☒ Yes ☐ No Perforated? ☒ Yes ☐ No How perforated? ☒ Factory ☐ Knife ☐ Torch Size of perforation <u>1/8</u> inches by <u>2 1/2</u> inches <table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th>Number</th><th>From</th><th>To</th></tr></thead><tbody><tr><td>6400 perforations</td><td>1100 feet</td><td>1500 feet</td></tr><tr><td>perforations</td><td>feet</td><td>feet</td></tr><tr><td>perforations</td><td>feet</td><td>feet</td></tr></tbody></table> Well screen installed? ☐ Yes ☒ No Manufacturer's name _____ Type _____ Model No. _____ Diameter _____ Slot size _____ Set from _____ feet to _____ feet Diameter _____ Slot size _____ Set from _____ feet to _____ feet Gravel packed? ☐ Yes ☒ No ☐ Size of gravel _____ Placed from _____ feet to _____ feet Surface seal depth <u>802</u> Material used in seal: ☒ Cement grout ☐ Bentonite ☐ Puddling clay ☐ _____ Sealing procedure used: ☐ Slurry pit ☐ Temp. surface casing ☒ Overbore to seal depth Method of joining casing: ☐ Threaded ☒ Welded ☐ Solvent Weld ☒ Cemented between strata Describe access port <u>2" coupling</u>	Thickness	Diameter	From	To	.250 inches	16 inches	-6 feet	140 feet	.337 inches	12 inches	+2 feet	802 feet	.250 inches	8 inches	780 feet	1500 feet	Number	From	To	6400 perforations	1100 feet	1500 feet	perforations	feet	feet	perforations	feet	feet																																																																																																							
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6. LOCATION OF WELL Sketch map location <u>must</u> agree with written location.  Subdivision Name _____ Lot No. _____ Block No. _____ County _____ SE 1/4 SW 1/4 Sec. <u>2</u> , T. <u>3N</u> , R. <u>2E</u> E/W.	11. DRILLERS CERTIFICATION <u>de</u> <u>de</u> I/We certify that all minimum well construction standards were complied with at the time the rig was removed. Firm Name <u>Materi Exploration, Inc.</u> Id. No. <u>429</u> Address <u>Box 500, Upton, WY 82730</u> Date <u>10-3-83</u> Signed by (Firm Officer) <u>[Signature]</u> and (Operator) <u>[Signature]</u>																																																																																																																																		

WELL LOG AND REPORT OF THE STATE RECLAMATION ENGINEER OF IDAHO

Permit No. 93045-2 Well No. _____ County ADA

Owner STATE OF IDAHO

Address _____

Driller Lukehart Drilling and Pump

Address 1819 Federal Way, Boise IDAHO

Well location 77 1/4 79 1/4 Sec. 11 T. 3 N. R. 2 E. 1/4

Size of drilled hole 8"

Locate well in section

NW 1/4	NE 1/4
SW 1/4	SE 1/4

Total depth of well 1075'

Give depth to standing water from the ground 6' Water temp 102 °Fahr.

On "Pumping Test" delivery was 300 g.p.m. or _____ c.f.s. Drawdown was _____ feet.

Size of pump and motor used to make test AIR COMPRESSOR

Length of time of test 16 hours _____ minutes.

If flowing well, give flow NO c.f.s. or _____ g.p.m. and of shut off pressure _____

If flowing well, described control works _____
(TYPE AND SIZE OF VALVE, ETC.)

Water will be used for DOMESTIC & SPRINKLING Weight of casing per lineal foot 24#

Thickness of casing 360 Casing material STEEL
(STEEL, CONCRETE, WOOD, ETC.)

Diameter, length and location of casing 8" 389' 6" 934' 1"
(CASING 12" IN DIAMETER OR LESS, GIVE INSIDE DIAMETER;
CASING OVER 12" IN DIAMETER, GIVE OUTSIDE DIAMETER)

CASING RECORD

Diam. Casing	From Feet	To Feet	Length	Remarks—seals, grouting, etc.
8"	0	389'	389'	8" is sealed in blue clay
6"	289'	986' 1"	497' 1"	6" is setting on gravel
				LOGS ✓

Number and size of perforations None located _____ feet to _____ feet from ground

Date of commencement of well 12/1/61 Date of completion of well MARCH 31/62

NWNE 510 3N 2E

WELL LOG

From Feet	To Feet	Type of Material	Water-bearing Formation Ans. Yes or No	Casing Perforated Ans. Yes or No
0'	70'			
0'	76'	muddy sand	yes	
70'	74'	gravel	yes	
74'	97'	muddy sand (yellow)	yes	
97'	109'	heaving sand fine (Brown)	yes	
109'	176'	blue sandy clay		
176'	190'	blue clay; sandy tried to set pipe formation (collapse)		
190'	198'	muddy sand (brown)	yes	
198'	203'	sandy clay (blue)	yes	
203'	209'	sandy clay (brown)	yes	
209'	218'	sand and gravel (to much sand to make open hole well)	yes	
218'	233'	muddy sand (brown)	yes	
233'	280'	muddy sand (blue)	yes	
280'	300'	blue clay (to sandy to hold pipe)	yes	
300'	317'	sand with small amount of gravel	yes	
317'	348'	fine sand (blue)	yes	
348'	358'	fine sand (brown)	yes	
358'	368'	fine muddy sand (brown)	yes	
If more space is required use Sheet No. 2				

WELL DRILLER'S STATEMENT

This well was drilled under my supervision and the above information is true and correct to the best of my knowledge and belief.

Signed _____

By _____

Dated _____, 19____

License No. _____

63

See Attachment B for Well 6

WELL DRILLER'S REPORT

State law requires that this report be filed with the Director, Department of Water Resources within 30 days after the completion or abandonment of the well.

1. WELL OWNER

Name State of Idaho, Department of
Natural Resources
Address Boise, Idaho
Owner's Permit No. _____

7. WATER LEVEL

Static water level flow feet below land surface
Flowing? ☒ Yes ☐ No G.P.M. flow _____
Temperature _____ ° F. Quality _____
Artesian closed-in pressure _____ p.s.i.
Controlled by ☒ Valve ☐ Cap ☐ Plug

2. NATURE OF WORK

Well #2 Capitol Mall
☒ New well ☐ Deepened ☐ Replacement
☐ Abandoned (describe method of abandoning)8 WELL TEST DATA Unknown☐ Pump ☐ Bailor ☐ Other

Discharge G.P.M. Draw Down Hours Pumped

3. PROPOSED USE

☐ Domestic ☐ Irrigation ☐ Test ☒ Geothermal
☐ Other (specify type) _____
☐ Municipal ☐ Industrial ☐ Stock ☐ Waste Disposal or
Injection

9. LITHOLOGIC LOG

83569

Hole Diam.	Depth		Material	Water	
	From	To		Yes	No
24	0	40	Top soil fill		X
20	40	81	Sand gravel & cobbles		X
20	81	130	Silty sand & coarse sand		X
130	130	151	Clay w/ silt & sand		X
151	151	178	Sand coarse & clean		X
178	178	300	Sand granitic & clay		X
300	300	764	Clay silty		X
764	764	935	Basalt w/clay & sand		X
935	935	1005	Sand w/qtz clean		X
1005	1005	1088	Basalt w/clay		X
1088	1088	1120	Sand qtz w/clay		X
1120	1120	1266	Basalt w/clay		X
1266	1266	1553	Clay & sand w/basalt chips		X
1553	1553	1635	Volcanics w/clay		X
1635	1635	1655	Sand coarse	X	
1655	1655	1690	Clayey sand & clay		X
1690	1690	1730	Sand w/granitics	X	
1730	1730	1775	Clay soft gritty		X
1775	1775	1793	Sand coarse volcanic	X	
1793	1793	2190	Volcanic rock silicious	X	
2190	2190	2220	Clay gritty		X
2220	2220	2240	Sand & clay		X
2240	2240	2267	Sand granitic cemented		X
2267	2267	2290	Sandstone & clay		X
2290	2290	2435	Sand granitic & volcanic	X	
2435	2435	2510	Clay some sand		X
2510	2510	2950	Volcanic rock glassy	X	
2950	2950	3030	Volcanic rock soapstone	X	
			TD		

4. METHOD DRILLED

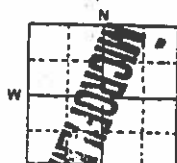
☐ Cable ☒ Rotary ☐ Dug ☐ Other

5. WELL CONSTRUCTION

Diameter of hole 14 3/4 inches Total depth 1286 feet
Casing schedule: ☒ Steel ☐ Concrete
Thickness 3/8 inches Diameter 20 inches From 0 feet To 138 feet
330 inches 12 inches 0 feet 1250 feet
250 inches 8 inches 1220 feet 2550 feet
____ inches _____ inches _____ feet _____ feet
____ inches _____ inches _____ feet _____ feet
Was casing drive shoe used? ☒ Yes ☐ No
Was a packer or seal used? ☒ Yes ☐ No
Perforated? ☒ Yes ☐ No
How perforated? ☒ Factory ☐ Knife ☐ Torch
Size of perforation 1/8 inches by 3 1/2 inches
Number of perforations From To
16 perforations 1300 feet 1420 feet
24 perforations 1420 feet 1450 feet
16 perforations 1450 feet 1506 feet
24 perforations 1506 feet 2558 feet
Well screen installed? ☐ Yes ☒ No
Manufacturer's name _____
Type _____ Model No. _____
Diameter _____ Slot size _____ Set from _____ feet to _____ feet
Diameter _____ Slot size _____ Set from _____ feet to _____ feet
Gravel packed? ☐ Yes ☒ No Size of gravel _____
Placed from _____ feet to _____ feet
Surface seal depth 40' Material used in seal ☒ Cement grout
☐ Puddling clay ☐ Well cuttings
Sealing procedure used ☐ Sherry gel ☒ Temporary surface casing
pumped ☐ Overbore to seal depth

6. LOCATION OF WELL

Sketch map location must agree with written location.



Subdivision Name _____

Lot No. _____ Block No. _____

City _____ Ada

1/2 Sec. 10, T. 3, R. 2 (N) S. R. 2 (E) W

10.

Work started 6-29-81 finished 9-4-81

11. DRILLERS CERTIFICATION

Firm Name Holman Drilling Corp. Firm No. 108

3410 Ninth Ave.

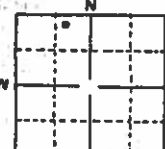
Address Spokane, WA 99202 Date 3-1-82Signed by (Firm Official) Arnold E. Holman

and

(Operator) Arnold E. Holman

WELL DRILLER'S REPORT

State law requires that this report be filed with the Director, Department of Water Resources within 30 days after the completion or abandonment of the well.

1. WELL OWNER Name <u>Boise Geothermal Ltd.</u> Address <u>P.O. Box 500 Boise, ID 83701</u> Owner's Permit No. _____		7. WATER LEVEL Static water level <u>flow</u> feet below land surface Flowing? ☒ Yes ☐ No G.P.M. flow _____ Temperature _____ °F. Quality _____ Artesian closed-in pressure _____ p.s.i. Controlled by ☒ Valve ☐ Cap ☐ Plug																																																																																																							
2. NATURE OF WORK Well #3 Military Reserve Park ☒ New well ☐ Deepened ☐ Replacement ☐ Abandoned (describe method of abandoning) _____		8. WELL TEST DATA Unknown ☐ Pump ☐ Bailor ☐ Other <table border="1"><thead><tr><th>Discharge G.P.M.</th><th>Draw Down</th><th>Hours Pumped</th></tr></thead><tbody><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr></tbody></table>		Discharge G.P.M.	Draw Down	Hours Pumped																																																																																																			
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	1045	1720	Volcanic rock multicolored flinty glassy w/pumice	X																																																																																																					
	1720	1897	Sandstone gray w/ granitic sand TD	X																																																																																																					
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6. LOCATION OF WELL Sketch map location must agree with _____  Subdivision Name _____ Lot No. _____ Block No. _____ County <u>Ada</u> <u>NE</u> 1/4 <u>NW</u> 1/4 Sec. <u>11</u> , T. <u>3</u> N/R, R. <u>2</u> E/W		10. Work started <u>5/15/81</u> finished <u>6/09/81</u>																																																																																																							
11. DRILLER'S CERTIFICATION Firm Name <u>Holman Drilling Corp.</u> Firm No. <u>108</u> E. 3410 Ninth Ave. Address <u>Spokane, WA 99202</u> Date <u>3-1-82</u> Signed by (Firm Official) <u>Arnold E. Holman</u> and <u>Arnold E. Holman</u> P.R.S. (Operator)																																																																																																									

WELL DRILLER'S REPORT

State law requires that this report be filed with the Director, Department of Water
days after the completion or abandonment of the well.

Location Corrected by IDWR To:

T03N R02E Sec. 11 SWNWNE

By: mciscell 2012-12-26

1. WELL OWNER

Name Boise Geothermal Ltd.Address P.O. Box 500 Boise, ID 83701

Owner's Permit No. _____

7. WATER LEVEL

Static water level flow feet below land surfaceFlowing? ☒ Yes ☐ No G.P.M. flow _____

Temperature _____ F. Quality _____

Artesian closed-in pressure _____ p.s.i.

Controlled by ☒ Valve ☐ Cap ☐ Plug

2. NATURE OF WORK

Well #1 Military Reserve Park

☒ New well ☐ Deepened ☐ Replacement☐ Abandoned (describe method of abandoning)

8. WELL TEST DATA Unknown

☐ Pump ☐ Bailer ☐ Other

Discharge G.P.M.	Draw Down	Hours Pumped

3. PROPOSED USE

Geothermal

☐ Domestic ☐ Irrigation ☐ Test ☒ Other (specify type)☐ Municipal ☐ Industrial ☐ Stock ☐ Waste Disposal or Injection

4. METHOD DRILLED

☐ Cable ☒ Rotary ☐ Dug ☐ Other

5. WELL CONSTRUCTION

Diameter of hole 14 3/4 inches Total depth 2008 feetCasing schedule: ☒ Steel ☐ Concrete

Thickness	Diameter	From	To
<u>250</u> inches	<u>16</u> inches	<u>0</u> feet	<u>40</u> feet
<u>330</u> inches	<u>12</u> inches	<u>0</u> feet	<u>874</u> feet
<u>25</u> inches	<u>8</u> inches	<u>837</u> feet	<u>1657</u> feet

Was casing drive shoe used? ☒ Yes ☐ NoWas a packer or seal used? ☒ Yes ☐ NoPerforated? ☒ Yes ☐ NoHow perforated? ☒ Factory ☐ Knife ☐ TorchSize of perforation 1/8 inches by 1 1/2 inches

4 R to ft Number	From	To
8 to round perforations	<u>874</u> feet	<u>1023</u> feet
	<u>1054</u> feet	<u>1074</u> feet
	<u>1399</u> feet	<u>1561</u> feet
	<u>1647</u> feet	<u>1657</u> feet

Well screen installed? ☐ Yes ☒ No

Manufacturer's name _____

Type _____ Model No. _____

Diameter _____ Slot size _____ Set from _____ feet to _____ feet

Diameter _____ Slot size _____ Set from _____ feet to _____ feet

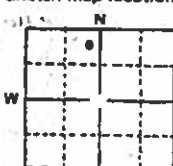
Gravel packed? ☐ Yes ☒ No Size of gravel _____

Placed from _____ feet to _____ feet

Surface seal depth 40 Material used in seal ☒ Cement grout☐ Puddling clay ☐ Well cuttingsSealing procedure used ☐ Sherry gr ☒ Temporary surface casingpumped ☐ Overbars to seal depth

6. LOCATION OF WELL

Sketch map location must agree with written location.



Subdivision Name _____

Lot No. _____ Block No. _____

County AdaNE % NW % Sec. 11, T. 3N N. 2, R. 2 E. 2

10.

Work started 3/16/81 finished 4/16/81

11. DRILLERS CERTIFICATION

Firm Name Holman Drilling Corp. Firm No. 108

E. 3410 Ninth Ave.

Address Spokane, WA 99202 Date 3-1-82Signed by (Firm Official) Arnold E. Holman

and

(Operator) Arnold E. Holman

USE TYPEWRITER OR
BALL POINT PEN

State of Idaho
Department of Water Resources

Well 10

WELL DRILLER'S REPORT

State law requires that this report be filed with the Director, Department of Water Resources, within 10 days after the completion or abandonment of the well.

Location Corrected by IDWR To:

T03N R02E Sec. 11 NWNWNE

By: mciscell 2012-09-05

1. WELL OWNER

Name Boise Geothermal Ltd.
Address P.O. Box 500 Boise, ID 83701
Owner's Permit No. _____

7. WATER LEVEL

Static water level flow feet below land surface
Flowing? ☒ Yes ☐ No G.P.M. flow _____
Temperature _____ F. Quality _____
Artesian closed-in pressure _____ p.s.i.
Controlled by ☒ Valve ☐ Cap ☐ Plug

2. NATURE OF WORK

Well #2 Military Reserve Park
☒ New well ☐ Deepened ☐ Replacement
☐ Abandoned (describe method of abandoning)

8. WELL TEST DATA

☐ Pump ☐ Bailer ☐ Other

Discharge G.P.M.	Draw Down	Hours Pumped

3. PROPOSED USE

Geothermal
☐ Domestic ☐ Irrigation ☐ Test ☒ Other (specify type)
☐ Municipal ☐ Industrial ☐ Stock ☐ Waste Disposal or Injection

9. LITHOLOGIC LOG

Hole Diam.	Depth		Material	Water	
	From	To		Yes	No
16	0	40	Fill & sandstone	X	
14 3/4	40	102	Siltstone grey	X	
	102	147	Sandstone w/clay	X	
	147	218	Siltstone-claystone	X	
	218	330	Basalt w/clay	X	
	330	360	Sandstone coarse	X	
	360	390	Basalt grey-blk w/clay	X	
	390	445	Sandstone w/clay	X	
	445	475	Clay red-brn	X	
	475	530	Sandstone-siltstone	X	
	530	620	Basalt brn-blk w/clay	X	
	620	658	Sandstone w/pyrite & clay	X	
9 7/8	658	855	Volcanic rock altered & broken-loss circulation at 668' & 757'		
	855	880	Sandstone coarse TD	X	

4. METHOD DRILLED

☐ Cable ☒ Rotary ☐ Dug ☐ Other

5. WELL CONSTRUCTION

Diameter of hole 14 3/4 inches Total depth 650 feet
Casing schedule: ☒ Steel ☐ Concrete
Thickness Diameter From To
250 inches 16 inches 0 feet 40 feet
330 inches 12 inches 0 feet 642 feet
_____ inches _____ inches _____ feet _____ feet
_____ inches _____ inches _____ feet _____ feet
_____ inches _____ inches _____ feet _____ feet
Was casing drive shoe used? ☒ Yes ☐ No
Was a packer or seal used? ☒ Yes ☐ No
Perforated? ☐ Yes ☒ No
How perforated? ☐ Factory ☐ Knife ☐ Torch
Size of perforation _____ inches by _____ inches
Number From To
_____ perforations _____ feet _____ feet
_____ perforations _____ feet _____ feet
_____ perforations _____ feet _____ feet

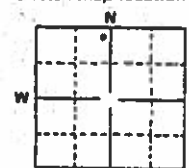
Well screen installed? ☐ Yes ☒ No
Manufacturer's name _____
Type _____ Model No. _____
Diameter _____ Slot size _____ Set from _____ feet to _____ feet
Diameter _____ Slot size _____ Set from _____ feet to _____ feet

Gravel packed? ☐ Yes ☒ No Size of gravel _____
Placed from _____ feet to _____ feet

Surface seal depth 40 Material used in seal ☒ Cement grout
☐ Puddling clay ☐ Well cuttings
Sealing procedure used ☐ Sherry pit ☒ Temporary surface casing pumped ☐ Overbore to seal depth

6. LOCATION OF WELL

Sketch map location must agree with written location.



MICROFILMED

Subdivision Name _____
Lot No. _____ Block No. _____

County Ada

NE 1/4 NW 1/4 Sec. 11 T. 3 N. R. 2 E. 10

10.

Work started 4/17/81 finished 5/08/81

11. DRILLERS CERTIFICATION

Firm Name Holman Drilling Corp. Firm No. 108
Address E. 3410 Ninth Ave.
Spokane, WA 99202 Date 3-1-82
Signed by (Firm Official) Arnold E. Holman PRES.
and
(Operator) Arnold E. Holman

USE ADDITIONAL SHEETS IF NECESSARY

FORWARD THE WHITE COPY TO THE DEPARTMENT

USE TYPEWRITER OR
BALL POINT PEN

State of Idaho
Department of Water Resources

Well 11

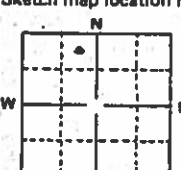
Location Corrected by IDWR To:

T03N R02E Sec. 11 SWNWNE

By: mciscell 2012-08-28

WELL DRILLER'S REPORT

State law requires that this report be filed with the Director, Department of Water Resources, within 30 days after the completion or abandonment of the well.

1. WELL OWNER Name <u>Boise Geothermal Ltd.</u> Address <u>P.O. Box 500 Boise, ID 83701</u> Owner's Permit No. _____	7. WATER LEVEL Static water level <u>flow</u> feet below land surface Flowing? ☒ Yes ☐ No G.P.M. flow _____ Temperature _____ F. Quality _____ Artesian closed-in pressure _____ p.s.i. Controlled by ☒ Valve ☐ Cap ☐ Plug																																																																																																																														
2. NATURE OF WORK Well # <u>4</u> Military Reserve Park ☒ New well ☐ Deepened ☐ Replacement ☐ Abandoned (describe method of abandoning) _____	8. WELL TEST DATA <u>Unknown</u> ☐ Pump ☐ Bailer ☐ Other Discharge G.P.M. _____ Draw Down _____ Hours Pumped _____																																																																																																																														
3. PROPOSED USE ☐ Domestic ☐ Irrigation ☐ Test ☒ Other (specify type) <u>Geothermal</u> ☐ Municipal ☐ Industrial ☐ Stock ☐ Waste Disposal or Injection	9. LITHOLOGIC LOG <u>83129</u> <table border="1"><thead><tr><th>Hole Diam.</th><th>Depth From</th><th>To</th><th>Material</th><th>Water Yes</th><th>No</th></tr></thead><tbody><tr><td>16</td><td>0</td><td>40</td><td>Top soil sandy</td><td></td><td>X</td></tr><tr><td>14 3/4</td><td>40</td><td>85</td><td>Sand & clay some qtz</td><td></td><td>X</td></tr><tr><td></td><td>85</td><td>95</td><td>Clay w/sandstone</td><td></td><td>X</td></tr><tr><td></td><td>95</td><td>145</td><td>Sandstone-siltstone w/ qtzite & pyrites</td><td></td><td>X</td></tr><tr><td></td><td>145</td><td>200</td><td>Basalt grn to grn-blk</td><td></td><td>X</td></tr><tr><td></td><td>200</td><td>225</td><td>Volcanic rock</td><td></td><td>X</td></tr><tr><td></td><td>225</td><td>270</td><td>Clay w/sand & basalt chips</td><td></td><td>X</td></tr><tr><td></td><td>270</td><td>285</td><td>Sandstone w/some clay</td><td></td><td>X</td></tr><tr><td></td><td>285</td><td>391</td><td>Clay multicolored</td><td></td><td>X</td></tr><tr><td></td><td>391</td><td>444</td><td>Sandstone w/clay</td><td></td><td>X</td></tr><tr><td></td><td>444</td><td>482</td><td>Sand & sandy clay</td><td></td><td>X</td></tr><tr><td></td><td>482</td><td>493</td><td>Sandy clay grn & gry</td><td></td><td>X</td></tr><tr><td></td><td>493</td><td>510</td><td>Sandstone? hard rock granular</td><td></td><td>X</td></tr><tr><td></td><td>510</td><td>552</td><td>Clay ash soapstone</td><td></td><td>X</td></tr><tr><td></td><td>552</td><td>610</td><td>Volcanic rock fractured</td><td></td><td>X</td></tr><tr><td>9 3/8</td><td>610</td><td>780</td><td>Volcanic rock</td><td></td><td>X</td></tr><tr><td></td><td>780</td><td>900</td><td>Sand & clay</td><td></td><td>X</td></tr><tr><td></td><td>900</td><td>1040</td><td>Sand & gravel</td><td></td><td>X</td></tr><tr><td></td><td>1040</td><td>1080</td><td>Basalt medium</td><td></td><td>X</td></tr><tr><td></td><td>1080</td><td>1100</td><td>Sand TD</td><td></td><td>X</td></tr></tbody></table>	Hole Diam.	Depth From	To	Material	Water Yes	No	16	0	40	Top soil sandy		X	14 3/4	40	85	Sand & clay some qtz		X		85	95	Clay w/sandstone		X		95	145	Sandstone-siltstone w/ qtzite & pyrites		X		145	200	Basalt grn to grn-blk		X		200	225	Volcanic rock		X		225	270	Clay w/sand & basalt chips		X		270	285	Sandstone w/some clay		X		285	391	Clay multicolored		X		391	444	Sandstone w/clay		X		444	482	Sand & sandy clay		X		482	493	Sandy clay grn & gry		X		493	510	Sandstone? hard rock granular		X		510	552	Clay ash soapstone		X		552	610	Volcanic rock fractured		X	9 3/8	610	780	Volcanic rock		X		780	900	Sand & clay		X		900	1040	Sand & gravel		X		1040	1080	Basalt medium		X		1080	1100	Sand TD		X
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USE ADDITIONAL SHEETS IF NECESSARY

FORWARD THE WHITE COPY TO THE DEPARTMENT

047966

RECEIVED
 JUN 17 1964

**WELL LOG AND REPORT OF THE
 STATE RECLAMATION ENGINEER OF IDAHO**

Department of Reclamation

 Permit No. 227148 Well No. _____ County Ada
 Owner Boise, city Boise Barracks
 Address _____
 Driller Kenneth Miller
 Address 3213 N 39th Boise
 Well location NW 1/4 NE 1/4 Sec. 14 T. 3 N. R. 2 E. W.
 Size of drilled hole 8"

Locate well in section

NW 1/4	NE 1/4
SW 1/4	SE 1/4

Total depth of well 385Give depth to standing water from the ground 67' Water temp. _____ °Fahr.On "Pumping Test" delivery was 400 g.p.m. or _____ c.f.s. Drawdown was 14' feet.Size of pump and motor used to make test Turbine 6" column (gas)Length of time of test 4 hours _____ minutes.

If flowing well, give flow _____ c.f.s. or _____ g.p.m. and of shut off pressure _____

If flowing well, described control works _____

(TYPE AND SIZE OF VALVE, ETC.)

Water will be used for irrigation Weight of casing per lineal foot 24 lbs.Thickness of casing 280 wall casing material STEEL
(STEEL, CONCRETE, WOOD, ETC.)Diameter, length and location of casing 8" 0 256
(CASING 12" IN DIAMETER OR LESS, GIVE INSIDE DIAMETER;
CASING OVER 12" IN DIAMETER, GIVE OUTSIDE DIAMETER)

CASING RECORD

Diam. Casing	From Feet	To Feet	Length	Remarks—seals, grouting, etc.
8"	0	256	257	
6"	240	385	145	— PERFORATED

Number and size of perforations 5/2 x 6 located 256 feet to 385 feet from groundDate of commencement of well July 1, 1953 Date of completion of well July 28, 1953

NWNE S. 14 3N 2E

WELL LOG

From Feet	To Feet	Type of Material	Water-bearing Formation Ans. Yes or No	Casing Perforated Ans. Yes or No
1	30'	Top Soil		
30'	50'	Gravel (TIGHT)		
50	74'	SAND Gravel (Loose)	yes	
74	80	yellow SAND and CLAY (Dry)		
80	103	Blue CLAY		
103	118	yellow SAND (Dry & TIGHT)		
118	142	SANDY CLAY STRINGS		
142	167	Blue CLAY LUMPS SAND	yes	
167	245	Blue CLAY		
245	250	SHALE CRICICE	yes	
250	290	SHALE		
290	310	Blue SAND (SOFT SPOT) ^{SOME} GRAVEL	yes	
310	330	SHALE		
330	340	SAND (Blue)	yes	
340	379	SHALE		
379	385	SANDY Blue CLAY	yes	
		main flow of water coming in at ~~310~~ 290 to 310		
If more space is required use Sheet No. 2				

WELL DRILLER'S STATEMENT

This well was drilled under my supervision and the above information is true and correct to the best of my knowledge and belief.

Signed

Kenneth Witt

By

Dated Aug 5, 1953

License No. 55

ATTACHMENT B

DRILLING AND COMPLETION REPORT (WELL 6)

DRILLING AND COMPLETION REPORT
CAPITOL MALL GEOTHERMAL EXPLORATORY WELL #1

May 1981

by

John Anderson

Idaho Department of Water Resources
Statehouse
Boise, Idaho

Prepared as part of the U.S. Department of Energy
Contract DE-AS07-77ET28407

SCANLAN ENGINEERING
600 EAST RIVER PARK LANE, SUITE 106
BOISE, IDAHO 83706

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Geology	5
Structural Geology	6
Geophysics	7
Conclusion	8

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ABSTRACT

Capitol Mall Exploratory Well #1 was drilled to a total depth of 2152 feet on state land near the Capitol Mall complex in Boise, Idaho. The completed well has an artesian "free flow" of approximately 300 gallons per minute. Fluid discharge temperature reaches a maximum of 67°C (153°F) during sustained production. The producing zone for the well is an uncased volcanic rock sequence from 1750 to 2152 feet.

HISTORY

The concept of a potential geothermal resource under the Capitol Mall area received renewed emphasis during a geothermal study of the Nampa-Caldwell area funded by the U.S. Department of Energy.^{1/} Data from the Nampa-Caldwell area suggested test drilling in the Capitol Mall area. A test well was recommended at 349 West Washington Street, with a target depth of 2200 feet.

Considerable interest in the concept of the state owning its own geothermal heating system developed at several levels of state government. The Idaho Department of Administration, in cooperation with the Idaho Office of Energy, arranged for funding from the Economic Development Administration of the U.S. Department of Commerce and the Permanent Building Advisory Committee of the Idaho Legislature. Access to the drilling site was provided by the Idaho Department of Lands.

A drilling contract was negotiated with Hiddleston Drilling Company of Mountain Home, Idaho. Rick Tremblay of the Idaho Department of Administration acted as project manager for the test hole with John Anderson of the Idaho Department of Water Resources serving as project geologist. Frank Sherman of the Idaho Department Water Resources acted as technical advisor for the drilling operation.

^{1/} Geological, Hydrological, Geochemical and Geophysical Investigations of the Nampa-Caldwell and Adjacent Areas, Southwestern Idaho: Mitchell, J. C. and Anderson, J. E., Idaho Department of Water Resources Water Information Bulletin 30, Part 11, in preparation.

DRILLING

Drilling began on August 11, 1980. The upper 370 feet of the well was drilled by the Wayne Stevens & Sons Drilling Company using a cable tool drilling rig. Static water level in this upper zone was approximately 40 feet below land surface. Conductor pipe, 16 3/4 inches in diameter was driven as drilling proceeded, to a depth of 118 feet. The interval from 118 to 370 feet was drilled "open hole" (without casing). Three hundred-seventy feet of 12 3/4 inch diameter surface casing was installed and cemented by the driller. Cement return was noted at the surface, but subsequent settling produced an annular void in the upper 170 feet.

Hiddleston Drilling Company started drilling on September 2, 1980. Tricone bits of 11-inch diameter were used. The well was drilled using "mud" consisting of a bentonite mud, LCM, quick trol and quick gel. Mud density and viscosity were monitored closely and held to not more than 9.2 pounds per gallon and 37 seconds, respectively, with heavy mud used only when the characteristics of the formation necessitated its use. A sand zone at 1530 feet was the only real problem due to its sloughing into the hole.

On October 24, 1980, a depth of 2152 feet was reached. In pulling back, while preparing to shut down operations for the night, the bit could not be raised above 2032 feet. After nearly 18 hours of "upward" drilling, the bit was freed. At this time, a decision was made to terminate the hole at 2152 feet rather than the 2200-foot target depth.

CASING

Prior to the installation of the production casing, a cement plug was "floated" in the hole. The plug was designed to occupy the interval from 1675 to 1735 feet. B. J. Hughes from Evanston, Wyoming, subcontracted for the plug and subsequent cement work. The plug was installed on November 17, 1980. Hiddleston Drilling installed 1300 feet of welded 8 5/8 inch casing and 340 feet of welded 10-inch casing. As this casing string would not go below 1643 feet, it was assumed that this was the depth of the top of the cement plug. On December 1, 1980, Hughes cemented the production string with visible cement return at the surface.

On December 3, 1980, drilling was resumed using an 8-inch diameter tricone bit. The bottom of the plug was reached at a

depth of 1750 feet. Several isolated layers of cement were encountered between 1750 to 1760 feet. No cement was found below 1760 feet. Figure 1 is a diagram of the well.

After drilling through the plug, the drillers pulled the drill rods back and terminated drilling for the day. One hour later the well started flowing at approximately 5 gpm.

WELL CLEANUP

On Friday, December 5, 1980, well cleanup began for the 402 feet of production zone below the cement plug. Clean water was circulated through the drill pipe and bit to flush the drilling mud out of the production zone. Well cleanup proceeded at the rate of about 40 feet per hour until a depth of 1950 feet was reached. At this time, a mud dispersant (Baraphos) was added to the cleanup water to enhance mud removal from the production zone.

Cleaning of the well continued at a rate of about 35 feet per hour until total depth was reached. Circulation was continued at total depth for 4 hours and 15 minutes to ensure thorough cleaning.

On Friday morning, prior to cleanup, the well was flowing at 18 gallons per minute. After cleanup, the discharge was measured at 138 gallons per minute.

On Saturday, December 6, 1980, Hiddleston Drilling "tripped out" of the well, the drill rod was removed and a 10-inch gate valve and stand pipe were attached to the production string. The well was shut in at approximately 3 p.m. on Saturday.

On Monday morning, December 8, 1980, the well was allowed to flow for 105 minutes. A flow measurement taken at this time, using a 12-gallon tub and stopwatch, indicated a flow rate of 205 gpm. Shut-in pressure was 22 psig when the well column was hot, dropping to approximately 15 psig as the column cooled. The increase in flow rate since the first post cleanup measurement is probably due to heating of the large volume of cold water introduced during the cleanup operations.

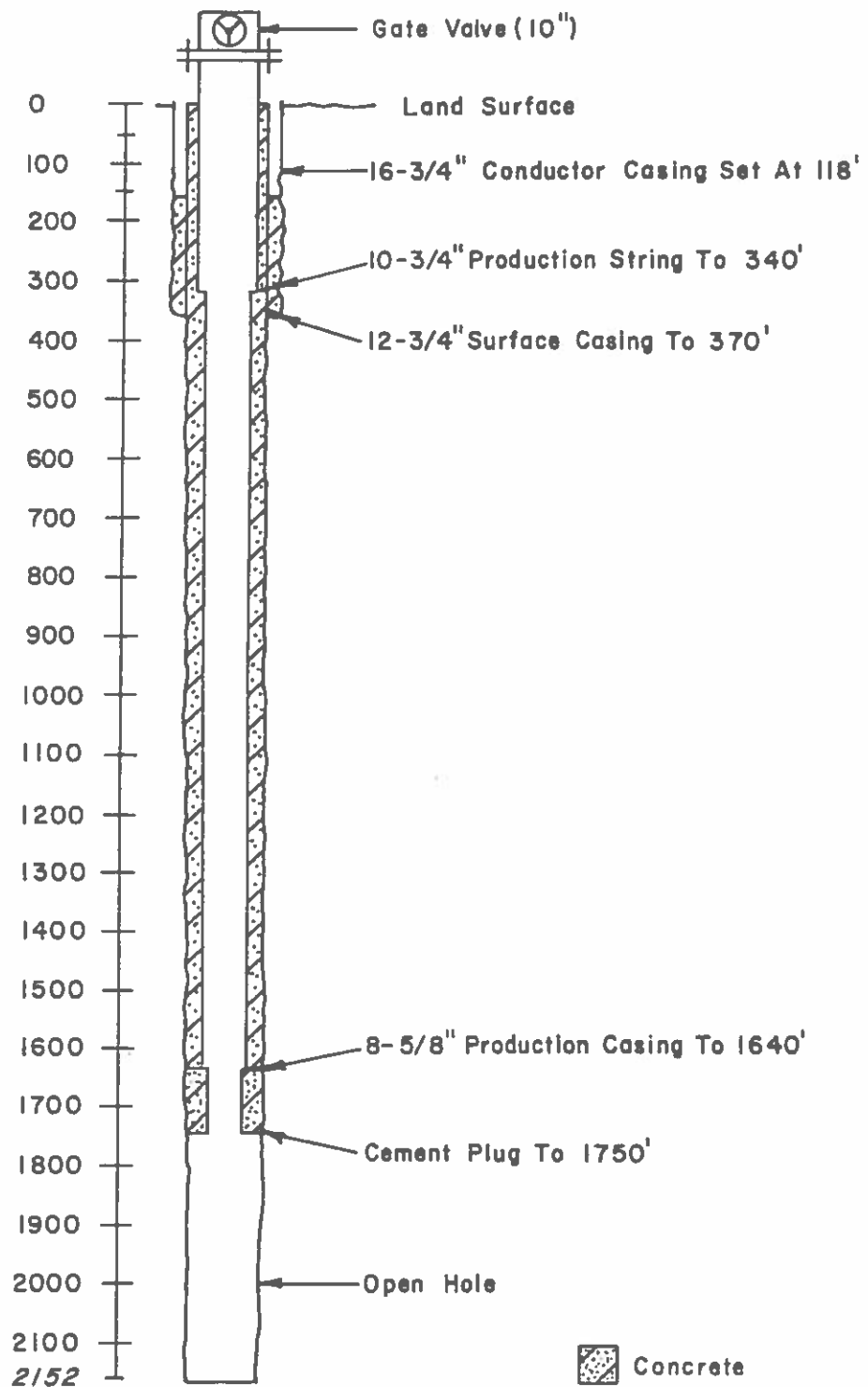


FIGURE 1. GENERAL WELL CONSTRUCTION

PUMP TEST INFORMATION

Pump testing of the well was contracted to Layne Pump of Nampa, Idaho. A surface pump was used along with 300 feet of pump column with the top of the pump bowls set at 303 feet.

Pump testing of the well began at 6:00 p.m. on Friday, December 12, 1980. Table 1 compares test design to actual test data. As pumping rates were increased, drawdown reached the top of the pumping bowls at a pumping rate of 800 gpm. That rate was maintained for three hours to see if the well would recover enough to sustain an 800 gpm pumping rate. After three hours, surging was still noticeable in the manometer tube as air was being sucked into the bowls, so testing was terminated. Two minutes after shutdown, the well started flowing.

TABLE 1. Pump Test Data, Capitol Mall Well #1

Designed		Actual		
Rate	Duration	Rate	Duration	Drawdown
350 gpm	3 hrs	345 gpm	3 hrs	132 ft 238 ft 303 ₊ ft
450 gpm	3 hrs	458 gpm	3 hrs	
550 gpm	18 hrs	550 gpm	18 hrs	
750 gpm	18 hrs	747 gpm	18 hrs	
1000 gpm	18 hrs	806 gpm	3 hrs	

Due to instrumentation problems, drawdown data for the low discharge rates (350 and 450 gpm) could not be obtained; however, these steps served as part of the "cleanup" of the well. Artesian flow was noticeably increased upon completion of the pump test. Flow measurements taken at this time indicated a free flowing discharge of 300 gpm.

HYDROLOGY

At a discharge rate of 550 gpm, the well water level was 132 feet below land surface after 18 hours of pumping. At 750 gpm, water was 238 feet below land surface after 18 hours of pumping. At a discharge rate of 800 gpm, the well was surging slightly, indicating that the water level was very near the top of the pump bowls at approximately 303 feet below land surface.

At all pumping rates, drawdown stabilized within the pumping period. The yield of this well during sustained pumping will be dependent to some extent on the pump and installation depth. It appears that 750 gallons per minute is a realistic production rate. Eight hundred gallons per minute may be possible but will require careful pump selection.

The drawdown data collected during the pump test are not amenable to standard analytic approaches. The recovery period was so brief that no usable data were collected. The only analysis of the data that appears appropriate is a method proposed by Kelly, Anderson, and Burnham.^{2/} Using this technique, a T (transmissibility) of approximately 5,000 gallons per day per foot is indicated. This T leads to a calculated S (storage coefficient) of 5×10^{-5} .

The temperature of the water produced during the pump test did not vary, remaining a constant 67°C (152°F). Samples of the water were taken for chemical analysis and sent to the Idaho Department of Health and Welfare laboratory (see Table 2). The water is of good overall water quality with an electrical conductivity value of 390 mhos/cm; however, the 16.9 mg/l fluoride level will create disposal problems.

GEOLOGY

Approximately 500 grams of drill cuttings were collected at 10-foot intervals or at every lithologic change during drilling. Figure 2 is a generalized lithologic log of the well.

The geology of the well is fairly close to that predicted with the exception of the significantly greater thickness of interbedded volcanics encountered below 1000 feet. One of these volcanic sequences found from 1461 to 1532 feet has been tentatively identified as an altered basalt with significant secondary silicification. Although this and other basalt units below 1200 feet drilled as hard, competent rock, responses on the geophysical logs for these units are more typical of sandy clays. This is apparently due to the alteration and silicification which probably results from hydrothermal activity in the fracture systems.

An unexpected thick sequence of volcanic rock was encountered below 1670 feet. This unit which extends to total depth

^{2/} The "cheat sheet": A New Tool for the Field Evaluation of Wells by Step-Testing, Ground Water, v. 18, no. 3, 1980, p. 294-298.

TABLE 2

WATER QUALITY DATA - CAPITOL MALL WELL #1
 SAMPLE COLLECTED AT COMPLETION OF PUMP TEST

	<u>mg/L</u>		<u>μg/L</u>
Total NO ₂ + NO ₃ as N	0.006	Arsenic, dissolved	10
Total Kjeldahl		Boron, dissolved	310
Nitrogen as N	0.6	Cadmium, dissolved	1
Bicarbonate Alkalinity		Chromium, dissolved	50
as CaCO ₃	91.	Copper, dissolved	10
Carbonate Alkalinity		Iron, dissolved	20
as CaCO ₃	22.	Lead, dissolved	50
Calcium	3.2	Manganese, dissolved	10
Magnesium	0.5	Mercury, dissolved	0.5
Sodium	88.	Silver, dissolved	1
Potassium	0.8	Zinc, dissolved	4
Chloride	6.85		
Fluoride	16.9		
Sulphate as SO ₄	22.		
Silica as SiO ₂	52.4		
Gross Beta Particle Activity	1.3 pCi/L		
Gross Alpha Particle Activity	<0.8 pCi/L		

0 - 80	Gravel and sand
80 - 370	Sand and clay (interbedded)
370 - 610	Greyish green clay
610 - 630	Sandy clay
630 - 645	Clay
645 - 670	Sand with clay stringers
670 - 730	Clay
730 - 735	Sandy brown clay
735 - 747	Altered basalt
747 - 890	Basalt
890 - 905	Clay - bluish tan grey
905 - 908	Sand
908 - 912	Brown clay
912 - 953	Basalt
953 - 978	Sand with clay stringers
978 - 995	Brownish grey clay
995 - 1000	Sand
1000 - 1002	Basalt stringer
1002 - 1035	Brown sandy clay
1035 - 1063	Sand and clay layers
1063 - 1072	Basalt
1072 - 1137	Sand and clay stringers
1137 - 1230	Basalt
1230 - 1235	Reddish brown clay
1235 - 1366	Basalt - altered and fractured
1366 - 1392	Sand and clay stringers
1392 - 1468	Basalt - altered and fractured
1468 - 1532	Hard fractured basalt (secondary silica)
1532 - 1566	Sand and clay (mostly sand)
1566 - 1590	Red brown clay
1590 - 1612	Sand
1612 - 1625	Welded tuff (hard)
1625 - 1662	Clean sand
1662 - 1670	Altered, silica rich volcanic
1670 - 2152(T.D)	Highly fractured, silica rich, porphyritic volcanic, "rhyolite," with vein filling or fracture filled with chalcedony, also contains Fe ₃ O ₄ .

FIGURE 2. GENERAL WELL LITHOLOGY

has been tentatively identified as a varicolored, porphyritic rhyolite containing magnetite, with joint and/or fracture fillings of green and red chalcedony.

It appears from the drilling records and the geophysical logs that most of the volcanic rock units are fractured to a considerable degree. Three water bearing sand units of moderate thickness (22 to 37 feet) occur between 1500 and 1670 feet. Grain size ranges from 0.5 to 5 mm with most grains being moderate to well-rounded in shape. Some grains appear to consist almost exclusively of iron sulfide. These units can generally be described as clean arkosic sands. They probably result from erosion of the Idaho batholith exposed along the Boise front.

Dr. Spencer Wood of Boise State University has mapped sequences of porphyritic rhyolite in the foothills north of Boise. Dr. Wood's descriptions of these volcanic rocks and descriptions of Lindgren^{3/} proved helpful in the identification of the cuttings collected during the drilling of the well.

STRUCTURAL GEOLOGY

From the data acquired^{*} during the Nampa-Caldwell study a gray arkosic sand zone was thought to exist at an approximate depth of 2200 feet below the Capitol Mall area; however, drilling did not intersect this sand zone. A second major consideration in selecting the drill site was the geologic structure of the area. From many previous geologic studies within the Boise foothills, it is apparent that a northwest trending normal fault system exists along the foothills with other suspected north-south faults intersecting these normal faults and possibly extending out into the plain. One such suspected north-south fault system may extend out of the Cottonwood Creek drainage. If this fault continues into the plain, it would have its surface expression within a few hundred feet of the drill site. The hope was that a secondary fault or shear zone associated with either of these systems, if encountered, would be permeable enough to yield water to the well.

From the drill speed records and geophysical well logs, it appears that at 2095 feet a fault zone or highly fractured shear zone was intersected. As the volcanic rock of the producing zone is fractured throughout, the amount of water coming from the fractures as compared to that from this suspected fault or shear zone cannot be determined. A downhole flow meter might quantify this interesting relationship.

^{3/} Lindgren, W., 1898, Description of the Boise quadrangle (Ida) U.S. Geol. Survey, Geologic Atlas, Folio 45, 7p.

GEOPHYSICS

Geophysical logging of the well was made possible through the cooperation and efforts of the U.S. Geological Survey, Water Resources Division, Boise.

Initial logging of the well was done by Dick McCullough, USGS, Water Resources Division, Denver, on October 4, 1980. Drilling at this time had only reached 1900 feet. Several of the logs were run from the bottom of the surface casing at 370 feet to 1890 feet. Mr. McCullough provided SP/Resistivity, Natural Gamma, Neutron Gamma, Gamma-Gamma, Sonic, Temperature, and Caliper Logs. As the temperature probe was not run first, it can be assumed the well was disturbed by the previous logging and the resultant temperature gradient plot is only somewhat accurate. Problems developed with the caliper probe during logging, and a calibrated log could not be obtained.

The SP/Resistivity log can be seen in figure 3.

Upon completion of drilling to 2152 feet, additional logging was done by R. Jensen and J. Bagbey, USGS Water Resources Division, Idaho Falls, on November 3, 1980. These logs consisted of Temperature, Neutron, and Caliper Logs and were run from 1500 feet to T.D. (total depth) with the exception of the Neutron log. This log was run from the bottom of the surface casing to T.D. A composite temperature log using data collected during drilling and from both logging efforts shows a steady increase in temperature with depth (figure 4).

Subsequent interpretation by IDWR staff of the geophysical logs indicates the sequence of volcanic rocks, found from 1670 feet to T.D., to be a series of flows, highly fractured, with a probable fault zone at 2095 feet, concurring with the drill speed records. The basalts below 1230 feet have been altered to such a degree that they have the characteristics of clay on most of the geophysical logs. This implies that they are probably not significant as potential aquifers. There is also an interesting reversal of the short and long resistivity curves opposite sand zones between 1530 feet and 1670 feet and in the upper portion of the rhyolite. The reversal suggests that the formation water may have a higher total dissolved solids content than the Boise water used for the drilling mud.

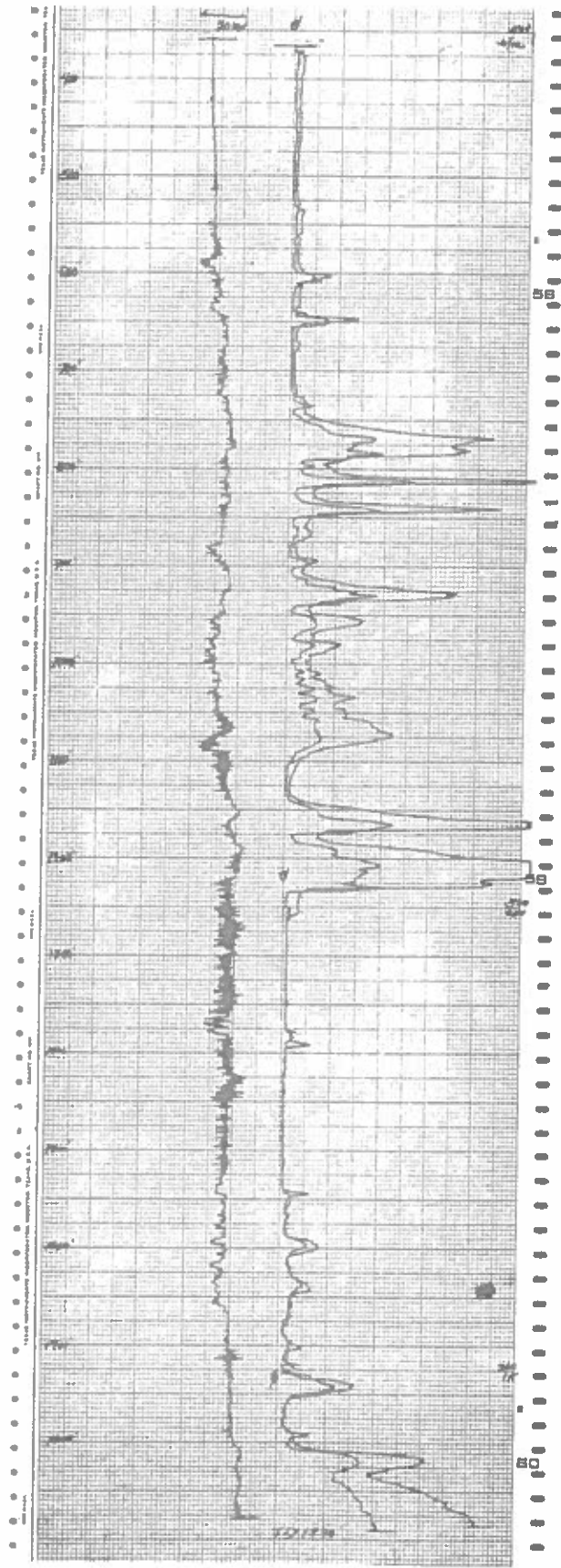


FIGURE 3. SP/RESISTIVITY LOG

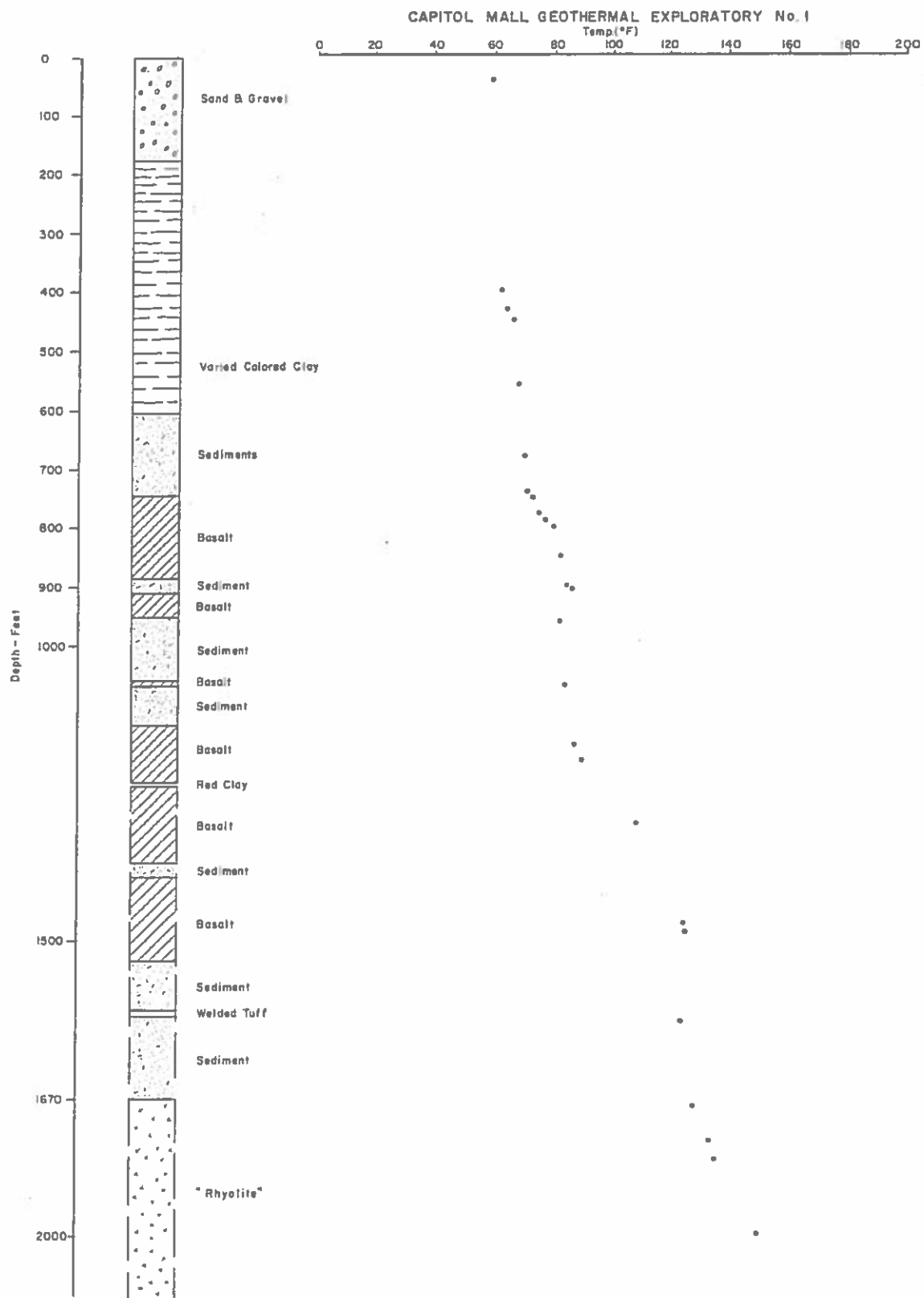


FIGURE 4. TEMPERATURE LOG

CONCLUSION

Capitol Mall Exploratory Well #1 has to be considered a success. It encountered a rock unit capable of yielding 750 gallons per minute of water with a well head temperature of 67°C (153°F). The aquifer has yet to be pumped for more than two days, but at this time it "free flows" 300 gallons per minute through the well.

The well demonstrates that a geothermal resource exists under the Capitol Mall complex and that successful geothermal wells need not be confined to the foothills fault area. Prior to drilling, the presence of the thick rhyolitic sequence from 1670 to 2152 feet could not have been predicted. The sand unit that was expected at 2100 to 2200 feet either does not extend this far from the Nampa-Caldwell area, or is slightly deeper than anticipated. The geologic log when coupled with geophysical data from the hole indicates that no cold water aquifers that have development potential exist below a depth of 1300 feet.

Shearer, Justin

From: Shearer, Justin
Sent: Friday, November 18, 2016 3:46 PM
To: 'tom.willis@boiseschools.org'
Cc: 'lgraves@spfwater.com'
Subject: Application for Permit No. 63-34298 Identified within the Boise Front Low Temperature Geothermal Ground Water Management Area
Attachments: DOC004.pdf

November 18, 2016

Tom Willis
Independent School District of Boise City
8169 W. Victory Rd
Boise, ID 83709

Re: Application for Permit No. 63-34298

Dear Applicant:

The Idaho Department of Water Resources (IDWR) received your water right application seeking ground water within the Boise Front Low Temperature Geothermal Ground Water Management Area (GWMA). (Please see attached application). The GWMA was established by the IDWR Director in 1987 to protect low temperature geothermal ground water (85 to 212 °F) from further adverse impacts. Impacts can include a reduction in the quantity, temperature and/or pressure of low temperature geothermal water. These impacts can potentially injure senior water rights using that source. Junior (new) water rights should not injure senior water rights.

IDWR recognizes three distinct aquifer systems in the area as follows: a shallow cold water source, a deeper cold water artesian source, and a still deeper low temperature geothermal artesian source. The faulted and fractured nature of the subsurface in this area creates zones within the GWMA where the low temperature geothermal source is interconnected with one or both of the cold water sources. The extent and location of these interconnected zones is not precisely known but can occur for wells 300 feet or more in depth. Therefore, the order establishing the GWMA included all ground water with a temperature greater than 85°F plus colder ground water 300 feet or more below land surface.

Your application proposes a cold water well at least 300 feet deep. Please submit information demonstrating the degree of interconnection, or lack thereof, between the cold water source being sought and the protected low temperature geothermal source in the specific area from which ground water is to be diverted. This information is needed to determine if the application is approvable with respect to GWMA criteria.

Please submit the requested information for application processing to continue. You may seek additional time to provide the information by making a written request to interrupt

Application 63-34298

October 20, 2016

processing for up to six (6) months. Your response including the requested information, or a request for more time to seek the information, must be received within the next sixty (60) days. The application will be voided without a timely written reply.

IDWR forms and other information are available on the Internet at www.idwr.idaho.gov. Please contact me at 208-334-2190 if you have any questions. Thank you for your attention to this matter.

Sincerely,

Justin Shearer
Water Resource Agent
IDWR Western Region

Justin Shearer
Idaho Department of Water Resources
Water Resource Agent
(208) 334-2190
justin.shearer@idwr.idaho.gov



SPF WATER
ENGINEERING

October 17, 2016

RECEIVED

OCT 20 2016

WATER RESOURCES
WESTERN REGION

Angie Grimm
IDWR Western Region Office
2735 Airport Way
Boise, ID 83705

Subject: Application for Permit

Dear Angie,

Enclosed on behalf of Boise School District, is an *Application for Permit* requesting diversion of ground water for irrigation of a future athletic complex.

Check No. 00212542 for \$250 is enclosed for the filing fee. Thank you very much for your consideration and assistance in this matter. Please call me if you have any questions.

Sincerely,

Lori Graves
Water Rights Specialist

Cc: Tom Willis

Enclosures

SPF file number: 474.0200