DRAFT

HYDROGEOLOGIC ASSESSMENT
AT CLEAR LAKES GRADE
FEDERAL-AID PROJECT RS-2709(006)
GOODING COUNTY, IDAHO

Prepared for:

Sharp and Smith Consulting Engineers and Surveyors
327 N. 27th Street
Boise, ID 83702

Prepared by:

Chen-Northern, Inc.
Boise, ID

October 1991

Chen Northern, Inc.

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DRAFT

October 2, 1991

Sharp and Smith Engineers
327 N. 27th Street
Boise, ID 83702

Attention: Mr. John Sharp, P.E.

Subject: Report of Hydrogeologic Assessment at Clear Lakes Grade, Gooding County, Idaho

Gentlemen:

Enclosed is our report summarizing the findings of our hydrogeologic assessment conducted at Clear Lakes Grade in Gooding County, Idaho.

If you have any questions regarding the contents of this report, please feel free to contact us at your convenience.

Respectfully submitted,

Steven A. Narkiewicz, P.E.
Division Manager

SAN/jw
Enclosure

HYDROGEOLOGIC ASSESSMENT
AT CLEAR LAKES GRADE
GOODING COUNTY, IDAHO

EXECUTIVE SUMMARY

A hydrogeologic assessment was conducted at Clear Lakes Grade in Gooding County, Idaho to characterize the hydrologic conditions in the vicinity and render an opinion on the potential changes in surface and groundwater conditions as a result of roadway construction. The proposed roadway will originate at the Snake River and proceed northeast approximately one-half mile where a fill section up to 140 feet thick and a cut section approximately 100 feet deep will be required to raise the southern section of the roadway through the canyon rim. North of the canyon the roadway continues north for a total length of about 2.2 miles. The proposed alignment intercepts numerous spring flows and streams below the canyon rim and several irrigation canals to the north.

Results of the investigation have been summarized below:

- The local stratigraphy consists of several sequences of basalt flows, separated by sand and gravel sedimentary interbeds.

- Groundwater is approximately 75 to 95 feet below ground surface (BGS) and will be intercepted by the road cut. A second water bearing unit, present at depths ranging from 185 to 200 feet BGS, will apparently not affect construction activities.

- Channels or conduits will be necessary to transmit as much as 107 CFS of water from irrigation canals S Coulee, S39 and S27 in the northern portion of the alignment.

- Drainage structures should be constructed to channel as much as 3 to 5 CFS of water beneath fill slopes on the south portion of the roadway. Additional drainage measures will be necessary to dewater the marsh located between stations 26+50 and 28+50.

- Up to 3.5 CFS of irrigation water will need to be diverted from the east side of the alignment between stations 51+00 and 60+00.

- Based on preliminary calculations and computer modelling, the road cut at the canyon rim will generate a steady-state flow of approximately 0.03 to 1 CFS; the first figure represents a flow rate based on measured hydraulic conductivity at the site and the second figure was calculated using an average hydraulic conductivity for fractured basalt obtained from the literature. Several factors may increase the discharge at the road cut from the measured value (0.03 CFS) including increased hydraulic conductivity at the road cut due to blasting, mass removal (load relaxation) resulting in widening of existing fractures at the road cut face, lateral increases in hydraulic conductivity from that measured, effects of drought over the last five years on "normal" water levels

versus those measured, and flushing of sediment from fractures at the road cut face. Accounting for these factors and using a safety factor of 10 times, a reasonable flow rate from the road cut for conveyance design may be 0.5 CFS.

- The road cut will depress the upper aquifer for a distance of approximately 2000 feet. The Madalena domestic and cellar water wells will lose about one foot of water due to road cut dewatering. Other area wells should not be affected. Blasting during construction may cause additional damage to uncased area wells.

- The springs at Clear Lakes Trout Hatchery, located about 6000 feet west of the road cut, should not be affected by construction activities.

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1.0 INTRODUCTION

This report presents the findings of the hydrogeologic assessment conducted at Clear Lakes Grade in Gooding County, Idaho. The report provides Sharp and Smith Consulting Engineers and Surveyors with information concerning the hydrogeologic conditions present in the vicinity of the proposed alignment of Secondary Highway Route 2709 (Clear Lakes Grade) at the time of this investigation.

1.1 Purpose and Scope

The purpose of the assessment is to characterize the present hydrologic conditions in the vicinity and render an opinion on the potential changes in surface and groundwater conditions as a result of roadway construction. The primary tasks of this investigation were to:

- Drill seven exploratory borings and collect representative subsoil and rock samples to characterize the subsurface materials beneath the site;
- Install groundwater monitoring wells in all seven borings to provide access to determine the groundwater migration direction and hydraulic properties of the water-bearing units underlying the site and for obtaining water-quality samples;
- Submit representative water samples to an EPA approved laboratory for analysis to document basic groundwater constituents;
- Install piping and weirs in ten locations to measure discharges from local springs and drainages;
- Conduct aquifer performance tests in selected monitoring wells;
- Conduct a well records and water rights search to identify potential groundwater usages within a one mile radius of the site; and

- Prepare a report summarizing the results of the field investigation.

2.0 SITE DESCRIPTION

The proposed Secondary Highway Route 2709 (Clear Lakes Grade) is located north of the Snake River between Mileposts 10.5 and 12.5 of the existing secondary highway route 2709 in Gooding County, Idaho (See Figure 1). The proposed project consists of a two to three lane roadway with a maximum grade of about seven percent. The proposed roadway will originate at the Snake River and proceed northeast approximately one-half mile across gently sloping irrigated agricultural land. A fill section up to 140 feet thick and a cut section approximately 100 feet deep will be required to construct the southern section of the roadway through the canyon rim. North of the canyon the roadway continues north across relatively level farm land for a total length of about 2.2 miles.

The site is surrounded on the north, south, and east by irrigated farming and ranching properties. Clear Lakes Country Club and Golf Course is located approximately one-half mile west of the site along the Snake River. Clear Lakes Fish Hatchery is situated along the northwest portion of the golf course. The hatchery receives its water from springs which emerge along the base of the canyon rim approximately one mile west of the proposed roadway alignment.

2.1 Geology

Gooding County lies along the south-central portion of the Snake River Plain subdivision of the Columbia Plateau physiographic province. The Snake River Plain is characterized by successive

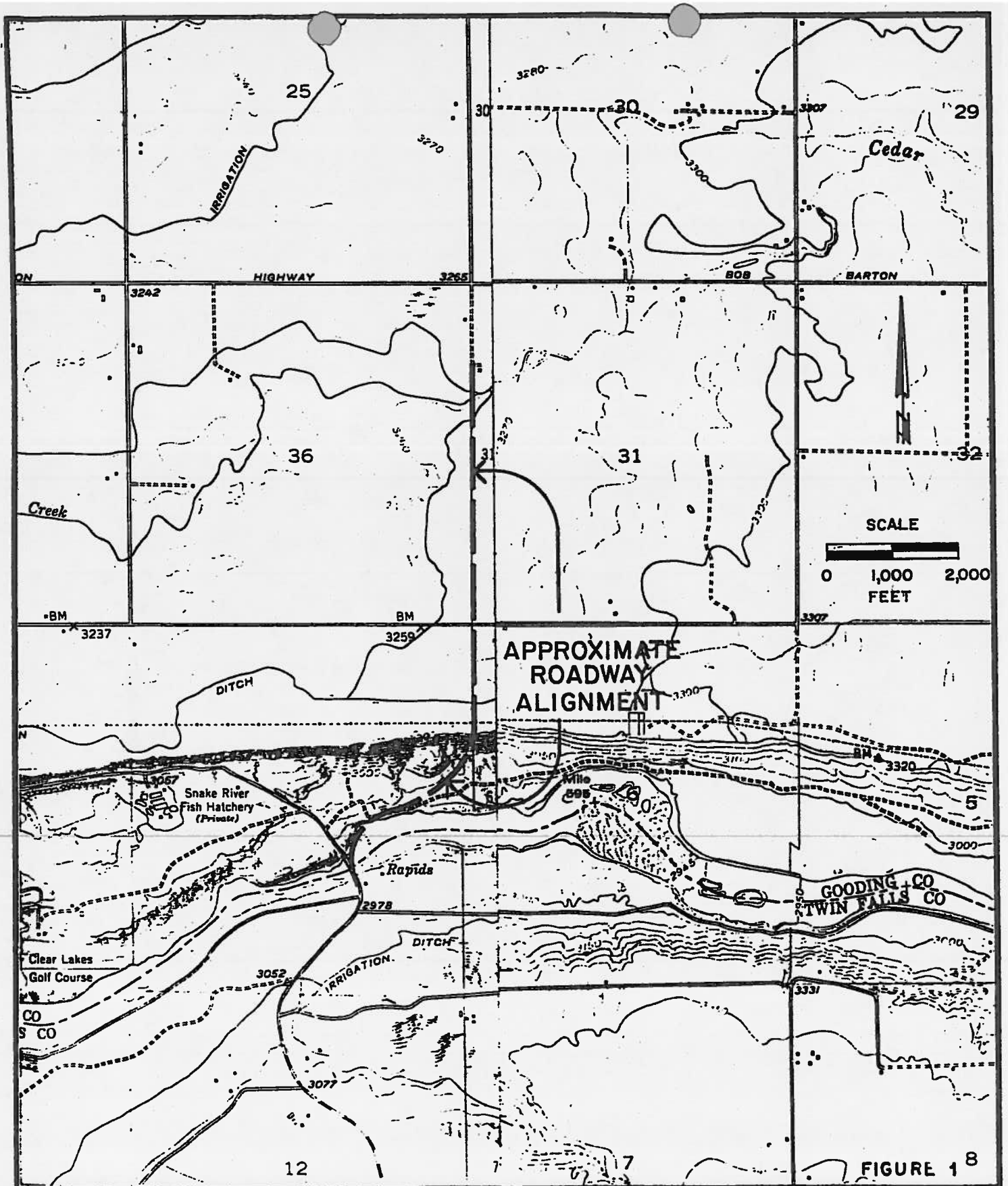


FIGURE 1

Chen-Northern, Inc.

VICINITY MAP
CLEAR LAKES GRADE
GOODING COUNTY, IDAHO

DATE	DRAWN	REVIEWED	SCALE	DRAWING NO.
SEPT. 1991	JFZ	PTS	AS SHOWN	190-1496

Quaternary basaltic lava flows of the Snake River Group, which are occasionally separated by alluvial, eolian, or volcaniclastic interbeds (IDHW, 1985).

The site lies within the transition zone between the eastern and western subdivision of the Snake River Plain (Street and DeTar, 1987). The oldest volcanic rocks exposed in the area are part of the Tertiary Banbury Basalt member of the Idaho Group (Malde and Powers, 1962). In the study area, the Banbury Basalt lies on a sequence of unconsolidated sand and gravel which exceeds 80 feet in thickness, and is overlain by a second sedimentary unit consisting of approximately 100 feet of slightly indurated sand and gravel of indeterminate age.

A series of younger, unaltered basalt flows and sedimentary interbeds of the Quaternary Snake River Group uncomfortably overlie Idaho Group formations. In the project area, the Thousand Springs Basalt Formation of the Snake River Group forms the prominent basalt cliffs and accompanying plateau which define the north side of the Snake River Canyon (Malde and Powers, 1962). This plateau is covered by a thin veneer of unconsolidated sediments.

The youngest lithologic unit in the area consists of cross-bedded coarse-grained cobbles and boulders identified by Malde and Powers (1962) as the Melon Gravel. The Melon Gravel was deposited in the Snake River Canyon during the Bonneville flood in late Pleistocene time. The Melon Gravel is locally covered by fine grained sand and silt of eolian and alluvial origin.

2.2 Hydrogeology

The study area is located near the western margin of the Snake River Plain Aquifer. The Snake River is the primary drainage in the area and has incised a steep walled canyon several hundred feet deep along the southern boundary of Gooding County. On the north

side of the canyon, numerous springs emerge from the canyon walls. Springs on the north bank of the Snake River Between Milner Dam, located approximately 20 miles east of Twin Falls and downstream to Hagerman include 11 of the 65 springs in the United States with discharges exceeding 100 CFS (Thomas, 1968).

The regional aquifer is recharged by stream flow from the mountains to the north, seepage from upstream portions of the Snake River, precipitation, and infiltration from unlined irrigation canals (Thomas, 1968). A potentiometric surface map of the regional aquifer indicates that the local groundwater flows from east to west (IDHW, 1985).

3.0 FIELD INVESTIGATION

The field investigation consisted of drilling seven exploratory borings, completing all borings as monitoring wells, and collecting water samples for laboratory analysis. Aquifer performance tests were conducted on selected wells to estimate hydraulic conductivities. Piping and weirs were installed at several locations below the canyon rim to evaluate discharges from springs and drainages. Water quality samples were obtained from the springs in an attempt to correlate these discharges with samples different aquifers.

3.1 Drilling and Subsurface Sample Collection

On March 19 through April 4, 1991, a truck-mounted air rotary drill rig with an eight inch hammer bit was used for advancing seven exploratory borings in the area north of the basalt escarpment. All borings were completed as monitoring wells.

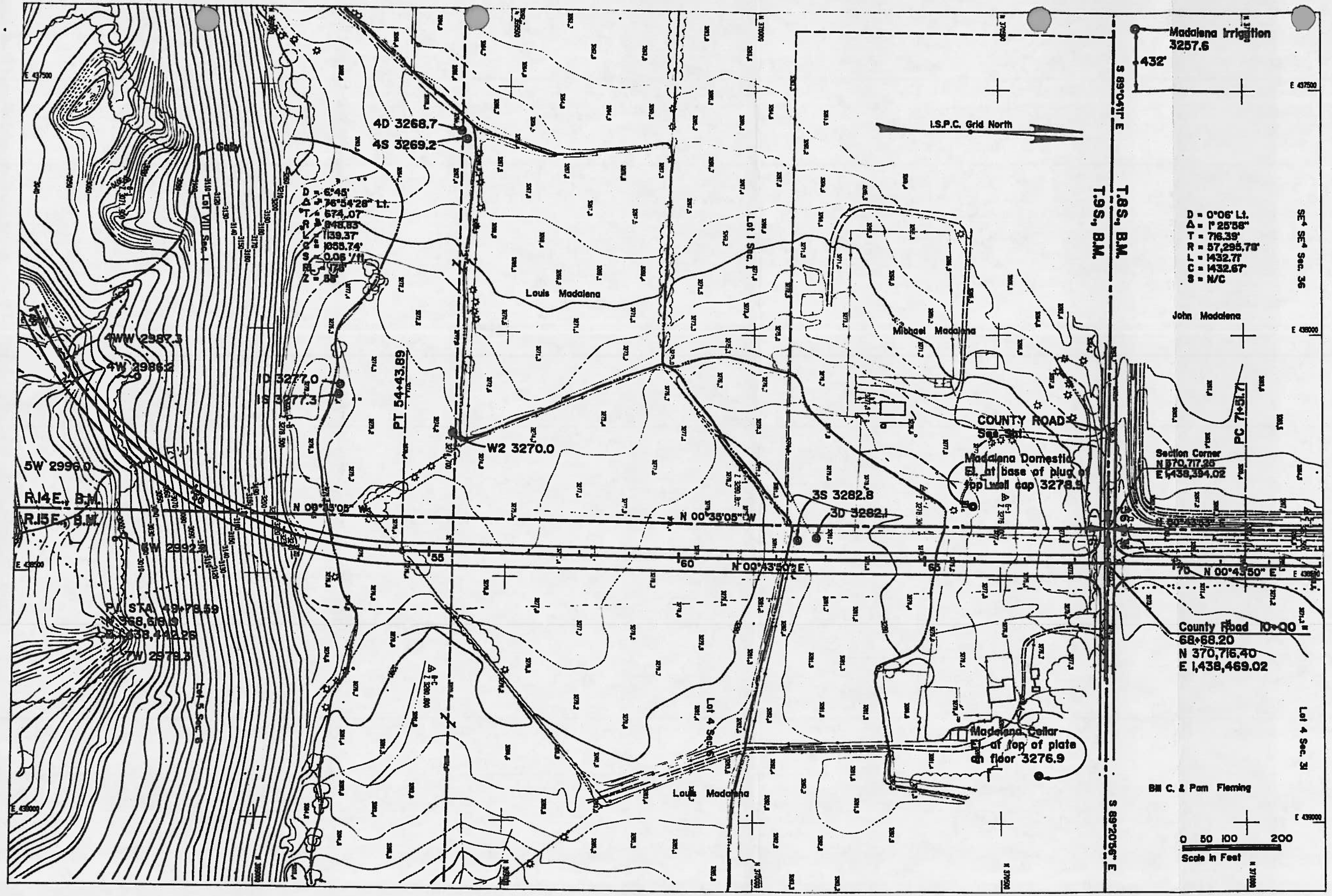
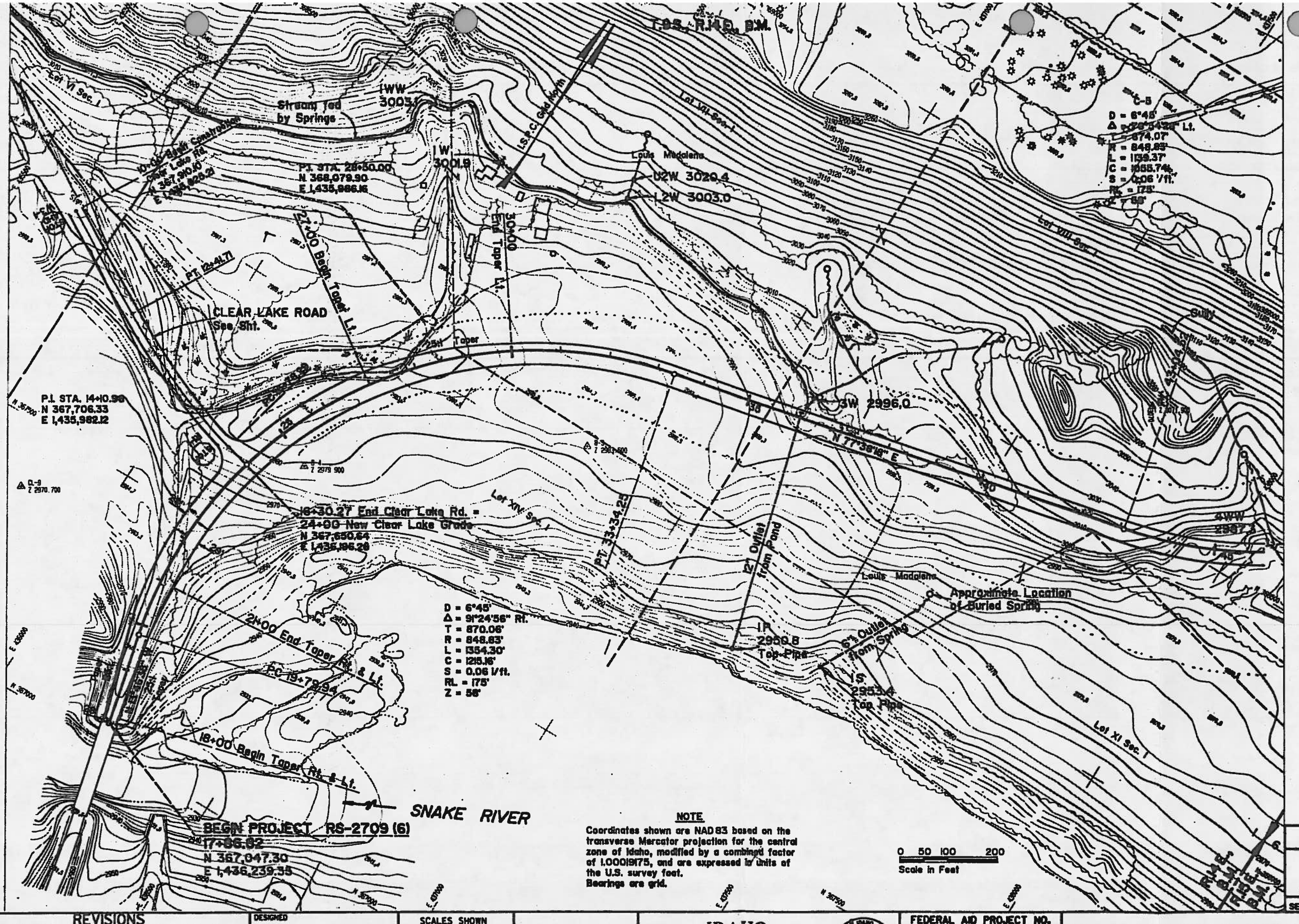


FIGURE 2B

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 34" X 22" PRINTS ONLY		IDAHO TRANSPORTATION DEPARTMENT	FEDERAL AID PROJECT NO.		FORM CATALOG NUMBER 26-0182100
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NO.					COUNTY
△				DETAILED						KEY NUMBER
△				DWG. CHECKED	DRAWING DATE:			REGION 10	IDAHO	SHEET 2 OF 2
△										
△										



NOTE

Coordinates shown are NAD 83 based on the transverse Mercator projection for the central zone of Idaho, modified by a combined factor of 1.00019175, and are expressed in units of the U.S. survey feet.
Bearings are grid.

LEGEND

- Head of Spring
- Elev. Top of Weir Plate
- Elev. Top of PVC Well Liner
- Elev. Top of PVC Weir
- Perennial Stream
- Intermittent Stream or Irrigation Channel
- Marsh
- Test Boring

0 50 100 200
FEET

FIGURE 2A

Chen-Northern, Inc.

SITE MAP
CLEAR LAKE GRADE
Gooding County, Idaho

DATE			SCALE	DRAWING NO.
SEPT. 1991		PTS	SHOWN	190-1496

REVISIONS				DESIGNED	SCALES SHOWN ARE FOR 34" X 22" PRINTS ONLY		FEDERAL AID PROJECT NO.		FORM CATALOG NUMBER 26-0182100
NO.	DATE	BY	DESCRIPTION	DESIGN CHECKED	CADD FILE NO.	IDAHO TRANSPORTATION DEPARTMENT			COUNTY
△				DETAILED					KEY NUMBER
△				DWG. CHECKED	DRAWING DATE:		REGION 10	IDAHO	SHEET 1 OF 2
△									
△									
△									

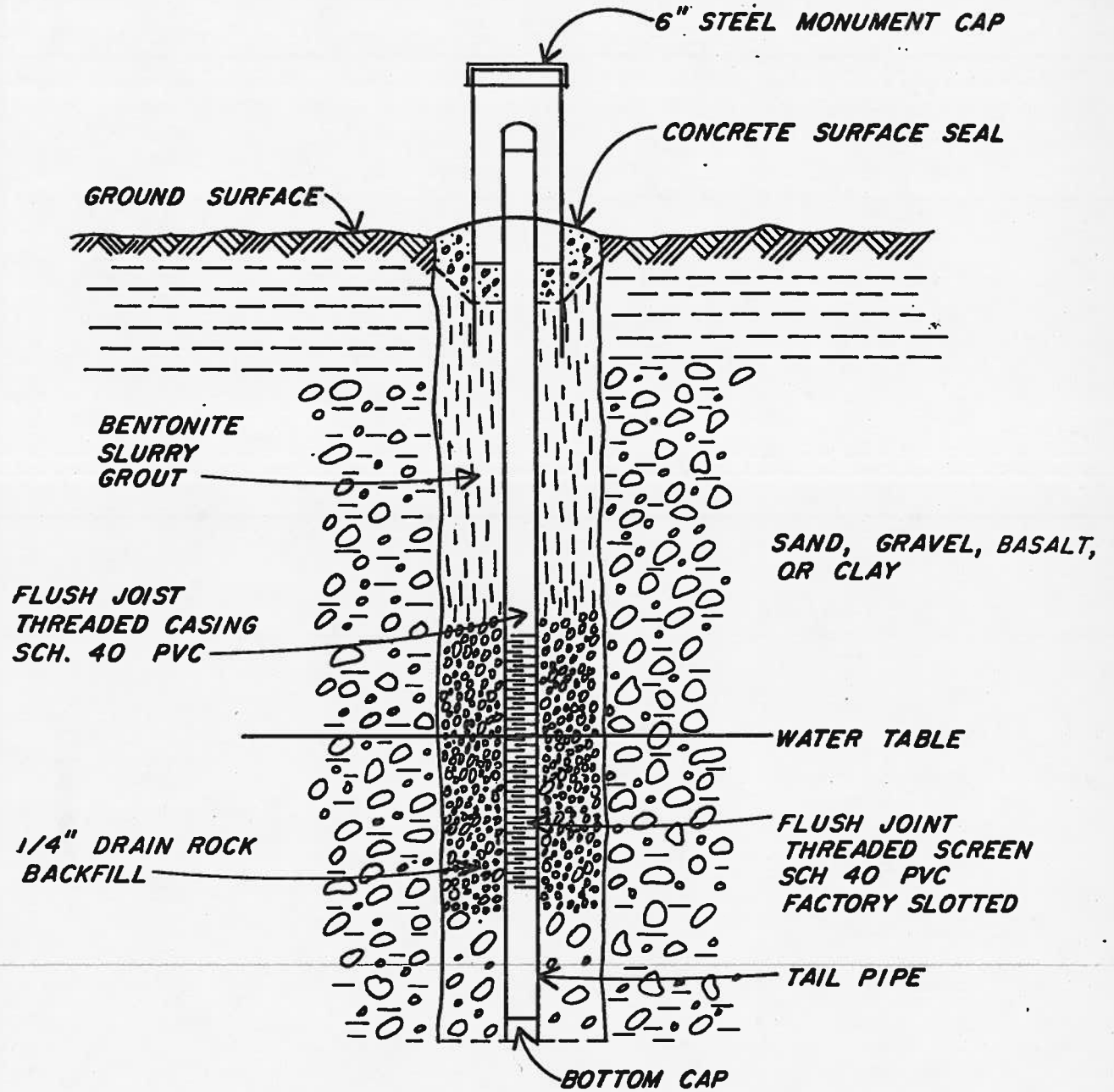
On August 19 through 22, 1991, an exploratory boring was advanced using rotary methods. Continuous core samples were obtained using a truck-mounted rotary drill rig. A one inch diameter PVC pipe was placed in the boring for temporary monitoring of groundwater levels. Figures 2A and 2B display the location of monitoring wells and other significant project features. Appendix A presents field observations, lithologic logs and sample collection methods.

3.2 Well Construction

Monitoring wells were installed in each boring using completion methods summarized in Appendix A. Figure 3 presents a schematic diagram of typical monitoring well construction.

During drilling, monitoring wells MW-1S, MW-3S, and MW-4S were installed where groundwater was initially encountered at approximately 80 to 100 feet BGS. Below this initial saturated zone, the moisture content of drill cuttings indicated that groundwater was also present at depths below about 180 to 200 feet BGS. Monitoring wells MW-1D, MW-3D, and MW-4D were completed in this interval. Well No. MW-2 was advanced to 400 feet and screened from 230 to 250 feet BGS.

On July 9, 1991, a survey was conducted by McCarter, Tuller and Chronic, Inc. (presently re-organized as Sharp and Smith) to determine the locations and elevations of the top of the well casings. Monitoring wells were developed using a mechanical bailer. Static water levels were measured periodically between April and September, 1991 to determine the groundwater migration direction and hydraulic gradient and evaluate changes in water levels throughout the irrigation season.



SCHEMATIC SHOWING TYPICAL MONITORING WELL CONSTRUCTION DETAIL

FIGURE 3

Chen-Northern, Inc.	DETAIL OF TYPICAL MONITORING WELL CONSTRUCTION			
DATE	DRAWN	REVIEWED	SCALE	DRAWING NO.
SEPT. 1991	JFZ	PTS	NTS	190-1496

Table 1 presents a summary of well completion and groundwater elevation data from the monitoring well network and selected local domestic and irrigation wells. Figure 4 depicts water level fluctuations throughout the irrigation season in monitoring well numbers MW-1S, MW-3S, and MW-4S, completed within the shallow aquifer. Figure 5 presents similar information for wells within the deeper saturated zones (MW-1D, MW-2, MW-3D, and MW-4D).

3.3 Flow Measurements of Springs and Drainages

Visual reconnaissance of the study area identified at least 11 springs flowing from the slope below the basalt escarpment. Measuring stations were constructed in drainages below the springs during March and April, 1991. In four of the springs (2WU, 2WL, 5W, and 6W), water was diverted to a 4 inch PVC pipe for measurement. Six drainages were fitted with 90 degree V-notch weirs (1WW, 1W, 3W, 4W, 4WW, and 7W). At location 1W, a Stevens chart recorder was installed to provide a continuous record of water level fluctuations.

TABLE 1
Groundwater Monitoring Well Data
(elevation in feet)

Well ID	Date	Depth to Water Level BTOC[1]	Elevation of Static Water Level	Screened Interval BGS[2]
MW-1S	3-28-91	88.83	3188.47	80'-100'
	4-12-91	89.22	3188.08	
	5-03-91	77.20	3200.10	
	5-24-91	73.32	3203.98	
	6-06-91	73.47	3203.83	
	6-19-91	76.63	3200.67	
	7-16-91	74.40	3202.90	
	8-01-91	72.65	3204.65	
	8-15-91	73.07	3204.23	
	9-10-91	73.35	3203.95	
	9-18-91	74.66	3202.64	

TABLE 1 CONT.

Well ID	Date	Depth to Water Level BTOC[1]	Elevation of Static Water Level	Screened Interval BGS[2]
MW-1D	3-28-91	196.92	3080.08	182'-207'
	4-12-91	197.07	3079.93	
	5-03-91	197.04	3079.96	
	5-24-91	196.35	3080.65	
	6-06-91	196.20	3080.80	
	7-16-91	196.10	3080.90	
	8-01-91	196.02	3080.98	
	8-15-91	195.98	3081.02	
	9-10-91	195.68	3081.32	
	9-18-91	195.75	3081.25	
MW-2	3-28-91	195.57	3074.43	230'-249'
	4-12-91	195.72	3074.28	
	5-03-91	195.74	3074.26	
	5-24-91	195.20	3074.80	
	6-06-91	194.98	3075.02	
	7-16-91	195.01	3074.99	
	8-01-91	194.82	3075.18	
	8-15-91	194.67	3075.33	
	9-11-91	194.04	3075.96	
	9-18-91	194.28	3075.72	
MW-3S	4-12-91	91.18	3191.62	89'-109'
	5-03-91	92.27	3190.53	
	5-11-91	92.57	3190.23	
	5-24-91	92.11	3190.69	
	6-06-91	91.97	3190.83	
	6-19-91	92.21	3190.59	
	7-16-91	91.70	3191.10	
	8-01-91	90.60	3192.20	
	8-15-91	89.83	3192.97	
	9-11-91	87.57	3195.23	
	9-18-91	87.17	3195.63	
MW-3D	4-12-91	184.98	3097.12	193'-212'
	5-03-91	186.03	3096.07	
	5-11-91	185.66	3096.44	
	5-24-91	185.09	3097.01	
	6-06-91	184.78	3097.32	
	7-16-91	184.67	3097.43	
	8-01-91	184.03	3098.07	
	8-15-91	183.77	3098.33	
	9-11-91	182.94	3099.16	
	9-18-91	183.05	3099.05	

TABLE 1 CONT.

Well ID	Date	Depth to Water Level BTOC[1]	Elevation of Static Water Level	Screened Interval BGS[2]
MW-4S	4-12-91	81.75	3187.45	85'-104'
	5-03-91	79.55	3189.65	
	5-24-91	74.78	3194.42	
	6-06-91	75.32	3193.88	
	6-19-91	76.40	3192.80	
	7-16-91	75.15	3194.05	
	8-01-91	74.59	3194.61	
	8-15-91	75.20	3194.00	
	9-11-91	73.75	3195.45	
	9-18-91	76.25	3192.95	
MW-4D	4-12-91	182.66	3086.04	182'-202'
	5-03-91	182.54	3086.16	
	5-24-91	182.09	3086.61	
	6-06-91	181.85	3086.85	
	7-16-91	182.04	3086.66	
	8-01-91	181.77	3086.93	
	8-15-91	181.73	3086.97	
	9-18-91	181.28	3087.42	
Madalena Domestic	3-28-91	88.16	3190.74	Open Hole Below 19'
	4-12-91	86.16	3192.74	
	5-03-91	88.18	3190.72	
	5-24-91	88.26	3190.64	
	6-06-91	88.25	3190.65	
Madalena Cellar	3-28-91	83.20	3193.70	Unknown
	4-12-91	83.20	3193.70	
	5-03-91	85.03	3191.87	
	5-24-91	85.04	3191.86	
	6-06-91	85.07	3191.83	
Madalena Irrigation	3-28-91	71.00	3186.60	Open Hole Below 19'
	4-12-91	71.00	3186.60	
	5-03-91	72.27	3185.33	
	5-28-91	72.42	3185.18	
	6-06-91	72.48	3185.12	

[1] - Below top of casing
[2] - Below ground surface

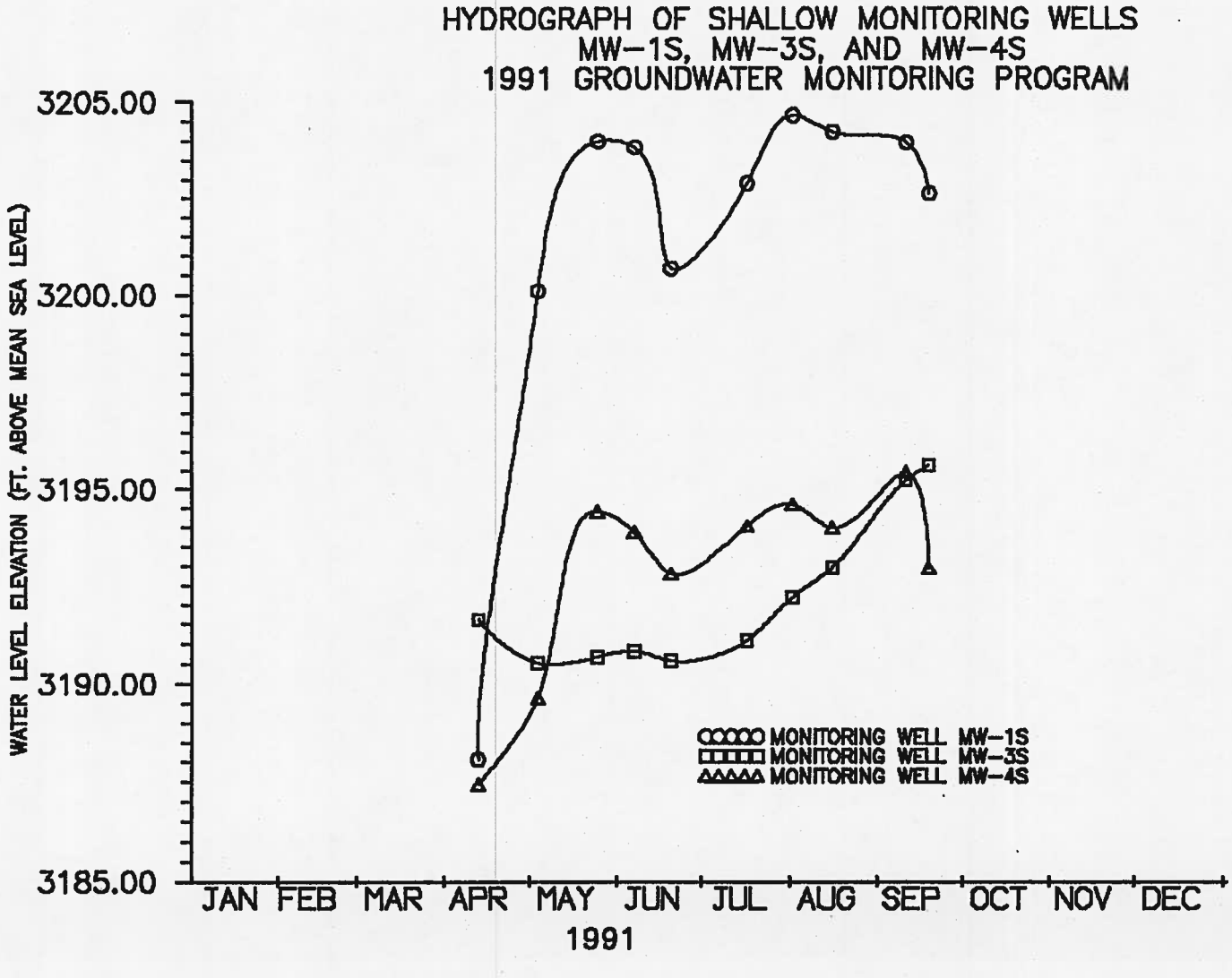

HYDROGRAPH OF SHALLOW MONITORING WELLS
MW-1S, MW-3S, AND MW-4S
1991 GROUNDWATER MONITORING PROGRAM
WATER LEVEL ELEVATION (FT. ABOVE MEAN SEA LEVEL)
3205.00
3200.00
3195.00
3190.00
3185.00
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1991
MONITORING WELL MW-1S
MONITORING WELL MW-3S
MONITORING WELL MW-4S

FIGURE 4

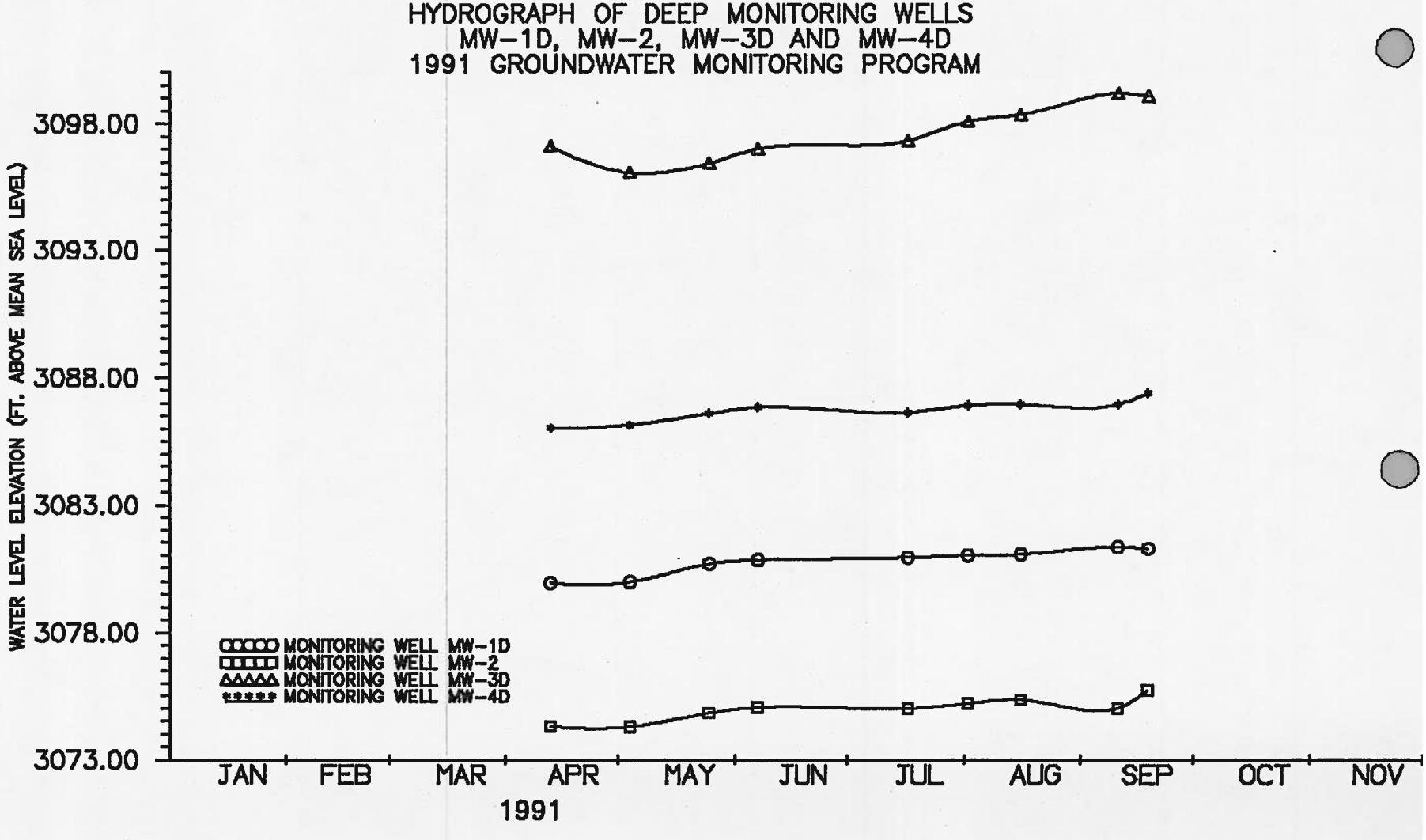

HYDROGRAPH OF DEEP MONITORING WELLS
MW-1D, MW-2, MW-3D AND MW-4D
1991 GROUNDWATER MONITORING PROGRAM
WATER LEVEL ELEVATION (FT. ABOVE MEAN SEA LEVEL)
3098.00
3093.00
3088.00
3083.00
3078.00
3073.00
MONITORING WELL MW-1D
MONITORING WELL MW-2
MONITORING WELL MW-3D
MONITORING WELL MW-4D
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
1991

FIGURE 5

On July 9, 1991, MTC, Inc. completed a survey to determine the location of springs and gauging stations. On Figure 2A springs are identified at the highest elevation where water was seen flowing from the talus. In some areas, phreatic plants are found above these elevations. However, surface water could not be positively located due to the coarse talus deposits covering the slope.

Stream discharge rates were measured throughout the period of March to September, 1991. Monitoring stations 5W, 6W, and 7W receive water primarily from spring flows. Monitoring stations 2WU, 2WL, 3W, 4W, and 4WW are influenced by spring flow as well as surface water which drains from the irrigated fields above the basalt escarpment. Stations 1W and 1WW receive water from springs west of the site. Table 2 presents water level information from the spring network. Figure 6 displays discharge fluctuations in springs 5W, 6W, and 7W throughout the period.

3.4 Groundwater Sampling

Water samples were collected from all seven monitoring wells and nine of the measuring stations on April 12, 1991. Sampling followed standard field procedures identified in Appendix B.

3.5 Aquifer Testing

Two types of aquifer tests were completed in conjunction with this investigation; slug tests and pumping tests. The slug tests were performed on July 17, 1991 and were completed by lowering a pressure transducer into the well, allowing the water level to stabilize, and then quickly inserting a solid cylinder into the well causing a sudden water level rise within the well casing. The declining water level was measured on a digital recorder coupled to the pressure transducer.

TABLE 2
Stream Discharge Data
(all values in cubic feet per second)

Date	Station ID 1W	1WW	2WU	2WL	3W	4W	4WW	5W	6W	7W
2-28-91	1.12	NM	0.006	0.006	0.324	0.380	0.266	0.078	0.042	0.072
3-22-91	0.921	NM	NM	NM	0.362	0.424	0.136	NM	NM	0.072
4-03-91	0.973	0.558	0.004	0.004	0.256	0.466	0.103	0.073	0.048	0.080
4-12-91	1.06	NM	0.004	0.004	0.322	0.463	0.071	0.070	0.047	0.080
4-16-91	0.991	1.06	0.004	0.004	0.322	0.463	0.052	0.069	0.047	0.080
4-26-91	1.14	NM	0.004	0.004	0.324	0.468	0.041	0.073	0.049	0.080
5-03-91	1.03	1.39	0.056	0.057	1.03	0.204	0.372	0.070	0.048	0.080
5-11-91	1.01	1.14	0.016	0.016	0.372	0.218	0.076	0.070	0.048	0.080
5-24-91	1.03	1.06	0.035	0.039	0.468	0.226	0.088	0.073	0.052	0.096
5-28-91	1.03	0.73	0.222	0.222	0.854	0.226	0.272	0.070	0.051	0.096
6-06-91	1.14	0.887	0.211	0.225	0.870	0.362	0.539	0.074	0.057	0.096
6-19-91	1.34	0.997	0.099	0.104	0.306	0.515	0.289	0.074	0.062	0.101
7-09-91	0.921	0.921	0.019	0.019	0.382	0.539	0.289	0.069	0.055	0.101
7-16-91	0.887	0.790	0.028	0.029	0.362	0.564	0.272	0.073	0.060	0.096
8-01-91	0.955	0.887	0.047	0.047	0.515	0.240	0.403	0.060	0.059	0.096

TABLE 2 CONT.

Date	Station ID 1W	1WW	2WU	2WL	3W	4W	4WW	5W	6W	7W
8-15-91	0.938	0.904	0.022	0.020	0.324	0.539	0.289	0.075	0.063	0.101
9-10-91	1.14	1.10	NM	NM	0.197	0.564	0.324	NM	NM	0.115
9-18-91	1.06	1.06	0.024	0.023	0.272	0.539	0.324	0.092	0.073	0.115

NM - Not Measured

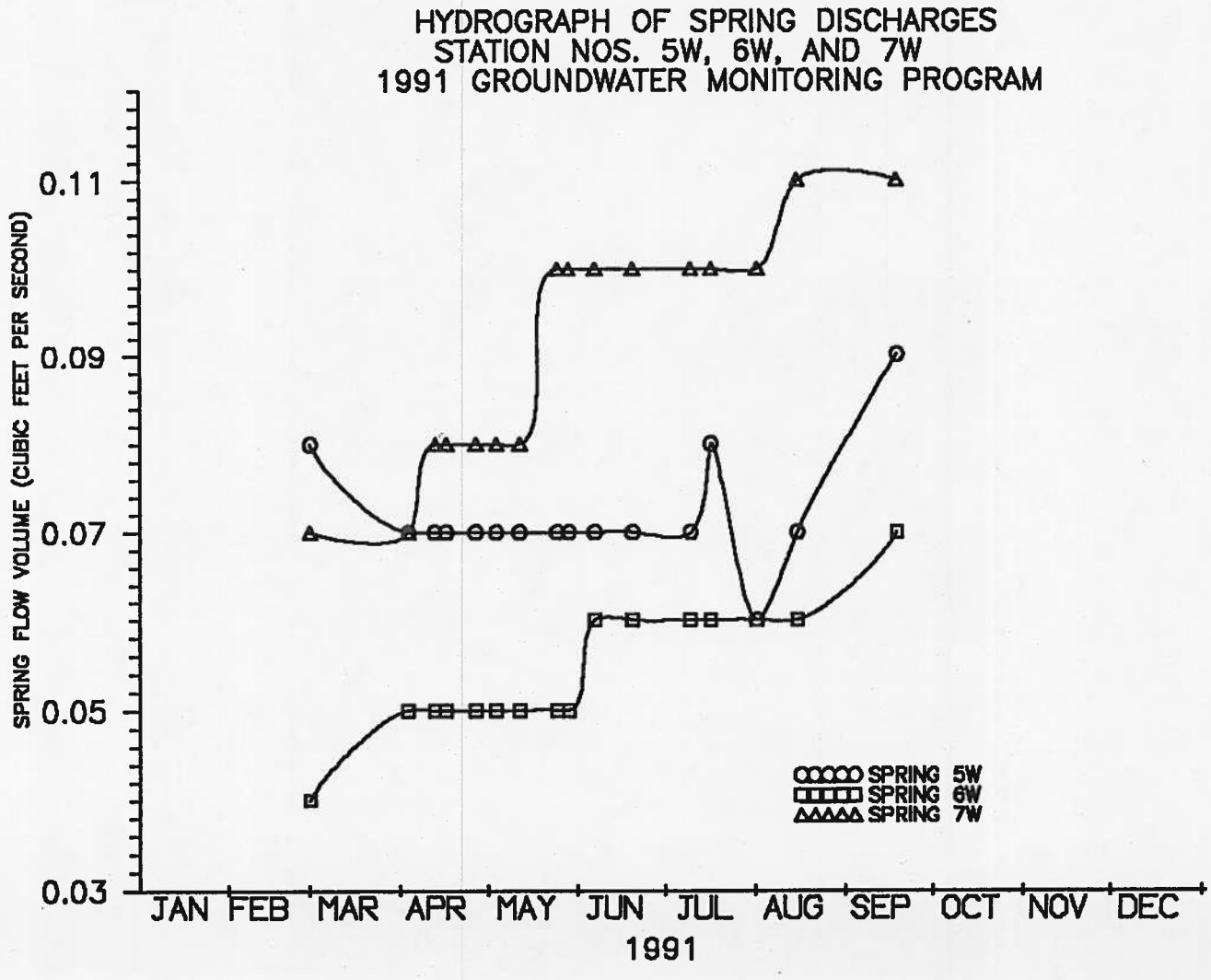

HYDROGRAPH OF SPRING DISCHARGES
STATION NOS. 5W, 6W, AND 7W
1991 GROUNDWATER MONITORING PROGRAM
SPRING FLOW VOLUME (CUBIC FEET PER SECOND)
0.11
0.09
0.07
0.05
0.03
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1991
SPRING 5W
SPRING 6W
SPRING 7W

FIGURE 6

The hydraulic conductivity was then calculated using methods described by Bouwer and Rice (1976 and 1989).

A constant discharge test was performed in monitoring well MW-1S on September 10 and 11, 1991. Results from the constant discharge test were used to generate a computer model which estimates groundwater fluctuations due to the construction of the proposed road cut. Appendix E presents details and assumptions used for production of the model.

4.0 LABORATORY ANALYSES

Groundwater samples were submitted to an EPA approved laboratory (Water supply laboratory certificate No. MT-0012) for analysis of cation/anion balance. Appendix B presents complete analytical reports and chain-of-custody documentation. Appendix C summarizes sample handling protocol.

5.0 LOCATION OF WATER WELLS

A well records search was conducted at Idaho Department of Water Resources (IDWR) to identify water wells filed with IDWR that are near the site. Local residents were also interviewed to identify wells not listed in IDWR records. Table 3 presents the owner, depth, water-level, and use of these wells. Figure 7 displays locations of wells within one-half mile of the site.

The majority of wells are located on the plateau area north of the Snake River canyon. Two irrigation wells (Nos. 17 and 18) and one domestic well (No. 19) not registered with IDWR are located approximately one-half mile west of the proposed roadway. A fourth

unregistered well (No. 20), used to water livestock, is present approximately 250 feet east of the alignment and is also identified as Madalena Cellar on Figure 2B. According to Mr. Madalena, all four unregistered wells are completed to depths of about 100 to 120 feet BGS. Appendix C presents copies of well driller reports for registered wells.

6.0 IRRIGATION WATER QUANTITIES

A water rights search was conducted at IDWR to identify sources and quantities of irrigation water currently in use across the site. Additional information was obtained in interviews with the landowner, Mr. Mike Madalena, and Mr. Ted Diehl and Mr. Bob Hackworth, employees of Northside Canal Company.

The land north of the basalt cliffs is irrigated by four major canals. The J8 Canal flows east to west and discharges over the canyon rim approximately one-half mile east of the proposed roadway. Mr. Madalena reportedly diverts and distributes up to 3.5 cubic feet per second (CFS) of water from the J8 canal in a series of secondary ditches which flow intermittently depending on irrigation schedules. Irrigation water not lost through evapo-transpiration or infiltration is discharged over the basalt cliff approximately 400 feet south of monitoring well MW-4. The water flows beneath the talus and emerges on the lower slope where it has recently eroded a steep-walled gully about ten feet deep and 100 feet long. The gully trends west to east and intercepts a small spring flow approximately 100 feet west of gauging station 4WW. The water is then channelled by canal past station 4W before discharging into the Snake River approximately one-half mile east of the alignment.

TABLE 3
Water Wells Filed With Idaho Division Of Water Resources
Within 1/2 Mile Of The Site

Reference Number	Owner	Location	Date Drilled	Depth (feet)	SWL (feet)	Screened Interval	Use
1	Mike Madalena	NE of NE Sec.1 T.9S, R.14E	7/81	105	85	open hole below 19 ft.	Domestic
2	John Madalena	SW of SE Sec.36 T.8S, R.14E	3/76	85	70	open hole below 19 ft.	Irrigation
3	Blick	NW of NE Sec.36 T.10S, R.17E	5/70	98	68	open hole below 70'	Irrigation
4	Strickland	NE of NW Sec.31 T.8S, R.15E	7/61	80	59	open hole below 10'	Irrigation
5	North Side Canal Co.	SW of NW Sec.31 T.8S, R.15E	10/76	98	62	open hole below 19.8'	Domestic
6	Neil Ambrose	NW of NW Sec.31 T.8S, R.15E	5/78	105	62	open hole below 19'	Domestic
7	Fleming	NW of NW Sec.31 T.8S, R.15E	6/79	110	75	open hole below 19'	Domestic
8	Northside Farms	NW of NE Sec.31 T.8S, R.15E	4/89	104	70	open hole below 20'	Domestic
9	Frank Henslee	NE of SE Sec.36 T.8S, R.14E	2/68	300	95	unknown	Irrigation
10	Wesley Frizen	SW of SE Sec.1 T.9S, R.14E	9/83	155	110	open hole below 143'	Domestic

TABLE 3 CONT.

Reference Number	Owner	Location	Date Drilled	Depth (feet)	SWL (feet)	Screened Interval	Use
11	O.G. Dairy	SE of SW Sec.36 T.8S, R.14E	6/78	130	80	open hole below 19'	Stock
12	Frank Madalena	SE of SE Sec.31 T.8S, R.15E	4/61	95	unknown	open hole below 70'	Irrigation
13	Ernest Weech	SW of SE Sec.31 T.8S, R.15E	9/51	110	84	open hole below 6'	Irrigation
14	Bill Fleming	SW of SE Sec.31 T.8S, R.15E	4/81	205	90	open hole below 19'	Stock
15	Lee Barnes	NE of NE Sec.12 T.9S, R.14E	3/76	220	86	open hole below 85'	Domestic
16	W. Grissom	NW of NE Sec.36 T.8S, R.14E	5/52	98	72	open hole below 8'	Domestic, Irrigation
	Water Wells Not Registered With Idaho Division of Water Resources						
17	John Madalena	SE of SW Sec.36 T.8S, R.14E	unknown	120?	unknown	unknown	Irrigation
18	Melvin Brown	NE of NW Sec.1 T.9S, R.14E	unknown	120?	unknown	unknown	Irrigation
19	Melvin Brown	NE of NW Sec.1 T.9S, R. 14E	unknown	120?	unknown	unknown	Domestic
20	Mike Madalena	NW of NW Sec.6 T.9S, R.15E.	unknown	120?	unknown	unknown	Stock

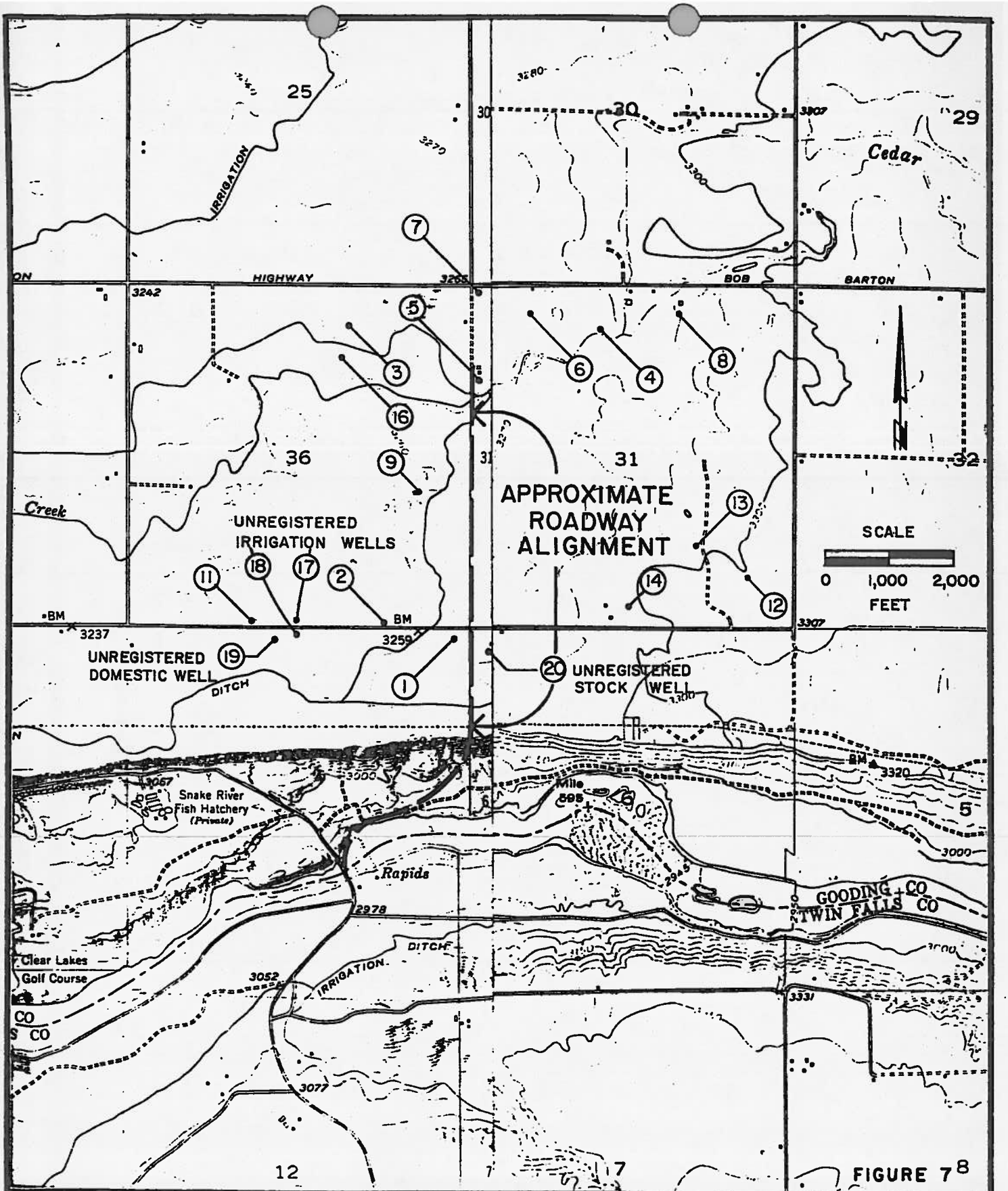


FIGURE 7

Chen-Northern, Inc.

LOCATION OF WATER WELLS
CLEAR LAKES GRADE
GOODING COUNTY, IDAHO

DATE	DRAWN	REVIEWED	SCALE	DRAWING NO.
SEPT. 1991	JFZ	PTS	AS SHOWN	190-1496

Three additional unlined irrigation canals flow east to west across the north portion of the alignment. The S Coulee flows across the alignment at station 104 (see Figure 2B) and carries flows of up to 75 CFS (Hackworth, 1991). Less than 1/4 mile east of the site, canal No. S 39 is diverted from S Coulee and crosses the alignment at approximately station 100, flowing south along the west edge of the proposed alignment before turning west at sta. 70 (see Figure 2B). Canal S 39 carries between 12 and 20 CFS. A third canal (S 27) flows at rates of 6 to 12 CFS and is diverted immediately east of the proposed roadway where it crosses at sta. 105. It is significant to note that flows in S39 and S27 are in addition to the 75 CFS in S Coulee.

In the area south of the canyon rim, much of the water flows to the site from the west in an irrigation canal located along the base of the talus slope. Water discharge rates are measured at gauging stations 1WW and 1W. Spring water is added to the canal at stations between 1WW and 1W and at stations 2WU, 2WL and 3W as well as possible other locations not identified in our reconnaissance. Water is collected in a small pond adjacent to 3W and used for irrigation or diverted by 12 inch pipe to a discharge point near the river (see Figure 2A).

7.0 RESULTS AND DISCUSSION

7.1 Local Geology

Lithologic logs from the seven monitoring well borings were used to characterize the subsurface sediments in the northern and central portion of the site. Geologic information from the southern portion of the site was obtained by local geologic reconnaissance. Additional on-site information will be obtained during the geotechnical field investigation phase of the project.

The site is comprised of several distinct geomorphic areas. The southern portion, presently used for alfalfa production, consists of a gently sloping alluvial valley of the Snake River. Surface soils are predominately fine-grained silty sand of alluvial and eolian origin. According to local resident Mr. Madalena, excessive surface water flows periodically produce gullies or circular depressions up to several feet wide in the valley soils.

North of the alluvial valley, the site is steeply sloped to vertical and rises approximately 240 feet in elevation. This portion of the study area includes a nearly vertical basalt escarpment approximately 40 to 80 feet in height which defines the north rim of the Snake River canyon. The basalt is moderately weathered, closely to moderately fractured, finely vesicular, and dark gray to black.

The base of the cliff terminates in talus. The talus slopes southward about 100 to 150 feet in elevation and consists of basalt blocks and boulders up to several feet in diameter. The boulders are subangular to angular, moderately weathered, finely vesicular and dark gray to black. Scattered pockets of phreatic vegetation within the talus suggest shallow surface water, possibly springs which emerge below the boulders.

Below the talus, the terrain is moderately to steeply sloped and covered by fine-grained silty sand. Several small outcrops of basalt are present between spring gauging stations 2WU and 4WW at elevations between 3020 and 3050 feet. The basalt is reddish brown, severely weathered, and closely fractured on exposed surfaces. This area contains the majority of springs on the site and also several gullies and depressions as large as 30 to 40 feet in diameter and 10 feet in depth, presumably formed by excess surface drainage or shallow groundwater flow.

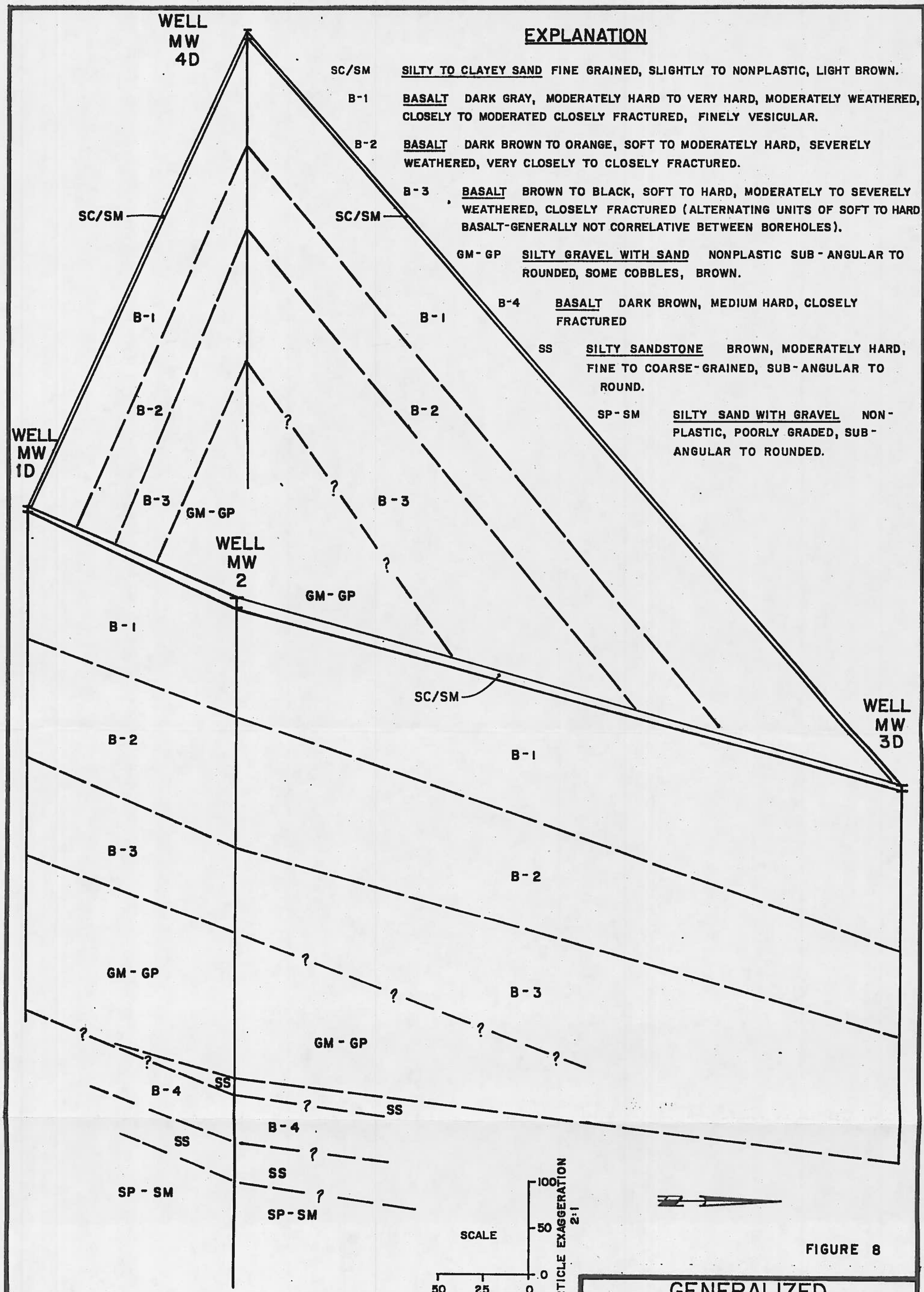
On the basalt plateau north of the canyon rim, the site is covered by 1.5 to 6 feet of silty to clayey sand. The sand is predominately fine grained, slightly plastic, moderately dense to dense and light brown to tan. A small amount of fine gravel and some slightly cemented lenses are present below one foot in depth. The upper six inches of the profile forms topsoil which supports alfalfa and other cattle forage crops.

The surface soils are underlain by several units of basalt bedrock which have been roughly grouped into units B1, B2, B3, and B4, based on general lithologic characteristics which are shown in Figure 8. The upper basalt unit (B1) which is dark grey, hard, moderately weathered, moderately to closely jointed and finely vesicular, extends to approximately 57 to 92 feet BGS and thickens to the north.

The dark gray basalt (B1) is underlain by a series of reddish brown to orange basalt flows (unit B2) which are soft to moderately hard and severely weathered to decomposed. Joints and fractures are very closely to closely spaced and contain moderately plastic clay fillings. During drilling, occasional voids were encountered, resulting in a loss of cuttings for several feet. In some areas, basalt flows are sufficiently weathered to form soil-like lenses. In borehole MW-3D, drill cuttings consisted mainly of clay from approximately 91 to 114 feet BGS.

At depths between about 108 and 138 feet, basalt flows are hard, dark gray to dark brown, vesicular, and moderately weathered (Unit B3). Fractures and joints are closely to moderately spaced, and frequently contain green to blue, slightly indurated clay fillings. Individual flows within this unit vary in thickness from five to eighteen feet.

Basalt units (B1, B2, and B3) are underlain by unconsolidated or lithified sediments below depths ranging from 185 to 205 feet.



EXPLANATION

SC/SM — SILTY TO CLAYEY SAND FINE GRAINED, SLIGHTLY TO NONPLASTIC, LIGHT BROWN.

B-1 — BASALT DARK GRAY, MODERATELY HARD TO VERY HARD, MODERATELY WEATHERED, CLOSELY TO MODERATED CLOSELY FRACTURED, FINELY VESICULAR.

B-2 — BASALT DARK BROWN TO ORANGE, SOFT TO MODERATELY HARD, SEVERELY WEATHERED, VERY CLOSELY TO CLOSELY FRACTURED.

B-3 — BASALT BROWN TO BLACK, SOFT TO HARD, MODERATELY TO SEVERELY WEATHERED, CLOSELY FRACTURED (ALTERNATING UNITS OF SOFT TO HARD BASALT-GENERALLY NOT CORRELATIVE BETWEEN BOREHOLES).

GM-GP — SILTY GRAVEL WITH SAND NONPLASTIC SUB-ANGULAR TO ROUNDED, SOME COBBLES, BROWN.

B-4 — BASALT DARK BROWN, MEDIUM HARD, CLOSELY FRACTURED

SS — SILTY SANDSTONE BROWN, MODERATELY HARD, FINE TO COARSE-GRAINED, SUB-ANGULAR TO ROUND.

SP-SM — SILTY SAND WITH GRAVEL NON-PLASTIC, POORLY GRADED, SUB-ANGULAR TO ROUNDED.

NOTE: LITHOLOGIC CONTACTS ARE PRESENTED ONLY TO AID IN VISUALIZATION AND ARE NOT TO BE USED TO INTERPRET ELEVATIONS OF ROCK UNITS OR OTHER FEATURES.

FIGURE 8

GENERALIZED GEOLOGIC FENCE DIAGRAM

CLEAR LAKES GRADE
GOODING COUNTY, IDAHO

Chen-Northern, Inc.

Drawn: JFZ	Scale: AS SHOWN	DRAWING NO.:
Checked: PTS	Date: SEPT. 1991	190-1496

Across the south portion of the site, the predominant material at this depth consists of silty to sandy gravel which is poorly graded, dense to very dense, subrounded to rounded, and nonplastic with some slightly cemented zones. In the north portion of the study area, basalt unit B3 was underlain by fine to coarse-grained silty sandstone. This sandstone was also encountered in borehole MW-2 beneath the gravel at a depth of about 263 feet to 270 BGS.

Boring MW-2 was continued to a depth of 400 feet and intercepted basalt (unit B4) or basalt interbedded with sand and gravel from a depth of approximately 270 to 300 feet BGS and silty sand with gravel below 300 feet.

7.2 Hydrogeology

7.2.1 Groundwater Elevations

Static water levels have been measured periodically from April to September, 1991. Measurements indicate the presence of at least two distinct water bearing zones. The upper aquifer is comprised of highly weathered, fractured basalt and contains water at approximately 71 to 92 feet BGS. Water level elevation data indicates that prior to the start of irrigation on April 24, 1991, the groundwater migration direction was towards the southwest with a gradient of about 0.004 (see Figure 9). Since the start of irrigation, water levels have risen five to fifteen feet in Wells MW-1S, MW-3S and MW-4S, probably from surface water recharging the shallow water-bearing unit. As a result, the groundwater flow has shifted to the north-northwest and the gradient has steepened to 0.018 (see Figure 10). Due to the response in water levels to surface irrigation this shallow aquifer appears to be unconfined.

A second aquifer, apparently isolated from the upper unit by low permeability basalt (basalt unit B3), is comprised of unconsolidated to slightly cemented silty to sandy gravel with

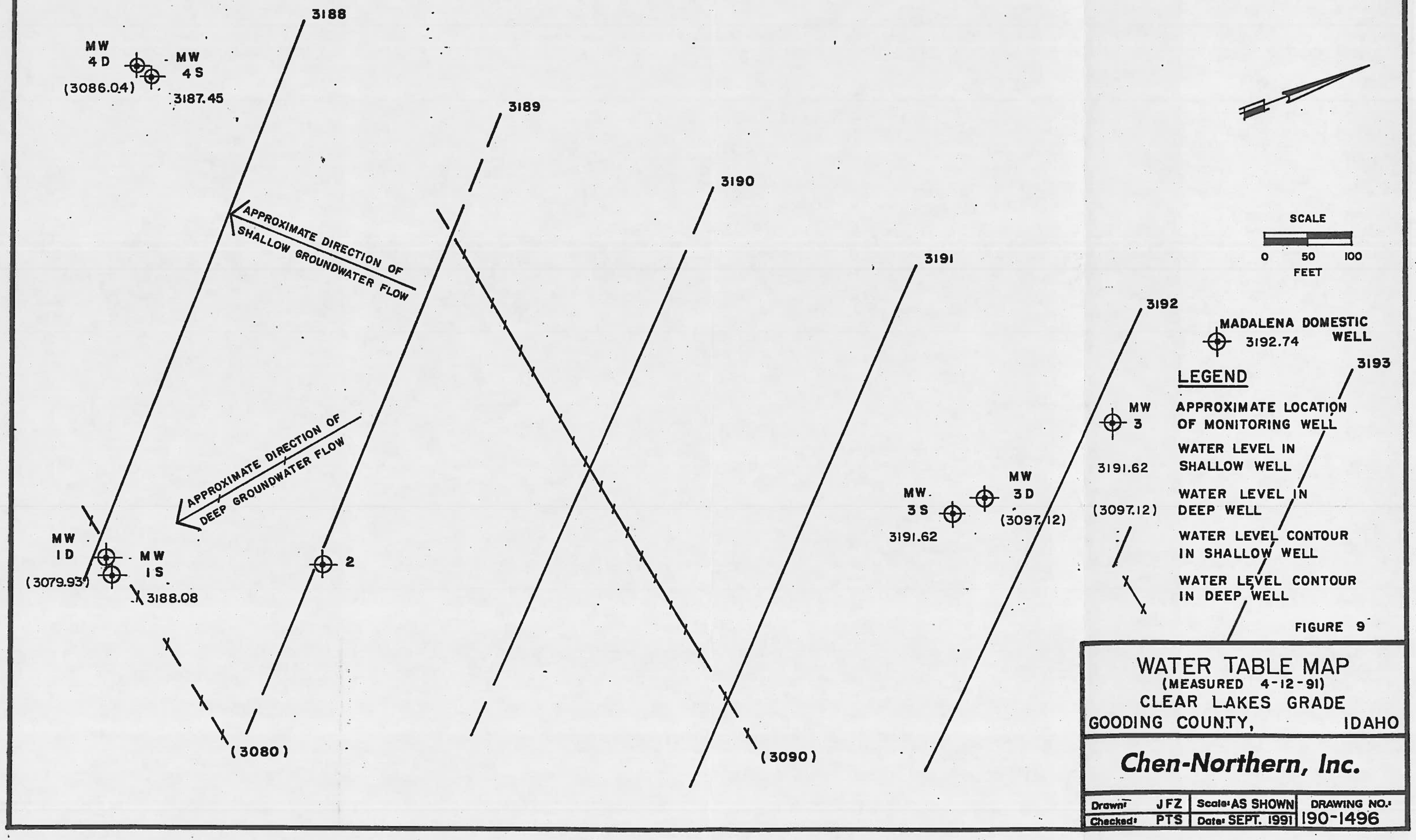


FIGURE 9

WATER TABLE MAP
(MEASURED 4-12-91)
CLEAR LAKES GRADE
GOODING COUNTY, IDAHO

Chen-Northern, Inc.

Drawn: JFZ	Scale: AS SHOWN	DRAWING NO.:
Checked: PTS	Date: SEPT. 1991	190-1496

MW 4D
(3086.66)
MW 4S
3194.05

APPROXIMATE DIRECTION OF SHALLOW GROUNDWATER FLOW

APPROXIMATE DIRECTION OF DEEP GROUNDWATER FLOW

MW 1D
(3080.90)
MW 1S
3202.90

MW 2

MW 3D
(3097.43)
MW 3S
3191.10

3200

(3085)

3195

(3095)

SCALE
0 50 100
FEET

LEGEND

MW 3	APPROXIMATE LOCATION OF MONITORING WELL
3191.10	WATER LEVEL IN SHALLOW WELL
(3097.43)	WATER LEVEL IN DEEP WELL
	WATER LEVEL CONTOUR IN SHALLOW WELL
	WATER LEVEL CONTOUR IN DEEP WELL

FIGURE 10

WATER TABLE MAP
(MEASURED 7-16-91)
CLEAR LAKES GRADE
GOODING COUNTY, IDAHO

Chen-Northern, Inc.

Drawn: JFZ	Scale: AS SHOWN	DRAWING NO.:
Checked: PTS	Date: SEPT. 1991	190-1496

groundwater encountered at depths from 185 to 200 feet BGS. The groundwater migration direction is generally to the south with an average gradient of 0.019. Water levels in the lower aquifer are not significantly affected by irrigation practices, as evidenced by the relative stability of measurements throughout the monitoring period. This suggests the aquifer is possibly confined.

Water levels in monitoring well MW-2, screened in unconsolidated gravel between 230 and 250 BGS, have consistently remained approximately 5 feet lower than water levels observed in MW-1D, MW-3D, and MW-4D. This deeper water-bearing zone is apparently confined and separated from the overlying aquifer, perhaps by lithified sedimentary layers.

7.2.2 Aquifer Performance Tests

Slug tests, performed on wells MW-2 and MW-3D on July 16, 1991, indicated hydraulic conductivities ranging from about 1 foot per day (ft/day) in monitoring well MW-2 to .5 ft/day in well MW-3D.

Slug tests provide estimates of hydraulic conductivity in the area immediately surrounding a well, but in fractured bedrock conductivity values are highly variable due to the fracture patterns in the rock. Hydraulic conductivities in well developed fracture zones may be several orders of magnitude higher than that observed in unfractured areas. Other anisotropies, such as variations in lithology, weathering or cementation may also cause significant differences in conductivity measurements.

Aquifer performance tests pump a known quantity of water from one well while water level fluctuations are measured in surrounding wells. These tests are more reliable indicators of aquifer conditions because the area between a pumping well and an observation well is used to calculate hydraulic conductivity.

In this regard, a pump test was performed on monitoring well MW-1S on September 10 and 11, 1991. The well was pumped with a 3 horsepower submersible pump at a constant rate of 7 gallons per minute for a period of approximately 25 hours. Water levels were periodically measured in wells MW-4S, MW-1S, MW-1D and exploratory boring B-1. The pumping rate was monitored throughout the test using a stop-watch and five gallon bucket. Water level fluctuations were recorded in well MW-4S, located approximately 550 feet west of MW-1S, and in exploratory boring B1, situated in the proposed road cut fill area 280 feet east of MW-1S. In the test area, hydraulic conductivities ranged from about 5 ft/day between MW-1S and MW-4S, to 3.5 ft/day between MW-1S and B1. Appendix D presents a summary of slug test data and pump test results from the monitoring well network.

7.2.3 Estimated Effects of Construction Activities

During and after construction, the deep cut at the canyon rim will intercept groundwater from the shallow unconfined aquifer. A drainage plan will be required to remove the water encountered. Based on the current roadway profile supplied by Sharp and Smith, a computer model was run to estimate the quantity of water which would flow from the road cut during the irrigation season. Using a hydraulic conductivity of 5 ft/day, a flow of 0.03 CFS would be predicted, once the aquifer had attained steady-state conditions. During the irrigation season, water levels are at seasonal highs. As water levels decline in the winter months, the flow from the road cut should decrease.

The observed conductivity produced from pump test data was then compared with a range of literature values reported for fractured basalt (Freeze and Cherry, 1979). Literature values ranged from 0.02 ft/day to 220 ft/day, placing observed site conditions in the approximate middle range of values. A second computer model was run using a "worst case" conductivity of 150 ft/day. Using the

textbook value, a steady state flow rate of 1 CFS from the road cut was generated. Use of this elevated figure should account for anisotropic variations not measured in the pump test.

Potentially significant elements not included in this analysis and modelling effort relate to increased hydraulic conductivity at the road cut due to blasting and mass removal (load relaxation) resulting in widening of existing fractures at the road cut face, lateral increases in hydraulic conductivity from that measured during the pump test, effects of drought over the last five years on "normal" water levels versus those measured, and flushing of sediment from fractures at the road cut face. Accounting for these factors and using a safety factor of 10 times, a reasonable flow rate from the road cut for conveyance design may be 0.5 CFS.

It is expected that construction of the road cut will be completed over the course of weeks to months. At this rate, drainage of groundwater levels should not exceed the value predicted by the computer model. If the road cut is completed at faster rates, flows exceeding the predicted value may occur.

A second area of consideration concerns effects on shallow wells and springs near the proposed roadway cut. Drainage of the shallow aquifer by the cut will cause a depression in the surrounding water table. Based on computer models, the zone of influence from the road cut will extend to the north, east and west approximately 2,000 feet. Water levels will decline approximately one foot in the Madalena domestic and cellar water wells (well Nos. 19 and 20), located about 1,400 feet north of the road cut. Other wells in the vicinity should be largely unaffected by water loss. Figure 11 depicts a theoretical model of water level elevations in the shallow aquifer prior to and following roadway construction.

Another area of concern to local water wells is the effect of blasting on the sidewalls of the wells. The wells in the vicinity

of the construction area are typically uncased. Blasting may cause some rock displacement within the well annulus, resulting in damage to down-hole pumping equipment. The Madalena domestic well is located approximately 60 feet west of a potential blast area, while the Madalena cellar well is situated about 380 feet east.

Although quantitative information is not available, it is anticipated that spring flow in the area immediately below the cut may be reduced. However, any decrease would be offset by drainage from the cut. Assuming a radius of influence of 2,000 feet, the large springs which provide water for Clear Lakes Fish Hatchery, located over 6,000 feet west of the cut, should not be affected.

Groundwater from the deeper aquifers is not expected to significantly affect roadway construction activities. The elevation of the top of the lower aquifer ranges from 3,080 to 3,100 feet above mean sea-level and the bottom of the road cut is anticipated at an elevation of 3,165 feet, based on road profile information provided by Sharp and Smith.

7.2.4 Surface Water

During the irrigation season, an overland flow of up to three and one half CFS is distributed over the area surrounding the proposed road cut, as estimated by Mr. Madalena. In addition, irrigation canals S Coulee, S 39 and S 27, in the north portion of the project, flow at rates of 75, 20 and 12 CFS, respectfully. There are no perennial streams or significant natural drainages north of the canyon rim.

In the area below the cliff, a perennial stream located at the toe of the talus slope flows from the existing roadway to the small collection pond south of stream gauge 3W. The water is currently piped from the collection pond south below the proposed roadway through a twelve inch iron pipe to a discharge port near the Snake

River (Figure 2). Cumulative water measurements obtained from gauging stations 1W, 2WL, and 3W indicate a discharge rate ranging from 1.3 CFS on April 3, 1991 to 2.5 CFS on May 3, 1991. Some water also flows parallel to the existing road and is stored in a marsh located near the south end of the proposed roadway between stations 26+50 and 28+50. Drainage plans may need to be considered for the marsh. Federal and State regulations should be considered to determine if they apply.

A second stream begins west of gauging station 4WW and flows west to east along the base of the slope and discharges into the Snake River approximately one-half mile east of the site. Cumulative measurements from stations 4WW, 4W, 5W, 6W and 7W suggest a flow rate ranging from 0.5 to 1.1 CFS.

7.3 Field and Analytical Test Results

Table 4 presents a summary of groundwater field measurements. In general, specific conductance values were higher in MW-1S, MW-3S and MW-4S and MW-2 than wells MW-1D, MW-3D and MW-4D. The pH in MW-2 was notably higher than other well samples.

TABLE 4

Summary of Groundwater Field Measurements

Sample Location	Date Sampled	pH	Temperature (°C)	Specific Conductance (umhos(cm.)
MW-1S	4-12-91	7.55	13.8	732
MW-1D	4-12-91	7.62	13.4	559
MW-2	4-12-91	8.07	13.5	684
MW-3S	4-12-91	7.49	13.3	694
MW-3D	4-12-91	7.55	13.0	583
MW-4S	4-12-91	7.64	13.2	655

TABLE 4 CONT.

Sample Location	Date Sampled	pH	Temperature (°C)	Specific Conductance (umhos(cm.)
MW-4D	4-12-91	7.62	12.2	517
1W	4-12-91	NA	16.0	589
2WU	4-12-91	NA	13.3	671
2WL	4-12-91	8.08	14.3	654
3W	4-12-91	7.90	16.2	601
4W	4-12-91	7.91	15.8	574
4WW	4-12-91	7.91	15.6	593
5W	4-12-91	7.94	15.7	581
6W	4-12-91	7.90	14.8	570
7W	4-12-91	7.89	15.0	584

NA - Not Analyzed

Field samples obtained from the stream gauging network indicate pH values similar to MW-2. Specific conductance values are most correlative to MW-1D, MW-3D and MW-4D.

Table 5 presents a summary of analytical results of water samples collected from all seven monitoring wells and nine of the gauging stations. Calcium carbonate alkalinity was generally greater than 200 milligrams per liter (mg/l) in the shallow wells and less than 200 mg/l in wells MW-1D, MW-3D and MW-4D. Monitoring well MW-2 apparently differs from the other deep wells as evidenced by an elevated sulfate value (67 mg/l) and lower calcium and magnesium concentrations (24 and 10 mg/l).

Water samples from stream gauging stations 4W, 5W, 6W, and 7W showed a general uniformity. Differences in 1W, 2WU, 2WL, and 3W could be attributed to surface water which is transported from west of the site.

Spring samples are similar but not strongly correlative with the well samples and may indicate a combined flow contribution from several aquifers as well as surface water. Appendix E presents complete analytical test reports and chain-of-custody documentation.

8.0 RECOMMENDATIONS

During the preliminary design phase of the project, a number of considerations should be evaluated to minimize hydrologic impacts. In the north portion of the roadway, water from irrigation canals S 27, S 39 and S Coulee will need to be channeled under the road. According to Northside Canal Company personnel, as much as 107 CFS of water may be present in the three canals.

In the area south of the Madalena residence (see Figure 2A), the current landholder is diverting 3.5 CFS onto fields for irrigation. Much of this water will intercept the east side of the future road cut and will need to be routed to the west side of the cut or be otherwise accounted for in drainage considerations.

TABLE 5
Summary of Analytical Results of Water Samples
Date Sampled 4-12-91

	Anions				Cations				Nutrients
Sample Location	Chloride as CL	Fluoride as F	Sulfate as SO_4	Total Alkalinity as $CaCO_3$	Calcium as Ca	Magnesium as Mg	Potassium as K	Sodium as Na	Nitrate & Nitrite as N
MW-1S	29	0.93	41	258	51	22	6.6	46	0.99
MW-1D	42	0.49	53	154	47	17	7.5	27	1.47
MW-2	55	0.58	67	186	24	10	5.2	108	1.71
MW-3S	40	0.55	44	198	51	24	6.7	35	2.86
MW-3D	40	0.55	49	179	56	22	6.5	29	2.24
MW-4S	27	0.53	57	246	60	23	6.3	46	0.94
MW-4D	38	0.53	40	159	45	16	7.3	33	1.79
1W	38	0.53	25	161	45	19	4.3	25	1.44
2WU	36	0.78	37	213	47	26	4.6	33	1.17
3W	40	0.53	40	164	45	19	4.6	25	1.41
4W	40	0.53	47	161	54	21	4.4	30	1.37
5W	39	0.58	52	171	55	21	4.3	30	1.30
6W	37	0.55	52	159	53	21	4.3	29	1.31
7W	38	0.58	46	166	53	21	4.4	29	1.30

(all concentrations are expressed as milligrams per liter which is equivalent to parts per million)

The road cut will intercept the upper aquifer along the north rim of the canyon resulting in a local depression in the water table and drainage of groundwater. Based on computer modeling, the groundwater discharge will most likely range from 0.03 to 1 CFS based on water levels observed during the irrigation season. Plans should be made to divert this water, presumably downgrade towards the river. Drawdown effects on local domestic and irrigation wells should be minimal with approximately one foot of loss in the Madalena domestic well and only minimal effect beyond the radius of influence of 2,000 feet. Blasting during construction may cause additional damage due to side wall failures in uncased wells.

Although conservative literature estimates have been used to predict groundwater flow from the road cut, it is possible that unanticipated subsurface conditions could be present which would increase the volume of water released. Diligent efforts have been made to allow for all variables, but a preferable method of forecasting water volumes would be to install an array of large volume pumping wells, completed such that the entire volume of the road cut could be de-watered prior to construction. In this manner, the actual volume of water could be measured under steady state conditions.

In addition, construction activities will also potentially affect local groundwater flow. The area surrounding the cut will be relatively more fractured, due to blasting. Fractures which presently contain soil fillings will likely be flushed clean, resulting in potentially higher flow rates. We recommend that upon completion of the cut, additional measurements be completed on water flow from the cut to assure adequate drainage structures are constructed.

The section of road south of the canyon rim will require drainage measures to divert spring flows and surface water from the north to the south of the fill. The channel which flows from gauging

station 1WW to 3W has contained between 1.3 and 2.5 CFS throughout the measuring period. Due to the large surface area upgradient of this channel, flows could exceed 2.5 CFS during severe storm events. The channel flowing from gauging station 4WW to 7W has carried from 0.5 to 1.1 CFS and lies directly under the proposed fill area. In addition, numerous springs daylight under the proposed fill. Construction activities in this area may yield additional springs not presently identified, and thus increase the amount of surface water.

One buried water source, located in the vicinity of the proposed fill slope, discharges from a six-inch pipe located in the south portion of the irrigated field below the talus slope (See Figure 2A). According to Mr. Madalena, the spring is encased in a box and piped to the discharge point near the Snake River. We recommend that the spring box be located to assure that it will not adversely affect the roadway in the future.

The marsh near the south end of the project contains water from springs west of the present roadway. In the event of high water flows from storm events or spring runoff, plans should include a method of dewatering the marsh and routing excess water across the new road.

9.0 SUMMARY

The northern portion of the site consists of 1.5 to 6 feet of silty sand soil covering a series of basaltic lava flows to depths ranging from 185 to 205 feet BGS. The upper basalt (unit B1) is dark gray, moderately weathered, moderately closely fractured and finely vesicular. A severely weathered, dark brown to orange, water bearing basalt (unit B2) underlies the gray basalt to depths

of 108 to 132 feet BGS. The weathered basalt is underlain by moderately weathered brown to black basalt (unit B3).

The basalt units overlie a sedimentary unit which persists to the depths drilled, approximately 400 feet, although minor flows of basalt may be present between 270 and 300 feet BGS. Near the canyon rim, silty gravel with sand occurred to about 260 feet BGS. In MW-3D to the north, a fine to coarse grained sandstone was present below 205 feet. A lens of basalt approximately 20 feet in thickness was identified in MW-1D below 276 feet (unit B4). Black drill cuttings obtained from MW-2 at a similar depth also suggest a thin basalt bed. Boring MW-2 continued through sandstone and silty gravel units to 400 feet BGS.

Groundwater is present below the site in several different aquifers. A perched shallow aquifer comprised of weathered and fractured basalt is found at 71 to 92 feet BGS. The water flow direction prior to the start of irrigation was to the southwest at a gradient of 0.004. Since irrigation began on April 24, 1991, the flow direction has shifted to the north-northwest with a gradient of 0.018. Hydraulic conductivities measured in the shallow aquifer ranged from 3.5 to 5 ft/day.

A lower, confined aquifer consisting of silty to sandy gravel was encountered at depths ranging from 185 to 197 feet BGS. Since April, 1991, the groundwater flow direction has remained southerly with a gradient of 0.019. Slug tests performed in July, 1991, indicate a hydraulic conductivity of about 0.5 ft/day. A third, apparently confined water bearing unit may be located at approximately 230 feet BGS.

A review of area well driller reports indicate several water wells are located within one-half mile of the site. The majority of wells are located in the shallow aquifer on the plateau north of the Snake River canyon and are used for irrigation or domestic

purposes. Some drawdown in wells located within approximately 2,000 feet of the road cut may be experienced due to depression of groundwater surrounding the cut. Based on computer modeling and the profile supplied by Sharp and Smith, the Madalena domestic and cellar wells may lose about one foot of static water level elevation due to the proposed road cut dewatering.

Road construction should be largely unaffected by groundwater on portions completed at approximate existing grade. Work in the cut section of roadway will need to include a drainage plan to remove approximately 0.03 to 1 CFS flowing from the cut slopes. Based on a safety factor of ten times the calculated flow rate, and accounting for other potentially significant factors, a flow rate of 0.5 CFS may be reasonable for preliminary design of water conveyance structures in the road cut.

Drainage structures will be necessary to allow as much as 3 to 5 CFS of spring and surface water to migrate beneath the fill slopes of the project at the base of the canyon rim. Additional water may be introduced by the cut slope above the fill.

Springs in the area of construction may experience a drop in flow rate, depending on the contribution supplied by the shallow aquifer to total spring flow. Springs in the area of Clear Lakes Trout Hatchery will not be influenced by construction activities, based on the information collected to this date.

It is important to point out that numerous factors can influence the hydrologic regime of a fractured basalt aquifer, especially in the Clear Lakes area. The lateral continuity of the aquifer is uncertain, which may result in conditions substantially different than those calculated during this investigation. However, the general lack of large-volume spring flows (similar to those west of the site near the fish hatchery) in the immediate vicinity of the proposed road cut tends to support aquifer parameter data collected

during this investigation. Other factors of note include the effects of drought conditions on the aquifer as evaluated during this investigation. Also, additional surface run-off that may occur during certain precipitation events, such as rain-on-snow, could impact drainage control structures.

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APPENDIX A

Lithologic Logs
Classification Methods
Monitoring Well Completion Details

Representative samples were collected from drill cuttings at approximately five to ten-foot intervals. Routine field subsoil and rock classification procedures were performed during drilling. Classification of unconsolidated material consisted of visual and textural identification in accordance with ASTM D2487, which is based on the Unified Soil Classification System. The rock identification procedure was modified from R. E. Goodman (1980).

Monitoring wells were installed in each boring using threaded, flush joint 4-inch I.D. schedule 40 PVC casing. A 20 to 25 foot section of manufactured screen with 0.02 inch openings (No. 20 slot) was installed in each boring. Washed 1/4 inch drain rock was placed in the annular space over the entire screened interval. Granular bentonite was backfilled above the drain rock to within approximately 6 feet below ground surface (BGS). A 6 inch diameter, above ground steel well protector with locking cap was concreted over the borehole to prevent surface contamination and unauthorized access. Tight fitting well caps were placed on the well casings.

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

JOB NO: 190-1496
PROJECT: Clear Lakes Grade STATE: ID COUNTY: Gooding WELL NO.: MW-1S

LEGAL LOCATION: T9S R14E S1 TRACT SE 1/4 NE 1/4 DESCRIPTIVE LOCATION: See Text

DATE STARTED: 3-26-91 DATE COMPLETED: 3-27-91 DRILLING COMPANY/ DRILLER: Walker Water Systems/F. Walker LOGGED BY: R.J. Pederson

DRILLING METHOD: Air Rotary BOREHOLE DIAMETER (In): 8" DRILL FLUIDS USED: Water

TOTAL DEPTH DRILLED (ft): 105 TOTAL DEPTH CASED (ft): 105 INTERVAL PERFORATED OR SCREENED (ft): from: 80 to: 100 DIAMETER OF CASING: 4" TYPE OF CASING: Sch 40 PVC

METHOD OF PERFORATION:
___ Open Hole
___ Open Bottom
___ Saw Slotted
X Factory 0.020 (size)
___ OTHER (specify) _____

DURING WELL CONSTRUCTION WAS/WERE:

	YES	NO
WELL DEVELOPED	____	X
WELL PUMPED	____	X
WATER SAMPLES COLLECTED	____	X
MATERIAL SAMPLES COLLECTED	X	____

ANNULAR COMPLETION CHARACTERISTICS
WELL PROTECTOR: Length 36" Diam. 6"
LOCK NO.: Dolphin

SURFACE SEAL: Type: Concrete from: 0 to: 6.6'
BACKFILL: Material: Bentonite from: 6.6' to: 60'
FILTER PACK: Type: 1/4"Gravel/Sand from: 60' to: 105'

STATIC WATER LEVEL FT: 88.83' MEASURING POINT DATE: 3-28-91 DESCRIPTION/ ELEVATION FT: top of PVC MEASURING POINT RELATIVE TO GROUND SURFACE (+/-): +1.26

REMARKS: _____

DRILLING RATE

INTERVAL (FT) below ground surface	LITHOLOGIC DESCRIPTION	Interval	Rate (ft/min)
0	Silty SAND with Minor Clay; slightly plastic, fine grained, tan, (SM)	0-10'	0.5 ft/min
3.0	BASALT; dark brown to dark grey, hard, close spaced fractures, moderately weathered, vesicular, fine grained, less weathered and wide spaced fractures beginning at 9.5' BGS, dark brown	10-15' 15-20' 20-30'	0.8 ft/min 0.7 0.4
16.5	BASALT; dark grey, moderately hard, moderately close spaced fractures, fresh, vesicular, fine grained	30-40' 40-50'	0.6 0.8
	- rock softer at 61' (close spaced fractures)	50-60'	1 ft/min
	- 61-64.8' moderately close to widely spaced fractures	60-70'	0.7 ft/min
	- 64.8-69.1' close spaced fractures	70-80'	2 ft/min
69.1	BASALT; medium brown, medium hard to soft, close spaced fractures, moderately to severely weathered, vesicular	80-90'	0.8 ft/min
		90-95'	0.8 ft/min
105	Bottom of Hole	95-105'	0.7 ft/min

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

JOB NO: 190-1496
PROJECT: Clear Lakes Grade STATE: ID COUNTY: Gooding WELL NO.: MW-1D

LEGAL LOCATION: T9S R14E S1 TRACT NE 1/4 NE 1/4 DESCRIPTIVE LOCATION: See Text

DATE STARTED: 3-25-91 DATE COMPLETED: 3-26-91 DRILLING COMPANY/ DRILLER: Walker Water Systems/F. Walker LOGGED BY: R.J. Pederson

DRILLING METHOD: Air Rotary DH Hammer BOREHOLE DIAMETER (In): 8" DRILL FLUIDS USED: Water and Quick Foam

TOTAL DEPTH DRILLED (ft): 280 TOTAL DEPTH CASED (ft): 207.5 INTERVAL PERFORATED OR SCREENED (ft): from: 182 to: 207 DIAMETER OF CASING: 4" Sch 40 TYPE OF CASING: PVC (Aardvark)

METHOD OF PERFORATION:
- ___ Open Hole
- ___ Open Bottom
- ___ Saw Slotted
- X Factory 0.020 (size)
- ___ OTHER (specify) ___

DURING WELL CONSTRUCTION WAS/WERE:

	YES	NO
WELL DEVELOPED	___	X
WELL PUMPED	___	X
WATER SAMPLES COLLECTED	___	X
MATERIAL SAMPLES COLLECTED	X	___

ANNULAR COMPLETION CHARACTERISTICS
WELL PROTECTOR: Length 36" Diam. 6"
LOCK NO.: Dolphin 1600

SURFACE SEAL: Type: Concrete from: 0 to: 6'
BACKFILL: Material: Bentonite from: 6' to: 164'
FILTER PACK: Type: -1/4" Washed Gravel from: 164' to: 207'

STATIC WATER LEVEL FT: 196.92 MEASURING POINT DATE: 3-28-91 DESCRIPTION/ ELEVATION FT: top of PVC MEASURING POINT RELATIVE TO GROUND SURFACE (+/-): +0.95

REMARKS: _____

DRILLING RATE

INTERVAL (FT) below ground surface	LITHOLOGIC DESCRIPTION	Interval	Rate (ft/min)
0 - 0.5	TOPSOIL, Silty SAND; fine to medium grained with moderate organic matter		
0.5	Silty SAND; slightly indurated, minor clayey laminae, nonplastic, medium to dark grey, becoming more clayey downward, sandier zones are more strongly cemented (SM)	1.5-6.5'	1 ft/min
1.5	BASALT; dark grey to dark brown, moderately hard to hard, minor vesicles, becomes harder and brown at 9.5' BGS	6.5-9.5'	1.6 ft/min
11	BASALT; medium to dark grey, hard, slightly vesicular, minor clay or alkali salt coatings on fracture surfaces	10-15'	1.2 ft/min
31.2	Well Fractured BASALT	15-30'	1 ft/min
33.1	Hard BASALT; dark brown to dark grey	30-40'	0.8 ft/min
54.0 - 54.3	Void: abundant fractures at 61.2'	40-50'	0.8 ft/min
		50-60'	1.7 ft/min
71.3	BASALT; brown, weathered with close-spaced fractures, very fine grained, minor clay on fractures, alkali salts on vesicles, zone is water saturated	60-70'	1.7 ft/min

JOB NO.: 190-1496
PROJECT: Clear Lakes Grade WELL NO.: MW-1D

DRILLING RATE

INTERVAL (FT) below ground surface	LITHOLOGIC DESCRIPTION	Interval	Rate (ft/min)
101	BASALT; dark brown, medium hard, abundant close spaced fractures, heavily weathered, locally contains clay, vesicular, very fine grained, becomes softer and increasing clay downward to 116.5'	70-80'	2 ft/min
		80-90'	2 ft/min
		90-100'	2 ft/min
		100-110'	1 ft/min
116.5	BASALT; dark brown, hard, wide spaced fractures with tan and green blue clay fillings, fresh fine grained basalt with minor vesicles	110-120'	.5 ft/min
		120-130'	.5 ft/min
137	BASALT; dark grey, very hard, wide spaced fractures, minor vesicles	130-140'	.6 ft/min
		140-150'	.5 ft/min
150.8	BASALT; dark grey to medium brown, medium hard, close spaced fractures, vesicular	150-160'	.8 ft/min
		160-170'	.8 ft/min
178.6	BASALT; dark to medium brown, medium hard, close spaced fractures becoming more altered, softer, and light brown downward	170-180'	.4 ft/min
		180-190'	1 ft/min
191	Silty GRAVEl with Sand; soft, round to subround, fine grained, light brown, weakly cemented in zones, tan to medium brown (GM/GP)	190-200'	2 ft/min
		200-210'	2 ft/min
210	Sandy GRAVEl with Silt; soft, round to subround, medium to very coarse sand, subround, saturated, tan (GP)	210-220'	1.4 ft/min
	Resumed drilling on 3-26-91	220-230'	1.4 ft/min .
240	Poorly Graded GRAVEl with Minor Coarse to Very Coarse Sand; round to subround, brown, tan, red and grey (GP)	230-240'	2 ft/min
	- Gravel becomes coarser to 265 and sand diminishes	240-250'	1.4 ft/min
	- Gravel changes to fine (granular) gravel at 265' with coarse to very coarse sand	250-260'	1.1 ft/min
276	BASALt or ANDESITE; dark brown, medium hard, closely spaced fractures	260-270'	1.1 ft/min
280	Bottom of Hole	270-280'	.8 ft/min

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

JOB NO: 190-1496
PROJECT: Clear Lakes Grade STATE: ID COUNTY: Gooding WELL NO.: MW-2

LEGAL LOCATION: T9S R14E S1 TRACTNE 1/4 NE 1/4 DESCRIPTIVE LOCATION: See Text

DATE STARTED: 3-19-91 DATE COMPLETED: 3-25-91 DRILLING COMPANY/ DRILLER: Walker Water Systems/F. Walker LOGGED BY: P. Spillers

DRILLING METHOD: Air Rotary BOREHOLE DIAMETER (In): 8" DRILL FLUIDS USED: Water & Quick Foam

TOTAL DEPTH DRILLED (ft): 400 TOTAL DEPTH CASED (ft): 255 INTERVAL PERFORATED OR SCREENED (ft): from: 229.9 to: 249.3 DIAMETER OF CASING: 4" PVC TYPE OF CASING:

METHOD OF PERFORATION:
___ Open Hole
___ Open Bottom
___ Saw Slotted
X Factory 0.020 (size)
___ OTHER (specify) _____

DURING WELL CONSTRUCTION WAS/WERE:

	YES	NO
WELL DEVELOPED	X	
WELL PUMPED		X
WATER SAMPLES COLLECTED		X
MATERIAL SAMPLES COLLECTED	X	

ANNULAR COMPLETION CHARACTERISTICS
WELL PROTECTOR: Length 36" Diam. 6"
LOCK NO.: Dolphin

SURFACE SEAL: Type: Concrete from: 0 to: 6'
BACKFILL: Material: Bentonite from: 6' to: 190'
FILTER PACK: Type: Sand from: 190' to: 400'

STATIC WATER LEVEL FT: 195.57' MEASURING POINT DATE: 3-28-91 DESCRIPTION/ ELEVATION FT: top of PVC MEASURING POINT RELATIVE TO GROUND SURFACE (+/-): +0.96'

REMARKS:

DRILLING RATE

INTERVAL (FT) below ground surface	LITHOLOGIC DESCRIPTION	Interval	Rate (ft/min)
0	TOPSOIL, Silty SAND; fine grained, sod, organics	0-5'	
0.5	Clayey SAND; medium dense, moist, slightly plastic, fine grained, slightly cemented below 1', brown (SC)	5-10'	1 ft/min
1.5	Silty to Clayey SAND with Gravel; slightly moist, medium dense, slightly to nonplastic, slightly to moderately cemented, some basalt fragments, light brown (SC/SM)	10-15'	1 ft/min
6	BASALT; dark grey, moderately hard, moderately closely jointed, severely weathered	15-20'	1 ft/min
	NOTE: soil filled fractures from 6' to 8' widely fractured below 10', hard void from 31.1' to 31.8' slightly fractured from 51.7' to 57.5' & 61.1' to 67.2' (hole caving between 60' & 70')	20-30'	1 ft/min
		30-40'	0.8 ft/min
		40-50'	0.8 ft/min
67.2	BASALT; brown, soft, severely weathered to decomposed, highly fractured, FeO2 stained	50-60'	0.8 ft/min
	circulation loss from 85' to 87', first groundwater	60-70'	2 ft/min

JOB NO.: 190-1496
PROJECT: Clear Lakes Grade WELL NO.: MW-2

INTERVAL (FT) below ground surface	LITHOLOGIC DESCRIPTION	DRILLING RATE Interval	Rate (ft/min)
		70-80'	5 ft/min
86.6	BASALT; moderately hard, very closely fractured, severely weathered, grey brown	80-90'	1 ft/min
92	BASALT; orange brown, soft, severely weathered to decomposed, highly fractured	90-100'	3.5 ft/min
		100-105'	1.2 ft/min
105	BASALT; grey brown, moderately hard, moderately weathered	105-110'	0.8 ft/min
	NOTE: gradual change to hard or very hard between 105' to 110'	110-117'	0.5 ft/min
	: open vertical joint or fracture from 117.5 to 123' filled with very soft, pale yellow to green claystone	117-120'	0.2 ft/min
124	BASALT; grey, hard, moderately weathered	120-130'	0.3 ft/min
133.3	BASALT; soft to moderately hard, brown, severely weathered	130-140'	1 ft/min
138	BASALT; black, hard, closely fractured, vesicular, slightly to moderately weathered	140-150'	1 ft/min
		150-160'	0.8 ft/min
		160-170'	0.7 ft/min
178	BASALT; brown to black, moderately hard, closely fractured, moderately weathered	170-180'	0.7 ft/min
185	Silty GRAVEL with Sand; saturated, nonplastic, subangular to rounded, fine grained, brown (GM/GP)	180-185'	1 ft/min
	NOTE: increase in groundwater below 185'	185-190'	5 ft/min
		190-200'	3 ft/min
		200-210'	3 ft/min
		210-220'	3 ft/min
		220-230'	5 ft/min
		230-240'	3 ft/min
245	Silty SAND with GRAVEL; saturated, nonplastic, subrounded to rounded, gravel is fine grained, brown (SM/SP)	240-250'	3 ft/min
		250-260'	3 ft/min
263	SANDSTONE; brown, moderately hard, fine to coarse grained, subangular to rounded	260-270'	1 ft/min
	NOTE: strong basalt component in sandstone between 272' & 297', fine sand and drilling fluids are black	270-280'	0.8 ft/min

JOB NO.: 190-1496
PROJECT: Clear Lakes Grade WELL NO.: MW-2

INTERVAL (FT) below ground surface	LITHOLOGIC DESCRIPTION	DRILLING RATE Interval	Rate (ft/min)
263	SANDSTONE; brown, moderately hard, fine to coarse grained, subangular to rounded	280-290'	0.5 ft/min
		290-300'	0.4 ft/min
	NOTE: coarsely fractured at 306', predominantly fine to medium grained with some coarse gravel or cobbles between 306' & 320', some interbedded lenses of fine sandstone	300-310'	0.25 ft/min
	: increase in formation water below 320'	310-320'	0.2 ft/min
320	Silty SAND with Gravel; saturated, nonplastic, poorly graded, subangular to rounded, brown (SP/SM)	320-330'	2 ft/min
		330-340'	2 ft/min
		340-350'	5 ft/min
		350-360'	3 ft/min
		360-370'	3.3 ft/min
		370-380'	1.5 ft/min
		380-390'	2.3 ft/min
400	Bottom of Hole	390-400'	2.4 ft/min

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

JOB NO: 190-1496
PROJECT: Clear Lakes Grade STATE: ID COUNTY: Gooding WELL NO.: MW-3S

LEGAL LOCATION: T9S R15E S6 TRACTNW 1/4 NW 1/4 DESCRIPTIVE LOCATION: See Text

DATE STARTED: 4-2-91 DATE COMPLETED: 4-3-91 DRILLING COMPANY/ DRILLER: Walker Water System/F. Walker LOGGED BY: P. Spillers

DRILLING METHOD: Air Rotary BOREHOLE DIAMETER (In): 8" DRILL FLUIDS USED: Water & Quick Foam

TOTAL DEPTH DRILLED (ft): 115 TOTAL DEPTH CASED (ft): 114.3 INTERVAL PERFORATED OR SCREENED (ft): from: 89.2 to: 108.6 DIAMETER OF CASING: 4" PVC TYPE OF CASING:

METHOD OF PERFORATION:
___ Open Hole
___ Open Bottom
___ Saw Slotted
X Factory 0.02" (size)
___ OTHER (specify)

DURING WELL CONSTRUCTION WAS/WERE:

	YES	NO
WELL DEVELOPED		X
WELL PUMPED		X
WATER SAMPLES COLLECTED		X
MATERIAL SAMPLES COLLECTED	X	

ANNULAR COMPLETION CHARACTERISTICS
WELL PROTECTOR: Length 36" Diam. 6"
LOCK NO.: Dolphin

SURFACE SEAL: Type: concrete from: 0 to: 5
BACKFILL: Material: Bentonite from: 5 to: 75
FILTER PACK: Type: Sand from: 75 to: 115

STATIC WATER LEVEL FT: 90.4' MEASURING POINT DATE: 4-3-91 DESCRIPTION/ ELEVATION FT: top of PVC MEASURING POINT RELATIVE TO GROUND SURFACE (+/-): +0.93

REMARKS:

DRILLING RATE

INTERVAL (FT) below ground surface	LITHOLOGIC DESCRIPTION	Interval	Rate (ft/min)
0	TOPSOIL, Silty CLAY; sod, organics	0-10'	0.7 ft/min
0.5	Silty SAND; moist, medium dense, slightly plastic, fine grained, light brown, (SM)	10-20'	0.8 ft/min
1.7	BASALT; dark grey, moderately hard, moderately closely jointed or fractured, moderately weathered, vesicular	20-30'	1 ft/min
	NOTE: closely fractured between 19.5' & 25'	30-40'	1 ft/min
	NOTE: moderately hard to hard between 40 & 62.5', vesicles decrease	40-50'	0.5 ft/min
62.5	BASALT; dark grey to brown, moderately hard, moderately closely fractured, moderately to severely weathered	50-60'	0.8 ft/min
	NOTE: predominately dark grey below 72.4', closely fractured	60-70'	0.8 ft/min
	: occasional light brown clay in fractures below 85', first groundwater	70-80'	0.9 ft/min
		80-90'	0.8 ft/min

JOB NO.: 190-1496
PROJECT: Clear Lakes Grade

WELL NO.: MW-3S

INTERVAL (FT) below ground surface	LITHOLOGIC DESCRIPTION	DRILLING RATE Interval	Rate (ft/min)
95'	BASALT; grey to brown, soft, very closely fractured, severely weathered to decomposed, vesicular. NOTE: local zones of brown clayey soil, first groundwater	90-100'	1.4 ft/min
115	Bottom of Hole	100-115'	2.8 ft/min

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

JOB NO: 190-1496
PROJECT: Clear Lakes Grade STATE: ID COUNTY: Gooding WELL NO.: MW-3D

LEGAL LOCATION: T9S R15E S6 TRACT NW 1/4 NW 1/4 DESCRIPTIVE LOCATION: See Text

DATE STARTED: 4-3-91 DATE COMPLETED: 4-4-91 DRILLING COMPANY/ DRILLER: Walker Water System/F. Walker LOGGED BY: P. Spillers

DRILLING METHOD: Air Rotary BOREHOLE DIAMETER (In): 8" DRILL FLUIDS USED: Water & Quick Foam

TOTAL DEPTH DRILLED (ft): 220 TOTAL DEPTH CASED (ft): 218 INTERVAL PERFORATED OR SCREENED (ft): from: 192.9 to: 212.3 DIAMETER OF CASING: 4" PVC TYPE OF CASING:

METHOD OF PERFORATION:
- ___ Open Hole
- ___ Open Bottom
- ___ Saw Slotted
- X Factory 0.02" (size)
- ___ OTHER (specify) ___

DURING WELL CONSTRUCTION WAS/WERE:

	YES	NO
WELL DEVELOPED	___	X
WELL PUMPED	___	X
WATER SAMPLES COLLECTED	___	X
MATERIAL SAMPLES COLLECTED	X	___

ANNULAR COMPLETION CHARACTERISTICS
WELL PROTECTOR: Length 36" Diam. 6"
LOCK NO.: Dolphin
SURFACE SEAL: Type: concrete from: 0 to: 6'
BACKFILL: Material: Bentonite from: 6' to: 173'
FILTER PACK: Type: Sand from: 173' to: 218'

STATIC WATER LEVEL FT: 89.0' MEASURING POINT DATE: 4-4-91 DESCRIPTION/ ELEVATION FT: top of PVC MEASURING POINT RELATIVE TO GROUND SURFACE (+/-): +0.96

REMARKS:

DRILLING RATE

INTERVAL (FT) below ground surface	LITHOLOGIC DESCRIPTION	Interval	Rate (ft/min)
0	Silty SAND; slightly moist, dense, nonplastic, trace of fine gravel, light brown (SM)	0-10'	0.6 ft/min
2	BASALT; dark grey, moderately hard, moderately closely fractured, moderately to severely weathered	10-20'	0.8 ft/min
	NOTE: soil fills fractures to 15', moderately hard below 15'	20-30'	0.8 ft/min
	: fractured zone at 7.9' to 8.2'	30-40'	0.8 ft/min
	: closely fractured, soft between 20.8' & 23.7'	40-50'	0.5 ft/min
	: moderately hard to hard between 40' & 50.4'	50-60'	0.8 ft/min
	: soft below 87'	60-70'	0.9 ft/min
		70-80'	0.9 ft/min
91.6	BASALT; brown to dark grey, very soft, very closely fractured, severely weathered (soil-like) to decomposed NOTE: numerous clay fragments in cuttings, first groundwater	80-90'	1 ft/min

JOB NO.: 190-1496
PROJECT: Clear Lakes Grade WELL NO.: MW-3D

INTERVAL (FT) below ground surface	LITHOLOGIC DESCRIPTION	DRILLING RATE Interval	Rate (ft/min)
		90-100'	2.9 ft/min
114	BASALT; reddish brown, very soft to soft, very closely fractured, severely weathered	100-110'	3.3 ft/min
		110-120'	2.3 ft/min
	NOTE: dark red to black below 130'	120-130'	2.5 ft/min
135	BASALT; dark grey to dark reddish brown, moderately hard, closely fractured, moderately to severely weathered, very vesicular	130-140'	1.8 ft/min
		140-150'	1.1 ft/min
158.2	BASALT; dark grey, moderately hard, closely to moderately closely fractured, moderately weathered NOTE: alternating moderately close layers of brown & black basalt below 158'	150-160'	1 ft/min
163	Brown BASALT	160-170'	0.9 ft/min
168.8	BASALT; dark brown & black, moderately hard, closely fractured, moderately to severely weathered, very vesicular	170-180'	1 ft/min
		180-190'	1.4 ft/min
	NOTE: soft, very closely fractured, below 194'	190-200'	1.4 ft/min
204	Silty SANDSTONE; light brown, soft, some basalt fragments	200-210'	2.5 ft/min
220	Bottom of Hole	210-220'	4 ft/min

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

JOB NO: 190-1496
PROJECT: Clear Lakes Grade STATE: ID COUNTY: Gooding WELL NO.: MW-4S

LEGAL LOCATION: T9S R14E S1 TRACTNE 1/4 NE 1/4 DESCRIPTIVE LOCATION: See Text

DATE STARTED: 3-27-91 DATE COMPLETED: 4-1-91 DRILLING COMPANY/ DRILLER: Walker Water System/F. Walker LOGGED BY: P. Spillers

DRILLING METHOD: Air Rotary BOREHOLE DIAMETER (In): 8" DRILL FLUIDS USED: Water & Quick Foam

TOTAL DEPTH DRILLED (ft): 110 TOTAL DEPTH CASED (ft): 110 INTERVAL PERFORATED OR SCREENED (ft): from: 84.6 to: 104.3 DIAMETER OF CASING: 4" PVC TYPE OF CASING:

METHOD OF PERFORATION:
___ Open Hole
___ Open Bottom
___ Saw Slotted
X Factory 0.02" (size)
___ OTHER (specify)

DURING WELL CONSTRUCTION WAS/WERE:

	YES	NO
WELL DEVELOPED	X	
WELL PUMPED		X
WATER SAMPLES COLLECTED		X
MATERIAL SAMPLES COLLECTED	X	

ANNULAR COMPLETION CHARACTERISTICS
WELL PROTECTOR: Length 36" Diam. 6"
LOCK NO.: Dolphin

SURFACE SEAL: Type: concrete from: 0 to: 7'
BACKFILL: Material: Bentonite from: 7' to: 73'
FILTER PACK: Type: Sand from: 73' to: 110'

STATIC WATER LEVEL FT: 81.6' MEASURING POINT DATE: 4-1-91 DESCRIPTION/ ELEVATION FT: top of PVC MEASURING POINT RELATIVE TO GROUND SURFACE (+/-): +1.29

REMARKS:

DRILLING RATE

INTERVAL (FT) below ground surface	LITHOLOGIC DESCRIPTION	Interval	Rate (ft/min)
0	TOPSOIL, Silty SAND; sod, organics	0-5'	.7 ft/min
1	Silty SAND; moist, medium dense, fine grained, slightly plastic, light brown (SM)	5-10'	.8 ft/min
2.6	BASALT; dark grey, soft, moderately closely fractured, moderately weathered, vesicular	10-15'	.6 ft/min
	NOTE: clayey cuttings, brown clay fills some fractures to 20'	15-20'	.7 ft/min
	: fracture zone at 22.2'	20-30'	.7 ft/min
22.2	BASALT; dark grey, hard, moderately closely fractured, moderately weathered, vesicular	30-40'	1.2 ft/min
	NOTE: some closely spaced, open fractures between 36.1' & 38', loss of circulation between 38' & 90'	40-50'	1 ft/min
57.1	BASALT; brown, very closely fractured, severely weathered with clay filling, soft	50-60'	1.2 ft/min
		60-70'	5 ft/min

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

JOB NO.: 190-1496
PROJECT: Clear Lakes Grade

WELL NO.: MW-4S

INTERVAL (FT) below ground surface	LITHOLOGIC DESCRIPTION	DRILLING RATE Interval	DRILLING RATE Rate (ft/min)
57.1	BASALT; brown, very closely fractured, severely weathered with clay filling, soft	70-80'	2.2 ft/min
		80-90'	1.8 ft/min
		90-100'	3 ft/min
110	Bottom of Hole	100-110'	2 ft/min

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

JOB NO: 190-1496
PROJECT: Clear Lakes Grade STATE: ID COUNTY: Gooding WELL NO.: MW-4D

LEGAL LOCATION: T9S R14E S1 TRACTNE 1/4 NE 1/4 DESCRIPTIVE LOCATION: See Text

DATE STARTED: 3-29-91 DATE COMPLETED: 4-2-91 DRILLING COMPANY/ DRILLER: Walker Water System/F. Walker LOGGED BY: P. Spillers

DRILLING METHOD: Air Rotary BOREHOLE DIAMETER (In): 8" DRILL FLUIDS USED: Water & Quick Foam

TOTAL DEPTH DRILLED (ft): 250 TOTAL DEPTH CASED (ft): 207.5 INTERVAL PERFORATED OR SCREENED (ft): from: 182.4 to: 201.8 DIAMETER OF CASING: 4" PVC TYPE OF CASING:

METHOD OF PERFORATION:
___ Open Hole
___ Open Bottom
___ Saw Slotted
X Factory 0.02" (size)
___ OTHER (specify) ____

DURING WELL CONSTRUCTION WAS/WERE:

	YES	NO
WELL DEVELOPED	X	
WELL PUMPED		X
WATER SAMPLES COLLECTED		X
MATERIAL SAMPLES COLLECTED	X	

ANNULAR COMPLETION CHARACTERISTICS
WELL PROTECTOR: Length 36" Diam. 6"
LOCK NO.: Dolphin
SURFACE SEAL: Type: concrete from: 0 to: 5'
BACKFILL: Material: Bentonite from: 5' to: 168'
FILTER PACK: Type: Sand from: 168' to: 207.5'

STATIC WATER LEVEL FT: 179.5 MEASURING POINT DATE: 4-1-91 DESCRIPTION/ ELEVATION FT: top of PVC MEASURING POINT RELATIVE TO GROUND SURFACE (+/-): +0.97

REMARKS:

DRILLING RATE

INTERVAL (FT) below ground surface	LITHOLOGIC DESCRIPTION	Interval	Rate (ft/min)
0 - 0.5	TOPSOIL, sod, organics, Silty SAND	0-2.4	
0.5	Silty to Clayey SAND; moist, slightly plastic, fine grained, some fine gravel, tan (SC/SM)	2.4-5.0'	0.5 ft/min
2.4	BASALT; dark grey to black, moderately hard to soft, moderately closely fractured, moderately weathered, vesicular	5-10'	0.6 ft/min
	NOTE: clay filled fractures to 15'	10-15'	0.3 ft/min
	: hard between 40' & 46.4'	15-20'	0.3 ft/min
	: highly fractured at 60.2	20-30'	0.5 ft/min
		30-40'	0.4 ft/min
		40-50'	0.3 ft/min
		50-60'	0.4 ft/min

JOB NO.: 190-1496
PROJECT: Clear Lakes Grade WELL NO.: MW-4D

INTERVAL (FT) below ground surface	LITHOLOGIC DESCRIPTION	DRILLING RATE Interval	Rate (ft/min)
64	BASALT; dark brown, moderately hard, very closely fractured-filled with claystone, severely weathered, vesicular	60-70'	1.5 ft/min
		70-80'	2.2 ft/min
83.4	BASALT; brown, severely weathered, soft, very closely fractured	80-90'	1.8 ft/min
	NOTE: open fracture from 99.5' to 100', first groundwater at 90'	90-100'	5.3 ft/min
108.3	BASALT; dark grey, moderately hard, moderately fractured, moderately weathered	100-110'	2 ft/min
	NOTE: contains groundwater	110-120'	0.9 ft/min
	NOTE: hard below 130', some claystone filled fractures	120-130'	0.7 ft/min
	: closely fractured or jointed below 133'	130-140'	0.4 ft/min
		140-150'	0.4 ft/min
		150-160'	0.5 ft/min
	: clay lens at 173', low to medium PI, dark grey	160-170'	0.5 ft/min
		170-180'	0.6 ft/min
181	Poorly Graded GRAVEL with Sand; dense, saturated, nonplastic, predominately fine grained, subrounded, brown to black (GP/GM)	180-190'	2.2 ft/min
		190-200'	4.2 ft/min
195	Poorly Graded SAND with Gravel; dense, saturated, nonplastic, predominately well graded, subrounded, brown (SP/SM)	200-210'	5 ft/min
		210-220'	4.3 ft/min
		220-230'	4.6 ft/min
		230-240'	3.3 ft/min
250	Bottom of Hole	240-250'	3.5 ft/min

APPENDIX B

Analytical Reports and Chain-of-Custody Forms
Water Sampling Procedures

Prior to sampling, wells were developed using a mechanical bailer until the water was relatively clear or at least three bore volumes. Samples were then obtained using a stainless steel bailer. Water samples from springs were collected directly from the stream near the point of discharge of measurement stations.

Pre-cleaned 500 milliliter (ml) bottles with tight fitting lids were filled for laboratory analysis of cation/anion balance. Samples were kept cool with ice packs following collection and during shipment to the laboratory. Samples were also analyzed in the field for temperature, pH, and specific conductance.

All samples remained in the custody of Chen-Northern field personnel until shipment to the laboratory. Time and date of sample collection, sample identification numbers, custody personnel, and time and date received by the lab were transcribed on the chain-of-custody forms for each sample. All sample containers were transferred directly to the laboratory by overnight courier.

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BILLINGS, MT 59107
(406) 248-9161
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TECHNICAL REPORT

REPORT TO:

ATTN: MR. PAUL SPILLERS
CHEN-NORTHERN, INC.
P. O. BOX 7777
BOISE, ID 83707

DATE: May 6, 1991
JOB NUMBER: 87-933
SHEET: 1 **OF** 15
INVOICE NO.: 113849

REPORT OF: Water Analysis - Clear Lake Grade (190-1496)

Sample Identification:

On April 16, 1991, these water samples (Lab Nos. 114392 - 114405) were received in our laboratory for analysis. Tests were conducted in accordance with the U.S. Environmental Protection Agency Manual EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes." The results of the analysis are shown on the following pages.

A < sign indicates less than the reported value was present in the sample.

Reviewed by

ba

Client Name: CHEN-NORTHERN, INC. BOISE, ID
Project No.: 87-933
Project Name: Water Analysis - Clear Lake Grade (190-1496)

May 6, 1991

Laboratory No.: 114392
Sample Name: MW-1S
Sample Date: 04/12/91
Collected by: Christopher Kaetzel
Time Sampled: 14:50:00

PARAMETER	AVERAGE VALUE		DATE ANALYZED
Anions:			
Chloride as Cl 35.45	29	mg/l	04/25/91
Fluoride as F 19.00	0.93	mg/l	04/24/91
Sulfate as SO4 48.10	41	mg/l	04/23/91
Total Alkalinity as CaCO3 50.00	258	mg/l	04/17/91
Cations:			
Calcium as Ca 20.04	51	mg/l	04/17/91
Magnesium as Mg 12.15	22	mg/l	04/17/91
Potassium as K 39.1	6.6	mg/l	04/25/91
Sodium as Na 22.99	46	mg/l	04/17/91
Nutrients:			
Nitrate + Nitrite as N 14.00	0.99	mg/l	04/19/91

Client Name: CHEN-NORTHERN, INC. BOISE, ID
Project No.: 87-933
Project Name: Water Analysis - Clear Lake Grade (87-933)

May 6, 1991

Laboratory No.: 114393
Sample Name: MW-1D
Sample Date: 04/12/91
Collected by: Christopher Kaetzel
Time Sampled: 15:15:00

PARAMETER	AVERAGE VALUE		DATE ANALYZED
Anions:			
Chloride as Cl	42	mg/l	04/25/91
Fluoride as F	0.49	mg/l	04/24/91
Sulfate as SO4	53	mg/l	04/23/91
Total Alkalinity as CaCO3	154	mg/l	04/17/91
Cations:			
Calcium as Ca	47	mg/l	04/17/91
Magnesium as Mg	17	mg/l	04/17/91
Potassium as K	7.5	mg/l	04/25/91
Sodium as Na	27	mg/l	04/17/91
Nutrients:			
Nitrate + Nitrite as N	1.47	mg/l	04/19/91

Client Name: CHEN-NORTHERN, INC. BOISE, ID
Project No.: 87-933
Project Name: Water Analysis - Clear Lake Grade (190-1496)

May 6, 1991

Laboratory No.: 114394
Sample Name: MW-2
Sample Date: 04/12/91
Collected by: Christopher Kaetzel
Time Sampled: 17:30:00

PARAMETER	AVERAGE VALUE		DATE ANALYZED
Anions:			
Chloride as Cl	55	mg/l	04/25/91
Fluoride as F	0.58	mg/l	04/24/91
Sulfate as SO4	67	mg/l	04/23/91
Total Alkalinity as CaCO3	186	mg/l	04/18/91
Cations:			
Calcium as Ca	24	mg/l	04/17/91
Magnesium as Mg	10	mg/l	04/17/91
Potassium as K	5.2	mg/l	04/25/91
Sodium as Na	108	mg/l	04/17/91
Nutrients:			
Nitrate + Nitrite as N	1.71	mg/l	04/19/91

Client Name: CHEN-NORTHERN, INC. BOISE, ID
Project No.: 87-933
Project Name: Water Analysis - Clear Lake Grade (190-1496)

Laboratory No.: 114395
Sample Name: MW-3S
Sample Date: 04/12/91
Collected by: Christopher Kaetzel
Time Sampled: 18:35:00

PARAMETER	AVERAGE VALUE		DATE ANALYZED
Anions:			
Chloride as Cl	40	mg/l	04/25/91
Fluoride as F	0.55	mg/l	04/24/91
Sulfate as SO4	44	mg/l	04/19/91
Total Alkalinity as CaCO3	198	mg/l	04/18/91
Cations:			
Calcium as Ca	51	mg/l	04/17/91
Magnesium as Mg	24	mg/l	04/17/91
Potassium as K	6.7	mg/l	04/25/91
Sodium as Na	35	mg/l	04/17/91
Nutrients:			
Nitrate + Nitrite as N	2.86	mg/l	04/19/91

Client Name: CHEN-NORTHERN, INC., BOISE, ID
Project No.: 87-933
Project Name: Water Analysis - Clear Lake Grade (190-1496)

Laboratory No.: 114396
Sample Name: MW-3D
Sample Date: 04/12/91
Collected by: Christopher Kaetzel
Time Sampled: 19:05:00

PARAMETER	AVERAGE VALUE		DATE ANALYZED
Anions:			
Chloride as Cl	40	mg/l	04/25/91
Fluoride as F	0.55	mg/l	04/24/91
Sulfate as SO4	269 49	mg/l	04/23/91
Total Alkalinity as CaCO3	179	mg/l	04/18/91
Cations:			
Calcium as Ca	56	mg/l	04/17/91
Magnesium as Mg	22	mg/l	04/17/91
Potassium as K	13.5 6.5	mg/l	04/25/91
Sodium as Na	29	mg/l	04/17/91
Nutrients:			
Nitrate + Nitrite as N	2.24	mg/l	04/19/91

Client Name: CHEN-NORTHERN, INC. BOISE, ID
Project No.: 87-933
Project Name: Water Analysis - Clear Lake Grade (190-1496)

Nay 6, 1991

Laboratory No.: 114397
Sample Name: MW-4S
Sample Date: 04/12/91
Collected by: Christopher Kaetzel
Time Sampled: 17:50:00

PARAMETER	AVERAGE VALUE		DATE ANALYZED
Anions:			
Chloride as Cl	27	mg/l	04/25/91
Fluoride as F	0.53	mg/l	04/24/91
Sulfate as SO4	57	mg/l	04/23/91
Total Alkalinity as CaCO3	246	mg/l	04/18/91
Cations:			
Calcium as Ca	60	mg/l	04/17/91
Magnesium as Mg	23	mg/l	04/17/91
Potassium as K	6.3	mg/l	04/25/91
Sodium as Na	46	mg/l	04/17/91
Nutrients:			
Nitrate + Nitrite as N	0.94	mg/l	04/19/91

Client Name: CHEN-NORTHERN, INC., BOISE, ID
Project No.: 87-933
Project Name: Water Analysis - Clear Lake Grade (190-1496)

May 6, 1991

Laboratory No.: 114398
Sample Name: MW-4D
Sample Date: 04/12/91
Collected by: Christopher Kaetzel
Time Sampled: 16:00:00

PARAMETER	AVERAGE VALUE		DATE ANALYZED
Anions:			
Chloride as Cl	38	mg/l	04/25/91
Fluoride as F	0.53	mg/l	04/24/91
Sulfate as SO4	40	mg/l	04/23/91
Total Alkalinity as CaCO3	159	mg/l	04/18/91
Cations:			
Calcium as Ca	45	mg/l	04/17/91
Magnesium as Mg	16	mg/l	04/17/91
Potassium as K	7.3	mg/l	04/25/91
Sodium as Na	33	mg/l	04/17/91
Nutrients:			
Nitrate + Nitrite as N	1.79	mg/l	04/19/91

Client Name: CHEN-NORTHERN, INC., BOISE, ID
Project No.: 87-933
Project Name: Water Analysis - Clear Lake Grade (190-1496)

May 6, 1991
Sheet 9 of 15

Laboratory No.: 114399
Sample Name: 1W
Sample Date: 04/12/91
Collected by: Christopher Kaetzel
Time Sampled: 20:25:00

PARAMETER	AVERAGE VALUE		DATE ANALYZED
Anions:			
Chloride as Cl	38	mg/l	04/25/91
Fluoride as F	0.53	mg/l	04/24/91
Sulfate as SO4	25	mg/l	04/23/91
Total Alkalinity as CaCO3	161	mg/l	04/18/91
Cations:			
Calcium as Ca	45	mg/l	04/17/91
Magnesium as Mg	19	mg/l	04/17/91
Potassium as K	4.3	mg/l	04/25/91
Sodium as Na	25	mg/l	04/17/91
Nutrients:			
Nitrate + Nitrite as N	1.44	mg/l	04/19/91

Client Name: CHEN-NORTHERN, INC., BOISE, ID
Project No.: 87-933
Project Name: Water Analysis - Clear Lake Grade (190-1496)

May 6, 1991

Laboratory No.: 114400
Sample Name: 2W UPPER
Sample Date: 04/12/91
Collected by: Christopher Kaetzel
Time Sampled: 20:20:00

PARAMETER	AVERAGE VALUE		DATE ANALYZED
Anions:			
Chloride as Cl	36	mg/l	04/25/91
Fluoride as F	0.78	mg/l	04/24/91
Sulfate as SO4	37	mg/l	04/23/91
Total Alkalinity as CaCO3	213	mg/l	04/18/91
Cations:			
Calcium as Ca	47	mg/l	04/17/91
Magnesium as Mg	26	mg/l	04/17/91
Potassium as K	4.6	mg/l	04/25/91
Sodium as Na	33	mg/l	04/17/91
Nutrients:			
Nitrate + Nitrite as N	1.17	mg/l	04/19/91

Client Name: CHEN-NORTHERN, INC., BOISE, ID
Project No.: 87-933
Project Name: Water Analysis - Clear Lake Grade (190-1496)

May 6, 1991

Laboratory No.: 114401
Sample Name: 3W
Sample Date: 04/12/91
Collected by: Christopher Kaetzel
Time Sampled: 20:20:00

PARAMETER	AVERAGE VALUE		DATE ANALYZED
Anions:			
Chloride as Cl	40	mg/l	04/25/91
Fluoride as F	0.53	mg/l	04/24/91
Sulfate as SO4	40	mg/l	04/23/91
Total Alkalinity as CaCO3	164	mg/l	04/18/91
Cations:			
Calcium as Ca	45	mg/l	04/17/91
Magnesium as Mg	19	mg/l	04/17/91
Potassium as K	4.6	mg/l	04/25/91
Sodium as Na	25	mg/l	04/17/91
Nutrients:			
Nitrate + Nitrite as N	1.41	mg/l	04/19/91

Client Name: CHEN-NORTHERN, INC., BOISE, ID
Project No.: 87-933
Project Name: Water Analysis - Clear Lake Grade (190-1496)

May 6, 1991

Laboratory No.: 114402
Sample Name: 4W
Sample Date: 04/12/91
Collected by: Christopher Kaetzel
Time Sampled: 20:10:00

PARAMETER	AVERAGE VALUE		DATE ANALYZED
Anions:			
Chloride as Cl	40	mg/l	04/25/91
Fluoride as F	0.53	mg/l	04/24/91
Sulfate as SO4	47	mg/l	04/23/91
Total Alkalinity as CaCO3	161	mg/l	04/18/91
Cations:			
Calcium as Ca	54	mg/l	04/17/91
Magnesium as Mg	21	mg/l	04/17/91
Potassium as K	4.4	mg/l	04/25/91
Sodium as Na	30	mg/l	04/17/91
Nutrients:			
Nitrate + Nitrite as N	1.37	mg/l	04/19/91

Client Name: CHEN-NORTHERN, INC., BOISE, ID
Project No.: 87-933
Project Name: Water Analysis - Clear Lake Grade (190-1496)

May 6, 1991
Sheet 13 of 15

Laboratory No.: 114403
Sample Name: 5W
Sample Date: 04/12/91
Collected by: Christopher Kaetzel
Time Sampled: 20:00:00

PARAMETER	AVERAGE VALUE		DATE ANALYZED
Anions:			
Chloride as Cl	39	mg/l	04/25/91
Fluoride as F	0.58	mg/l	04/24/91
Sulfate as SO4	52	mg/l	04/23/91
Total Alkalinity as CaCO3	171	mg/l	04/18/91
Cations:			
Calcium as Ca	55	mg/l	04/17/91
Magnesium as Mg	21	mg/l	04/17/91
Potassium as K	4.3	mg/l	04/25/91
Sodium as Na	30	mg/l	04/17/91
Nutrients:			
Nitrate + Nitrite as N	1.30	mg/l	04/19/91

Client Name: CHEN-NORTHERN, INC., BOISE, ID
Project No.: 87-933
Project Name: Water Analysis - Clear Lake Grade (190-1496)

May 6, 1991
Sheet 14, Of 15

Laboratory No.: 114404
Sample Name: 6W
Sample Date: 04/12/91
Collected by: Christopher Kaetzel
Time Sampled: 20:00:00

PARAMETER	AVERAGE VALUE		DATE ANALYZED
Anions:			
Chloride as Cl	37	mg/l	04/25/91
Fluoride as F	0.55	mg/l	04/24/91
Sulfate as SO4	52	mg/l	04/23/91
Total Alkalinity as CaCO3	159	mg/l	04/18/91
Cations:			
Calcium as Ca	53	mg/l	04/17/91
Magnesium as Mg	21	mg/l	04/17/91
Potassium as K	4.3	mg/l	04/25/91
Sodium as Na	29	mg/l	04/17/91
Nutrients:			
Nitrate + Nitrite as N	1.31	mg/l	04/19/91

Client Name: CHEN-NORTHERN, INC., BOISE, ID
Project No.: 87-933
Project Name: Water Analysis - Clear Lake Grade (190-1496)

May 6, 1991

Laboratory No.: 114405
Sample Name: 7W
Sample Date: 04/12/91
Collected by: Christopher Kaetzel
Time Sampled: 20:00:00

PARAMETER	AVERAGE VALUE		DATE ANALYZED
Anions:			
Chloride as Cl	38	mg/l	04/25/91
Fluoride as F	0.58	mg/l	04/24/91
Total Alkalinity as CaCO3	166	mg/l	04/18/91
Sulfate as SO_4	46	mg/l	04/23/91
Cations:			
Calcium as Ca	53	mg/l	04/17/91
Magnesium as Mg	21	mg/l	04/17/91
Potassium as K	4.4	mg/l	04/25/91
Sodium as Na	29	mg/l	04/17/91
Nutrients:			
Nitrate + Nitrite as N	1.30	mg/l	04/19/91

Chen Northern, Inc. CHAIN OF CUSTODY RECORD

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☐ OTHER

Proj. No. 190-1491a

Project Name: Elmo Lakes Study

Samplers: (Signature) C Kurtz Paul Gallus

Sta. No.	Date	Time			Station Location	No. of Containers	Grab	Composite					Remarks
MW-1S	4-12-91	14	5	0		1	X						
MW-1D		15	1	5		1	X						
MW-2		17	3	0		1	X						
MW-3S		18	3	5		1	X						
MW-3D		19	0	5		1	X						
MW-4S		17	5	0		1	X						
MW-4D		16	0	0		1	X						
DW-B		19	2	0	Madeline Homestead well	1	X						Not Sent
DW-A		19	3	0	Madeline Domestic well	1	X						Not Sent
DW-C		19	4	5	Bernice Domestic well	1	X						Not Sent
1W		20	2	5	Well #1	1	X						
2W upper		20	2	0	Flow Pipe #2 (Upper)	1	X						
3W		20	2	0	Well #3	1	X						
4W		20	1	0	Well #4W	1	X						
5W		20	0	0	Flow Pipe #5	1	X						
6W		20	0	0	Flow Pipe #6	1	X						

Relinquished by: (Signature)	Date / Time	Rec'd by: (Signature)	Relinquished by: (Signature)	Date / Time	Rec'd by: (Signature)
Chuck Kurtz	4/15 1600	Fed Ex		4/16/91	CAT Lab Blgs L. Elmela
Relinquished by: (Signature)	Date / Time	Rec'd by: (Signature)	Relinquished by: (Signature)	Date / Time	Rec'd by: (Signature)
Relinquished by: (Signature)	Date / Time	Rec'd for laboratory by: (Signature)	Date / Time	Remarks	

White — Sample Office · Yellow — Lab Copy · Pink — Return to Sample Office with Lab Results

Chen Northern, Inc. CHAIN OF CUSTODY RECORD

Consulting Engineers & Scientists

☐ BILLINGS
600 SOUTH 25TH STREET
P. O. BOX 30615
BILLINGS, MT 59107
(406) 248-9161
FAX (406) 248-9282

☒ BOISE
370 BENJAMIN LANE
P. O. BOX 7777
BOISE, ID 83707
(208) 377-2100
FAX (208) 376-5349

☐ CASPER
605 N. WAREHOUSE ROAD
P. O. BOX 2599
CASPER, WY 82602
(307) 234-5126
FAX (307) 266-5143

☐ GREAT FALLS
528 SMELTER AVENUE
P. O. BOX 951
GREAT FALLS, MT 59403
(406) 453-1641
FAX (406) 727-2070

☐ HELENA
1610 B STREET
P. O. BOX 4699
HELENA, MT 59604
(406) 443-5210
FAX (406) 449-9729

☐ TRI-CITIES
2214 NORTH 4TH AVENUE
P. O. BOX 2601
TRI-CITIES, WA 99302
(509) 547-1671
FAX (509) 547-1673

☐ OTHER _____

Proj. No. 190 1496 Project Name Moon Lakes Grade Hydro

Samplers: (Signature) C Kotz

Sta. No.	Date	Time			Station Location	No. of Containers	Carbon Beam Column	Remarks
7 W	4 17	20	0	0	WELL #7	1	1	

Relinquished by: (Signature)	Date / Time	Rec'd by: (Signature)	Relinquished by: (Signature)	Date / Time	Rec'd by: (Signature)
Chuck Kotz	4.15 1600	[illegible]	[illegible]	4/16/91	[illegible]
Relinquished by: (Signature)	Date / Time	Rec'd by: (Signature)	Relinquished by: (Signature)	Date / Time	Rec'd by: (Signature)
Relinquished by: (Signature)	Date / Time	Rec'd for laboratory by: (Signature)	Date / Time	Remarks	

CAT Lab Olga

White — Sample Office Yellow — Lab Copy Pink — Return to Sample Office with Lab Results

APPENDIX C

Area Well Drillers Reports

Form 238-7
1/78

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

USE TYPEWRITER OR
BALLPOINT PEN

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 Mike Mallows

Address Wendell Ida

Owner's Permit No. _____

2. NATURE OF WORK

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

3. PROPOSED USE

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

4. METHOD DRILLED

☒ Rotary ☒ Air ☐ Hydraulic ☐ Reverse rotary
☐ Cable ☐ Dug ☐ Other _____

5. WELL CONSTRUCTION

Casing schedule: ☒ Steel ☐ Concrete ☐ Other _____

Thickness	Diameter	From	To
.219 inches	4 inches +	1 feet	19 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 19 Material used in seal: ☐ Cement grout ☐ Puddling clay ☒ Well cuttings
Sealing procedure used: ☐ Slurry pit ☐ Temp. surface casing ☒ Overbore to seal depth
Method of joining casing: ☐ Threaded ☐ Welded ☐ Solvent Weld ☐ Cemented between strata

7. WATER LEVEL

Static water level 45 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 _____

8. WELL TEST DATA

☐ Pump ☐ Bailer ☐ Air ☐ Other _____

Discharge G.P.M.	Pumping Level	Hours Pumped

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
8	0	4	Top Soil		
	4	19	Gray lava		
6	19	100	" "		
	100	105	Black Cinders		

☐ Abandoned (describe method of abandoning) _____

Discharge G.P.M.	Pumping Level	Hours Pumped

3. PROPOSED USE

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

4. METHOD DRILLED

☒ Rotary ☐ Air ☐ Hydraulic ☐ Reverse rotary
☐ Cable ☐ Dug ☐ Other _____

5. WELL CONSTRUCTION

Casing schedule: ☒ Steel ☐ Concrete ☐ Other _____

Thickness	Diameter	From	To
_____ inches	6 inches +	1 feet	15 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 19 Material used in seal: ☐ Cement grout ☐ Puddling clay ☒ Well cuttings
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 _____

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Wat Yes
8	0	4	Top Soil	
	4	19	Gray lava	
6	19	100	" "	
	100	105	Black Cinders	

10.

Work started July 15 finished July 16

6. LOCATION OF WELL

Sketch map location must agree with written location.

N / W / E / S

Subdivision Name _____
Lot No. _____ Block No. _____
County Minidoka
¼ ¼ Sec. 1, T. 9 N/S, R. 22 E/W

11. DRILLERS CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name C B Fatout Sons Firm No. _____
Address Rupert Idaho Date 7/16
Signed by (Firm Official) James Fatout
and
(Operator) [signature]

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 DRILLER'S REPORT

RECEIVED

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 John Madalena
Address Wendell Ida
Owner's Permit No.

2. NATURE OF WORK
☒ New well ☐ Deepened ☐ Replacement
☐ Abandoned (describe method of abandoning)

3. PROPOSED USE
☐ 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 16 inches Total depth 85 feet
Casing schedule: ☐ Steel ☐ Concrete

Thickness	Diameter	From	To
260 inches	16 inches	1 feet	19 feet
____ inches	____ inches	____ feet	____ 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 19 Material used in seal ☒ Cement grout ☐ Puddling clay ☐ Well cuttings
Sealing procedure used ☐ Slurry pit ☐ Temporary surface casing ☒ Overbore to seal depth

6. LOCATION OF WELL
Sketch map location must agree with written location.

36
Subdivision Name
Lot No. Block No.
County Gooding
SW ¼ SE ¼ Sec. 36 T. 6 ☐S, R. 14 ☒E W

7. WATER LEVEL
Static water level 70 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

8. WELL TEST DATA
☒ Pump ☐ Bailer ☐ Other

Discharge G.P.M.	Draw Down	Hours Pumped
No test		

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
16	0	4	Top Soil		✓
	4	25	Gray Lava		✓
	25	55	Red Lava		✓
	55	70	Gray Lava		✓
	70	85	Gray Lava Cracker	✓	

10.
Work started ____ finished March 2-16

11. DRILLER'S CERTIFICATION
Firm Name Gleaton & Sons
Firm No.
Address Wendell Ida Date
Signed by (Firm Official) James Gleaton
and (Operator) Ross Farley

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

3

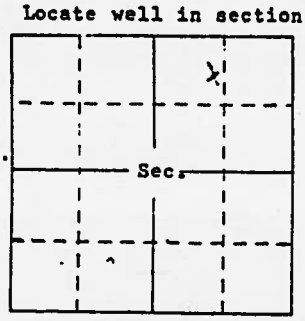
REPORT OF WELL DRILLER
State of Idaho

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

WELL OWNER:
Name Blick,
Address WENDELL

Owner's Permit No.
NATURE OF WORK (check): Replacement well ☐
New well ☒ Deepened ☐ Abandoned ☐
Water is to be used for: Irrigation
METHOD OF CONSTRUCTION: Rotary ☐ Cable ☒
Dug ☐ Other (explain)
CASING SCHEDULE: Threaded __ Welded ✓
"Diam. from ft. to ft.
"Diam. from ft. to ft.
"Diam. from ft. to ft.
"Diam. from ft. to ft.
Thickness of casing: Material:
Steel ☒ concrete ☐ wood ☐ other ☐
(explain)
PERFORATED? Yes ☒ No ☐ Type of perforator used:
Size of perforations: " by "
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
WAS SCREEN INSTALLED? Yes ☐ No ☐
Manufacturer's name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.
CONSTRUCTION: Well gravel packed? Yes ☐
No. ☐ size of gravel Gravel placed from ft. to ft. Surface seal provided? Yes ☐ No ☐ To what depth?
ft. Material used in seal:
Did any strata contain unusable water? Yes ☐
No. ☐ Type of water:
Depth of strata ft. Method of sealing strata off:
Surface casing used? Yes ☐ No. ☐
Cemented in place? Yes ☐ No ☐

Locate well in section



LOCATION OF WELL: County
NW¼ NE¼ Sec. 36 T. 5S R. 14 E/W

Size of drilled hole: Total depth of well: Standing water level below ground: Temp. Fahr. * Test delivery: gpm or cfs Pump? ☐ Bail ☐
Size of pump and motor used to make test:
Length of time of test: Hrs. Min.
Drawdown: ft. Artesian pressure: ft. above land surface Give flow cfs or gpm. Shutoff pressure:
Controlled by: Valve ☐ Cap ☐ Plug ☐
No control ☐ Does well leak around casing?
Yes ☐ No ☐

DEPTH FROM FEET	DEPTH TO FEET	MATERIAL	WATER YES OR NO
0'	3'	Top soil	
3	32	Gray lava	
32	55	Yo-dein lava	
55	76	Cinder + loose lava	
76	96	Gray lava	
96	98	Packed lava, some salt & water	
		water, 1st at 65 ft	
		Return at 65 ft	
		Put 12" casing	
		15 ft perforations	
		16" hole to 76 ft	
		12" hole from 76 ft to 98 feet	
			yes

Work started:
Work finished:
Well Driller's Statement: This well was drilled under my supervision and this report is true to the best of my knowledge.
Name: [illegible]
Address: W ENDELL, IDA
Signed by:
License No. 21 Date: 5-25-70

Use other side for additional remarks

RECEIVED
MAY 17 1967
Department of Reclamation

REPORT OF WELL DRILLER
State of Idaho

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

WELL OWNER:
Name W. A. Strickland
Address Wendell

Owner's Permit No. [illegible]
NATURE OF WORK (check): Replacement well ☐
New well ☒ Deepened ☐ Abandoned ☐
Water is to be used for: Irrigation

METHOD OF CONSTRUCTION: Rotary ☐ Cable ☒
Dug ☐ Other ☐ (explain)

CASING SCHEDULE: Threaded — Welded —
16 "Diam. from 0 ft. to 10 ft.
"Diam. from ft. to ft.
"Diam. from ft. to ft.
"Diam. from ft. to ft.
Thickness of casing: .[illegible] Material:
Steel ☐ concrete ☐ wood ☐ other ☐

(explain)
PERFORATED? Yes ☐ No ☒ Type of perforator used:

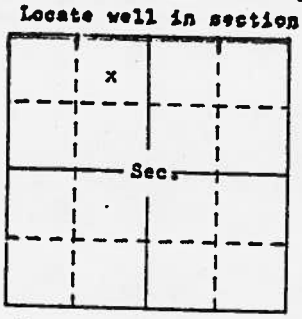
Size of perforations: " by "
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
WAS SCREEN INSTALLED? Yes ☐ No ☐
Manufacturer's name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

CONSTRUCTION: Well gravel packed? Yes ☐
No. ☐ size of gravel Gravel placed from ft. to ft. Surface seal provided? Yes ☒ No ☐ To what depth? ft. Material used in seal:
Cement base around well

Did any strata contain unusable water? Yes ☐
No. ☒ Type of water:
Depth of strata ft. Method of sealing strata off:

Surface casing used? Yes ☒ No. ☐
Cemented in place? Yes ☐ No ☐

Locate well in section



LOCATION OF WELL: County [illegible]
[illegible] ¼ [illegible] ¼ Sec. 31 T. 8 N/S R. 1 E/W

Use other side for additional remarks

Size of drilled hole: 16" Total depth of well: 60 ft. Standing water level below ground: 59 ft. Temp. Fahr. ° Test delivery: 4[illegible] 675 gpm or cfs Pump? ☒ Bail ☐
Size of pump and motor used to make test: Not tested 6" Turbine
Length of time of test: Few Hrs. Min.
Drawdown: [illegible] ft. Artesian pressure: ft. above land surface Give flow cfs or gpm. Shutoff pressure:
Controlled by: Valve ☐ Cap ☐ Plug ☐
No control ☒ Does well leak around casing?
Yes ☐ No ☒

DEPTH FROM FEET	DEPTH TO FEET	MATERIAL	WATER YES OR NO
0	2	top soil	no
2	14	grey lava	"
14	25	black cinders	"
25	41	brown lava	"
41	[illegible]	grey lava	"
[illegible]	55	lava cutting	yes
55	60	cinders	"

Work started: July 1961
Work finished: July 1961
Well Driller's Statement: This well was drilled under my supervision and this report is true to the best of my knowledge.
Name: C. B. Erickson - Contr.
Address: Wendell
Signed by C. B. Erickson
License No. 21 Date: 5-14-62

USGS

USE TYPEWRITER OR BALL POINT PEN

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.

Department of Water Resources
Southern District Office

1. WELL OWNER

Name North Side Canal Company

Address Jerome, Idaho

Owner's Permit No.

2. NATURE OF WORK

☒ New well ☐ Deepened ☐ Replacement

☐ Abandoned (describe method of abandoning)

3. PROPOSED USE

☒ 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 6 inches Total depth 98 feet

Casing schedule: ☒ Steel ☐ Concrete

Thickness	Diameter	From	To
.250 inches	6 5/8OD inches	+1 feet	-19'8" feet
inches	inches	feet	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

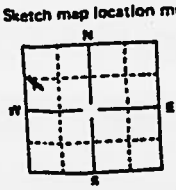
Placed from feet to feet

Surface seal depth 18 Material used in seal ☒ Cement grout ☐ Puddling clay ☐ Well cuttings

Seeling procedure used ☐ Slurry pit ☐ Temporary surface casing ☒ Overbore to seal depth

6. LOCATION OF WELL

Sketch map location must agree with written location.



Subdivision Name

Lot No. 2 Block No.

County Gooding

SW ¼ NW ¼ Sec. 31 T. 8S N/S, R. 15EBM E/W

7. WATER LEVEL

Static water level 62 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

8. WELL TEST DATA NONE

☐ Pump ☐ Bailer ☐ Other

Discharge G.P.M.	Draw Down	Hours Pumped

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
8	0	1	Top Soil		X
	1	4	Broken Gray Basalt		
	4	12	Hard Gray Basalt		
	12	16	Med Hard Brown Basalt		
8/6	16	32	Hard Gray Basalt		
	32	41	Hard Gray Basalt w/small breaks		
	41	43	Very Hard Gray Basalt		
	43	45	Med Hard Gray Basalt w/sm. breaks		
	45	49	Hard Gray Basalt		
	49	60	Hard Gray Basalt w/small breaks	X	
	60	65	Hard Gray Basalt /large breaks	X	
	65	80	Med Hard Grayish Brown Basalt	X	
	80	89	Hard Gray Basalt		X
	89	95	Hard Gray Basalt /sm. breaks	X	
	95	98	Hard Gray Basalt/lg. breaks	X	

10.

Work started 10/8/76 finished 10/9/76

11. DRILLERS CERTIFICATION

Firm Name SMITH DRILLING & PUMP CO., INC. Firm No. 11

Address 328 West Avenue A Date 10/11/76

Signed by (Firm Official)

and

(Operator) Lee A. Rhea II

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

Form 238-7
1/78

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

USE TYPEWRITER OR BALLPOINT PEN

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 Neil Ambrose

Address Wendell

Owner's Permit No. _____

2. NATURE OF WORK

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

3. PROPOSED USE

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

4. METHOD DRILLED

☒ Rotary ☒ Air ☐ Hydraulic ☐ Reverse rotary
☐ Cable ☐ Dug ☐ Other _____

5. WELL CONSTRUCTION

Casing schedule: ☒ Steel ☐ Concrete ☐ Other _____

Thickness	Diameter	From	To
.250 Inches	6 Inches	+ 1 feet	19 feet
_____ Inches	_____ Inches	_____ feet	_____ feet
_____ Inches	_____ Inches	_____ feet	_____ feet
_____ Inches	_____ Inches	_____ feet	_____ feet

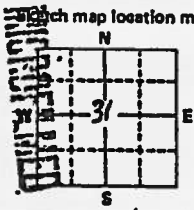
Was casing drive shoe used? ☐ Yes ☒ No
Was a packer or seal used? ☐ Yes ☒ No
Perforated? ☐ Yes ☒ No
How perforated? ☐ Factory ☐ Knife ☐ Torch
Size of perforation _____ inches by _____ inches

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 19 Material used in seal: ☐ Cement grout ☐ Puddling clay ☒ Well cuttings
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 _____

6. LOCATION OF WELL

Sketch map location must agree with written location. 36



Subdivision Name _____
Lot No. _____ Block No. _____
County Gooding
NW ¼ NW ¼ Sec. 31, T. 8 ☐S, R. 15 ☒E, B.M.

7. WATER LEVEL

Static water level 62 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 _____

8. WELL TEST DATA

☐ Pump ☐ Bailer ☐ Air ☐ Other _____

Discharge G.P.M.	Pumping Level	Hours Pumped

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
6	0	3	top Soil		✓
	3	19	Gray lava		✓
6	19	91	Gray lava	✓	
	91	105	Black Cinders	✓	

RECEIVED
MAY 01 1978
Department of Water Resources

10.

Work started 5-23 finished 5-23

11. DRILLERS CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name C B Eaton Firm No. 26
Address Wendell Date 5-25-78
Signed by (Firm Official) James Eaton
and
(Operator) [signature]

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

Form 238-7
1/78

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

Name Leonard Fleming

Address Wendell

Owner's Permit No. _____

2. NATURE OF WORK

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

3. PROPOSED USE

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

4. METHOD DRILLED

☒ Rotary ☒ Air ☐ Hydraulic ☐ Reverse rotary
☐ Cable ☐ Dug ☐ Other _____

5. WELL CONSTRUCTION

Casing schedule: ☒ Steel ☐ Concrete ☐ Other _____

Thickness	Diameter	From	To
.260 Inches	6 Inches +	1 feet	19 feet
_____ Inches	_____ Inches	_____ feet	_____ feet
_____ Inches	_____ Inches	_____ feet	_____ feet
_____ Inches	_____ Inches	_____ feet	_____ feet

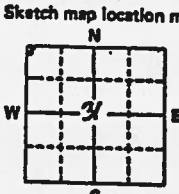
Was casing drive shoe used? ☐ Yes ☒ No
Was a packer or seal used? ☐ Yes ☒ No
Perforated? ☐ Yes ☒ No
How perforated? ☐ Factory ☐ Knife ☐ Torch
Size of perforation _____ inches by _____ inches

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 19 Material used in seal: ☐ Cement grout ☐ Puddling clay ☒ Well cuttings
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 _____

6. LOCATION OF WELL

Sketch map location must agree with written location.



Subdivision Name _____
Lot No. _____ Block No. _____
County Gooding
NW ¼ NW ¼ Sec. 31, T. 8 ☒S ☐N, R. 15 ☒E ☐W.

7. WATER LEVEL

Static water level 75 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 _____

8. WELL TEST DATA

☐ Pump ☐ Bailer ☐ Air ☐ Other _____

Discharge GPM	Pumping Level	Hours Pumped

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Department of Water Resources

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
8	0	3	top Soil		✓
	3	19	Gray lava		✓
6	19	58	Gray lava		✓
	58	116	No Returns	✓	

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JUL 5 1979
Department of Water Resources
Southern District Office

10.

Work started June 1 finished June 2

11. DRILLERS CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name C B Eaton Firm No. 24
Address Wendell Ida Date June 2
Signed by (Firm Official) James Eaton
and
(Operator) _____

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

Form 238-7
9-82

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

USE TYPEWRITER OR BALLPOINT PEN

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 Phil Blick

Name Northside Farms

Address PO Box 635 Castleford Id

Owner's Permit No. 36-89-5-009

2. NATURE OF WORK

☒ New well ☐ Deepened ☐ Replacement
☐ Abandoned (describe abandonment procedures such as materials, plug depths, etc. in lithologic log)

3. PROPOSED USE

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

4. METHOD DRILLED

☐ Rotary ☐ Air ☐ Hydraulic ☐ Reverse rotary
☒ Cable ☐ Dug ☐ Other _____

5. WELL CONSTRUCTION

Casing schedule: ☒ Steel ☐ Concrete ☐ Other _____

Thickness	Diameter	From	To
.250 inches	6" inches	+ 1 feet	20 feet
_____ inches	_____ inches	_____ feet	_____ feet
_____ inches	_____ inches	_____ feet	_____ feet
_____ inches	_____ inches	_____ feet	_____ feet

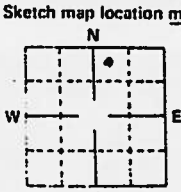
Was casing drive shoe used? ☐ Yes ☒ No
Was a packer or seal used? ☐ Yes ☒ No
Perforated? ☐ Yes ☒ No
How perforated? ☐ Factory ☐ Knife ☐ Torch
Size of perforation _____ inches by _____ inches

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 19 Material used in seal: ☒ Cement grout ☐ Bentonite ☐ Puddling clay ☒ Well Cuttings
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 Well Cap

6. LOCATION OF WELL

Sketch map location must agree with written location.



Subdivision Name _____
Lot No. _____ Block No. _____
County Gooding
¼ ¼ ¼ Sec. 31 T. 8 ☐N ☒S R. 15 ☐E ☒W.

7. WATER LEVEL

Static water level 70' 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 _____
Describe artesian or temperature zones below

8. WELL TEST DATA

☐ Pump ☒ Bailer ☐ Air ☐ Other _____

Discharge G.P.M.	Pumping Level	Hours Pumped

9. LITHOLOGIC LOG

Bore Diam.	Depth From	Depth To	Material	Water Yes	Water No
	0	3	Top Soil		
	3	5	White Talk Clay		
	5	32	Lava		
	32	39	Lava Stringers Cynders		
	39	45	Lava		
	45	60	Grey Rubble Hard		
	60	101	Lava Stringers Cynders	X	
	101	104	Cynders	X	

RECEIVED
JUL 31 1989
Department of Water Resources
Southern Region Office

10. Work started 3-28-89 finished 4-1-89

11. DRILLERS CERTIFICATION DL

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name B+B Drilling Firm No. 171
Address RT 1 Box 1, Id 83336 Date 5-30-89
Signed by (Firm Official) Jim Bartlett
and
(Operator) Jim Bartlett

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

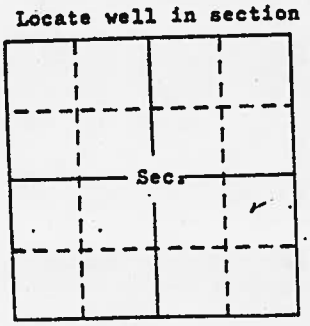
RECEIVED
APR 1
Department of Reclamation

REPORT OF WELL DRILLER
State of Idaho

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

WELL OWNER:
Name Frank Henslee
Address Hagerman, Idaho
Owner's Permit No. [illegible]
NATURE OF WORK (check): Replacement well ☐
New well ☐ Deepened ☒ Abandoned ☐
Water is to be used for: Irrigation
METHOD OF CONSTRUCTION: Rotary ☐ Cable ☒
Dug ☐ Other ☐ (explain)
CASING SCHEDULE: Threaded ☐ Welded ☐
"Diam. from ft. to ft.
"Diam. from ft. to ft.
"Diam. from ft. to ft.
"Diam. from ft. to ft.
Thickness of casing: Material:
Steel ☐ concrete ☐ wood ☐ other ☐
PERFORATED? Yes ☐ No ☐ Type of perforator used: (explain)
Size of perforations: " by "
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
WAS SCREEN INSTALLED? Yes ☐ No ☐
Manufacturer's name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.
CONSTRUCTION: Well gravel packed? Yes ☐ No. ☐ size of gravel Gravel placed from ft. to ft. Surface seal provided? Yes ☐ No ☐ To what depth? ft. Material used in seal:
Did any strata contain unusable water? Yes ☐ No. ☒ Type of water:
Depth of strata ft. Method of sealing strata off:
Surface casing used? Yes ☒ No. ☐
Cemented in place? Yes ☐ No ☐

Locate well in section



LOCATION OF WELL: County Gooding
[illegible] ¼ SE ¼ Sec. [illegible] T. [illegible] N/S R. 14E E/W

Size of drilled hole: 12"
depth of well: 300 ft. Standing water level below ground: 95 ft. Temp. Fahr.
Test delivery: gpm or cfs Pump? ☐ Bail ☒
Size of pump and motor used to make test:
Length of time of test: Hrs. Min.
Drawdown: ft. Artesian pressure: ft. above land surface Give flow cfs or gpm. Shutoff pressure:
Controlled by: Valve ☐ Cap ☐ Plug ☐
No control ☐ Does well leak around casing? Yes ☐ No ☐

DEPTH FROM FEET	DEPTH TO FEET	MATERIAL	WATER YES OR NO
155	160	Hard grey lava	
160	217	Black lava, layers of porous lava	
217	255	Hard grey lava	
255	271	Black hard lava	
271	240	Hard grey lava	
240	248	Brown silt	
248	288	Brown sand & gravel, picked up quite a bit of water.	
288	300	Brown sticky clay.	

Work started: Feb. 15, 1968
Work finished: March 1, 1968
Well Driller's Statement: This well was drilled under my supervision and this report is true to the best of my knowledge.
Name: Elmer Austin
Address: Hansen, Idaho
Signed by: Elmer Austin
License No. 73 Date: 3/11/68
Mack Gray Well Drilling

Use other side for additional remarks

USGS

37

Form 238-7
9/82

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

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.

USE TYPEWRITER OR BALLPOINT PEN

RECEIVED
FEB 6 1984
Department of Water Resources

1. WELL OWNER

Name Westley Friesen

Address Buhl

Owner's Permit No. _____

2. NATURE OF WORK

☒ New well ☐ Deepened ☐ Replacement
☐ Abandoned (describe abandonment procedures such as materials, plug depths, etc. in lithologic log)

3. PROPOSED USE

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

4. METHOD DRILLED

☒ Rotary ☒ Air ☐ Hydraulic ☐ Reverse rotary
☐ Cable ☐ Dug ☐ Other _____

5. WELL CONSTRUCTION

Casing schedule: ☒ Steel ☐ Concrete ☐ Other _____

Thickness	Diameter	From	To
250 inches	8 inches +	1 feet	143 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 143 Material used in seal: ☐ Cement grout ☐ Bentonite ☒ Puddling clay ☐ Cuttings
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 _____

6. LOCATION OF WELL

Sketch map location must agree with written location.

N / W / E / S

Subdivision Name Country Estates
Lot No. 9 Block No. _____
County Twin Falls
SW ¼ SE ¼ Sec. 1 T. 17 S R. 14 E W.

7. WATER LEVEL

Static water level 110 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 _____
Describe artesian or temperature zones below.

8. WELL TEST DATA

☐ Pump ☐ Bailer ☐ Air ☐ Other _____

Discharge G.P.M.	Pumping Level	Hours Pumped

9. LITHOLOGIC LOG

Bore Diam.	Depth From	Depth To	Material	Water Yes	Water No
18	0	40	Clay Pea Rock		✓
	40	93	Gravel Rock		✓
	93	143	Clay Pea Rock		✓
	143	155	Clay Gravel	✓	

RECEIVED
JAN 5 1984
Department of Water Resources
Southern Region Office

JAN 31 1984
Department of Water Resources
Southern Region Office

10. Work started Aug 15 finished Sept 8

11. DRILLERS CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time this was removed.

Firm Name C.B. Eaton Drlg Firm No. 26
Address Wendell Ida Date 11-14-83
Signed by (Firm Official) James Eaton
and
(Operator) James Eaton

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

Form 238-7
.78

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

USE TYPEWRITER OR BALLPOINT PEN

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 C G Dirty

Address Wendell

Owner's Permit No. _____

2. NATURE OF WORK

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

3. PROPOSED USE

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

4. METHOD DRILLED

☒ Rotary ☒ Air ☐ Hydraulic ☐ Reverse rotary
☐ Cable ☐ Dug ☐ Other _____

5. WELL CONSTRUCTION

Casing schedule: ☒ Steel ☐ Concrete ☐ Other _____

Thickness	Diameter	From	To
.156 inches	6 inches +	1 feet	15 feet
_____ inches	_____ inches	_____ feet	_____ feet
_____ inches	_____ inches	_____ feet	_____ feet
_____ inches	_____ inches	_____ feet	_____ feet

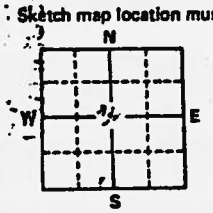
Was casing drive shoe used? ☐ Yes ☒ No
Was a packer or seal used? ☐ Yes ☒ No
Perforated? ☐ Yes ☒ No
How perforated? ☐ Factory ☐ Knife ☐ Torch
Size of perforation _____ inches by _____ inches

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 15' Material used in seal: ☐ Cement grout ☐ Puddling clay ☒ Well cuttings
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 _____

6. LOCATION OF WELL

Sketch map location must agree with written location. (36)



Subdivision Name _____
Lot No. _____ Block No. _____
County Gooding
¼ NE ¼ SW ¼ Sec. 36, T. 5 N/S, R. 14 E/W.

7. WATER LEVEL

Static water level 22 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 _____

8. WELL TEST DATA

☐ Pump ☐ Bailer ☐ Air ☐ Other _____

Discharge G.P.M.	Pumping Level	Hours Pumped

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
8	0	10	Top Soil		
	10	15	Clay Gravel		
6	15	90	Clay Gravel		
	90	130	No Returns	✓	

10.

Work started 6-3 finished 6-6

11. DRILLERS CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name C B Eaton Firm No. 26
Address Wendell Date 6-6-78
Signed by (Firm Official) _____
and
(Operator) _____

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

Rec. Aug 17, 1967

Well Log Form 1

WELL LOG AND REPORT TO THE STATE RECLAMATION ENGINEER OF IDAHO

SUBMIT WITHIN 30 DAYS AFTER COMPLETION OF WELL: SEE IDAHO STATUTES 42-238

Permit No. 23900 Well No. _____ County Gooding

Owner Frank , Madelene

Address Wendell, Idaho

Driller C. E. Eaton & Sons

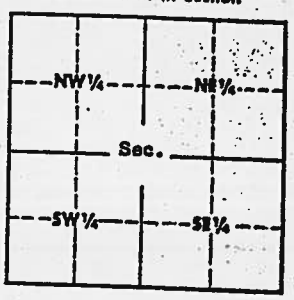
Address Wendell, Idaho

Well location SE ¼ SE ¼ Sec. 31, T. 8 S, R. 15 E/W

Size of drilled hole 12"

Total depth of well 97'

Locate well in section



Give depth to standing water from the ground _____ Water temp. _____ °Fahr.

Test delivery was 1500 g.p.m. or _____ c.f.s. Drawdown was _____ feet. Pump? X Bail? _____

Size of pump and motor used to make test 10 " turbine

Length of time of test 3 hrs. _____ 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 _____

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

Diameter, length and location of casing 70' x 12" from surface to 70'. (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.

Number and size of perforations _____ located _____ feet to _____ feet from ground

Date of commencement of well Spring of 1961 Date of completion of well Spring of 1961

SESE S.31 8S 15E

USGS

n2e2

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MAY 17 1967
Department of Reclamation

WELL LOG

From Feet	To Feet	Type of Material	Water-bearing Formation Ans. Yes or No	Casing Perforated Ans. Yes or No
0	4	Top soil		
4	32	Gray lava		
32	53	Brown lava		
53	65	Gray lava		
65	72	cinders	yes	
72	95	black coarse cuttings	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 complete, true and correct to the best of my knowledge and belief.

Signed C B Elton & Son.

By Earl L Nielsen

Dated 5-14, 1967

License No. 26

Well Driller's Helper

Entered in drillers book!

RECEIVED
JAN 2 - 1952
Department of Reclamation

WELL LOG AND REPORT TO THE STATE RECLAMATION ENGINEER OF IDAHO

Log No.
Rec.
Well No.
Permit No. 8 5 2 5 4

(DO NOT FILL IN)

Owner Ernest Weech (C. E. Weech) Address Wendell, Idaho

Driller C. B. Eaton & Sons Address Wendell, Idaho Lic. No. 26

Location of Well: [illegible] ¼ [illegible] ¼ Sec. 31, T. [illegible] N/S, R. [illegible] E/W, [illegible] County,

and [illegible] feet N/S, and [illegible] feet E/W from [illegible] Corner of [illegible] ¼ [illegible] ¼ Sec. [illegible]

Size of Drilled Hole 16 in. Total depth of Well 110 ft.

Give depth of standing water from surface 84 ft. Water Temp. [illegible] °Farenheit

On pumping test delivery was 900 g.p.m. or [illegible] c.f.s. Drawdown was no feet.

Size of pump and motor used to make the test 20 h.p. turbin pump

Length of time pumped during check was [illegible] hr., [illegible] minutes.

If flowing well, give flow in c.f.s. [illegible] or g.p.m. [illegible] and shut in pressure [illegible]

If flowing well, describe control works. [illegible]
(TYPE AND SIZE OF VALVE, ETC.)

Water will be used for irrigation Weight of casing per linear foot [illegible]

Thickness of casing 12 g. Casing material [illegible]
E.G., PIPE, CONCRETE, WOOD.

Diameter, length and location of casing 6 ft. surface pipe
(CASING 12" IN DIAMETER AND UNDER GIVE INSIDE DIAMETER; CASING OVER 12" IN DIAMETER GIVE OUTSIDE DIAMETER.)

Number and size of perforations [illegible] located [illegible] feet to [illegible] feet from surface of ground.

Other perforations [illegible]

Date of commencement of well [illegible] Date of completion of well September 1, 1951

Type of well rig Spudder

CASING RECORD

DIAM. CASING	FROM FEET	TO FEET	LENGTH	"REMARKS" -- SEALS, GROUTING, ETC.
54				

GENERAL INFORMATION—Pumping Test, Quality of Water, Etc.

SWSE S. 31 8S 15E

WELL LOG

From Feet	To Feet	Type of Material	Drilling Time Hrs.	Drilling Time Min.	Water-bearing Formation Ans. Yes or No	Casing Perforated Ans. Yes or No
1	6	surface pipe				
6	60	Gray lava				
60		Crevice				
60	90	Red lava				
90	110	Porous lava				
		Blue clay				
		If more space is required use Sheet No. 2				

WELL DRILLERS STATEMENT

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

Signed C. R. EATON & SONS

By Earl F. Nelson

Dated December 28, 1956

License No. 26

Form 238-2
7/78

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

WELL DRILLER'S REPORT

USE TYPEWRITER OR BALLPOINT PEN

968

Idaho 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: Bill Fleming
Address: Wendell
Owner's Permit No.

2. NATURE OF WORK
☒ New well ☐ Deepened ☐ Replacement
☐ Abandoned (describe method of abandoning)

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

4. METHOD DRILLED
☒ Rotary ☒ Air ☐ Hydraulic ☐ Reverse rotary
☐ Cable ☐ Dug ☐ Other

5. WELL CONSTRUCTION
Casing schedule: ☒ Steel ☐ Concrete ☐ Other

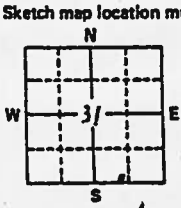
Thickness	Diameter	From	To
.260 inches	6 inches +	1 feet	19 feet
inches	inches	feet	feet
inches	inches	feet	feet
inches	inches	feet	feet

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 19 Material used in seal: ☐ Cement grout ☐ Puddling clay ☒ Well cuttings
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

6. LOCATION OF WELL
Sketch map location must agree with written location.



Subdivision Name
Lot No. Block No.
County Gooding
SW¼ SE¼ Sec. 31, T. 8 N/S, R. 16 E/W.

7. WATER LEVEL
Static water level 90 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

8. WELL TEST DATA
☐ Pump ☐ Bailer ☐ Air ☐ Other

Discharge G.P.M.	Pumping Level	Hours Pumped

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
8	0	5	top Soil		X
	5	19	Gray lava		X
6	19	60	" "		X
	60	75	Brown lava		
	75	205	Gray lava	X	

RECEIVED
JUL 2 1981
Department of Water Resources

RECEIVED
JUN 26 1981
Dept of Water Resources

10. ob. dl
Work started Apr 1 13 finished Apr 1 24-81

11. DRILLERS CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.
Firm Name C B Eaton & Son Firm No. 76
Address Wendell Ida Date 6-23-81
Signed by (Firm Official) James E Eaton
and
(Operator)

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

WELL LOG

From Feet	To Feet	Type of Material	Drilling Time Hrs.	Drilling Time Min.		
1	6	surface pipe				
6	60	Gray lava				
60		Gravies				
60	90	Red lava				
90	110	Porous lava				
		Blue clay				
		If more space is required use Sheet No. 2				

WELL DRILLERS STATEMENT

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

Signed C. B. EATON & SONS

By Earl T. Yakeum

Dated December 28, 19 56

License No. 26

16

WELL LOG AND REPORT TO THE STATE RECLAMATION ENGINEER OF IDAHO

Log No. ____
Rec. June 18, 1952
Well No. ____
Permit No. P-24112

DO NOT FILL IN

Owner William Grissom Driller Eaton & Sons

Address Wendell, Idaho Address Wendell, Idaho Lic. No. 6

Location of Well: N.W. ¼ N.E. ¼ Sec. 36, T. 8 N/S, R. 14 E/W Gooding County.

and ✓ feet N/S, and ✓ feet E/W from ✓ corner of ✓ ¼ ✓ ¼ Sec. ✓

Water will be used for Irrigation & domestic Total depth of well 98 feet

Size of drilled hole 12" Weight of casing per linear foot ✓

Thickness of casing ✓ Casing Material ✓
e.g., pipe, concrete, wood.

Diameter, length and location of casing ✓
(Casing 12" in diameter and under give inside diameter; casing over 12" in diameter give outside diameter.)

Number and size of perforations — located — feet to — feet from surface of ground.

Other Perforations: —

If flowing well, give flow in c.f.s. ____ or g.p.m. ~~450~~ and shut in pressure ____

If nonflowing well, give depth of standing water from surface 72 feet

If flowing well, describe control works ____
(Type and size of valve, etc.)

On pumping test delivery was 450 g.p.m. or ____ c.f.s. Drawdown was none feet

Length of time pumped during check was week hr. ____ min. Water temp. 60 °Fahrenheit.

Date of commencement of well May, 1952 Date of Completion of well ✓ May, 1952

Type of well rig Spudding

CASING RECORD

Diam. Casing	From Feet	To Feet	Length	"Remarks"—Seals, Grouting, Etc.
12			8 ft	Through top soil Cemented

GENERAL INFORMATION—Pumping Test, Quality of Water, Etc.

NW.1/4 SE.1/4 Sec. 36 T. 8 S. R. 14 E.

Permit 24112

WELL LOG

From Feet	To Feet	No.	Type of Material	Drilling Time Hrs.	Drilling Time Min.	Water-bearing Formation Am. Yds or No	Casing Perforated Am. Yds or No
1	6		top soil				
6	46		Gray Lava cavings				
46	72		Red Lava				
72	90		Water in Red Lava				
90	91		Red Sand				
91	99		Gay Lava cavings				
			If more space is required use Sheet No. 2				

WELL DRILLERS STATEMENT

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

Signed C B Caton & Sons

By James Eaton

Dated _____, 19____ License No. _____

Subscribed and sworn before me this _____ day of _____ 19____

NOTARIZATION NOT NECESSARY UNDER NEW LAW.

_____ Notary Public

My Commission expires _____

_____ Residing at

APPENDIX D

Slug Test Data and Computations

Tested 7-16-91

Clear Lakes

Hydraulic Conductivity - MW 3D

$L = 212 - 185 = 27'$ (bottom of screen to avg. water level)

$H = 27'$

$D = 270' - 185' = 85'$ (from possible basalt lens or sandstone up to water level)

$r_w = 0.33'$

$r_c = 0.17'$

1) $\ln \frac{H}{r_w} = \ln \frac{27}{0.33} = 4.40$ 2) $\frac{L}{r_w} = 81.82$

3) $A = 3.8 \quad B = 0.7$ 4) $\ln \left(\frac{D-H}{r_w}\right) = \ln \frac{85-27}{0.33} = 5.17$

5) let $t = 100$ sec $y_o = 10.5'$ $y_t = 6.0'$

$\left(\frac{1}{t}\right) \ln \frac{y_o}{y_t} = \frac{1}{100} \ln \frac{10.5'}{6.0'} = 0.006$

6) $\ln \frac{Re}{r_w} = \left[\frac{1.1}{\ln \left(\frac{H}{r_w}\right)} + \frac{A + B \ln \left(\frac{D-H}{r_w}\right)}{\frac{L}{r_w}}\right]^{-1}$

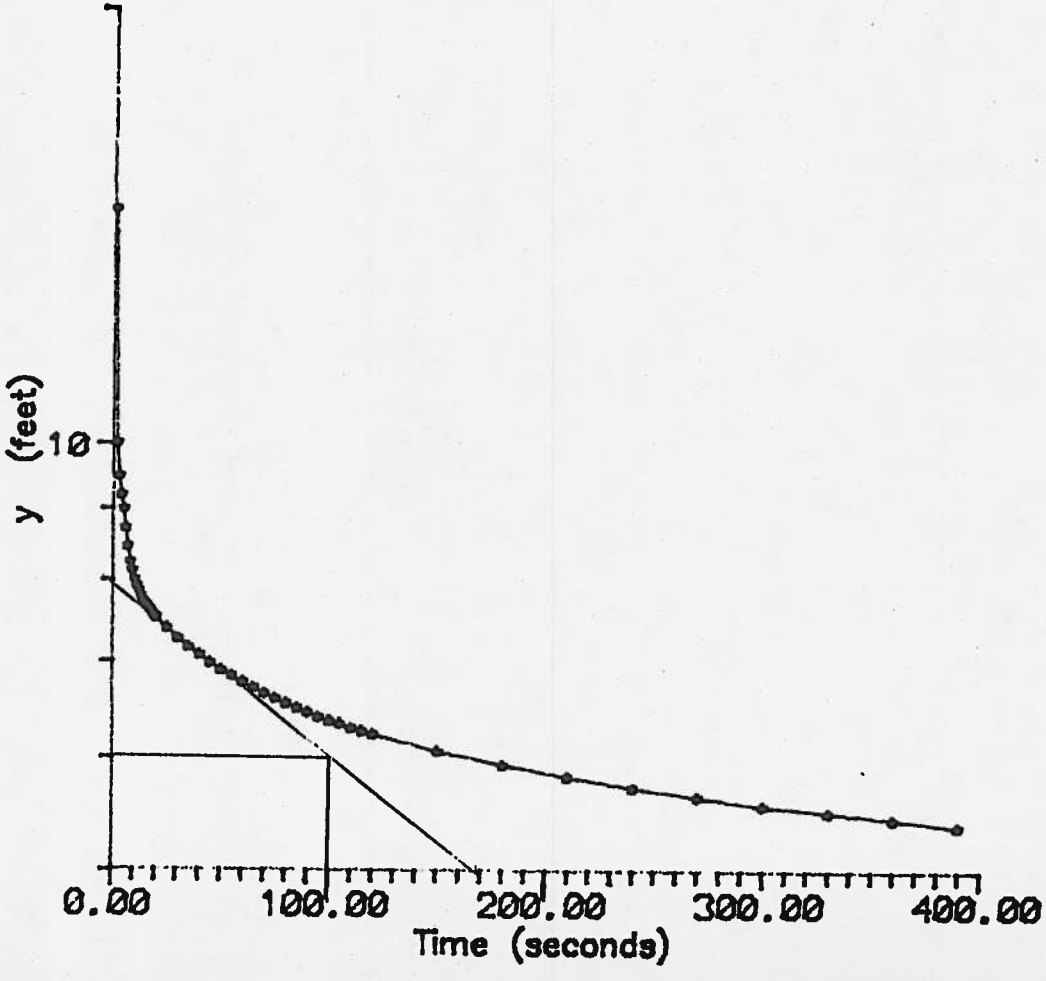
$\ln \frac{Re}{r_w} = \left(\frac{1.1}{4.40} + \frac{3.8 + 0.7(5.17)}{81.82}\right)^{-1} = 2.94$

7) $K = \frac{r_c^2 \ln \frac{Re}{r_w}}{2L} \cdot \frac{1}{t} \ln \frac{y_o}{y_t}$

$K = \frac{(0.17)^2 2.94}{2(27)} \cdot 0.006$

$K = 9.4 \times 10 \times 10^{-6} \frac{ft}{sec} = 6.07 \frac{gal/day}{ft}$ $\times .134 = ft/day$ .81 ft/d

Water Level Recovery Vs. Time For Slug Test On Monitoring Well MW-3D



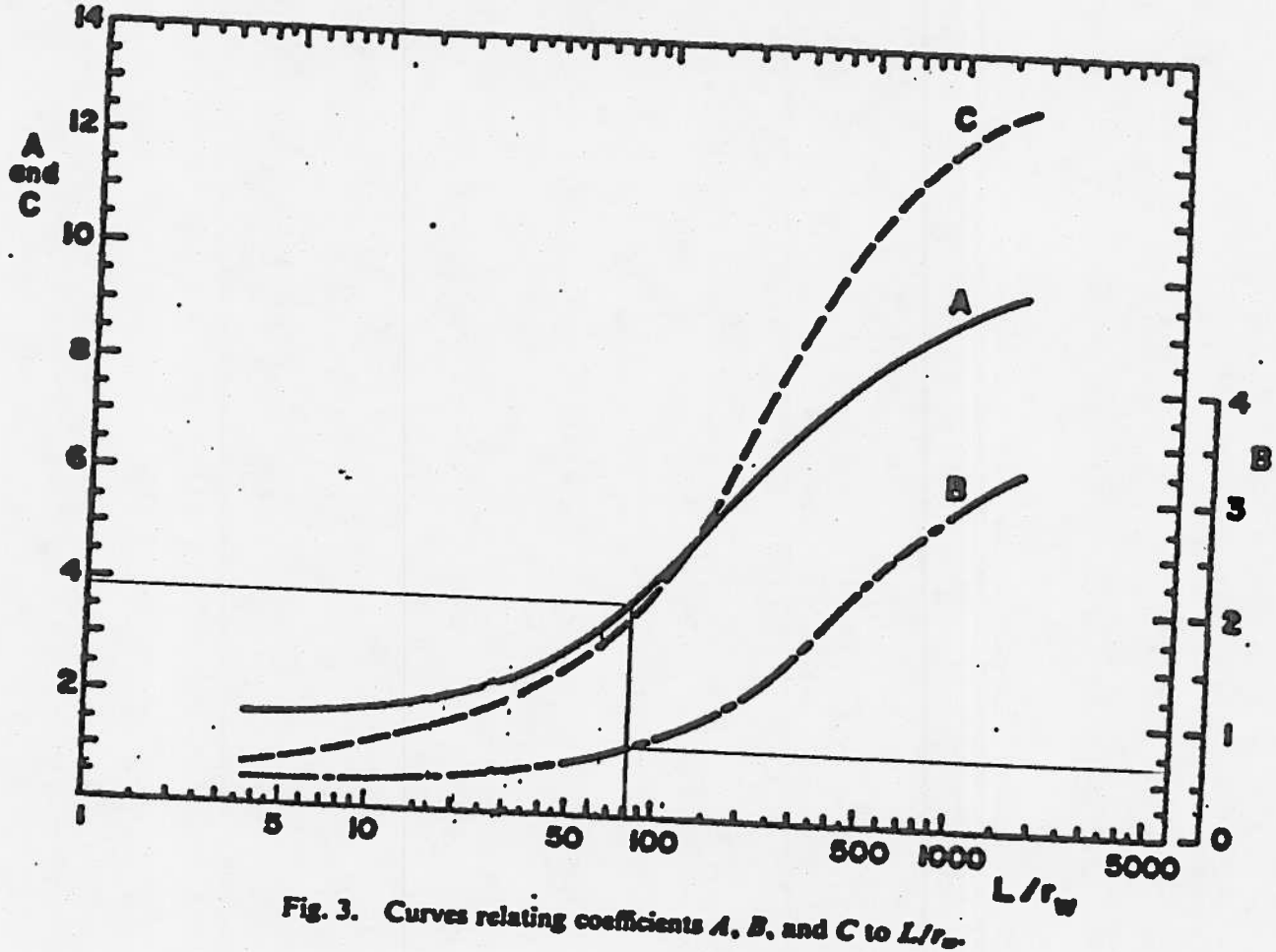


Fig. 3. Curves relating coefficients *A*, *B*, and *C* to L/r_w.

Clear Lakes
Well MW-3D

Tested 7-16-91

Clear Lakes

Hydraulic Conductivity : MW-2

$L = 249 - 230 = 19'$ (screened interval submerged in H_2O)

$H = 249 - 195 = 54'$ (bottom of screen to avg. H_2O level)

$D = 270 - 195 = 75'$ (sandstone/basalt layer up to H_2O level)

$r_w = 0.33'$

$r_c = 0.17'$

1) $\ln \frac{H}{r_w} = \ln \frac{54}{0.33} = 5.10$

2) $\frac{L}{r_w} = \frac{19}{0.33} = 57.58$

3) $\boxed{A = 3.3 \qquad B = 0.5}$

4) $\ln\left(\frac{D-H}{r_w}\right) = \ln \frac{75-54}{0.33} = \boxed{4.15}$

5) let $t = 50$ sec $\qquad y_0 = 4.2' \qquad y_t = 0.55'$

$$\frac{1}{t} \ln \frac{y_0}{y_t} = \frac{1}{50} \ln \frac{4.2}{0.55} = \boxed{0.041}$$

6) $$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln\left(\frac{H}{r_w}\right)} + \frac{A + B \ln\left(\frac{D-H}{r_w}\right)}{\frac{L}{r_w}} \right]^{-1}$$

$$\ln \frac{R_e}{r_w} = \left(\frac{1.1}{5.10} + \frac{3.3 + 0.5(4.15)}{57.58} \right)^{-1} = \boxed{0.16}$$

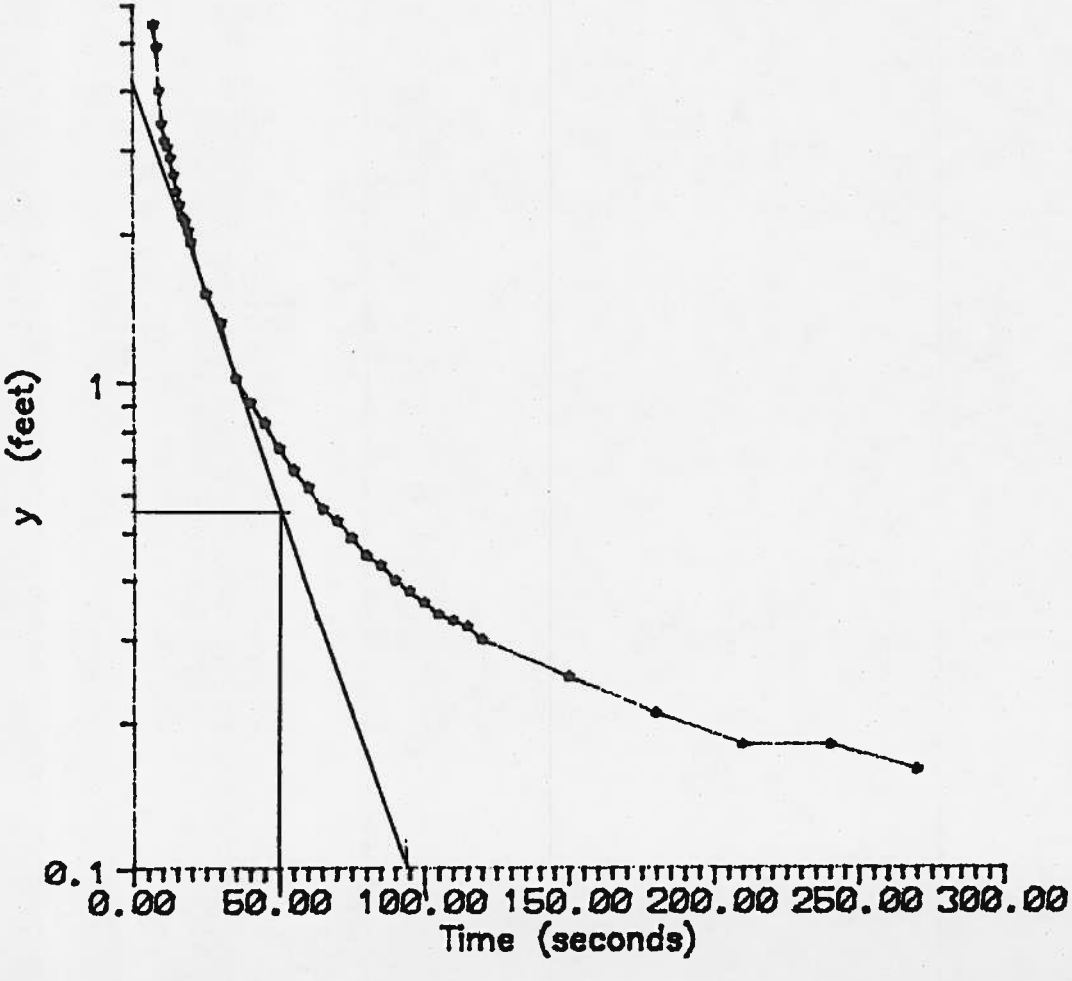
7) $$K = \frac{r_c^2 \ln \frac{R_e}{r_w}}{2L} \cdot \frac{1}{t} \ln \frac{y_0}{y_t}$$

$$K = \frac{(0.17)^2 (0.16)}{2(19)} \cdot 0.041$$

$$K = 4.99 \times 10^{-6} \frac{ft}{sec} = 3.22 \frac{gal/day}{ft^2}$$

.43 ft/day

Water Level Recovery Vs. Time For Slug Test On
Monitoring Well MW-2



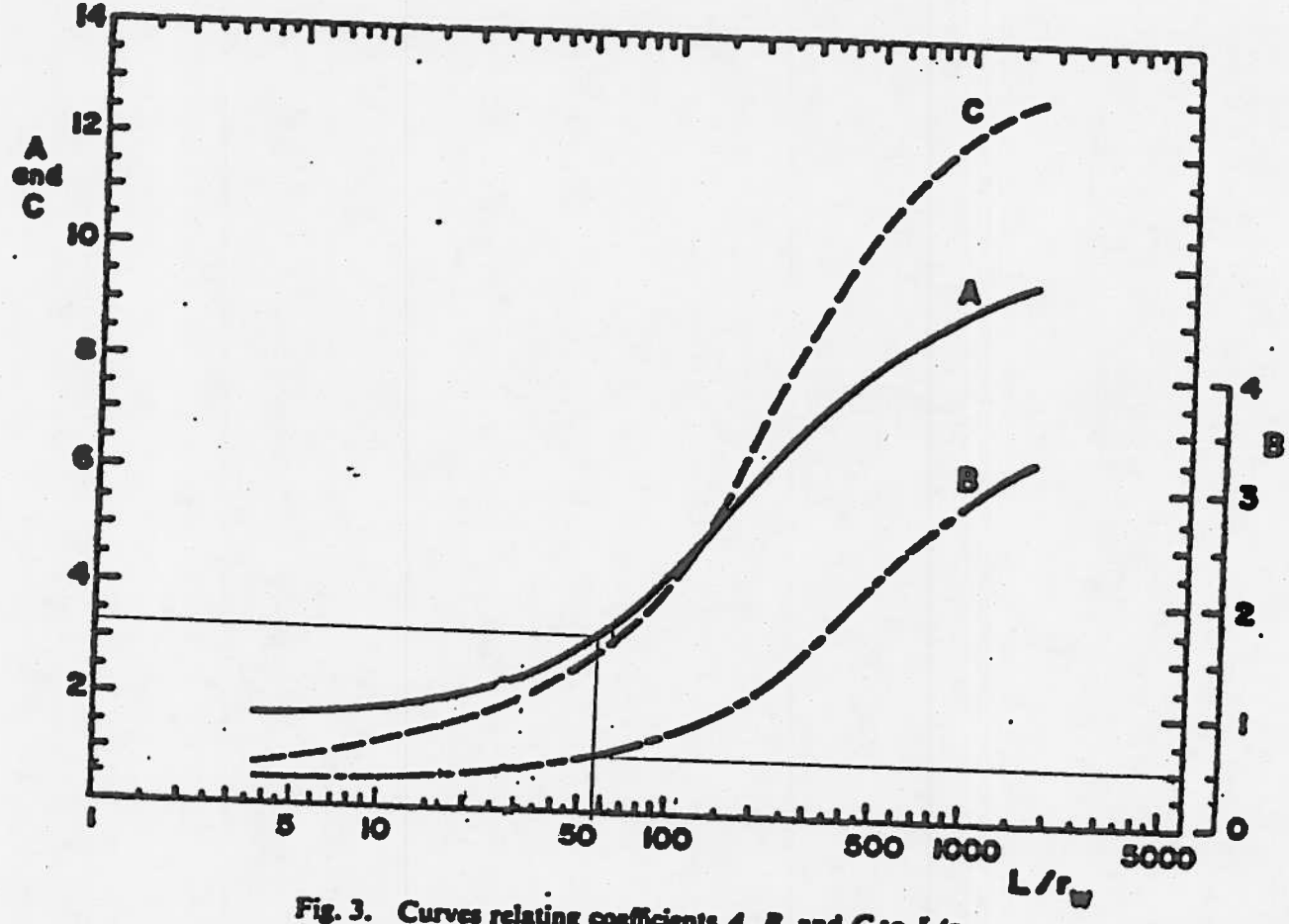


Fig. 3. Curves relating coefficients *A*, *B*, and *C* to L/r_w.

Clear Lakes
Well MW 2

APPENDIX E

Pump Tests and Modeling Data

A computer model was used to estimate groundwater fluctuations due to the construction of the proposed road cut. Input data for the model included measured and assumed bedrock hydraulic conductivities, groundwater gradients, proposed road cut geometry, and various boundary conditions.

Data was evaluated using the U.S.G.S. MODFLOW groundwater flow model (McDonald and Harbaugh, 1988). MODFLOW is a three-dimensional model which allows simulation of a heterogenous aquifer with boundary conditions and steady or transient state conditions.

Executing MODFLOW involves dividing the area of interest into blocks by superimposing a rectangular grid over the modeled area. Each block is then assigned aquifer parameters. MODFLOW then formulates an equation for groundwater flow based on Darcy's law for fluid movement in a porous medium.

The proposed road cut was modeled using a single layer 40 by 18 node grid, centered over the cut face. The southern boundary of the grid was aligned along the top of the canyon rim. The grid was placed in this manner to allow simulation of spring and road cut drainage; the grid extends north, east, and west to the assumed boundary conditions for the modeled area. The southern boundary was modeled with drainage nodes to simulate water lost through spring flow. The elevations of the drain nodes were determined based on known groundwater elevations and gradient of the shallow water-bearing unit. The northern edge of the modeled area is represented with a constant-head boundary with head values corresponding to known groundwater elevations. Execution of the model under these conditions developed an estimate of total spring discharge and allowed calibration of the model to observed conditions.

A second model was developed that simulated the proposed road cut by using drain nodes along the southern boundary and cut area. The nodes were placed along saturated portions of the cut at elevations approximating the final road grade. By using drain nodes to simulate the cut, a water budget can be calculated by the model which provides an estimated groundwater flow rate.

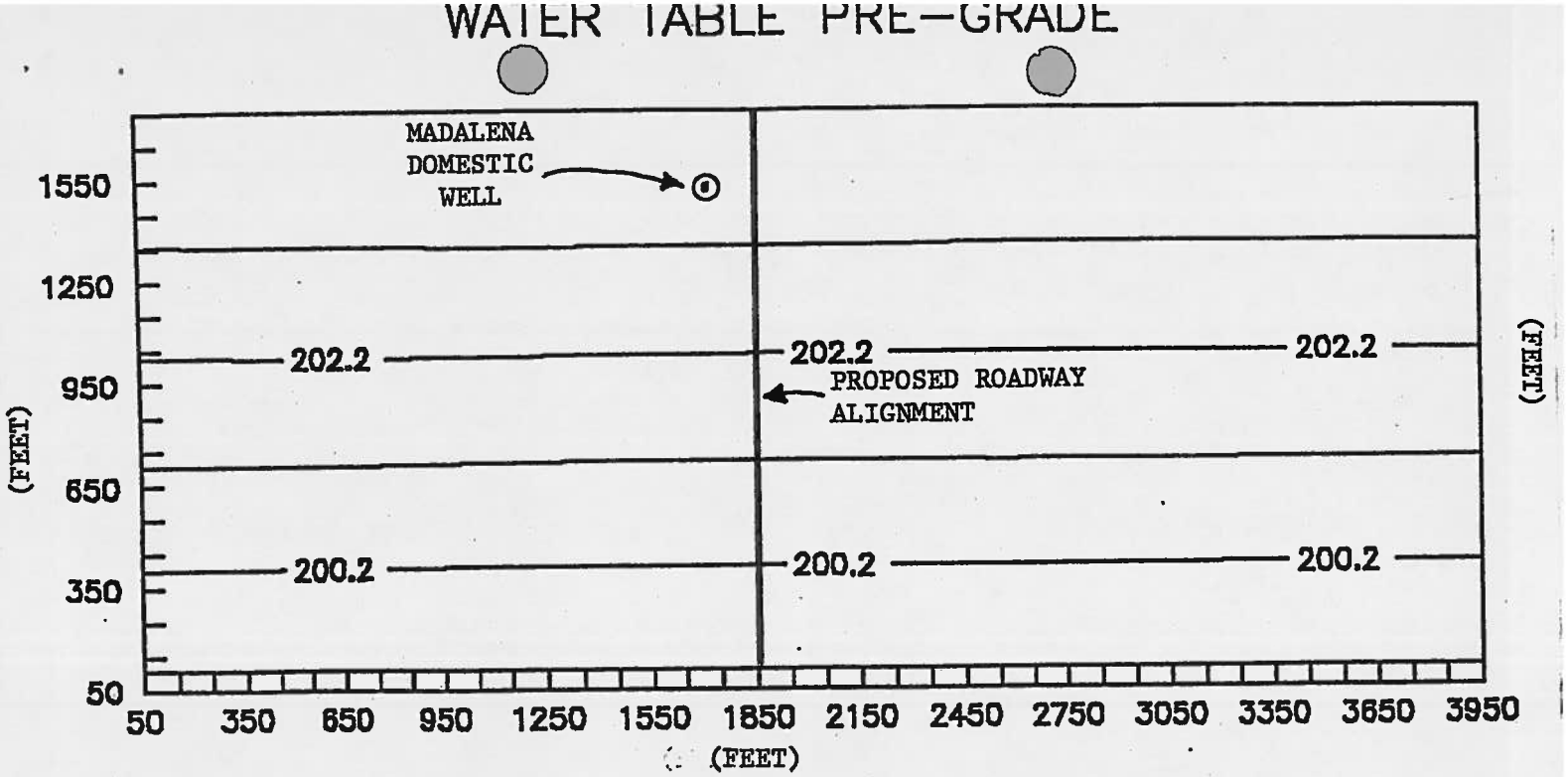
Estimates of groundwater flow from the proposed road cut were determined using the following methodology:

- Constant-head boundaries were established on the north boundary of the grid. Drain nodes were placed along the southern boundary to simulate spring discharge;

- Nodes were assigned hydraulic conductivity values based on aquifer pump test data and values for fractured bedrock obtained from Freeze and Cherry (1979);

- The initial model was run until steady state conditions were achieved to generate a flow field across the domain corresponding to pre-construction conditions. This allows verification of the assumed boundary conditions and aquifer parameters;

- A second model simulating the road cut was also run until steady state conditions were obtained. The difference in water volume collected in the drain nodes from the pre-construction model with the second model following road construction represents the volume of water flowing from the completed road cut.



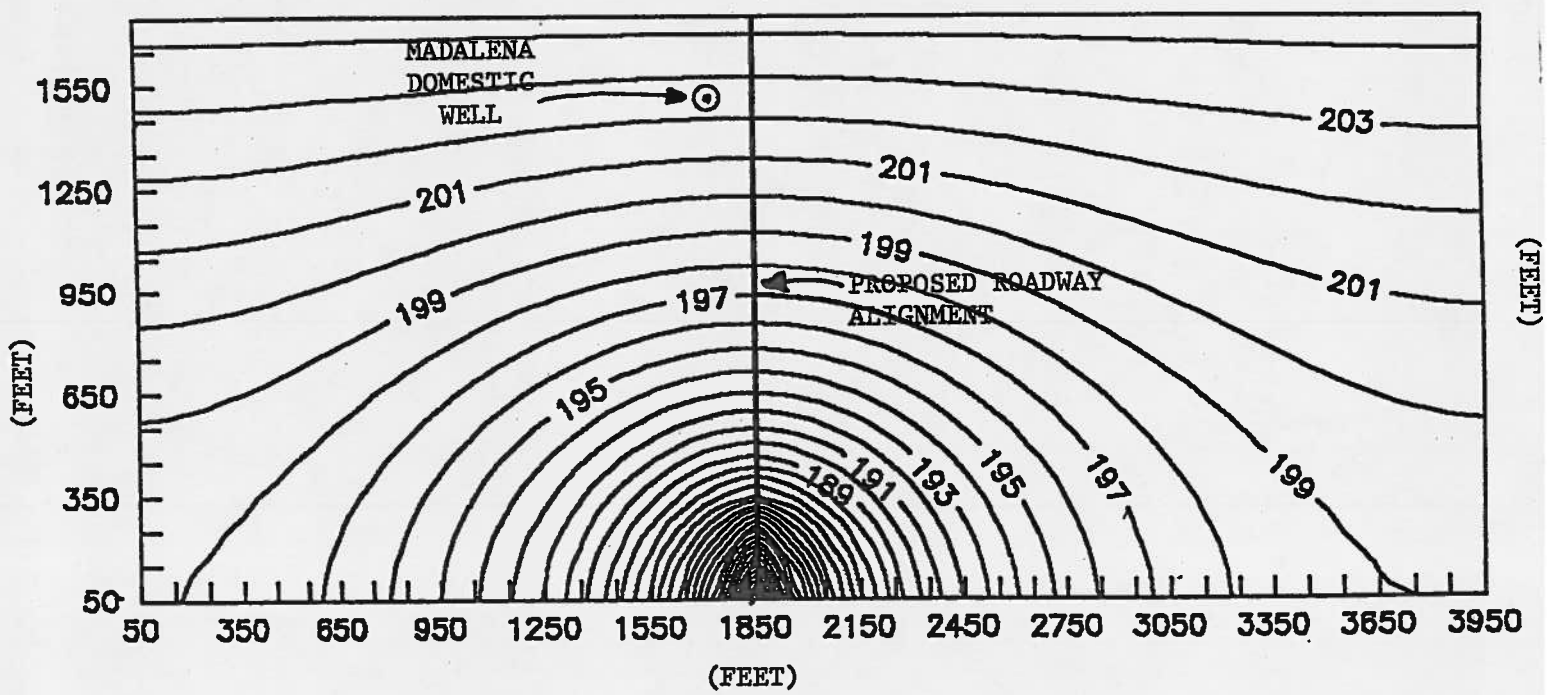
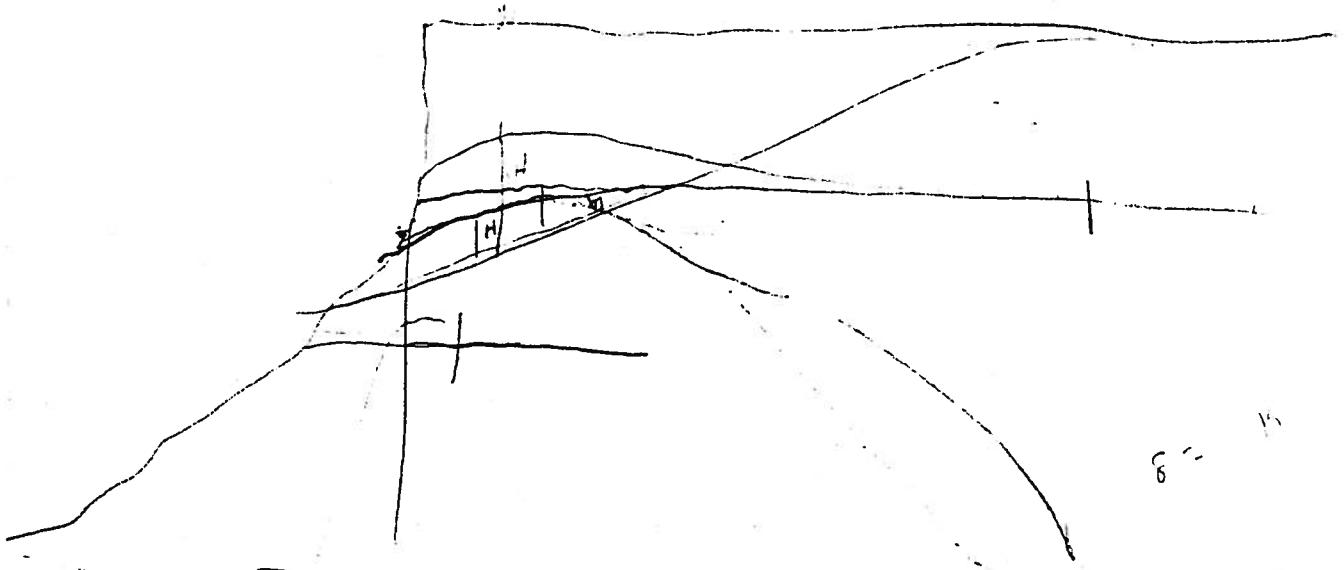


FIGURE 11

ESTIMATED GROUNDWATER LEVEL CHANGES
INDUCED BY THE PROPOSED ROADCUT



DRAINS OUT = 32,622,000 Ft³/day

ROAD OUT 42,510,000

i = .0036

40 COLUMNS
25 ROWS

DX = DY = 100'

BASE = 3150

DRAIN NODES

C	R	ELEV
19	15	162
18	16	159
17	17	156
16	18	153
15	18	150
14	19	177
13	20	145

94.2

HEAD = 150.6

	ELEV.	ROW
DRAIN 1	164	18
DRAIN 2	171	17
DRAIN 3	178	16
DRAIN 4	185	15
DRAIN 5	192	14
DRAIN 6	199	13

SPRING NODES = 202.6

ROW 18

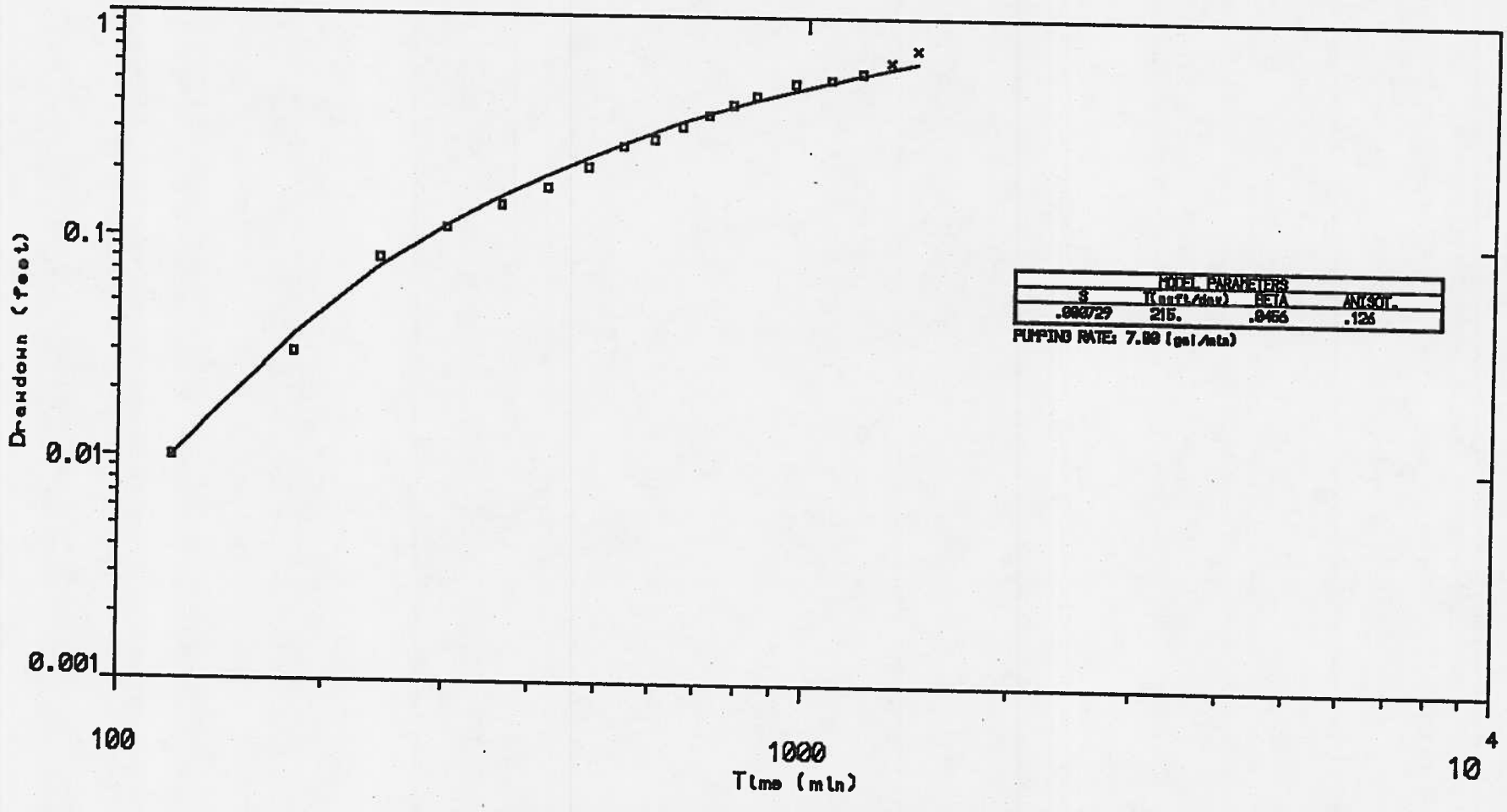
3270

DRAIN NODES REPRESENTING SPRING LINE = 2

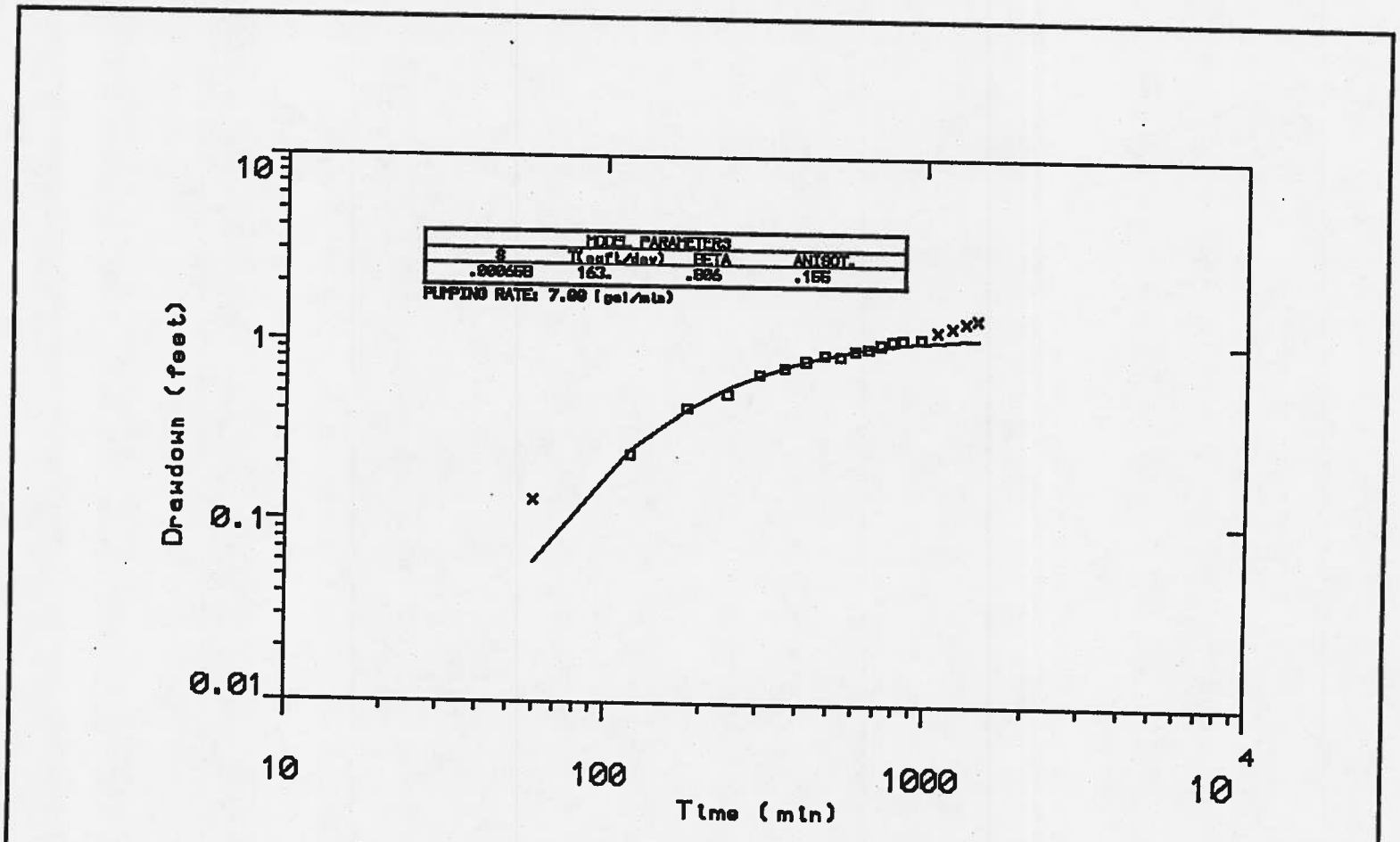
147.84

HEAD = 147.84

06/02 12:38:08 21.95



for: SHARP AND SMITH	CLEAR LAKES GRADE
by: Chen-Northern	BUHL, IDAHO GOODING COUNTY
Aqulfer: FRACTURED BASALT Thickness: 125. Depth: 110. feet Screen: Base: 100. Top: 80.0 feet Distance: 560. feet Pumping well: MW-1S	Date: 10 SEPT 91 | Well No.: MW-4S



for: SHARP AND SMITH	CLEAR LAKES GRADE
by: Chen-Northern	BUHL, IDAHO GOODING COUNTY
Aquifer: FRACTURED BASALT Thickness: 125. Depth: 118. feet Screen: Base: 100. Top: 80.0 feet Distance: 280. feet Pumping Well: MW-18	Date: 10 SEPT 91 | Well No.: B-1

Chen Northern, Inc.

AQUIFER TEST DATA

WELL OBSERVED (Data Reported on This Form) MW1-S
WELL TESTED MW1-S
TEST DATE 9/10/91

Project Clear Lake Grade Personnel D May

WELL DESCRIPTION

State Idaho County _____ Location: T _____ R _____ Sec. _____ Tract _____

Borehole Diam.(in) _____ Well Diam.(in) _____ Well Depth(ft) 105 Perforated Zone(s)(ft) 80'-100

Desc. of MP _____ Stick-up(ft) _____ SWL below MP(ft) _____ SWL below GS(ft) 73.35

Aquifer Name _____ Aquifer Description (Lithology, Thickness, Depth to Top) _____

TEST DESCRIPTION

Test Type: (Circle One)
1. Pumping Well Drawdown
2. Observation Well Drawdown
3. Pumping Well Recovery
4. Observation Well Recovery
5. Bailer Recovery
6. Slug Injection or Removal
7. Hvorslev Test
8. Other (Specify) _____

Distance of Observation Well from Pumping Well(ft) _____ Pump hp. & type _____ Pump Depth(ft) _____

Water Quality Sample Taken? yes no Specific Conductance (μmhos/cm @ 25°C) _____ Temp(°C) _____ Time _____

Avg. Discharge(gpm) _____ Test Duration(min) _____ Max WL Change(ft) _____ Transmissivity (gpd/ft) _____

Storativity _____ Hydraulic Conductivity(gpd/ft²) _____ Specific Capacity(gpm/ft of drawdown) _____

REMARKS _____

Date & hour	Time	Head (ft)	SWL	Q	SC	pH		
9/10/91	1147	26.25		5gal in 25sec				
pump off	1200	8.95						
	1230	26.82		5gal in 32.0sec	pump ON			
	1330	19.17			553.5	7.11		
	1430	16.21		5gal in 36 sec				
	1530	14.40						
	1630	12.62		5gal in 39sec				
	1730	11.37			552.5	7.45		
	1830	10.16		5gal in 41.35sec				
	1930	9.02						
	2030	8.27		5gal in 42.30sec				
	2130	7.52			545.5	7.40		
	2230	6.55		5gal in. 42.77sec				
	2300	5.80			Closed down valve to Reduce flow rate			
	2330	6.75		5gal in 43.9sec				
9/11/91	0030	6.45						
	0130	5.53		5gal in 44.65 sec	adjust	value		
	0230	5.98			554.01	7.46		
	0330	6.84		5gal in 44.55sec	adjust value @ 0300			
	0430	5.90						
	0530	5.20		5gal in 45.59sec	adjust@0547.			
	0630	6.80			548.12	7.49		

Chen Northern, Inc.

AQUIFER TEST DATA

WELL OBSERVED (Data Reported on This Form) MW4-S

WELL TESTED MW4-S

Project Clean Labs Grade Personnel D May TEST DATE 9/16/91

WELL DESCRIPTION

State Idaho County Location: T R Sec. Tract

Borehole Diam.(in) 8 Well Diam.(in) 4 Well Depth(ft) 110 Perforated Zone(s)(ft) 84.6 - 104.3

Desc. of MP Top of pvc Stick-up(ft) SWL below MP(ft) 73.75 SWL below GS(ft)

Aquifer Name FR Aquifer Description (Lithology, Thickness, Depth to Top) FRACTURED BASALT

TEST DESCRIPTION

Test Type: (Circle One) 1. Pumping Well Drawdown; (2) Observation Well Drawdown; 3. Pumping Well Recovery; 4. Observation Well Recovery; 5. Bailer Recovery; 6. Slug Injection or Removal; 7. Hvorslev Test; 8. Other (Specify)

Distance of Observation Well from Pumping Well(ft) 5.60 Pump hp. & type 3hp Pump Depth(ft)

Water Quality Sample Taken? yes (no) Specific Conductance (µmhos/cm @ 25°C) Temp(°C) Time

Avg. Discharge(gpm) Test Duration(min) Max WL Change(ft) .63 Transmissivity (gpd/ft)

Storativity Hydraulic Conductivity(gpd/ft²) Specific Capacity(gpm/ft of drawdown)

REMARKS

Date & hour	Time	SWL			t	s		
9/16/91	1330	73.78			60			
	1430	73.79			120	0.01		
	1530	73.81			180	0.03		
	1630	73.84			240	0.06		
	1730	73.89			300	0.11		
	1830	73.92			360	0.14		
	1930	73.86	Pump turned off		420	0.17		
	2030	73.95			480	0.21		
	2130	73.95			540	0.24		
	2230	73.97			600	0.28		
	2330	74.01			660	0.32		
	0030	74.05			720	0.36		
	0130	74.09			780	0.40		
	0230	74.13			840	0.44		
	0330	74.16			900	0.47		
	0430	74.19			960	0.50		
	0530	74.20			1020	0.51		
	0630	74.21			1080	0.52		
	0730	74.23			1140	0.54		
	0830	74.25			1200	0.54		
	0930	74.27			1260	0.58		
	1030	74.32			1320	0.63		
	1130	74.38			1380	0.69		

Chen Northern, Inc.

AQUIFER TEST DATA

WELL OBSERVED (Data Reported on This Form) B7

WELL TESTED MW1-S

Project Clear Lakes Grade Personnel DMoy TEST DATE 9/10/91

WELL DESCRIPTION

State Idaho County _____ Location: T _____ R _____ Sec. _____ Tract _____

Borehole Diam.(in) _____ Well Diam.(in) 1" Well Depth(ft) 118 Perforated Zone(s)(ft) 98 - 118

Desc. of MP TOP OF PVC Stick-up(ft) 1.0' SWL below MP(ft) 72.59 SWL below GS(ft) 72.43

Aquifer Name SNAKE RIVER BASALT Aquifer Description (Lithology, Thickness, Depth to Top) FRACTURED BASALT

TEST DESCRIPTION

Test Type: (Circle One) 1. Pumping Well Drawdown; 2. Observation Well Drawdown; 3. Pumping Well Recovery; 4. Observation Well Recovery; 5. Bailer Recovery; 6. Slug Injection or Removal; 7. Hvorslev Test; 8. Other (Specify) _____

Distance of Observation Well from Pumping Well(ft) 280' Pump hp. & type _____ Pump Depth(ft) _____

Water Quality Sample Taken? yes no Specific Conductance (μmhos/cm @ 25°C) _____ Temp(°C) _____ Time _____

Avg. Discharge(gpm) _____ Test Duration(min) _____ Max WL Change(ft) _____ Transmissivity (gpd/ft) _____

Storativity _____ Hydraulic Conductivity(gpd/ft²) _____ Specific Capacity(gpm/ft of drawdown) _____

REMARKS _____

Date & hour	Time	t	SWL(ft)	s				
9/10/91	1230		72.59					
	1330	60	72.72	0.13				
	1430	120	72.82	0.23				
	1530	180	73.01	0.42				
	1630	240	73.10	0.51				
	1730	300	73.25	0.66				
	1830	360	73.31	0.72				
	1930	420	73.38	0.79				
	2030	480	73.44	0.85				
	2130	540	73.48	0.89				
	2230	600	73.49	0.90				
	2330	640	73.52	0.93				
9/11/91	0030	720	73.57	0.98				
	0130	780	73.62	1.03				
	0230	840	73.62	1.03				
	0330	900	73.63	1.04				
	0430	960	73.65	1.06				
	0530	1020	73.66	1.07				
	0630	1080	73.74	1.15				
	0730	1140	73.78	1.19				
	0830	1200	73.81	1.22				
	0930	1260	73.87	1.28				
	1030	1320	73.89	1.30				

OVER

Chen Northern, Inc.

AQUIFER TEST DATA

WELL OBSERVED (Data Reported on This Form) MW4-D

WELL TESTED MW1-S

Project Clear Lakes Grade Personnel D Moy TEST DATE 9/10.91

WELL DESCRIPTION

State Idaho County _____ Location: T _____ R _____ Sec. _____ Tract _____

Borehole Diam.(in) _____ Well Diam.(in) _____ Well Depth(ft) _____ Perforated Zone(s)(ft) _____

Desc. of MP _____ Stick-up(ft) _____ SWL below MP(ft) _____ SWL below GS(ft) 181.2

Aquifer Name _____ Aquifer Description (Lithology, Thickness, Depth to Top) _____

TEST DESCRIPTION

Test Types (Circle One): 1. Pumping Well Drawdown 2. Observation Well Drawdown 3. Pumping Well Recovery 4. Observation Well Recovery 5. Bailer Recovery 6. Slug Injection or Removal 7. Hvorslev Test 8. Other (Specify) _____

Distance of Observation Well from Pumping Well(ft) _____ Pump hp. & type _____ Pump Depth(ft) _____

Water Quality Sample Taken? yes no Specific Conductance (μmhos/cm @ 25°C) _____ Temp(°C) _____ Time _____

Avg. Discharge(gpm) _____ Test Duration(min) _____ Max WL Change(ft) _____ Transmissivity (gpd/ft) _____

Storativity _____ Hydraulic Conductivity(gpd/ft²) _____ Specific Capacity(gpm/ft of drawdown) _____

REMARKS _____

Date & hour	Time	SWL						
9/10/91	1330	181.15						
	1730	181.15						
	2030	181.05	diver + scope					
	2330	181.05						
	0230	181.05						
	0530	181.06						
	0830	181.05						
	1130	181.05						

Chen Northern, Inc.

AQUIFER TEST DATA

WELL D (Data Reported WE S T)

Project Clear Lakes Grade Personnel D Moll

WELL DESCRIPTION

State Idaho County _____ Location: T _____ R _____ Sec. _____

Borehole Diam.(in) _____ Well Diam.(in) _____ Well Depth(ft) _____ Perforated Zone(s) _____

Desc. of MP _____ Stick-up(ft) _____ SWL below MP(ft) 4

Aquifer Name _____ Aquifer Description (Lithology, Thickness, Depth to Top) _____

TEST DESCRIPTION

Test Type: (Circle One)
1. Pumping Well Drawdown
2. Observation Well Drawdown
3. Pumping Well Recovery
4. Observation Well Recovery
5. Bailer Recovery
6. Slug Injection or Removal

Distance of Observation Well from Pumping Well(ft) _____ Pump hp. & type _____

Water Quality Sample Taken? yes no Specific Conductance (μmhos/cm @ 25°C) _____ Temp _____

Avg. Discharge(gpm) _____ Test Duration(min) _____ Max WL Change(ft) _____ Transmis _____

Storativity _____ Hydraulic Conductivity(gpd/ft^2) _____ Specific Cap _____

REMARKS _____

Date & hour	Time	SWL				
9/10/01	1745	195.4				
	1845	195.45				
	2145	195.48				
	0045	195.50				
	0345	195.49				
	0645	195.49				
	0945	195.48				
	1245	195.49				

Chen Northern, Inc.

AQUIFER TEST DATA

WELL OBSERVED (Data Reported on This Form): MW1-D

WELL TESTED: MW1-S

Project: Clear Lakes Grade Personnel: D Moy TEST DATE: 9/10/91

WELL DESCRIPTION

State: Idaho County: Location: T R Sec. Tract

Borehole Diam.(in) Well Diam.(in) Well Depth(ft) Perforated Zone(s)(ft)

Desc. of MP Stick-up(ft) SWL below MP(ft) SWL below GS(ft): 195.4

Aquifer Name Aquifer Description (Lithology, Thickness, Depth to Top)

TEST DESCRIPTION

Test Type: (Circle One)
1. Pumping Well Drawdown
2. Observation Well Drawdown
3. Pumping Well Recovery
4. Observation Well Recovery
5. Bailer Recovery
6. Slug Injection or Removal
7. Hvorslev Test
8. Other (Specify)

Distance of Observation Well from Pumping Well(ft) Pump hp. & type Pump Depth(ft)

Water Quality Sample Taken? yes no Specific Conductance (µmhos/cm @ 25°C) Temp(°C) Time

Avg. Discharge(gpm) Test Duration(min) Max WL Change(ft) Transmissivity (gpd/ft)

Storativity Hydraulic Conductivity(gpd/ft²) Specific Capacity(gpm/ft of drawdown)

REMARKS

Date & hour	Time	SWL						
9/10/91	1445	195.4						
	1845	195.45						
	2145	195.48						
	0045	195.50						
	0345	195.49						
	0645	195.49						
	0945	195.48						
	1245	195.49						