Hydrogeological Assessment of Well Yield Problems at Yankee Fork State Park Interpretive Center

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Staff Report 00-17
December 2000

Note: This study was completed in 1995.

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CONTENTS

ILLUSTRATIONS

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ABSTRACT

With concerns over excessive water level drawdown in a water supply well at the Yankee Fork State Park Interpretive Center and the need to establish a reliable supply to meet state fire code at the site, the Idaho Department of Parks and Recreation (IDPR) asked the Idaho Geological Survey to investigate the problem and recommend possible remedial action. Although the well has been able to supply adequate irrigation water during the irrigation season, it has been unable to meet demand early in the irrigation season, prior to mid-April or early May. This study synthesized relevant information on the site's hydrogeology and well yield characteristics, utilizing available well log information and drawdown data to develop a preliminary conceptual model of the local hydrogeologic system.

The shallow gravel aquifer in the vicinity of the IDPR interpretive center is sensitive to local recharge induced by leakage from the many nearby irrigation canals in the Salmon River valley. Based on short-term pumping tests conducted on the IDPR Well, the shallow aquifer appears to be capable of providing up to 500 gallons per minute from several appropriately spaced wells, but only during the irrigation season. Because of low ground-water levels during the winter and early spring before canals fill with water, the shallow aquifer cannot sustain even moderate levels of pumping. To ensure a reliable quanitity of water at all times, either a temporary river water source should be developed or a reservoir constructed that is capable of providing adequate storage to meet fire code requirements.

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[1] Idaho Geological Survey, Branch Office at Pocatello, Idaho State University, Pocatello.

SUMMARY OF CONCLUSIONS

The shallow gravel aquifer in the vicintiy of the IDPR interpretive center is sensitive to local recharge induced by leakage from the many nearby irrigation canals in the Salmon River valley. During the irrigation season, ground-water levels are relatively high and the aquifer is capable of supplying up to 100 gpm at the IDPR Well for pumping durations of at least 30 minutes. During the winter and early spring, the shallow aquifer cannot sustain even moderate pumping, because of low ground-water levels. On the basis of pumping tests conducted on the IDPR Well, the shallow aquifer appears to be capable of providing a 500 gpm supply from five appropriately spaced wells, but only during the irrigation season.

Two alternative sources of water supply are proposed: installing a dedicated supply line and pump to tap the river when fire fighting demands a high water supply rate; and constructing a surface or subsurface reservoir with sufficient storage to supply short-term peak fire fighting demand. The existing IDPR Well would continue to be used for potable water supply, and for maintaining reservoir storage.

Possible irregularities were identified in the construction and surface seal of the IDPR Well. The well completion information indicated on the well log does not match the description of how the casing was installed, and the well may not meet Idaho Department of Water Resources code. To ensure that the IDPR Well's water supply is not vulnerable to contamination by leakage of surface-derived contaminants because of an inadequate surface seal, the inside of the casing should be viewed with a borehole camera to locate the depth at which casing perforations actually commence. If the casing is perforated within 5-10 feet of the surface, as suspected, it should be driven deeper or replaced. In any case, the well head area should be cordoned off and protected from direct runoff of irrigation water, fertilizer/pesticide application, and other surface activities that could impact the well head.

INTRODUCTION

In April 1994, the Idaho Department of Parks and Recreation (IDPR) expressed concern over excessive water level drawdown and poor well yield observed in a water supply well located at the Yankee Fork State Park Interpretive Center. The center is located two miles south of Challis, Idaho at the junction of state highways 93 and 75. The Idaho Geological Survey (IGS) was asked to examine the well and to advise on the cause of the problem and to suggest possible remedial action.

Since its construction in 1991, the well has been able to supply adequate irrigation water during the irrigation season but has been unable to meet demand early in the irrigation season, typically before mid-April or early May. Since the IDPR Interpretive Center must meet state and local fire fighting code requirements, which stipulate the availability of a reliable water supply of several hundred gallons per minute (gpm), and since the water yield of the existing supply well is inadequate to meet this requirement in the spring, additional or alternative water supplies are being sought.

Figure 1 shows the study area and immediate region, including the locations of private wells and irrigation canals relative to the valley margins (approximated by the trace of the 5120-foot elevation contour). The study was confined to the immediate area of the IDPR Center and supply well (NW1/4 NW1/4 sec. 10, T.13N., R.19E.) but included

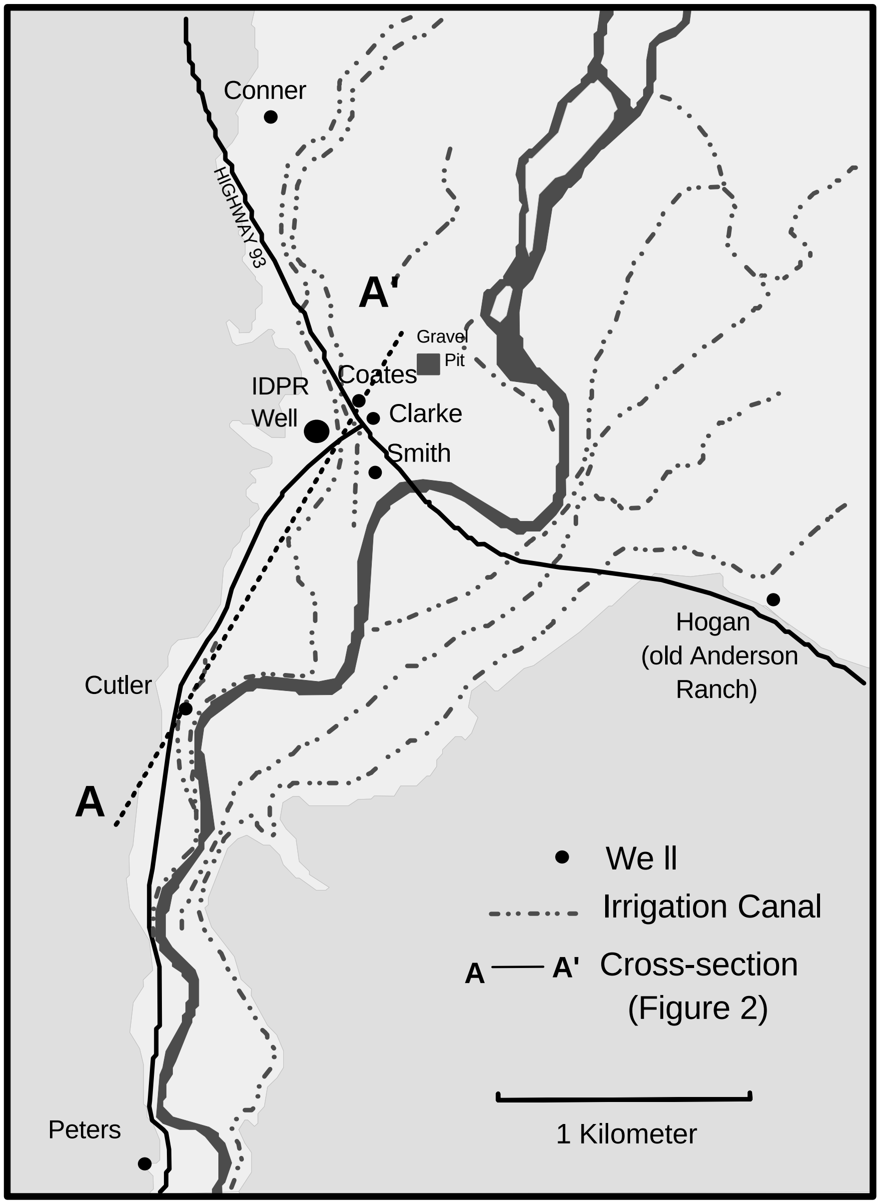


Figure 1 - Locations of wells and canals in the vicinity of the Idaho Parks and Recreation well. The approximate extent of the Salmon River valley is indicated by the location of the 5120 ft elevation contour. Geologic cross-section A-A' shown in Figure 2.

information from local private, commercial and municipal wells and geologic data from much of T.13-14N., R.19E. in order to build a consistent picture of the IDPR Well's geohydrologic context.

The purpose of this report is (a) to examine and synthesize relevant information on the site's hydrogeology and well yield characteristics, (b) to construct a preliminary conceptual model of the local hydrologic system influencing the IDPR Well, and (c) to propose possible alternative actions to alleviate the water supply shortage.

DATA SOURCES AND ANALYSIS

REGIONAL GEOHYDROLOGY

Little is known of the study area's hydrology and surficial deposits. The bedrock geology of the immediate study area is dominated by mixed felsic, intermediate and basic volcanic rocks and Paleozoic sedimentary rocks (McIntyre and Hobbs, 1978; Fisher and others, 1983). Based on surface exposures, the bulk porosity of these rock types is very low, so that permeability is likely controlled almost exclusively by the orientation and density of fractures in the rock mass.

South of Challis, the Salmon River flows through a valley deeply incised in predominantly andesitic and rhyolitic volcanics. Immediately south of Challis the valley widens to about three miles where it occupies the Warm Springs Creek graben on the north west flank of the Lost River Range, and where it is known as Round Valley. The surficial geology of the valley is characterized by poorly to moderately well-sorted colluvium, fanglomerate, and alluvial and fluvial gravels. Alluvial fans and remnant terraces are built out from the base of the highlands below Blue Mountain and the areas west and northwest of Challis. These sedimentary materials are of unknown total thickness but are probably less than a few hundred feet near the western margin of Round Valley. The gravel fill in the narrow portion of the Salmon River valley south of the IDPR Interpretive Center also is likely to be fairly shallow near the valley margins, and thicker towards its center.

INTERVIEWS

Brief interviews were conducted with IDPR staff, private well owners, and others with knowledge of well yield characteristics and hydrologic trends in the study area. This information was used to substantiate inferences made on examining the IDPR Well data and other well log information. This information was also useful in identifying mutually consistent observations of the response and characteristics of the local hydrologic system and in developing a conceptual hydrologic model of the system. Summaries of interviews are included in Appendix A.

WELL LOG DATA

An extensive search for all available well logs in the study area was not undertaken in this study. However, all well logs for the study area on file with the Idaho Department of Water Resources District Office in Twin Falls were obtained for use in evaluating subsurface lithology and estimating specific capacities of wells. Well information was also obtained from several other sources listed below, and these sources constitute the bulk of the lithologic data used to create a conceptual hydrogeologic model of the study area. All well logs used in this report are on file with the IGS Pocatello office. The well log for the IDPR Well is attached in Appendix B.

Figure 2 depicts the preliminary interpretation of the inferred subsurface relationships along cross-section A-A' in Figure 1. A brief pumping test was conducted on the IDPR Well to determine drawdown characteristics and to estimate hydraulic conductivity for predicting drawdown under various pumping conditions and multiple-well scenarios. Additional relevant data on the IDPR Well and private and city wells are summarized below.

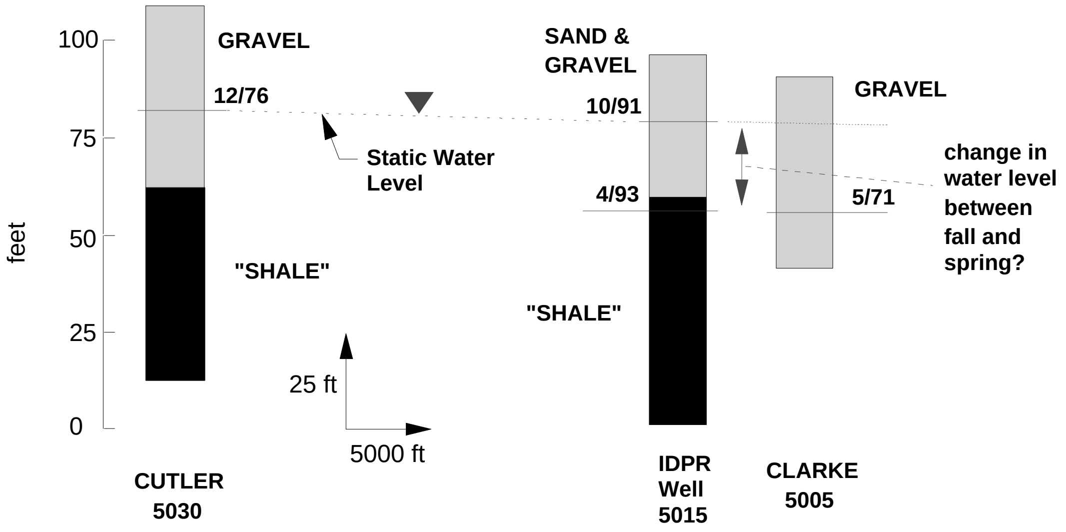


Figure 2 - Generalized well logs showing thin saturated gravel aquifer in the Salmon River valley south of Round Valley along cross-section A - A' (Figure 1). The magnitude of difference in water levels measured in wells drilled between fall and spring (measurement dates shown) corresponds to the magnitude of water level fluctuations observed in the IDPR well (ca. 20-25 ft) prior to, and after filling of irrigation canals in spring. Approximate elevations of local land surface are shown below well names.

IDPR Interpretive Center Well

Lithology

Aquifer appears to be dominantly comprised of fluvial gravel and sand to 48 feet below land surface (bls); see Figure 2. Hard, fractured, blue "shale" (probably fissile andesitic volcanic rocks; pers. comm., F. Moye, 1994) was encountered to 100 ft bls.

Construction

The well was drilled with the air rotary method, October 1991. The pump was originally set at about 60 ft bls but moved to 75 ft in May 1993. Casing was set to 52 ft bls (according to driller's invoice) but was recorded as 100 ft on the driller's log; this depth is crucial to the interpretation of the present data, for the efficient development of this particular well, and for the design and location of future wells in the immediate vicinity.

According to the driller's log, the well casing is perforated from 22 to 50 ft bls, 48 perforations total. However, according to Rick Brown (and recorded on the driller's log), the perforations were cut with a torch prior to installation. Also according to Mr. Brown, the perforations extended from the base of the casing to the surface; after completion of drilling, the ground around the well was excavated to about 6-8 feet depth with a backhoe, and the exposed perforations were welded closed. This was corroborated by the slight depression still visible at ground surface and the appearance of disturbed ground around the well casing. If the perforations are indeed located in this manner, then the 18-foot deep surface seal (as required by state law) reported by the driller would be inaccurate and misleading and could lead to future contamination of this well's water supply due to leakage from the surface along the casing.

Specific Capacity

Based on the driller's log, the well was pumped during development at "150+" gallons per minute (gpm) for six hours and showed a pumping level of "99 ft" (bls), compared to a static level of 18 feet bls. If taken at face value, this would suggest that the well's specific capacity is about 1.5 gpm/foot of drawdown. However, because the reported pumping level was at the bottom of the well and because the discharge rate appears to have been higher than 150 gpm, this apparent specific capacity is of questionable accuracy.

Well Test Data of May 10-11, 1994

The well was briefly shut-in during two periods on May 10, and brief pumping tests were performed to evaluate aquifer permeability. Drawdown-time data for both tests are presented in Appendix C and summarized in Figure 3. Recovery-phase data (residual drawdown vs time) were also collected for the longer May 11 test and also are presented in Appendix C. The most prominant feature of these drawdown data is the achievement of near-steady drawdown after about 2-5 minutes of pumping. This suggests either that the system is recharged locally or that the aquifer is unconfined.

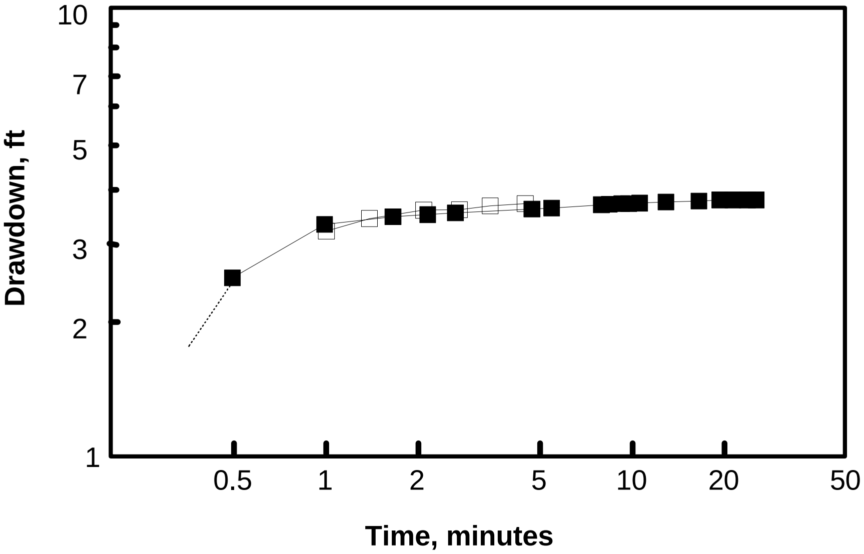


Figure 3 - Drawdown vs time data on double logarithmic graph, for pumping tests on IDPR Well, at 107 gpm discharge rate. Open squares represent 5/10/94 test; filled squares represent 5/11/94 test. The flattening of the curves beyond about 2-5 minutes of pumping suggests either a recharge source very nearby or the effects of pore dewatering in an unconfined aquifer setting.

Since the distance from local recharge sources (e.g., several hundred feet to the nearest canal) precludes the possibility that the flattening of the well's drawdown could occur within so short a time, and because the geology is consistent with an unconfined system, the drawdown data were interpreted as an unconfined aquifer's response. A transmissivity of roughly 490 ft^2/day was estimated by fitting the observed drawdown-time data to the Neuman (1975) delayed drainage type curves for unconfined aquifers. In terms of specific capacity, this is approximately equivalent to about 2 gpm/ft, which is close to the apparent specific capacity reported in the driller's log for the IDPR Well and similar to values reported for the nearby Clarke well (see below). Therefore, the aquifer at this location appears to behave as an unconfined (water table) system whose water level may be sensitive to local recharge from such sources as river leakage and canal leakage.

Other Wells

Of the well logs obtained from IDWR, two contained well development data which permitted an estimate of specific capacity, and hence transmissivity, of the shallow gravel aquifer. One well log, from the old Anderson Ranch (currently occupied by Nate Hogan), indicates a minimum specific capacity of about 1 gpm/ft; another, from the Junction Trading Post well owned by Ron Clarke, indicates a specific capacity of 3-4 gpm/ft. Both these values are similar to those estimated from the driller's log for the IDPR Well and from the IDPR Well's pumping test, so that it appears the transmissivity of the shallow gravel aquifer in an area around the IDPR Well is of the order of 500 ft2/day.

Several deep wells owned by Challis City and the Northgate Inn have reliable well log information. The City East Well #1, located east of Highway 93 about 2000 ft from the Salmon River in a 200+ foot thick, coarse gravel aquifer has a specific capacity about 10 times higher than the Anderson Ranch and Junction Trading Post wells. However, because of its greater screened interval, the permeability of its gravel aquifer is approximately equivalent to that observed in the vicinity of the IDPR Well. The other two city wells are completed in, and obtain water from, fractured bedrock (volcanics). The development data for these wells indicate that, because of the much larger screened interval from which these wells draw their water, the fractured bedrock's permeability is approximately a tenth that of the IDPR Well's gravels. The Northgate Inn well, north of the city, is completed partly in gravel and partly in bedrock and has very low specific capacity (0.1 gpm/ft). If this specific capacity primarily reflects the saturated thickness of the gravel unit, the apparent permeability of the gravel would be less than one one-hundreth of the IDPR Well's gravels. On the assumption that the shallow gravel permeability is similar to that around the IDPR Well, the Northgate Inn well appears to draws its water primarily from the fractured bedrock, whose permeability is very low. The above information suggests that the hydraulic conductivity of fractured bedrock in the area, where it is being exploited for ground-water, is one to two orders of magnitude lower than that of the shallow gravel.

CONCEPTUAL HYDROGEOLOGIC MODEL

HYDROGEOLOGIC SETTING

The primary water-bearing unit in the valley appears to be the shallow gravel unit in the floor of the valley which overlies fractured, water-bearing volcanic rocks of much lower permeability. The gravel aquifer appears to be relatively thin in the Salmon River valley, from the interpretive center southwards (see Figure 2). However, its thickness in Round Valley may be much greater (e.g., City East Well #1's gravel aquifer appears to be 300 feet thick).

On the basis of the IDPR Well's pumping test, the specific capacities of two nearby private wells, and the specific capacity of City East Well #1, the permeability of the shallow gravel aquifer is about 3500 gallons per day per foot (470 ft^2/day, 143 m^2/day). On the basis of well development data available for the deep bedrock wells in the area, the permeability of the fractured volcanics encountered in the lower part of the IDPR Well apparently is 10 to 100 times lower than the permeability of the shallow gravel aquifer.

Water table elevations near the IDPR Well are controlled by the regional hydraulic gradient (about 0.1% in the Salmon River valley, possibly higher near its confluence with Round Valley) and by local infiltration of surface water from canals and irrigation ditches.

SURFACE WATER AND GROUND-WATER INTERACTION

Based on interviews with local residents, well owners, and IDPR staff, wells completed in the shallow gravel aquifer owe a substantial portion of their total capacity to leakage from local surface water sources. Near the IDPR Well, these sources are primarily the Salmon River and local irrigation canals. Wells located near the river (Smith, Cutler wells; see Appendix A) or in tributary valleys (Peters well) appear to not have major seasonal water yield fluctuations and may reflect the influence of river infiltration to the shallow aquifer. Other wells on or near the valley margins and within several hundred feet of canals show marked dependence of both water level and yield on the presence or absence of water in the canals (IDPR Well, Conner well, and numerous shallow wells in Round Valley mentioned by Joe Chester). Tom Coates indicated that the basement of his house has been plagued by flooding almost every year since the canal west of his house was constructed. Since his basement's sump pump consistently begins operating in June of every year, canal seepage apparently takes about 1-1.5 months to infiltrate the 200-300 meters distance from the canal.

In the recent past, the canals have been filled in late April-early May, which is the time of the year that the IDPR Well has recovered. For example, after the canal water had come in May 1, 1993, the IDPR Well ceased pumping air when its water level rebounded by tens of feet; in mid-April 1994, the well was again experiencing low water levels and poor yield, which disappeared by late April, nine days after the canals were filled.

Those wells near the IDPR Well which are apparently dependent on canal water for local recharge also do not experience problems with low water levels and/or yield in the fall or late summer. This suggests that the shallow gravel aquifer in the Salmon River valley is recharged and maintained by canal seepage throughout the irrigation season, and that, following the cessation of canal flow in the fall, ground-water storage in the shallow aquifer gradually declines through the winter so that water levels are at their lowest point every spring before canal water diversion.

RECOMMENDATIONS

Using the estimates of shallow gravel transmissivity obtained from the IDPR Well's pumping test, and assuming a homogeneous shallow aquifer of similar hydraulic characteristics in the immediate vicinity of the IDPR Well, a simple analytical aquifer model was constructed to evaluate the impacts of single and multiple well pumping. Because a single-well pumping test is inadequate to define other key hydraulic parameters necessary for an accurate drawdown prediction of unconfined aquifer response (eg: specific yield, vertical hydraulic conductivity) and because both recharge and low-permeability hydrologic boundaries exist within several hundred feet of the IDPR Well site, an accurate prediction of well drawdown and alternative pumping scenarios is not possible. The analytical model used in this study assumed a vertical to horizontal permeability ratio of 1:10 to 1:1000, a specific yield of 0.2 and an approximate cancellation of the effects of the nearby hydrologic boundaries because of the location of the IDPR Well site approximately midway between these boundaries (see Figure 1). Given these approximations, the drawdown predictions are considered unreliable and no more than rough estimates.

Based on the model, the effect of pumping the IDPR Well, alone, at 100 gpm continuously during the irrigation season (when canal leakage recharges the shallow aquifer) would be to produce a total drawdown of 6-8 feet at the pumping well. If four more identical wells, also pumping continuously at 100 gpm, were spaced equidistantly about the IDPR Well on a perimeter with a radius of 200 feet, the maximum drawdown would occur in the central well and would be of the order of 20 feet. Because the saturated thickness of the gravel aquifer is about 20 feet (at least during dry years, such as 1994), the central well probably could not operate continuously at this pumping rate without breaking suction; the remaining four wells would have drawdowns between 10 and 15 feet and might also suffer significantly from the decreased saturated thickness induced by pumping.

Five wells, identical to the IDPR Well and adequately spaced, could supply 500 gpm of water during the irrigation season for short-term (e.g., 30-minute) emergency use. Before the canals fill each spring, however, when only the low-permeability fractured bedrock aquifer could be exploited, any reasonable number of additional shallow wells alone could not reliably provide 500 gpm. Even during the irrigation season, the wells' ability to perform to design specifications would be sensitive to ground-water level conditions, and might not be adequate in all years. Furthermore, a multiple well arrangement would be costly to install and maintain, and does not appear to be a cost-effective solution for meeting occasional high water demand.

On the basis of the foregoing discussion, an alternative water supply system should be considered for fire fighting purposes. One option is to site and develop one or more deep bedrock wells (comparable to the the deep city wells), which could supply the requisite yield. However, because of the expense of deep drilling and the uncertainty of locating adequate water-bearing and permeable zones in the fractured bedrock, such an option should be considered a last resort.

A second alternative is to develop an emergency water supply from the river, utilizing a dedicated pump and transmission line which would only be activated when fire fighting water demand existed. This would require obtaining the required channel alteration, water diversion, and water rights permits, but appears to be a feasible option.

A third alternative would be to build and maintain a surface or subsurface storage tank or reservoir. The reservoir would be kept full during the winter and early spring and replenished during the irrigation season by intermittent pumping of the existing IDPR Well. A high-capacity water distribution system would draw on this storage for all non-culinary demand, whereas drinking water would continue to be supplied directly from the IDPR Well and pressure tank system. The reservoir would be capable of supplying a minimum rate of fire fighting water for a specified period. For example, for a 30 minute supply at 500 gpm, about 2,000 cubic feet of storage would be required; an in-ground, lined reservoir 30 x 20 x 5 feet would be more than adequate. The existing IDPR Well could fill such a reservoir to capacity in less than 4 hours during the summer months. To fill the reservoir during the early spring, the well would have to operate intermittently to allow ground-water levels to recover between pumping cycles; in this case, the filling of the reservoir could take one to two weeks. A set of cut-off switches should be installed in the well at adjustable depths so as to automatically cycle the pump on and off during reservoir filling and during normal operation.

REFERENCES

Fisher, F.S., D.H. McIntyre, and K.M. Johnson, 1983, Geologic Map of the Challis 1^o x 2^o Quadrangle, Idaho, 1:250,000: U.S. Geological Survey Map OFR 83-523.

McIntyre, D.H. and S.W. Hobbs, 1978, Geologic map of the Challis quadrangle, Custer County, Idaho: U.S. Geol. Survey Open-file Report 78-1059.

Neuman, S.P., 1975, Analysis of pumping test data from anisotropic unconfined aquifers considering delayed gravity yield: Water Resources Research, 11, p. 329-34.

APPENDIX A Interview Summaries

Rick Brown and Chuck Felton, IDPR staff. The IDPR Well was drilled in October 1991, and no data or reports of water levels for the 1992 water year are available. During the spring of 1993, after the Interpretive Center building was opened, the well started sucking air during pumping when static water levels were at about 45-50 ft bls (water level measured in April 1993 was 45.5 feet bls); canals were filled May 1, 1993, after which the well's yield became adequate. Later in May 1993, the pump was dropped to 75 feet bls in an attempt to avoid air sucking. In mid-April 1994, before diversions of upstream river water to the canals, well yield was again reported as poor; canal diversion occurred April 16, and by April 25, static water level in the well was 40 ft bls and capacity was sufficient to irrigate at a sustained discharge of 40-50 gpm.

Joe Chester, commercial well servicing. He had excellent knowledge of well water yield problems. Wells in the Salmon River valley south of the Interpretive Center are tapping very heterogeneous shallow aquifer(s), where nearby wells can show very different water yields. As an example, he described wells on Ray Laverty's property all within about 600 feet of the house. One, at 280 feet deep, barely provided any water at all. A shallower nearby well, however, produced excellent water quality and quantity.

Wells north of Challis along Challis Creek Road, which are situated on the alluvial fan terrace, are 250-400 feet deep and are all subject to low water levels in the spring of the year. Wells in the main river valley are generally 40-60 feet deep and also generally appear to be very sensitive to the presence or absence of water in the canals which run along the west side of the valley.

Deep wells in the area are apparently not subject to similar reliance on canal operation, but nevertheless are generally not free from low-yield problems. For example, the Mormon Church's deep (>400 feet) well north of town pumps continuously at only about 5 gpm with surface storage to provide peak demand. The 1,000 ft deep Northgate Inn well experiences >300 feet of drawdown at 50 gpm.

Dean Smith, private well owner. His shallow (60 feet) well, located in river valley gravel, was pumping 56 gpm in early May 1994. He estimated it was capable of a rate as high as 200 gpm. Static water level in early May was approximately 28 feet bls and was said to fluctuate between 22 and 28 feet bls through the year.

Tom Coates, private well owner. During the first week of May 1994, Coates noticed that his well was pumping sand, and surmised that the pump was intermittently breaking suction. A sump pump was installed in the basement of his house to alleviate chronic flooding that occurred after the canal was constructed, and has consistently started operating in June of every year, consistent with delayed arrival of seepage water from the two canals located 300-900 feet to the west.

Jim Conner, private well owner. Conner observed over the past several drought year that water levels in his ca. 130-foot deep well have always shown a rise of about 40 feet after the canals filled in the spring. He recalled that in 1980 or 1981, which were not drought years, the well's static water level was 117 ft bls; in June of the following year, the water level had risen to 40 ft bls. Since his water demand is low, the well produces only 5-10 gpm fairly continuously, but it is unknown whether this represents its maximum capacity. Despite the low demand, the well will draw down when used for irrigation before the canals are filled.

Michael Cutler, private well owner. Of two wells in the river valley south of the Interpretive Center, the deep (ca. 300 feet) one is completed in bedrock and produces a minimal quantity of water barely sufficient for culinary use. The shallow well has its pump set at about 60 feet bls in gravel. This well produces water of excellent quality and quantity, and has not suffered from excessive drawdown in 11 years of operation, including drought years.

Pete Peters, private well owner. This well, located in the mouth of the Birch Creek tributary valley south of the Interpretive Center, is 75 feet deep and shows very little seasonal water level variation year round. The well produces approximately 60 gpm and static water level is about 65 ft bls.

APPENDIX B Well Log Information

Information on subsurface lithology and well completion was obtained from drillers' logs, where available. Copies of eight well logs, obtained from the sources listed below, are on file at the IGS Pocatello Branch Office. A copy of the IDPR well log, obtained from IDPR Interpretive Center personnel is included in this appendix.

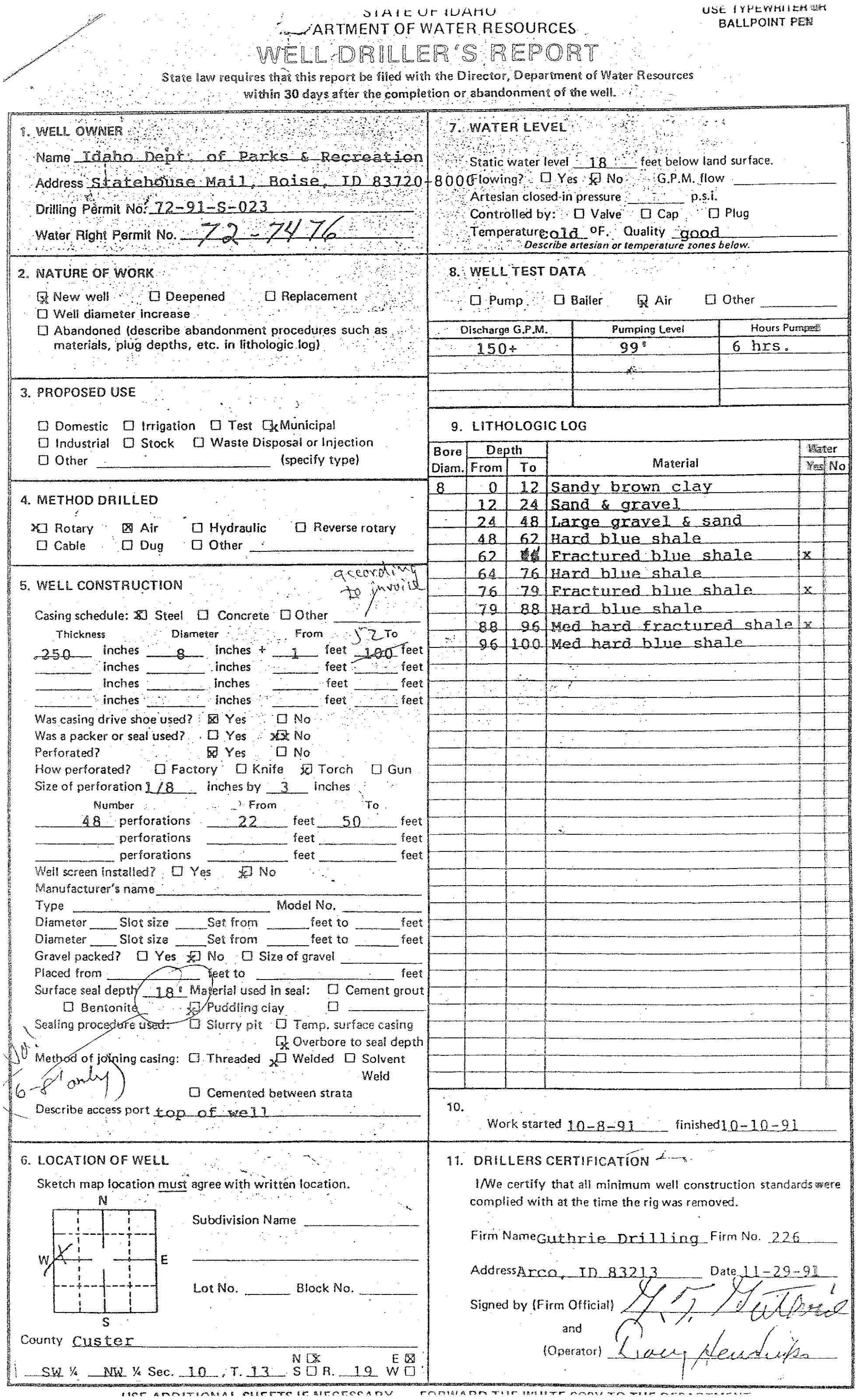
Sources: Idaho Department of Water Resources,
Twin falls Field Office

City of Challis

Idaho Department of Parks and Recreation
(example included below)

Northgate Inn

Idaho Department of Parks and Recreation Well Log



STATE OF IDAHO
ARTMENT 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 Idaho Dept. of Parks & Recreation
Address Statehouse Mail, Boise, ID 83720-8000
Drilling Permit No. 72-91-S-023
Water Right Permit No. 72-7476

2. NATURE OF WORK

☒ New well ☐ Deepened ☐ Replacement
☐ Well diameter increase
☐ 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

according to invoice

Casing schedule: ☒ Steel ☐ Concrete ☐ Other ____

Thickness		Diameter		From		To	
.250	inches	8	inches	+ 1	feet	52 ~~100~~	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 ☐ Gun
Size of perforation 1/8 inches by 3 inches

Number		From		To	
48	perforations	22	feet	50	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
☐ Bentonite ☒ Puddling clay ☐ ____
Sealing procedure used: ☐ Slurry pit ☐ Temp. surface casing
☒ Overbore to seal depth
Method of joining casing: ☐ Threaded ☒ Welded ☐ Solvent Weld
☐ Cemented between strata
Describe access port top of well

No! 6-8' only

6. LOCATION OF WELL

Sketch map location must agree with written location.

N
W E
S

Subdivision Name ____________
Lot No. ____ Block No. ____

County Custer

SW ¼ NW ¼ Sec. 10, T. 13 N ☒ S ☐ R. 19 E ☒ W ☐

7. WATER LEVEL

Static water level 18 feet below land surface.
Flowing? ☐ Yes ☒ No G.P.M. flow ____
Artesian closed-in pressure ____ p.s.i.
Controlled by: ☐ Valve ☐ Cap ☐ Plug
Temperature cold °F. Quality good
Describe artesian or temperature zones below.

8. WELL TEST DATA

☐ Pump ☐ Bailer ☒ Air ☐ Other ____

Discharge G.P.M.	Pumping Level	Hours Pumped
150+	99'	6 hrs.

9. LITHOLOGIC LOG

Bore Diam.	Depth From	Depth To	Material	Water Yes	Water No
8	0	12	Sandy brown clay		
	12	24	Sand & gravel		
	24	48	Large gravel & sand		
	48	62	Hard blue shale		
	62	64	Fractured blue shale	x	
	64	76	Hard blue shale		
	76	79	Fractured blue shale	x	
	79	88	Hard blue shale		
	88	96	Med hard fractured shale	x	
	96	100	Med hard blue shale		

10.

Work started 10-8-91 finished 10-10-91

11. DRILLERS CERTIFICATION

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

Firm Name Guthrie Drilling Firm No. 226
Address Arco, ID 83213 Date 11-29-91
Signed by (Firm Official) G. T. Guthrie
and
(Operator) Gary Hendricks

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

APPENDIX C Water level data for pumping tests on IDPR Well

Idaho Dept. Parks & Recreation Supply Well | Yankee Fork State Park Interpretive Center

5/10/94 static water level after
20 min. shut-in = 21.9 ft bls

	t, minutes	*log(t)*	*water level, ft bls*	*drawdown, ft*
Pump on:	0	n.a.	21.9	0
	1	0	25.08	3.18
	1.5	0.18	25.29	3.39
	2.5	0.4	25.44	3.54
	3.5	0.54	25.45	3.55
	4.67	0.67	25.52	3.62
	6.5	0.81	25.56	3.66

5/11/94 static water level after
12 hour shut-in = 21.5 ft bls

Pump discharge rate = 107 gpm

	t, minutes	*log(t)*	*water level, ft bls*	*drawdown, ft*
Pump on:	0	n.a.	21.5	0
	0.5	-0.3	24	2.5
	1	0	24.79	3.29
	1.67	0.22	24.92	3.42
	2.17	0.34	24.96	3.46
	2.67	0.43	24.99	3.49
	4.75	0.68	25.06	3.56
	5.5	0.74	25.08	3.58
	8	0.9	25.14	3.64
	8.5	0.93	25.15	3.65

	9.33	0.97	25.16	3.66
	9.83	0.99	25.16	3.66
	10.67	1.03	25.17	3.67
	13	1.11	25.19	3.69
	16.67	1.22	25.21	3.71
	19.5	1.29	25.23	3.73
	21.5	1.33	25.23	3.73
	24	1.38	25.23	3.73
	25.67	1.41	25.23	3.73
Pump turned off:				
	25.67	n.a.	25.23	3.73
	26.33	n.a.	21.83	0.33
	27.5	n.a.	21.72	0.22
	28	n.a.	21.69	0.19
	28.75	n.a.	21.65	0.15
	29.5	n.a.	21.63	0.13
	30.25	n.a.	21.6	0.1
	31	n.a.	21.59	0.09
	33.5	n.a.	21.56	0.06
End Test :	34.5	n.a.	21.54	0.04