The present study was initiated in February 1970 by the Department of Geology and Mineral Industries for the purpose of evaluating geologic conditions of the Klamath Hills with respect to establishment of an experimental barrel washing facility. The geologic data will assist with plans for the disposal operation. Siting and design of the facility is a cooperative effort among scientists from Oregon State University, Waste Management Group; the Klamath County Extension Service; and the State Department of Agriculture. Experiments at the site will include tests for solar evaporation and bacterial degradation of herbicide and pesticide wastes. This project is the first of its kind in the State to locate regional collection stations for washing used herbicide and pesticide containers. Administration of newly enacted pollution regulations requires the orderly disposal of toxic wastes so this project serves a very important need in society. The findings in this research will relate to other areas where use is made of agricultural chemicals.

The objectives of the study by the Department are to define the following characteristics of the disposal site: (1) relationships to the regional geology, (2) foundation material, and (3) containment and isolation properties. These
findings will supplement data on the chemical and biologic processes involved in waste disposal. Requirements for testing and monitoring to protect groundwater supplies are the responsibility of the State Engineer.

Geography

The proposed waste disposal facility is situated in a small closed basin within the Klamath Hills, 8 miles south of the city of Klamath Falls. Because this small valley lies at the base of Folsom Peak it is here referred to as Folsom Basin. This property and several thousand acres surrounding it are owned by the O'Connor Livestock Company.

Folsom Basin is enclosed by lava-capped hills on the west, north, and east, and a low pass approximately 400 feet higher than the valley floor forms the southern border. Folsom Ridge, bordering the east side of the valley, rises 400 feet above the valley floor. Relief of the ridge to the west is only 100 feet.

Annual precipitation in the Klamath Hills averages 14 inches with a considerable amount as snow. Climate of the region is arid with a mean temperature of 50°F. Land use in the hills is principally for grazing sheep, but some grain is grown on the slopes. Erosion of the land surface is taking place very slowly under present climatic conditions and because of the resistant capping lavas and ash beds.

Geology

The Klamath Hills are a result of block faulting which uplifted that area while the larger surrounding region sank. Forces at the crust of the
earth have caused large masses of rock to break apart, some being down-dropped and others pushed upward in a pattern referred to as "Basin and Range Structure." This fracture pattern, which is aligned in a general north-south direction extends from southernmost Nevada into southeastern Oregon. The rocks involved in block faulting in eastern Oregon are largely of volcanic and lacustrine origin. Thousands of feet of volcanic rocks were deposited, and in basin areas, lake sediments were interbedded with the volcanics as intermountain lakes formed from time to time. Thick lacustrine beds of considerable areal extent indicate that many of the lakes were quite large.

The Klamath Hills are bounded by large faults and also dissected by smaller faults, all generally aligned in a NW-SE direction (see geologic map). Folsom Basin was formed by relatively minor fault displacement (250'-350') which to some extent was a hinge-type or tilted movement. The Klamath Hills were uplifted as a unit by normal type faulting. Folsom Ridge has an apparent northeasterly dip where as the opposite ridge and Folsom Basin have a southeasterly dip. The fault planes appear to be nearly vertical.

Relationships of rock units were investigated on the slope of Folsom Peak. The descriptions of these units along with information from test drilling and water wells have been combined to make a generalized rock column for the Klamath Hills (see p. 4). Discussions with Eugene Ciancanelli, geologist with Geothermal Resources, Inc. who has recently made detailed studies of the Klamath Hills, indicate that stratigraphic relationships are complicated by facies changes, especially between the north and south ends of the Klamath Hills.
Basalt, cinders, palagonite tuff breccia, etc, thickness between 100 and 400 feet.

Pyroclastic Tuff - large fragments of tuff and basalt, siliceous.
Lithic Tuff - fine grained, un cemented.
Lithic Tuff - coarse, siliceous.
Diatomite - Fairly pure, up to 80' thick.

Tuffaceous Lake Sediments - silts and silty sand.

Tuff and Breccia

Tuffaceous Lake Sediments - as above described.

Basalt - top portion weathered, fresh samples similar to the younger basalt.
A synthesis of geologic history from the study of this area agrees very well with that described for the region by Peterson and McIntyre (1970). The oldest rocks exposed in the Klamath Hills are typified by lake sediments of middle to late Pliocene age. These sediments include beds of volcanic ash and tuff as well as diatomite. The lake beds and interbeds of tuff were gently compressed into broad NW to NE trending folds before younger volcanic rocks were deposited (Peterson and McIntyre, 1970). Tuff, breccias and some lava flows of early pleistocene age appear to have been deposited upon an eroded surface of lake beds to a thickness of 150 feet to 200 feet. Extrusion of basalt with some explosive eruptions of cinders and other pyroclastic rocks followed.

The upper basalt unit and associated eruptive rocks now occur as isolated ridge cappings at several locations in the area, indicating considerable erosion since they were extruded. Sizeable talus deposits from these rocks developed below Folsom Peak and the other peaks in the north portion of the hills. Movement on the fault bordering the east side of Folsom Basin has displaced the basalt talus so that it now is opposite diatomite. This relationship can be seen at the gravel pit on the south end of Folsom Peak.

A high heat flow in Klamath Hills may indicate volcanic activity within Holocene time or at least be evidence of near-surface magma bodies. Most water wells in the area encounter hot water. A well on the Liskey Ranch in sec. 34, T. 40 S., R. 9 E., yields 200 F brackish water. The prospect for development of geothermal resources or the existence at depth of a magmatic heat source in the vicinity of the Klamath Hills should not interfere with the proposed waste facility.
Shallow Drilling

Six shallow auger and diamond core holes were drilled in Folsom Basin to investigate the nature of the rocks beneath the ground surface (see p. 7). Foundation material in the vicinity of the proposed disposal site was explored to a depth of approximately 60 feet. Hole #2 was abandoned at a depth of 26 feet because of caving, so Hole #4 was drilled as a twin and caving overcome by running 15 feet of 2-inch casing. Loss circulation at 57 feet in Hole #4 prevented further penetration of the rock.

The upper 50 feet of rock underlying Folsom Basin consists of tuff and tuffaceous silt which apparently have low permeabilities. Drilling fluid returns in Hole #4 light colored suggesting that diatomite had been reached at 53 feet but no core was recovered. Circulation was lost while coring at 55 feet in Hole #4 and the hole took water at a rate of 5 gpm rate. Deeper drilling is needed to determine the extent of the permeable zones beneath the test site.

Logs of water wells drilled in the area show the stratigraphic sequence to a depth of 400 feet (see water well map p. 8). The O'Connor water well in sec. 27, T. 40 S., R. 9 E., is closest to the proposed disposal site. The log from this well shows more than 100 feet of fine clayey sediments were penetrated before reaching the water table (see water well logs in Appendix). The log of the O'Connor well shows 30 feet of diatomite at the top of the hole and no other beds of this material below this depth. The exposure of diatomite at the gravel pit below Folsom Peak show it to be as much as 80 feet thick at that location.
Summary

There are both favorable and unfavorable attributes of the Folsom Basin disposal site. The favorable characteristics are:

1. Relatively impermeable sedimentary rocks and volcanics which underlie the valley.
2. The site is an estimated 150 feet above the water table.
3. The climate is arid, with minimized erosion and runoff.
4. The land is limited to grazing.

On the negative side of the ledger:

1. To some extent the basin is a groundwater recharge area.
2. The valley is bordered by a large fault which may channel seepage into domestic wells.

The fault, at valley level, cuts rock that probably was not competent enough to fracture during movement so it is likely that there are no fissures to act as channels for seepage. Cementation along the fault resulting from ascending mineralized water could assist in sealing off the fault zone; however, not much cementation was noted along the fault at the south end of Folsom Peak.

3. Thermal waters occur along the west side of the Klamath Hills but no springs were seen around the hills which could transport chemicals to lower lying lands.

Recommendations

The main danger at Folsom Basin site is the possibility of vertical seepage to the water table. An exploratory hole should be drilled and
cored to the top of the groundwater surface near the proposed disposal facility in order to determine the porosity and permeability of rocks underlying the valley. The hole could later be used to monitor any seepage that may occur from the surface spreading of chemicals. Travel time of seepage through the foundation rocks could be estimated from the core data and these values correlated with degradation rates of the waste chemicals.

Location of the disposal facility should be as far west as possible of the fault that parallels the base of the ridge east of the valley and at a location in the basin which is judged to be the greatest distance from usable water. The advice of the State Engineer should be sought in this matter.

An understanding of rock characteristics and hydrologic conditions at Folsom Basin will allow the disposal system to be designed for a desired safety factor. The considerations for investigation of this site should also include tests of foundation materials for ion exchange and sorption properties.

References


DESCRIPTIONS OF AUGER SAMPLES
(Power Auger)

HOLE NO. 1  DATE February 7, 1970
LOCATION SW1/4 NE1/4 Sec 26, T los, R 9E Klamath County
ELEVATION 4560' Topo  WATER LEVEL Water Table Not Encountered
DRILLER Ron Jackson  DESCRIPTIONS BY V.C. Newton

Sample Depth  Description of Material
0 - 5'  Silty Loam; dark gray with a few small irregular pieces of volcanic ash. No moisture.
5 - 9'  Fine Sandy, Clayey Tuffaceous Silt; dark brownish gray with small grains of weathered feldspar, some quartz, surrounded pieces of basalt and other volcanic debris. Occasional small pieces of white ash. Some thin layers of hardpan in this formation. No moisture.
9 - 11'  Tuffaceous Clayey Silt; medium brown, fine size pieces of feldspar and volcanic material as before, some fragments of pyroxene crystals and light colored ash. No moisture.
11 - 12'  Silty Clay; medium brown, fairly soft and contains moisture.
12 - 17'  Clayey Tuffaceous Siltstone; medium brown, firm with feldspar and volcanic debris as before. No moisture.
17 - 21'  Clayey Tuffaceous Siltstone; dark greenish gray, very firm, composed as above, some fragments of white weathered ash. No moisture.
O'CONNER RANCH

DESCRIPTIONS OF AUGER SAMPLES
(Diamond Core)

<table>
<thead>
<tr>
<th>Hole No.</th>
<th>Date</th>
<th>Location</th>
<th>Elevation</th>
<th>Water Level</th>
<th>Driller</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>February 8, 1970</td>
<td>NW 1/4 NE 1/4 Sec 26, T 4OS, R 9E Klamath County</td>
<td>4560' Topo</td>
<td>No Water Encountered</td>
<td>Ron Jackson</td>
<td>Descriptions by V.C. Newton and Don Baggs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample Depth</th>
<th>Description of Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 3'</td>
<td>Clayey Tuffaceous Silt; medium brownish gray, with fine fragments of feldspar, quartz and volcanic debris, occasional fragments of pyroxene crystals and pumice. No moisture.</td>
</tr>
<tr>
<td>3 - 5'</td>
<td>Fine Sandy Tuffaceous Silt; medium brown, contains fragments as above, very fine, slightly moist, firm.</td>
</tr>
<tr>
<td>5 - 9'</td>
<td>Tuffaceous Clayey Siltstone; medium brown, very firm, fragments as above but with scattered pieces of pumice. No moisture.</td>
</tr>
<tr>
<td>9 - 18'</td>
<td>Lithic Tuff; medium brown, contains medium size pieces of pumice and basalt.</td>
</tr>
<tr>
<td>18 - 21'</td>
<td>Tuffaceous Sandstone; grayish brown, medium grain, composed of feldspar, quartz and small pieces of basalt.</td>
</tr>
<tr>
<td>21 - 24'</td>
<td>Lithic Tuff; medium brown, consists of medium size fragments of basalt and pumice. Appears to have fair porosity.</td>
</tr>
<tr>
<td>24 - 26'</td>
<td>Lithic Tuff; as above but finer material and porosity is less.</td>
</tr>
</tbody>
</table>
O'CONNER RANCH

DESCRIPTIONS OF AUGER SAMPLES
(Diamond Core)

HOLE NO. 3  DATE  August 2, 1970
LOCATION NE1/4 NW1/4 Sec 26, T 40S, R 9E Klamath County
ELEVATION 1570' Topo  WATER LEVEL  No Water Encountered
DRILLER Bob Dolor  DESCRIPTIONS BY V.C. Newton

Sample Depth Description of Material
0 - 6' Lithic Tuff; grayish brown, firm, consists of feldspar, quartz, fine fragments of basalt and pieces of mafic mineral. No moisture.
6 - 12' Lithic Tuff; tan color, very firm, consists of fine to medium size particles of eruptive debris; feldspar, quartz and fragments of pyroxene crystals. No moisture.
12 - 13' Core - Crystal Ash; medium gray, microcrystalline, hard. Consists of crystal fragments of feldspar, some pyroxene and probably some quartz although the core appeared to be mostly feldspar fragments cemented together.
**O’CONNOR RANCH**

**DESCRIPTIONS OF AUGER SAMPLES**  
(Diamond Core)

**HOLE NO.** 4  
**DATE** August 3, 1970

**LOCATION** NE1/4 NW1/4 Sec 26, T 40S, R 9E Klamath County

**ELEVATION** 4560' Topo  
**WATER LEVEL** No Water Encountered

**DRILLER** Bob Doler  
**DESCRIPTIONS BY** V.C. Newton

<table>
<thead>
<tr>
<th>Sample Depth</th>
<th>Description of Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 9'</td>
<td>Tuffaceous Silt; medium grayish brown, loose, friable, consists of eruptive debris; feldspar, quartz and fragments of pyroxene crystals.</td>
</tr>
<tr>
<td>9 - 53'</td>
<td>Tuffaceous Siltstone and Lithic Tuff; medium brown, firm to very firm, consists of eruptive debris; feldspar, quartz, mafic mineral fragments. Portions are partially silicified (of the Tuff).</td>
</tr>
<tr>
<td>53 - 57'</td>
<td>Diatomaceous Sediments (?); Light colored sediment could be seen in the circulating water while drilling this interval. The hole took water at a rate of 5 gallons per minute in this interval. None of the material was recovered in the core barrel. Drilling was halted at this depth as the pipe kept sticking.</td>
</tr>
</tbody>
</table>
O'CONNER RANCH

DESCRIPTIONS OF AUGER SAMPLES
(Hand Auger)

HOLE NO. 5        DATE October 8, 1970

LOCATION         WATER LEVEL  None Encountered
                 SW1/4 NE1/2 Sec 35, T 40S, R 9E Klamath County

ELEVATION 4380' Topo  DRILLER Newton

DESCRIPTIONS BY V.C. Newton

Sample Depth Description of Material

0 - 6' Diatomaceous Silt and Diatomite; drilled in saddle between basalt outcrops.
O'CONNER RANCH

DESCRIPTIONS OF AUGER SAMPLES
(Hand Auger)

HOLE NO. 6  DATE October 8, 1970

LOCATION SW1/4 SW1/4 Sec 25, T 40S, R 9E Klamath County

ELEVATION 4590' Topo  WATER LEVEL None Encountered

DRILLER Newton  DESCRIPTIONS BY V.C. Newton

Sample Depth  Description of Material

0 - 4'      Tuffaceous Sand; brown, fine grained, friable.

4 - 12'     Diatomaceous Sand; tan, very silty, may also be bentonitic.

12 -        Hit hard cobble or silicified tuff?

There is a possibility that this material is slide debris as the hole is a short distance from the Folsom fault scarp.
(1) OWNER: Leo Hatney
Address: Route 1, Box 626, Klamath Falls, Oregon

(2) LOCATION OF WELL:
County Klamath
Owner's number: 1 in N\,E\, 4\, Section 24, T. 40 S, R. 9 E, W.M.
Bearing and distance from section or subdivision corner: South 21 degrees, 17' west 4,230 ft. from the
NE corner of Sec. 24, in T. 40 S, R. 9 E, W.M. in Klamath County, Oregon.

(3) TYPE OF WORK (check):
New Well [X] Deepening [ ] Reconditioning [ ] Abandon [ ]
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
PRIVATE [X] Municipal [ ] Industrial [ ] Commercial [ ]

(5) TYPE OF WELL:
Rotary [X] Cable [ ] Driven [ ] Jetted [ ]
Dug [ ] Bored [ ]

(6) CASING INSTALLED:
12" Diam. from Top ft. to 1\,14 \, ft. Gage
12" Diam. from ft. to ft. Gage
12" Diam. from ft. to ft. Gage

(7) PERFORATIONS:
Type of perforator used
Perforated? Yes [X] No [ ]

<table>
<thead>
<tr>
<th>SIZE of perforations</th>
<th>in.</th>
<th>by</th>
<th>in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>perforations from</td>
<td>ft. to</td>
<td>ft.</td>
<td></td>
</tr>
<tr>
<td>perforations from</td>
<td>ft. to</td>
<td>ft.</td>
<td></td>
</tr>
<tr>
<td>perforations from</td>
<td>ft. to</td>
<td>ft.</td>
<td></td>
</tr>
<tr>
<td>perforations from</td>
<td>ft. to</td>
<td>ft.</td>
<td></td>
</tr>
<tr>
<td>perforations from</td>
<td>ft. to</td>
<td>ft.</td>
<td></td>
</tr>
<tr>
<td>perforations from</td>
<td>ft. to</td>
<td>ft.</td>
<td></td>
</tr>
</tbody>
</table>

(8) SCREENS:
Well screen installed Yes [X] No [ ]
Manufacturer's Name

<table>
<thead>
<tr>
<th>Type</th>
<th>Model No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diam. Slot size Set from</td>
<td>ft. to</td>
</tr>
<tr>
<td>Diam. Slot size Set from</td>
<td>ft. to</td>
</tr>
</tbody>
</table>

(9) CONSTRUCTION:
Was well gravel packed? Yes [X] No [ ]
Size of gravel:
Gravel placed from ft. to ft.
Was a surface seal provided? Yes [X] No [ ] To what depth? ft.
Material used in seal:
Did any strata contain usable water? Yes [X] No [ ]
Type of water? Depth of strata:
Method of sealing strata off:

(10) WATER LEVELS:
Static level 120 ft. below land surface Date 9/1/57
Artesian pressure lbs. per square inch Date

(11) WELL TESTS:
Drawdown is amount water level is lowered below static level Was a pump test made? Yes [X] No [ ] If yes, by whom? Interstate. If
Yield: gal./min. with ft. drawdown after hrs.
Roller test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes [X] No [ ]

(12) WELL LOG:
Diameter of well 12" inches.
Depth drilled 1\,14\,\, ft. Depth of completed well 1\,14\,\, ft.
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Soil</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Chalk</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>Rock</td>
<td>30</td>
<td>33</td>
</tr>
<tr>
<td>Chalk</td>
<td>33</td>
<td>36</td>
</tr>
<tr>
<td>Gravely Chalk</td>
<td>36</td>
<td>40</td>
</tr>
<tr>
<td>Rock</td>
<td>40</td>
<td>47</td>
</tr>
<tr>
<td>Cemented Gravel</td>
<td>57</td>
<td>61</td>
</tr>
<tr>
<td>Rock</td>
<td>61</td>
<td>78</td>
</tr>
<tr>
<td>Cemented Gravel</td>
<td>78</td>
<td>82</td>
</tr>
<tr>
<td>Rock</td>
<td>82</td>
<td>84</td>
</tr>
<tr>
<td>Cemented Gravel</td>
<td>84</td>
<td>93</td>
</tr>
<tr>
<td>Rock</td>
<td>93</td>
<td>121</td>
</tr>
<tr>
<td>Rock</td>
<td>121</td>
<td>148</td>
</tr>
</tbody>
</table>

(Note) This well was drilled in Sept 1949 as an 8th Well. It was ready out to a 12th Well in summer of 1957.

Work started May 18, 1957 Completed May 19, 1957

(13) PUMP:
Manufacturer’s Name ____________
Type: ____________

Well Driller’s Statement:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME__OPEN__STORRY WELL DRILLING__
Address: 2615 Hiard St., Klamath Falls, Oregon
Driller’s well number [ ]

(Signed) ____________
(Well Driller)

License No. ____________ Date: Nov. 24, 1957

(USE ADDITIONAL SHEETS IF NECESSARY)
E. E. STOREY  
Well Drilling  
Tucked 4-3990  
3831 Hope Street  
KLAMATH FALLS, OREGON  

O'CONNOR LIVESTOCK CO.  
ROUTE 1, BOX 863  
KLAMATH FALLS, OREGON  
NE 4, NE 4, SE 1/4 T41S R9E  

Started 12/13/65  
Finished 3/8/66  

**LOG**  

<table>
<thead>
<tr>
<th>Depth</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>chalk rock</td>
</tr>
<tr>
<td>46</td>
<td>brown lava rock</td>
</tr>
<tr>
<td>81</td>
<td>brown shale</td>
</tr>
<tr>
<td>123</td>
<td>brown lava rock</td>
</tr>
<tr>
<td>131</td>
<td>brown lava rock</td>
</tr>
<tr>
<td>131</td>
<td>green shale with layers of brown lava</td>
</tr>
<tr>
<td>169</td>
<td>green shale</td>
</tr>
<tr>
<td>173</td>
<td>gray shale with layers of brown lava</td>
</tr>
<tr>
<td>200</td>
<td>gray shale</td>
</tr>
<tr>
<td>207</td>
<td>gray shale</td>
</tr>
<tr>
<td>207</td>
<td>brown lava</td>
</tr>
<tr>
<td>214</td>
<td>gray shale</td>
</tr>
<tr>
<td>221</td>
<td>gray shale with coarse sand</td>
</tr>
<tr>
<td>238</td>
<td>gray shale</td>
</tr>
<tr>
<td>261</td>
<td>gray shale</td>
</tr>
<tr>
<td>261</td>
<td>gray basalt</td>
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<td>263</td>
<td>green shale with small streaks of lava</td>
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<td>344</td>
<td>gray shale</td>
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<td>396</td>
<td>gray shale</td>
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<td>493</td>
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<tr>
<td>500</td>
<td>brown and yellow shale</td>
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<tr>
<td>533</td>
<td>sticky green shale</td>
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<td>651</td>
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<td>718</td>
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<td>718</td>
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<td>740</td>
<td>black basalt</td>
</tr>
<tr>
<td>742</td>
<td>blue basalt</td>
</tr>
<tr>
<td>761</td>
<td>black wormy lava</td>
</tr>
<tr>
<td>775</td>
<td>black cinder, hard</td>
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<tr>
<td>779</td>
<td>decomposed black lava</td>
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<tr>
<td>784</td>
<td>brown lava</td>
</tr>
<tr>
<td>818</td>
<td>black lava broken</td>
</tr>
<tr>
<td>827</td>
<td>brown lava, broken</td>
</tr>
<tr>
<td>839</td>
<td>black lava, broken</td>
</tr>
<tr>
<td>841</td>
<td>brown lava, broken</td>
</tr>
<tr>
<td>846</td>
<td>black lava, broken</td>
</tr>
</tbody>
</table>

**Note:**
Hole cut in size from 16” to 12” @ 775’  

*Static water level 139' 6” on 3-9-66*  

*continued*
WATER WELL REPORT

STATE OF OREGON

(1) OWNER:
Name: O'Connell Ranch
Address: P.O. Box 368

(2) LOCATION OF WELL:
County: Klamath
Driller's well number: H
NE 1/4 SE 1/4 Section 27 T. 19N R. 24E W.M.

(3) TYPE OF WORK (check):
- Well
- Deepening
- Reconditioning
- Abandon

(4) PROPOSED USE (check):
- Domestic
- Industrial
- Municipal

(5) TYPE OF WELL:
- Rotary
- Driven
- Cable
- Jetted
- Other

(6) CASING INSTALLED: Threaded
- Diam. from 22 ft. to 20 ft. Gage 2.50

(7) PERFORATIONS:
- Perforated? Yes
- Size of perforator used:
  - 2 in. by 6 ft.

(8) SCREENS:
- Well screen installed? Yes
- Manufacturer's Name
  - E.T. Stone

(9) CONSTRUCTION:
- Well seal material used in seal: Concrete
- Depth of seal 20 ft. Was a packer used? No
- Diameter of well bore to bottom of seal 12 in.
- Were any loose strata cemented off? Yes
- Was a drive shoe used? Yes
- Was well gravel packed? Yes
- Size of gravel:
  - 1 in.
- Gray placed from 2 ft. to 7 ft.
- Any strata contain unusable water? Yes
- Type of water:
  - Muddy
- Depth of strata

(10) WATER LEVELS:
- Static level 10.1 ft. below land surface
- Date: 3/18/61
- Artesian pressure:
  - 100 lbs. per square inch

(11) WELL TESTS:
- Drawdown is amount water level is lowered below static level
- Was a pump test made? Yes
- If yes, by whom?
- Yield:
  - gal./hr. with ft. drawdown after hrs.

- Water test:
  - 15 gal./min. within 6 ft. drawdown after 5 hrs.
- Artesian flow
  - g.p.m. Date
- Temperature of water

(12) WELL LOG:
- Diameter of well below casing
- Depth drilled 20 ft. Depth of completed well 20 ft.
- Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Soil</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Gray Clay</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Yellow Clay</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Blue Clay</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>Gray Shale</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>Blue Lava Breccia</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Green Shale</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

(13) PUMP:
- Manufacturer's Name
- Type
- Water Well Contractor's Certification:
- This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
- Name: E. E. Storey
- Address: 1841 Hope
- Drilling Machine Operator's License No.: 145
- [Signed] E. E. Storey (Water Well Contractor)
- Contractor's License No.: 145 Date: 3/30/61
STATE ENGINEER
Salem, Oregon

Well Record

OWNER: O'Conner

MAILING ADDRESS:

LOCATION OF WELL: Owner's No.

CITY AND STATE:

S. 1/4 NW. 1/4 Sec. T. N. E.

Bearing and distance from section or subdivision corner

Altitude at well

TYPE OF WELL: Drilled. Date Constructed

Depth drilled. Depth cased

Casing Record:

6 inch

FINISH:

AQUIFERS:

WATER LEVEL:
160 feet below land surface, 1954

PUMPING EQUIPMENT: Type Jet

Capacity G.P.M.

WELL TESTS:

Drawdown ft. after hours G.P.M.

Drawdown ft. after hours G.P.M.

USE OF WATER Domestic, stock Temp °F.

SOURCE OF INFORMATION USGS

DRILLER or DIGGER

ADDITIONAL DATA:

Log Water Level Measurements Chemical Analysis Aquifer Test

REMARKS:
Well Log

Owner: L. Motschenbacher

Driller: E. E. Storey

Date Drilled: 1953

<table>
<thead>
<tr>
<th>CHARACTER OF MATERIAL</th>
<th>From</th>
<th>To</th>
<th>Thickness (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alluvium (some fault-disturbed materials):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil, boulders and clay</td>
<td>0</td>
<td>63</td>
<td>63</td>
</tr>
<tr>
<td>Yonna formation:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boulders and sand (agglomerate?)</td>
<td>63</td>
<td>105</td>
<td>42</td>
</tr>
<tr>
<td>Sandstone</td>
<td>105</td>
<td>132</td>
<td>27</td>
</tr>
<tr>
<td>Rock, gray (tuff or agglomerate?)</td>
<td>132</td>
<td>148</td>
<td>16</td>
</tr>
<tr>
<td>Rock, water-bearing (tuff or agglomerate?)</td>
<td>148</td>
<td>150</td>
<td>2</td>
</tr>
<tr>
<td>Sandstone, blue</td>
<td>150</td>
<td>155</td>
<td>5</td>
</tr>
</tbody>
</table>

STATIC WATER LEVEL 55' on August 1953
OWNER: Ottis Osborn
Address: Midland, Oregon

(2) LOCATION OF WELL:
County: Klamath
Owner's number, if any: L. S. S. W. 1 Section 27, T. 10 S., R. 9 E. W.M.
Bearing and distance from section or subdivision corner: 27 1/3

(3) TYPE OF WORK (check):
New Well [ ] Deepening [ ] Reconditioning [ ] Abandon [ ]
If 'Abandon', describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic [ ] Industrial [ ] Municipal [ ]
Irrigation [X] Test Well [ ] Other [ ]

(5) TYPE OF WELL:
NUMBER WATER

(6) CASING INSTALLED:
Threaded [ ] Welded [ ]
Diam. from 0 ft. to 0 ft. to 179 ft. Gage .250
3/4 " Diam. from 0 ft. to 0 ft. to 179 ft. Gage .250

(7) PERFORATIONS:
Perforated? [X] Yes [ ] No
Type of perforator used
Size of perforations

(8) SCREENS:
Well screen installed [X] Yes [ ] No
Manufacturer's Name
Type [ ] Slot size
Model No.
Set from ft. to ft. ft.

(9) CONSTRUCTION:
Was well gravel packed? [X] Yes [ ] No
Size of gravel:
Gravel placed from ft. to ft. ft. 179
Was a surface seal provided? [X] Yes [ ] No
To what depth? ft. ft.
Material used in seal:
Did any strata contain unusable water? [X] Yes [ ] No
Type of water:
Method of sealing strata off:

(10) WATER LEVELS:
St. level 32 ft. below land surface: 11-4-65
Artesian pressure: 80 lbs. per square inch: 11-4-65

(11) WELL TESTS:
Drawdown is measured from water level lowered below static level: Kei Hartley
Was a pump test made? Yes [X] No [ ] If yes, by whom:
Yield: 150 gal./min. with 2 ft. drawdown after 1 hour.

Bailer test: gal./min. with ft. drawdown after hours.
Artesian flow: g.p.m. Date
Temperature of water: 186° Was a chemical analysis made? Yes [X] No [ ]

(12) WELL LOG:
Diameter of well: 10" I.D., inches.
Depth drilled: 118 ft. Depth of completed well: 118 ft.
Formation: Describe by color, character, size of material and structure, and show thickness of strata and kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>Page</th>
<th>Log No.</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandy loam</td>
<td>0</td>
<td>9</td>
<td></td>
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</tr>
<tr>
<td>Yellow shale</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand, gravel &amp; boulders</td>
<td>19</td>
<td>21</td>
<td></td>
<td></td>
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<tr>
<td>Yellow shale</td>
<td>21</td>
<td>38</td>
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<td></td>
</tr>
<tr>
<td>Blue shale</td>
<td>38</td>
<td>136</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lava boulders &amp; shale</td>
<td>50</td>
<td>53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue shale</td>
<td>53</td>
<td>126</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fine gravel</td>
<td>126</td>
<td>121</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gray shale, caving</td>
<td>127</td>
<td>152</td>
<td></td>
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<tr>
<td>Gray-blue shale</td>
<td>152</td>
<td>168</td>
<td></td>
<td></td>
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<tr>
<td>Sandy blue shale</td>
<td>168</td>
<td>173</td>
<td></td>
<td></td>
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<tr>
<td>Blue shale with hard streaks</td>
<td>173</td>
<td>189</td>
<td></td>
<td></td>
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<tr>
<td>Lava boulders embedded in blue shale</td>
<td>189</td>
<td>200</td>
<td></td>
<td></td>
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<tr>
<td>Lava rock cemented</td>
<td>200</td>
<td>210</td>
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<tr>
<td>Brilliant blue shale</td>
<td>210</td>
<td>261</td>
<td></td>
<td></td>
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<tr>
<td>Lava rock and blue shale</td>
<td>261</td>
<td>272</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravel</td>
<td>272</td>
<td>273</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gray sticky shale</td>
<td>273</td>
<td>283</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soft brown sandy clay</td>
<td>283</td>
<td>305</td>
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<td></td>
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<tr>
<td>Gray blue shale</td>
<td>306</td>
<td>317</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hard basalt boulders</td>
<td>317</td>
<td>347</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boulders &amp; black sticky clay</td>
<td>347</td>
<td>353</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue basalt rock</td>
<td>353</td>
<td>366</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sticky clay</td>
<td>366</td>
<td>371</td>
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<td></td>
<td>371</td>
<td>375</td>
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</tr>
</tbody>
</table>

Work started Sept. 16, 1965 Completed Nov. 8, 1965

(13) PUMP:
Manufacturer's Name
Type: H.P.
Well Driller's Statement:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME: Ken Hartley
Well Drilling
Address: Box 572, Klamath Falls, Oregon

Driller's well number

[Signature] [Date] 1965

License No. 161 [Date] Nov. 8, 1965

(USE ADDITIONAL SHEETS IF NECESSARY)
<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>boulders and clay</td>
<td>375</td>
<td>380</td>
</tr>
<tr>
<td>pink volcanic ash, sticky</td>
<td>380</td>
<td>383</td>
</tr>
<tr>
<td>loose lava rock in clay</td>
<td>383</td>
<td>395</td>
</tr>
<tr>
<td>broken blue basalt</td>
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<td>405</td>
</tr>
<tr>
<td>red lava</td>
<td>405</td>
<td>417</td>
</tr>
<tr>
<td>dense hard basalt</td>
<td>417</td>
<td>418</td>
</tr>
<tr>
<td>(12) WELL LOG: Diameter of well: Inches.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth drilled: ft.</td>
<td>244</td>
<td>246</td>
</tr>
<tr>
<td>Depth of completed well: ft.</td>
<td>246</td>
<td>246</td>
</tr>
</tbody>
</table>

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.
PLIOCENE

Upper Basalt

Late eruptive rocks
cinder cones, tuffs

Basalt flows, pyroclastic
breccia, tuff and some interbedded
tuffaceous sandstone

Lacustrine - fluvialile
tuffaceous siltsone and diat-
omite.