

Hemenway, Sandy

From: Neely, Ken
Sent: Monday, January 28, 2013 8:57 AM
To: Hemenway, Sandy
Cc: Vincent, Sean; Ragan, Brian
Subject: FW: Kestler well in 10S 18E 6
Attachments: DOC.pdf; Kestler Well Memo.docx

Sandy,

I think this note went from John Carlson, IDWR employee, to John Beals, IDWR employee. Based on the language, I would say that a seal was placed in the annular space between the 6 inch casing string and the well bore. Assuming it was successful, the lowest water zone would be isolated from the upper zones, and thus the low-temperature geothermal water would not be tributary to the Snake River.

Also attached is our memo.

Ken

From: Hemenway, Sandy
Sent: Monday, January 28, 2013 8:35 AM
To: Neely, Ken
Subject: Kestler well in 10S 18E 6

Here's the page that was following the first 2 pages of the well log for Kestler.

From: Neely, Ken
Sent: Friday, January 25, 2013 10:43 AM
To: Hemenway, Sandy
Subject: Thoughts about the well in 10S 18E 6

Hi Sandy,

When you are in your office, I'd like to stop by and chat about this.

Ken

Kenneth W. Neely, Technical Hydrogeologist
Idaho Department of Water Resources
Phone: 208-287-4852
Fax: 208-287-6700
Statewide Program Website:
<http://www.idwr.idaho.gov/WaterInformation/GWQuality/default.htm>
Geothermal Website:
http://www.idwr.idaho.gov/WaterInformation/GeothermalResources/geo_default.htm

Memo

January 28, 2013

To: Sandy Hemenway, Senior Water Resource Agent

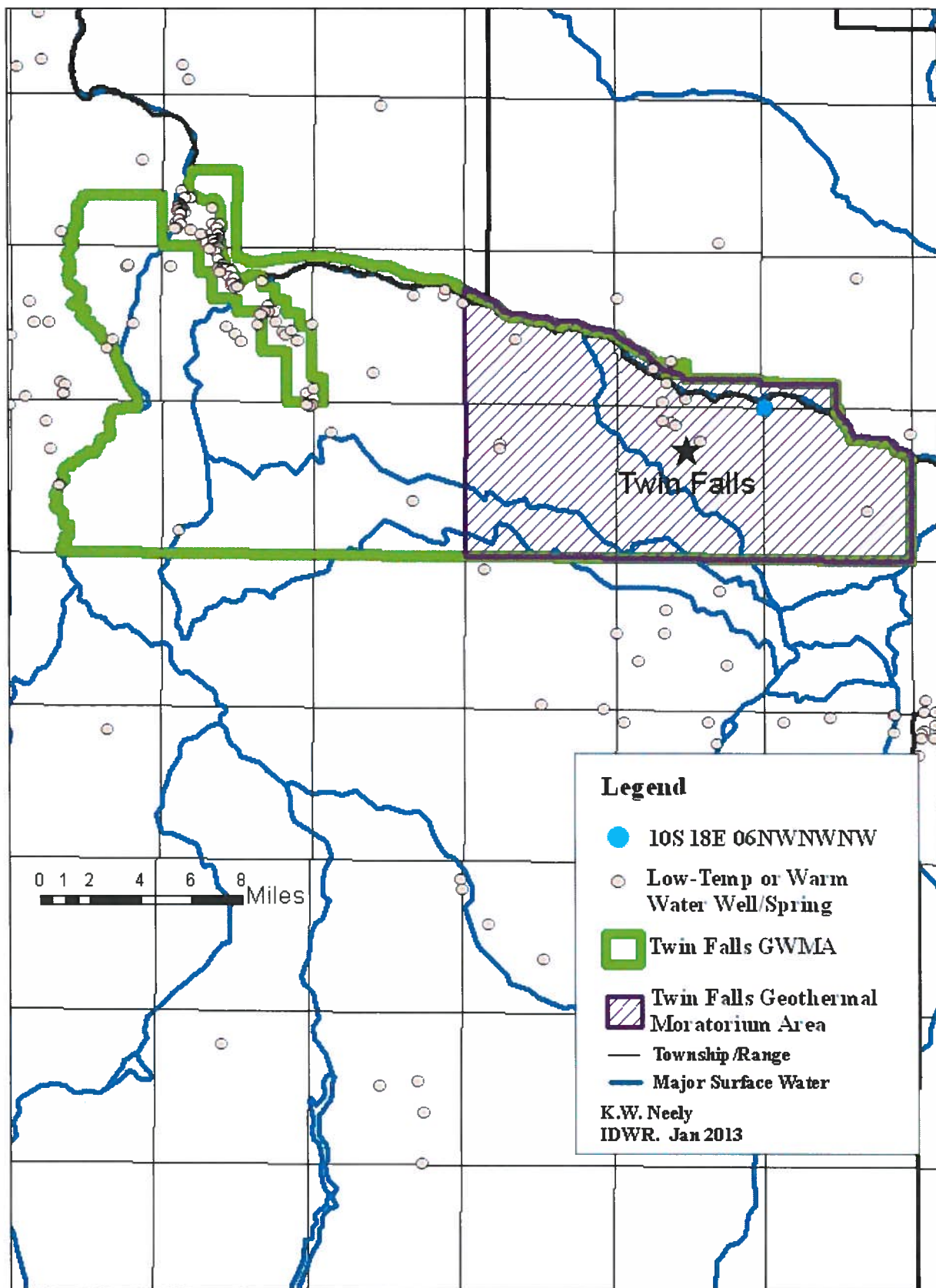
From: Ken Neely, Technical Hydrogeologist, and Sean Vincent, Hydrology Section Manager

RE: Relationship of ground water in a well in Twin Falls County to the Snake River.

The well of interest is in northern Twin Falls County, about 3.5 miles northeast of the city of Twin Falls. The well is located in T10S R18E Section 6, NWNWNW. The well is located within the boundaries of the Twin Falls Ground Water Management Area which was established by IDWR in 1984. The well is also located in the Twin Falls Geothermal Moratorium Area, which was established in 1987, and has been extended in 1992, 1997, 2002, and 2008. The well is within the Trust Water area of the Milner-Swan Falls designation.

According to the well driller's report, the well was completed in January 1987. The well is 1,300 feet in total depth and has three strings of casing, with the deepest being a 6-inch casing from 2 feet above the ground level to 1,173 feet below the ground level. Water zones were recorded at 110-125 ft, 135-150 ft, 503-507 ft, and 1,150-1,300 ft. The water-bearing aquifer from 1,150-1,300 ft is in rhyolite of the Idavada Formation. The water temperature at the land surface was reported to be 108 degrees Fahrenheit, which classifies it as a Low-Temperature Geothermal Resource. The well had a shut-in pressure of 78 p.s.i. A surface seal was set to 6.5 feet below the land surface with cement grout. According to notes that appears to be from John Carlson to John Beals (both were previous IDWR employees), the surface seal requirement of 18 feet was waived. Furthermore, the notes indicate that a seal was placed between the 6 inch casing and the well bore from about 525 feet to 1,173 feet.

The lithologic descriptions on the well driller's report indicate that there is about 180 feet of clay interbedded in hard igneous rock (rhyolite and andesite) between the possible water zone at 503-507 ft, and the top of the producing zone at 1,150 ft. Most of the clay zones are thin. However, the clay zone directly above the 1,150 ft producing zone is 72 feet thick. Furthermore, there are several andesite zones noted as being "very hard". These clay and andesite zones are believed to be impermeable. Thus, it is believed that the producing zone is hydrologically isolated from the shallower zones. This hypothesis is supported by 1) the occurrence of low temperature geothermal water, which also occurs in other deep wells in Twin Falls County, and 2) the presence of artesian flow at the wellhead along with corresponding high shut-in pressure. Based on these hydrogeologic observations, and on the internal IDWR notes indicating that a seal had been placed from about 525 ft to 1,173 ft, we believe that the low-temperature geothermal producing zone in this well is not tributary to the Snake River.



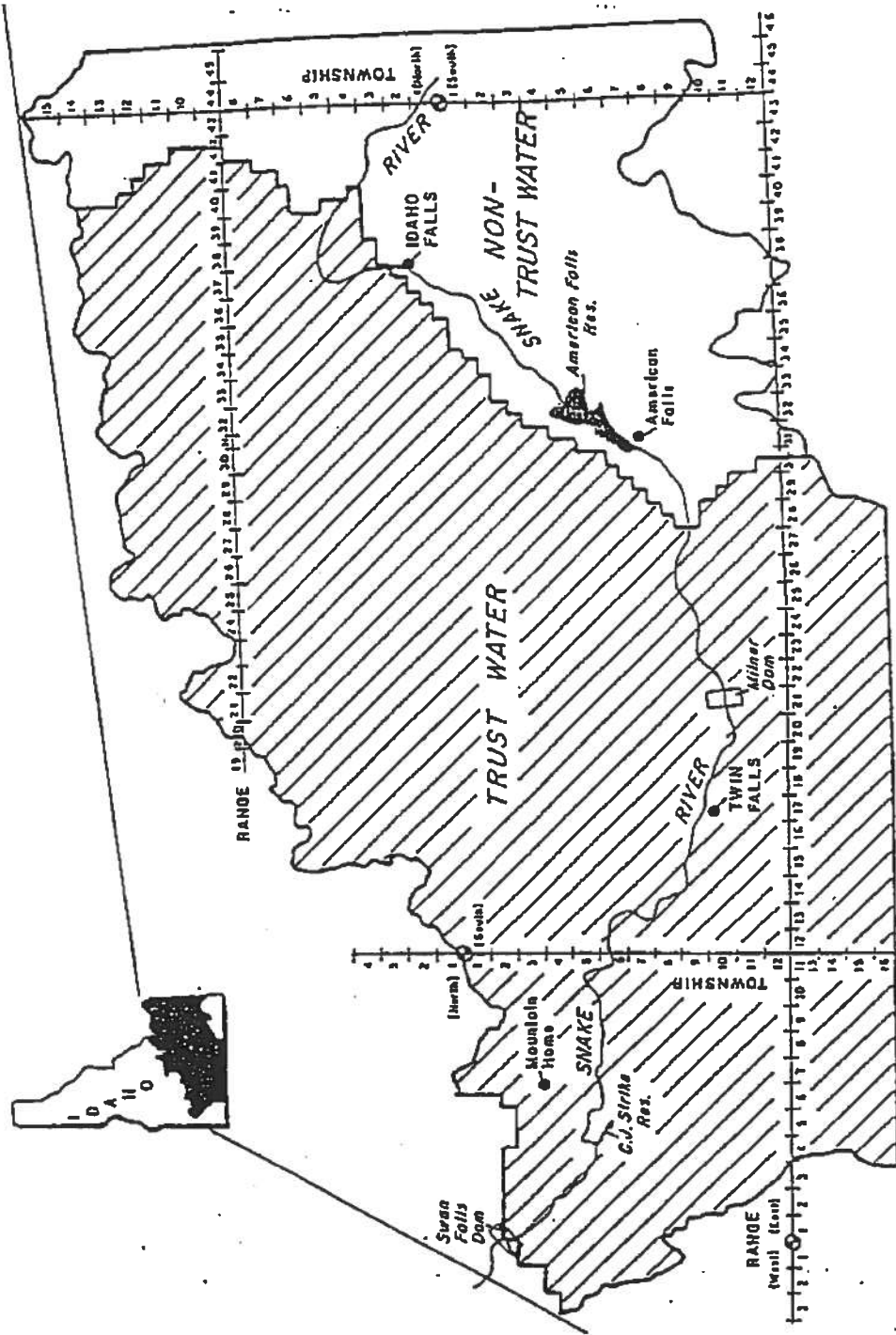


EXHIBIT A

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORTUSE 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.

JAN 16 1987

1. WELL OWNER Name <u>Mike Kestler</u> Address <u>N.E. of City, Twin Falls, Id.</u> Owner's Permit No. <u>47-7492</u>		7. WATER LEVEL Static water level _____ feet below land surface. Flowing? ☒ Yes ☐ No G.P.M. flow <u>200 (est.)</u> Artesian closed-in pressure <u>78</u> p.s.i. Controlled by: ☒ Valve ☐ Cap ☐ Plug Temperature <u>108</u> °F. Quality <u>good</u> Describe artesian or temperature zones below																																																																																																																																																																																
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 ☐ Bailer ☐ Air ☐ Other _____ <table border="1"><thead><tr><th>Discharge G.P.M.</th><th>Pumping Level</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.	Pumping Level	Hours Pumped																																																																																																																																																																												
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3. PROPOSED USE ☐ Domestic ☐ Irrigation ☐ Test ☐ Municipal ☐ Industrial ☐ Stock ☐ Waste Disposal or Injection ☒ Other <u>geothermal</u> (specify type)		9. LITHOLOGIC LOG <u>86382</u> <table border="1"><thead><tr><th>Bore Diam.</th><th>Depth From</th><th>To</th><th>Material</th><th>Water Yes No</th></tr></thead><tbody><tr><td>12"</td><td>0</td><td>1</td><td>Brown clay</td><td></td></tr><tr><td>11"</td><td>1</td><td>30</td><td>Grey basalt</td><td></td></tr><tr><td>11"</td><td>30</td><td>36</td><td>light clay</td><td></td></tr><tr><td>11"</td><td>36</td><td>50</td><td>Brown basalt</td><td></td></tr><tr><td>11"</td><td>50</td><td>64</td><td>Grey basalt</td><td></td></tr><tr><td>11"</td><td>64</td><td>66</td><td>Brown clay</td><td></td></tr><tr><td>11"</td><td>66</td><td>72</td><td>Red-brown basalt</td><td></td></tr><tr><td>11"</td><td>72</td><td>110</td><td>Grey basalt</td><td></td></tr><tr><td>11"</td><td>110</td><td>125</td><td>Grey Silty Clay + gravel</td><td>x</td></tr><tr><td>11"</td><td>125</td><td>130</td><td>Brown basalt</td><td>x</td></tr><tr><td>11"</td><td>130</td><td>135</td><td>Basalt (slightly green)</td><td>x</td></tr><tr><td>12"</td><td>135</td><td>150</td><td>Gravel, silt + sand</td><td>x</td></tr><tr><td>9"</td><td>150</td><td>167</td><td>Decomposed Rhyolite</td><td>x</td></tr><tr><td>9"</td><td>167</td><td>369</td><td>Brown rhyolite</td><td>x</td></tr><tr><td>9"</td><td>369</td><td>385</td><td>Grey-brown rhyolite</td><td></td></tr><tr><td>9"</td><td>385</td><td>445</td><td>Grey rhyolite</td><td></td></tr><tr><td>9"</td><td>445</td><td>465</td><td>Grey-brown rhyolite</td><td></td></tr><tr><td>9"</td><td>465</td><td>492</td><td>Brown rhyolite</td><td></td></tr><tr><td>9"</td><td>492</td><td>503</td><td>Grey rhyolite</td><td></td></tr><tr><td>9"</td><td>503</td><td>507</td><td>Dark sand</td><td>? x?</td></tr><tr><td>9"</td><td>507</td><td>518</td><td>Black Rock (Soft + shiny)</td><td>x</td></tr><tr><td>9"</td><td>518</td><td>537</td><td>Rocky clay in layers</td><td></td></tr><tr><td>9"</td><td>537</td><td>546</td><td>Brown clay</td><td></td></tr><tr><td>9"</td><td>546</td><td>550</td><td>Brown Rhyolite</td><td></td></tr><tr><td>9"</td><td>550</td><td>553</td><td>Brown clay</td><td></td></tr><tr><td>9"</td><td>553</td><td>598</td><td>Grey Rhyolite</td><td></td></tr><tr><td>9"</td><td>598</td><td>602</td><td>Red-brown clay</td><td></td></tr><tr><td>9"</td><td>602</td><td>626</td><td>Black Rhyolite</td><td></td></tr><tr><td>9"</td><td>626</td><td>631</td><td>Red-brown clay</td><td></td></tr><tr><td>9"</td><td>631</td><td>635</td><td>Brown rhyolite</td><td></td></tr><tr><td>9"</td><td>635</td><td>636</td><td>Tan + green shale</td><td></td></tr><tr><td>9"</td><td>636</td><td>745</td><td>Andesite (very hard)</td><td></td></tr><tr><td>9"</td><td>745</td><td>779</td><td>Black rhyolite + grey clay in layers</td><td></td></tr><tr><td>9"</td><td>779</td><td>783</td><td>Brown clay (sticky)</td><td></td></tr></tbody></table>		Bore Diam.	Depth From	To	Material	Water Yes No	12"	0	1	Brown clay		11"	1	30	Grey basalt		11"	30	36	light clay		11"	36	50	Brown basalt		11"	50	64	Grey basalt		11"	64	66	Brown clay		11"	66	72	Red-brown basalt		11"	72	110	Grey basalt		11"	110	125	Grey Silty Clay + gravel	x	11"	125	130	Brown basalt	x	11"	130	135	Basalt (slightly green)	x	12"	135	150	Gravel, silt + sand	x	9"	150	167	Decomposed Rhyolite	x	9"	167	369	Brown rhyolite	x	9"	369	385	Grey-brown rhyolite		9"	385	445	Grey rhyolite		9"	445	465	Grey-brown rhyolite		9"	465	492	Brown rhyolite		9"	492	503	Grey rhyolite		9"	503	507	Dark sand	? x?	9"	507	518	Black Rock (Soft + shiny)	x	9"	518	537	Rocky clay in layers		9"	537	546	Brown clay		9"	546	550	Brown Rhyolite		9"	550	553	Brown clay		9"	553	598	Grey Rhyolite		9"	598	602	Red-brown clay		9"	602	626	Black Rhyolite		9"	626	631	Red-brown clay		9"	631	635	Brown rhyolite		9"	635	636	Tan + green shale		9"	636	745	Andesite (very hard)		9"	745	779	Black rhyolite + grey clay in layers		9"	779	783	Brown clay (sticky)	
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4. METHOD DRILLED ☐ Rotary ☐ Air ☐ Hydraulic ☐ Reverse rotary ☒ Cable ☐ Dug ☐ Other _____		10. Work started <u>30 Aug 1986</u> finished <u>7 Jan 1987</u>																																																																																																																																																																																
5. WELL CONSTRUCTION Casing schedule: ☒ Steel ☐ Concrete ☐ Other _____ <table border="1"><thead><tr><th>Thickness</th><th>Diameter</th><th>From</th><th>To</th></tr></thead><tbody><tr><td>250 inches</td><td>10 inches</td><td>1 1/2 feet</td><td>6 1/2 feet</td></tr><tr><td>194 inches</td><td>8 inches</td><td>6 feet</td><td>149 feet</td></tr><tr><td>250 inches</td><td>6 inches</td><td>2 feet</td><td>1173 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 _____ inches by _____ inches <table border="1"><thead><tr><th>Number</th><th>From</th><th>To</th></tr></thead><tbody><tr><td>_____ perforations</td><td>_____ feet</td><td>_____ 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>6 1/2</u> Material used in seal: ☒ Cement grout ☐ Bentonite ☐ Puddling clay ☐ _____ Sealing procedure used: ☐ Slurry pit ☐ Temp. surface casing ☒ Overbore to seal depth ☐ Solvent Weld Method of joining casing: ☐ Threaded ☒ Welded ☐ Solvent Weld ☐ Cemented between strata Describe access port _____		Thickness	Diameter	From	To	250 inches	10 inches	1 1/2 feet	6 1/2 feet	194 inches	8 inches	6 feet	149 feet	250 inches	6 inches	2 feet	1173 feet	Number	From	To	_____ perforations	_____ feet	_____ feet	_____ perforations	_____ feet	_____ feet	_____ perforations	_____ feet	_____ feet	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>Baley & Henry</u> Firm No. <u>86</u> Address <u>Muntz up h, Id.</u> Date <u>7 Jan 1987</u> Signed by (Firm Official) <u>B. Baley</u> and <u>B. Baley</u> (Operator)																																																																																																																																																				
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6. LOCATION OF WELL <u>Pg 1 of 3</u> Sketch map location must agree with written location. <table border="1"><tr><td>N</td><td></td><td>E</td></tr><tr><td>W</td><td></td><td>E</td></tr><tr><td>S</td><td></td><td>E</td></tr></table> Subdivision Name _____ Lot No. _____ Block No. _____ County <u>Twin Falls</u> <u>NW</u> 1/4 <u>NW</u> 1/4 Sec. <u>6</u> T. <u>10</u> N. R. <u>18</u> E. <u>NE</u>		N		E	W		E	S		E																																																																																																																																																																								
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USE ADDITIONAL SHEETS IF NECESSARY - FORWARD THE WHITE COPY TO THE DEPARTMENT

Form 2287
8-65

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

USE TYPEWRITER OR
BALLPOINT PEN

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 <i>DRILLER</i> Name <u>Mik Kestlew</u> Address _____ Owner's Permit No. _____	7. WATER LEVEL Static water level _____ feet below land surface Flowing? ☐ Yes ☐ No G.P.M. flow _____ Artesian pressure in pressure _____ p.s.i. Controlled by ☐ Valve ☐ Cap ☐ Plug Temperature _____ of Quality _____ Deposits within casing or between casing joints below																																																																																																											
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 ☐ Bailor ☐ Air ☐ Other _____ <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>Discharge G.P.M.</th> <th>Pumping Level</th> <th>Pressure Pounds</th> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>	Discharge G.P.M.	Pumping Level	Pressure Pounds																																																																																																								
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6. LOCATION OF WELL P7 2 of 3 Sketch map location must agree with written location N W E S Subdivision Name _____ Lot No. _____ Block No. _____ County <u>Twin Falls</u> NW 1/4 NW 1/4 Sec 6 T 10 S. R. 18 E	10. DRILLER'S CERTIFICATION I We certify that all minimum well construction standards were complied with at the time the rig was removed Firm Name <u>Boley & Henry</u> Firm No. <u>86</u> Address <u>Murfreesboro, TN</u> Date <u>8 Jan 1967</u> Signed by (Firm Official) <u>Blaine Boley Jr.</u> and (Operator) <u>Blaine Boley Jr.</u>																																																																																																											

USE ADDITIONAL SHEETS IF NECESSARY - FORWARD THE WHITE COPY TO THE DEPARTMENT

To: Joe B.

Mike Hestler. T10s R 18 E sec 6 NW 1/4 NW 1/4

1173' of 6 ID. casing set in 8" bore of which 149' of 8" ID. casing

Volume of annular space between 6.5" O.D. casing and 8" bore

$$(8^2 - 6.5^2) \cdot 0.005454 = \text{cu ft/lin. ft.} = 0.1186 \text{ cu ft/lin. ft.} \times 1173' = 139 \text{ cu}$$

Placed 60 bgs of Class A-B cement 47940 cu ft/bag dry 6 gal. H₂O = .801 cu ft =

$$1.28 \text{ cu ft bag slurry} \times 60 = 76.82 \text{ cu ft.}$$

assuming a perfect well bore seal would extend 647'

or approx to 525.

If this seal flowed up the annular space for approx 150'
it would probably not even be ad To isolate the producing
zones from upper thief zones based on lithology, possibly even 25'
would do.

I have no problem with surface seal sealer.

J P E 2/17/87

MICROFILMED

AUG 22 1989